SATELLITE COMMUNICATIONS:
THE POLITICAL DETERMINATION
OF TECHNOLOGICAL DEVELOPMENT,
1961-1975

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ABSTRACT

The thesis sets forth a model relating political contention to technological development. The selective realisation of a technical potentiality is shown to have been determined by conflict and negotiation among shifting alliances of state and private-industrial entities, each attempting to impose its requirements upon an emergent technology and thereby to dictate the precise form and pace of technical development.

The course of communications satellite development is examined during the technology's formative period—from 1961 to 1975—as the product of struggles over technological control. Negotiation centered upon control, and contending modes of technical development were promoted and opposed on the basis of their perceived consequences upon the distribution of effective control over the technology.

The initial mode of satellite development lasted from 1961 to 1971, and is characterised as pre-emptive underdevelopment; urgency and haste were combined with tight constraints on the qualitative breadth allowed to technological articulation. Pre-emptive underdevelopment derived from an uneasy political accommodation struck among constituencies dominant during this phase: the U.S. government, American communications carrier industry and a Western European intergovernmental bloc. The reigning compromise was directed toward expediting satellite development sufficiently to forestall rival deployments without endangering existing and anticipated interests in both satellite and competitive technologies. Technical development beneath a minimum level risked undermining the regime of control by leaving open the possibility of rival satellite systems: but development beyond a maximum level would have harmed the outstanding industrial and political interests in whose defence control was sought, while subverting the control regime by widening the legitimate scope for multinational participation in authority over the technology.

Pre-emptive underdevelopment, it is argued, was succeeded largely by the products of its own success in meeting the policy requirements of initially dominant entities and in thus reducing the continued importance of satellite technology as a political arena and instrumentality. Restraints upon development could therefore, in the post-1971 period, be relaxed, while the growing demand for a wider array of satellite services encouraged emergence of a more intensive mode of technological development under the auspices of a de-cartelised, quasi-federal and multinational political regime.
ACKNOWLEDGEMENTS

Individual authorship is, in many respects, more convention than fact. A work such as this one--whatever its original component--remains basically a recounting and reinterpretation of a history as shaped, experienced and recorded by others. More important, the conceptual priorities, hunches and analytical skills that the author brings to bear have been largely engendered and nourished by still others, leaving the individuality of the ultimate authorship further suspect.

This study dates back to a suggestion made to me in late 1969 by the late Stephen Hymer, who was then associate professor of economics at Yale and my senior year adviser. Hymer proposed that I examine international telecommunications and broadcasting as both indices and instruments of American political and economic expansionism. I finished an essay on the subject the following spring, having benefited directly from his counsel and indirectly from the influence and guidance of professors Charles E. Lindblom and Susan Lepper.

Although I left the subject alone for the next four years, the influence of two people with whom I came in contact during that period is very much present in this work. The first was Professor Kostas Axelos of the University of Paris-I, whose lectures and writings afforded me access to some understanding of Hegelian dialectics; in the course of this study, that understanding became a principal theoretical device for conceptualising the phased political and technological development of satellite technology.
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In addition to the IBI library, I also made considerable use of the LSE's Library of Politics and Economics, the University of London's Senate House Library, the library of the Institute for Advanced Legal Studies, the British Library, the City University of London library, Yale University's Sterling Memorial Library, the Federal Communications Commission's library and the Library of Congress.
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Casper, Wyoming, U.S.A.

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PART ONE

INTRODUCTION:
Satellites and their precursors
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ABBREVIATIONS AND ACRONYMS

ABC: American Broadcasting Company
ADSCP: Advanced Defence Satellite Communications Programme
Aerosat: Aeronautical Satellite System
ARPA: Advanced Research Projects Agency
ATS: Applications Technology Satellite
AT&T: American Telephone & Telegraph Company
BNSS: Broadcasters’ Nonprofit Satellite Service
CARIFTA: Caribbean Free Trade Association
CBS: Columbia Broadcasting System
CEPT: European Conference of Posts and Telecommunications
CBTS: European Conference of Satellite Telecommunications
Comsat: Communications Satellite Corporation
CPUOS: UN Committee on the Peaceful Uses of Outer Space
DCA: Defence Communications Agency
DOD: Department of Defence
DTM: Director of Telecommunications Management
EARC: Extraordinary Administrative Radio Conference
EBU: European Broadcasting Union
EEC: European Economic Community
ELDO: European Launcher Development Organisation
ESA: European Space Agency
ESRO: European Space Research Organisation
FAA: Federal Aviation Agency
FCC: Federal Communications Commission
FDMA: Frequency Division Multiple Access
Fleetsatcom: Naval communications satellite system
GE: General Electric
GT&E: General Telephone & Electronics
HF: High Frequency
ICAO: International Consultative Aviation Organisation
ICBM: Intercontinental Ballistic Missile
ICSC: Interim Communications Satellite Committee
IDSCP: Interim Defence Satellite Communications Programme
IMO: International Maritime Organisation
CHAPTER ONE: INTRODUCTION AND OVERVIEW

1. CONTROVERSIES INTRODUCED

Between 1965 and 1969 the world's first public communications system based upon earth satellites was put into global operation, providing broadband transmission facilities capable of conveying virtually any electrical media: telephone, telegraph, teletype, facsimile, high-speed data, radio and television. The project was an extraordinary one technically and organisationally. An advanced aerospace technology, barely out of its infancy, was formally entrusted to an international commercial organisation specially created to carry forth its development and application. Within a decade the organisation's membership grew from 17 to 91 nations; four generations of satellites had successively been deployed, and some 40,000 voice-circuits of capacity were in place. From a single transatlantic pathway in 1965 the network expanded to 359 pathways worldwide by 1975. In a few years' time the capacity for interconnecting metropolitan regions of the world was increased several-fold, while cheap high-quality links were for the first time made available to regions long reliant on antiquated and undependable services. (1)

The project and the technology were hatched from a mould pre-formed by the political and industrial contradictions of the era. There were, as a U.S. satellite official observed in 1966, "conflicts within conflicts within conflicts." (2) The satellite system was, at the same time, the product of state policies explicitly aimed at sustaining national supremacy abroad, and of unparalleled international cooperation; of peaceful objectives whose realisation entailed use of military hardware designed for massive destruction; of narrowly commercial calculation wedded to a mandate to serve on an equal
basis rich and poor areas of the world; of a new technology placed in the hands of the very industrial interests that stood to lose the most from its success; and of a communications device developed to dramatise global power, yet whose actual functioning could subvert that hegemony by interconnecting the powerless without obliging them to submit to the continuous mediation of the powerful.

Accordingly, the venture has been subject to contrasting judgements throughout its history. The first major step toward creating the global system was the establishment, by an act of the U.S. Congress in August 1962, of the Communications Satellite Corporation (Comsat), a private profit-seeking corporation whose ownership was divided between the American communications carrier industry and the general investing public, and which would serve as America's chosen vehicle in the commercial communications satellite field. "Congress", said President Kennedy when he signed the Comsat Act, "has taken a step of historic importance."\(^{(3)}\) A leading Republican senator applauded "the first opportunity for us as a nation to extend our social structure into space."\(^{(4)}\) Among liberals the combination of state initiative and private ownership was viewed as an ingenious approach to a host of social ills:

No idea has set some Congressional hearts throbbing more than the notion that 'Comsat-Type corporations' should be set up to solve a whole range of social problems...If such a Federally-organized and privately-financed enterprise can be set up to shoot satellites into orbit, why not a similar partnership for rebuilding the cities?\(^{(5)}\)

Investors, inspired by talk of a future billion-dollar-a-year business, welcomed the new corporation warmly\(^{(6)}\) and the New York Stock Exchange for the first time approved a company's stock for listing before shares had actually been issued. "Comsat ranks as the biggest publicly labeled speculation in Wall Street history", said The New York Times.\(^{(7)}\)
Opposition to the Comsat Act, however, had been intense from dis­
sident Senate Democrats who denounced the alienation of a government-
developed technology from the public domain and who saw anti-competitive
potential in the new corporation's ownership provisions. The bill was
called "shocking and unconscionable" and a giveaway of our taxpayer-
financed communications space satellites to a private monopoly." A
filibuster on the Senate floor forced the bill's supporters to vote to
debate - the first time cloture had been passed in 35 years. Former President Truman complained:

I don't think the President understands the bill. The damned
Republicans and some Democrats are trying to give away public
property. The public spent 25 or 30 billion dollars developing
satellites and the communications system ought to be publicly
owned. The Republicans will give away everything if you don't
watch them.

The Act created "a unique corporation designed to do little more than
accommodate the established economic interests...a convenient institutional
mechanism for preserving institutional relationships."

Similarly contradictory observations were occasioned by the next
stage in the satellite system's creation, the establishment in 196^ of the
International Telecommunications Satellite Consortium (Intelsat), negotiated
among the U.S. and 17 mainly Western European countries. American officials
acclaimed Intelsat as a "blueprint for modern communications", and "the
first truly international partnership of independent nations in a commercial
venture." Intelsat was "an unprecedented commercial enterprise...

Nowhere else can we find less developed countries introduced
as members of a multinational activity having a substantial
capital subscription, advanced technical operations, immediate social, political and economic impact, and growing revenues.

President Johnson praised Intelsat as "quite simply a cooperative undertak­
ing of many nations to finance an international communications system
which is of advantage to all."

Foreign observers were less enthusiastic, and pointed to Comsat's
status within the 1964 Intelsat arrangements - subject to re-negotiation
in 1969 - as majority stockholder, manager and U.S. representative. "To the critical eye", said a British UN official, "Comsat is Lord High Executioner and Lord High Everything Else." A French paper delivered at the 1968 UN space conference charged that the United States "is crushing with its technical and technological might the European countries by creating monstrous satellites and earth satellites and imposing them upon all." A Soviet official stated that in establishing the space communications system, the U.S. has practically ignored the UN and the ITU /International Telecommunications Union/. Behind the backs of these organizations, it arranged with a small group of Western countries for the sharing out of the profits from the operation on American terms.

An Asian Intelsat staffmember described the interim organisation as a "North Atlantic club", and an official of the U.S. State Department who helped negotiate the 1964 arrangements has written of "a failure of vision and purpose in United States policy", marked by "excessive unilaterism."

Of greater importance than these political controversies, however, has been disagreement over the ultimate success of the technological effort that the organisational arrangements were fashioned to sustain. On the one hand was the achievement of a worldwide network which by mid-1975 comprised 88 ground stations in 64 countries served by an orbiting constellation of five on-line and four reserve high-capacity satellites. A Comsat executive has fairly asked whether "any new technology has been brought to practical application in so many parts of the world so rapidly after its conception." Indeed, Intelsat's inauguration of global satellite service in July 1969 came less than 12 years after the first artificial satellite was launched in October 1957; seven years after the first transatlantic telephone call via satellite; and six years after the first successful high-altitude geostationary satellite, the design which became the basis of the commercial network.
Far lengthier delays between invention and widespread availability have been seen in much more trivial devices: 79 years for the fluorescent lamp, 56 years for the gyrocompass, 27 years for the zip fastener, nine for the safety razor. The creation of a fully operational international communications network on a global scale in less than a decade, incorporating a previously unproven and virtually unimagined technology, can justly be termed remarkable.

On the other hand, as J. Halloran has written, "We need to bear in mind the social costs that stem from restricted or inadequate exploitation of an innovation." Utilisation of the satellite system, for example, has been dominated overwhelmingly by telephone traffic. In 1971, the year when permanent organisational arrangements for Intelsat were agreed after two years of negotiation, full-time leases of satellite circuits for phone service accounted for 83 percent of usage, a fact which led journalist B. Maddox to call Intelsat "the big telephone company in the sky." With so-called record traffic-telegraph, teletype, facsimile and data - comprising most of the remainder, one of the most spectacular potential uses of the network, live intercontinental television relay, has been relegated to tertiary importance - between two and five percent of Intelsat's circuit use and revenues. Although TV relay on an intercontinental basis can only be accomplished via satellite, and despite the fact that this capability was invoked frequently to enhance the attractiveness of the satellite project, television's relative share of Intelsat circuits was by the early 1970s showing a consistent decline due to overall increases in the system's capacity, and consisted "primarily of international broadcasts of news events and special programmes (e.g. visits among Heads of States, major space shots and major sports events)", as Comsat's president wrote in 1975. A 1969 European Broadcasting Union report complained of "limited availability and generally rather adverse conditions" faced by broadcasters wishing to
use satellite circuits; high tariffs, high minimum transmission
times, an unwillingness of some national telecommunications entities
to carry TV at all, a limited demand, and a general attitude on Intelsat's
part that TV relay is marginal and expendable have all been blamed for the
paucity of traffic. (33)

The "atmosphere of celebration" that has accompanied growth of
the satellite system has, however, been dampened by much more than the
lack of TV traffic: larger dissatisfaction has derived from the belief
in an epoch-making potentiality of the technology which, it is felt, has
been largely neglected and under-explored by the most competent and best-
endowed organisation available for the task. Technically, satellites are
far more than what Fortune magazine called "the great cable in space", differencing markedly from all preceding forms of electrical transmission,
which are deployed as single-route links of fixed capacity, capable of
connecting only two points directly or through elaborate switching
equipment. (36) In terms of capacity, coverage, capital and operating
costs and flexibility satellites offer great advantages over rival tech­
nologies. The Intelsat IV satellites deployed in the late 1960s provided -
depending upon how many terminals were connected at once - between five
and ten times the circuit capacity of the contemporary generation of
undersea cables. Coverage is global, aside from polar regions, irres­
pective of natural obstacles and topography. The cost of a three-sat­
ellite worldwide capability was around 10 percent greater than that of a
single transatlantic phone cable and, operationally, because the synchro­
ous orbital band is located at the extremely high altitude of 23,400 miles,
much the greater part of the total distance travelled by any transmission
is between earth and spacecraft: thus the cost of using satellite relays
is virtually insensitive to terrestrial distances. Finally, satellites
can handle a number of different routes simultaneously, re-allocating
capacity among various pathways according to their precise traffic requirements, and serving either point-to-point or point-to-multiple points communication patterns. Circuits need not be assigned permanently to earth stations, and terminals can be mobile.\(^{(37)}\) "In short, contrary to some representations, satellites are not 'just another transmission medium', but can substitute for both the transmission and the switching-routing facilities required in terrestrial networks"\(^{(38)}\) - not merely a cable, but a "network in the sky."\(^{(39)}\)

With those capabilities, the possible applications of satellite systems are clearly not limited to duplicating the services provided since the mid-1950s by successive generations of undersea phone cables. Satellites can furnish domestic or regional service, substituting for extensive and costly terrestrial microwave or cable networks; they can broadcast to vast areas from a single transmitter to suitably augmented receivers, provide navigational guidance to ships and aeroplanes, and conduct precise surveys of agriculture and natural resource deposits.

It is then against this backdrop of great possibilities that much of the dissatisfaction with Intelsat has been voiced. In late 1969, while permanent organisational arrangements were being negotiated to succeed the 1964 interim agreements, a report by a 20th Century Fund-Carnegie Endowment conference urged Intelsat to expand its operational rubric to encompass a multiplicity of satellite applications: "An integrated and global system of satellite communications, taking into consideration the coordination of existing or projected systems, is most desirable as a means of assuring the best service with the greatest economy."\(^{(40)}\) The course Intelsat took can be charted from the account of a similar conference two years later, which reported

general dismay that this consortium of nearly 80 countries, the owner of the world's first global satellite system, should have adopted a structure through which it can become nothing more than an international telecommunications carrier...Intelsat was becoming a restricted commercial organization for conventional communications traffic.\(^{(41)}\)
Intelsat had, in effect, formalised its specialisation "into the accepted and conventional role of an intercontinental carrier of voice and message traffic", while "the future development of satellite communications will occur outside the framework of this consortium."(42) The result was deemed likely "to consign satellite communications to a global framework much more diffuse and decentralized than it need have been."(43)

Intelsat's renunciation of a wide-ranging monopoly over satellite applications has been defended as appropriate to satellite technology - the development of focussed and hence localised beaming techniques having rendered unnecessary supervision on a worldwide basis(44) - and as a prudent way to avoid creating unduly a centralised supra-national authority.(45) But it has not hitherto been explained as a necessary response to a developmental stalemate caused by unresolved political conflicts internationally and within the United States, and a means thereby to unfreeze satellite development by liberalising the structure of control over the field.

By the time permanent organisational arrangements for Intelsat were agreed in 1971, satellite development had been skewed and stunted in the following respects: 1.) effective priority had gone to deployment of military communications systems and, in the public sphere, to establishment of facilities for the intercontinental relay of voice and record traffic; 2.) development of systems dedicated to regional - intra-continental - service had not occurred; 3.) use of satellites to replace domestic telecommunications infrastructure was largely unexploited; 4.) broadcasting via satellite either to intermediary ground transmitters or directly to receiving sets had not taken place on a significant scale; 5.) specialised satellite systems (e.g. aviation guidance or maritime communications) had not been created outside the military.
None of these undeveloped or underdeveloped applications required significantly more sophisticated technology than was contemporaneously being deployed by Intelsat - and to the degree that work was going forth in those areas, it was almost entirely outside the Intelsat rubric. In October 1965 - six months after Intelsat's first spacecraft, Early Bird, was put in service over the Atlantic - the launch of a second Soviet Molniya satellite assured nine hours daily domestic telecommunications between Moscow and Vladivostok; by 1972 the resulting Orbita network was providing TV coverage to a potential audience estimated at 65 percent of the Soviet population. Canada too embarked independently on creating a domestic satellite system in 1967, and Telesat began full-time operations in December 1973. Canada's satellites were built by Hughes Aircraft, which had supplied all but one of Intelsat's satellite generations. Numerous proposals for domestic satellite service within the U.S. had been made starting in 1966, including systems for broadcast relay, high-speed data, cable TV interconnection, direct broadcast, and supplementary voice and record relay service. Technical feasibility was not at issue in the delays that kept satellites out of the U.S. until 1974: it was accepted that the high-altitude geostationary satellite - with multiple-access capability, which had been developed by Hughes and used successfully by Intelsat, was a thoroughly practicable technology for any and all of the proposed services.

In short, the fact that a decade after satellites had demonstrated their usefulness they were being used primarily as a supplementary means of relaying intercontinental telephone calls suggests a distortion of technical potential - if not a basic malocclusion between evident need and effective demand. For the first time the means of providing at low cost virtually all forms of mass media and telecommunication services - domestically, regionally or internationally - was available for global
deployment. The profound bias toward serving metropolitan commercial and administrative activities which resulted is not explicable by the character or inherent limits of the technology itself. The explanation must be sought in the political and industrial interests whose collisions - and collusions - comprise the history of the technology's formative years.

2. AN OUTLINE OF THE SATELLITE SYSTEM'S POLITICAL HISTORY

For the United States internationally, the 1962 creation of the Comsat Corporation marked, in retrospect, a mid-way point between Sputnik and Vietnam, combining elements of the post-Sputnik technological hysteria with an emergent awareness of the need to establish reliable links with areas at the margins of the American military and commercial periphery. The timing of President Kennedy's first formal announcement of an accelerated communications satellite programme is suggestive of the two themes, coming in May 1961, soon after the intelligence failure represented by the Bay of Pigs invasion and the Soviet scientific achievement signalled by Yuri Gagarin's first orbital flight.

Both elements merge in what H. Schiller has termed "an inseparable military connection" to early satellite activities, evident in the scientific and technical environment from which satellites emerged and in the applications for which they were most urgently required. The U.S. rocket programme had languished as a curious sidelight - to the advantage of manned bombers - until H-bomb tests in 1952 and 1954 proved light-weight thermonuclear warheads to be feasible. Moreover, under the Kennedy Administration U.S. strategic policy was undergoing a fundamental shift from the Eisenhower-Dulles doctrine of 'massive retaliation, no conventional wars' to one of 'flexible response, limited wars'. On the one hand, this change entailed a considerable increase in the size and
sophistication of the American nuclear arsenal, making both possible and desirable some indication of a corresponding U.S. resolve to share the fruits of modern war technology for peaceful purposes. On the other hand, the more finely controlled military capability required by the new doctrine would need much improved communications facilities: delays of from 24 to 36 hours were, according to the Secretary of State, not unusual in attempts to reach diplomatic missions through existing channels.\(^{(52)}\)

A global satellite system would up-grade the "vital nerve system of our modern military establishment,"\(^{(53)}\) consolidating control over remote operations; it would, along with the commitment to place a man on the moon (also announced in Kennedy's May 1961 statement), legitimate space activity in general and help secure international agreement on radio frequencies - required too for the military's programme - at a crucial September 1963 meeting in Geneva; and it would provide an American-led but nonetheless multinational project that was symbolically appealing to the 'non-committed' newly independent countries of the Third World, whose importance was increasingly appreciated within the U.S. government, and reassuring to America's allies.\(^{(54)}\) From these concerns, and from a desire to recoup national prestige believed lost because of early Soviet space triumphs, derived a firm state policy supporting rapid and worldwide deployment of communications satellites.

It was not, however, the state's objectives that so inflamed passions in the Senate during the Comsat Act debates, but rather the terms of the new corporation's integration into the American communications carrier industry. The industry, led by its dominant member American Telephone & Telegraph (AT&T), had moved quickly and skillfully during 1961 to draft organisational proposals calling for private consortium ownership of the satellite system, hoping thereby to pre-empt the possibility of government ownership. Although the Act settled that issue, it left open the more dangerous possibility that the new corporation would develop into a fully
independent and well-endowed competitor with exclusive rights to a low-cost alternative to the carriers' submarine cable holdings. Since cables were a more expensive and therefore - under U.S. regulatory practice - more profitable technology, their protection was a principal carrier concern. Furthermore, the unconditional success of satellite technology under Comsat's auspices would facilitate the corporation's expansion into the much richer domestic communications market. These considerations prompted a series of complex challenges to Comsat by the carrier industry between 1965 and 1971, which were adjudicated and largely sustained by the Federal Communications Commission. Recounted below in Part IV, the challenges effectively: forced Comsat to share ownership of U.S. earth stations with the carriers; prevented Comsat from selling its services to entities other than its carrier competitors; gave the carriers wide discretion over whether to channel traffic by satellite or through their own cables; adopted uniform overseas pricing policies, so that satellite economies were not reflected in lower relative tariffs; permitted new high-capacity cables to be built in the Caribbean, Atlantic and Pacific; and denied Comsat a franchise on domestic satellite service. The net effect of these decisions was to constrict Comsat's operational autonomy to where it became virtually a wholly dependent resource of the private carrier industry, and to restrain utilisation of the global satellite system by the biggest source of international telecommunications traffic, the United States.

For Comsat, this erosion domestically rebounded onto a deteriorating position internationally. From 1964 to 1971, while Intelsat functioned under interim arrangements, Comsat used its dominance in the consortium to force the pace of satellite development and deployment, both to secure its standing at home vis-a-vis its carrier rivals and to justify its dominant Intelsat role in view of the forthcoming organisational re-negotiations, which would begin in 1969. Dissatisfaction on the part of
European participants dated from the first set of negotiations in 1963-64 when, notably, attempts to mandate an international spread of equipment procurement contracts were rejected by Comsat in favour of procuring solely on the basis of best price and quality—a formula likely to assist American producers in extending their competitive advantages. Indeed the very dominance secured by the U.S. for Comsat served to dampen European enthusiasm for cooperation, encourage foreign collaboration with American carriers on new cable projects, and enhance the political and industrial allure of separate satellite development outside the Intelsat rubric. The U.S. government assisted Comsat by promulgating a 'single global system' policy, which justified blocking exports of potentially satellite-related hardware and data by American manufacturers and denying launcher services to independent satellite initiatives that might draw traffic from the Intelsat system. Until Intelsat, however, officially determined just which applications its system would provide, this was applied to virtually all non-Intelsat systems. Thus with the Europeans resisting Comsat's efforts to expand Intelsat's competence into new satellite fields in order to avoid extending American dominance into promising avenues for independent exploitation, and with the U.S. trying to block most satellite efforts outside Intelsat, the field was headed for stalemate.

The stakes of satellite availability were, however, being dramatically widened by the enormous interest in the technology shown by Third World countries which, by the time the Intelsat re-negotiations opened in 1969, comprised more than half the organisation's membership. These countries, for the most part, supported substantial modifications in Intelsat's structure and procedures to create a wider spread of effective influence to be exercised. More important, they were impressed by the numerous as-yet undeveloped applications of satellite technology and
unwilling to let outstanding disputes among industrial countries restrain the technology's qualitative spread. For the U.S., the importance attached to the field had diminished in large measure because of the system's success in fulfilling the objectives originally associated with it: a Soviet system had not emerged to rival Intelsat; the network was providing the required services and was self-sustaining, and the project had enlisted global participation and some enthusiasm. Steps toward greater multilateralisation were supported by Western European as well as Third World members, and relaxation of the 'single global system' claim would open up opportunities for American manufacturers — who had lost business because of export restrictions -- as well as European firms.

Thus, in the permanent Intelsat arrangements concluded in May 1971, Comsat lost its comprehensive veto and had its vital managerial role made contractual and limited to technical and operational matters; a transition was begun toward an international secretariat for administrative and financial management; two plenary assemblies, one intergovernmental and the other consisting of nominated operating entities, were created. Most important, procedures were adopted to permit Intelsat members to build and operate domestic, regional and specialised satellite systems, either within or without Intelsat.

With this evident devolution of control came decompression and a surge of renewed efforts in the satellite field. In addition to the Canadian system, domestic satellites were deployed in the United States and Indonesia, a year-long experiment on direct satellite broadcast was conducted in India; planning continued on a European telecommunications satellite network, an Arab League system and similar in Japan, Brazil, and among France and francophone areas of Africa and the Americas. Separate international forums were established to negotiate development of an aeronautical guidance satellite system and a maritime communications
network. Within Intelsat, large blocks of hitherto unused capacity began being leased at promotional rates for bilateral and domestic service. De-monopolisation in the satellite field has meant diversification and proliferation; de-monopolisation was premised on securing the main objectives for which control was sought, the fulfilment of which permitted relaxation of developmental restraints that had helped to sustain that control.

3. OTHER STUDIES OF THE SATELLITE SYSTEM CONSIDERED

Two preliminary points should be made on the secondary satellite literature before examining the small number of full-length works on the subject that have appeared; first, they are the work of Americans; second, none has emerged from the research tradition of media studies. The present study is no exception to the first point, which is mentioned because the works taken collectively represent a minor cross-section of the contemporary range of American socio-political discourse - from technocratic analysis and pluralism/incrementalism, to neo-populism and neo-imperialism. What is impressive however is less the range than the overall lack of coherence: each treatment focusses on a single theme of a complicated history, developing it with a conceptual bigotry that makes difficult finding common ground on which to base dialogue. The point is not variety of interpretation, but widely divergent background assumptions as to the location of the satellite history's meaning - and therefore basic disagreement over sources and weights of social determinants, especially as concerns relations between state and private sectors.

As to the second observation, the satellite system's history fits poorly into the principal concerns of media studies because it requires consideration of an emergent, not a given, technological form and because that form has been defined as a telecommunications device, not a 'mass
medium'. With few exceptions communications technologies are treated in media studies not as social outcomes but as social inputs, and the precise forms in which technologies are deployed are implicitly regarded as necessary ones. Attention therefore centres on uses, contents and their determinants, yielding the "informational bias" identified by R. Houlton. The neglect of telecommunications in media studies shows recent indications of remedy, basically because of an awareness that new transmission techniques, by extending broadband capabilities, provide means of conveyance which are technically indifferent as to which media are carried. Nevertheless, media studies have tended to regard telecommunications - in this sense, point-to-point techniques - as little more than precursors to the emergence of broadcasting.

The first social scientist to examine Comsat and Intelsat was H. Schiller, whose treatment forms part of a larger demonstration of the uses of communications control to extend and consolidate American global hegemony. The state component in the satellite history is therefore emphasised, and Comsat is viewed essentially as a state instrument, albeit profitably owned and controlled by monopolistic communications carriers. Schiller's central problematic is that of imperialism and anti-imperialism, and he therefore ignores the long domestic industrial conflicts through which the private carriers imposed their requirements on satellite development.

In contrast, M. Kinsley's work is an expose of AT&T's efforts to hinder full development of satellite technology and the FCC's failure adequately to protect the new technology, ultimately to the detriment of the 'public interest'. Although that analysis coincides in important respects with the present work, there are equally important differences. First, Kinsley misconstrues the larger regulatory context within which the satellite history unfolded, a context marked by the FCC's growing
activism and capacity to identify emergent communications requirements, ruling against AT&T where monopolistic inefficiencies were believed to endanger important elements of the national communications capability. AT&T, as we shall recount in Part IV, lost during this period monopolies over several sub-markets where protection from competition had either been enjoyed or was sought. Some attempt is therefore necessary to explain why its anti-satellite campaign should at the same time have been sustained. Second, Kinsley focusses on a single aspect of state behaviour in the communications field, the so-called regulatory, consisting of stabilising and protecting an existing configuration of private power. Reform of regulatory policy and procedure would presumably leave the state with no interest to defend but the public's; the state is therefore seen as a potentially neutral and ameliorative force, once freed from corrupting private influence. Finally and consequently, Kinsley's argument cannot engage the core of Schiller's thesis, that of central state leadership in establishing American dominion in the satellite field in support of expansionist aims. Just as Kinsley's critique of "corporate Luddism" has no place in Schiller's work, so Kinsley's concluding endorsement of state satellite ownership ignores Schiller's contention that the state's deep and growing involvement in communications already was permitting an effectively centralised orchestration of action in support of imperialist objectives.

If Kinsley presumes the possibility of state benevolence, J. Galloway attempts to prove its reality. Galloway's treatment merges two strands of American political theory which ought to be distinguished: incrementalism and pluralism. Regarding the first, he seeks to demonstrate that state satellite policy evolved in an incrementally rational manner, achieving clarity and consistency in steps thanks to mutual adjustment by participants. Although it is true that the policy emerged somewhat
gradually and that some measure of modification of positions occurred, the twin requirements of expeditious development and private ownership were non-negotiable; moreover, to accept the conclusion that the outcome was rational, incrementalism's sole immanent criterion of rationality must be endorsed - agreement among participants. Kinsley's account of a systematically emasculated technological potential can have no place in such a confined problematic and, in fact, Galloway notes the various anti-Coasmat FCC decisions only in passing, finally making no attempt to determine how effectively the satellite system was used.

The second strain, that the process was pluralistic, is also unacceptable. Pluralism cannot be reduced to the number of formal entities apparently participating in a decision-making process. In the satellite case, access to that process was indeed categorically limited: the U.S. international carrier industry's 1961 self-selection as the private sector's legitimate representative excluded the domestic carriers, aerospace industry, electronics manufacturers and broadcasters. Similarly the 1963-64 international negotiations involved a small number of industrial countries, notwithstanding the commitment to globalise the system. Furthermore, within those limited categories of participants effective power was widely unequal: one can for instance speak of nine U.S. international carriers, but one must not thereby presume political equivalence between the U.S.-Liberia Radio Company and AT&T. Likewise, international negotiation among roughly equivalent powers is hardly likely to conclude by awarding one of them two-thirds of the votes on subsequent collective decisions. In sum, the satellite system emerged in our view from an accommodation between two monopolies, a state monopoly over rocket launchers and an AT&T monopoly over American telephone traffic. If there was a more general, pluralistic process of mutual adjustment, it was adjustment to this accommodation, not of it.
Thus these three works represent three very different attempts to locate the determinants of satellite activities. Schiller finds that determination in an undifferentiated, state-directed U.S. expansionism, while Kinsley locates it in a process of domestic corporate manoeuvring and regulatory corruption. For Galloway, the satellite system arose from the formal decisions reached by various state agencies in performing a legitimate role in overseeing formation of consensus among interested entities, first within the U.S. and then internationally.

A fourth interpretation is offered by M. Snow, former Comsat economist, in a study which stresses the importance to Intelsat of meeting various internal economic objectives - like full cost recovery - in order to become self-sustaining.\(^{(66)}\) The work's principal flaw is a technocratic bias whereby political decisions are treated as technical givens. While, for instance, adducing figures to indicate that only one-third of satellite system capacity was actually being utilised, he asserts that normal engineering prudence requires providing double the capacity which is normally used - thus ignoring the question of why new transatlantic cables were being fully loaded within days of opening. Snow's conclusion that cost-minimisation has been Intelsat's major detectable goal is unsatisfactorily reconciled with this overcapacity; the possibilities that Comsat was encouraging overinvestment in order to inflate its domestic rate base, was creating an in-house R&D capability out of proportion to the international system's requirements, and was using Intelsat to test components that were more capacious, sophisticated and expensive than international usage required - and were in fact destined for domestic service - are mentioned only in passing. Moreover, by raising internal economic objectives to the status of full-scale social determinants, Snow avoids analysing the conditions under which commercialisation - and with it, the obligation to compete with well-entrenched rivals for heavy-traffic markets - was deemed a desirable way to
institutionalise the system.

That issue is addressed by the final work considered, in which J. Kildow explores the alleged irreconcilability of commercial operation and public service. (67) The work trivialises this opposition, however, by focussing exclusively on Comsat's behaviour, which is indicted for being 'business-like' and hostile to the 'political' influences brought by European Intelsat members. To sustain the condemnation Kildow gravely distorts the determinants of commercialisation, Comsat's industrial autonomy and its actual conduct vis-a-vis its European partners. Comsat is said to have been free to determine the satellite system's operational philosophy - viz. commercial or public service - when in fact the corporation was explicitly created by Congress as private and profit-seeking (see below Part II), expected to enter and compete within the existing international industry. Comsat's unsuccessful struggles with the U.S. communications industry, furthermore, formalised its role as a "carriers' carrier" which, like a gentleman's gentleman, made it dependent on its domestic bosses. This history is not mentioned, presumably because it undermines the portrayal of Comsat as a bullish and independent American profiteer. Lastly, the facile distinction between Comsat as commercial and the Europeans as political is misleading and finally empty. The commercial approach the U.S. favoured was a means to political control, since it justified translating America's big share of international traffic into stockholdings and 'political' votes. The political approach of the Europeans was likewise directed at securing national commercial advantages: a 'political' formula requiring Intelsat to procure a percentage of its equipment in Europe would improve the export capability of aerospace forms there. Moreover, although Kildow apparently holds that an initial decision in favour of state ownership of Comsat would have obviated later difficulties, she does not suggest how; unless that was accompanied by a state take-over of the entire U.S. international
communications industry, the remaining private companies would have been obliged to compete with a government-supported - and if operated as a 'public service' a government-subsidised - satellite entity. And internationally, it is arguable that if Comsat had been state-run the concessions ultimately made at the Intelsat re-negotiations would have been unlikely. In the end, perhaps it was just as well that the U.S. could afford not to care about Comsat's fate.

There are, in conclusion, four principal elements to the history of the satellite system, all of which are considered by none of the full-length works. 1.) An initial phase of satellite activity, from 1961 to 1971, yielded a technical outcome that was, paradoxically, both aggressively and urgently pursued and tightly restrained as to qualitative breadth of application. 2.) Even in the restricted form in which it was deployed, the technology itself necessarily drew an ever wider range of participants and thereby helped expand the variety of formative influences upon its further development and application. 3.) The initial phase of satellite activity was succeeded by another, dating from 1971, during which qualitatively greater development has occurred within a de-monopolised, quasi-federal structure of control. 4.) Throughout, the U.S. government played a central role vis-a-vis satellite technology and private industry, as final guarantor of the technical adequacy of the national communications capability; the resulting form of satellite development cannot therefore be reduced to its compliance with private industrial objectives, and instead needs explanation in terms of negotiation between those objectives and the state's definition of national requirements.

In the next chapter, we shall put forth the theoretical framework that will inform this account of the history of satellite communications. Part II deals with the socio-political origins of the technology: Chapter Three with the evolution of U.S. government satellite policy and Chapter Four with the development of U.S. industrial policy, both through
1961; the Fifth Chapter recounts the passage of the 1962 Comsat Act. In Part III, the 1963-64 negotiations through which the interim Intelsat was created are described and analysed; Chapter Six concerns their background - European aerospace activities and U.S. views thereon; Chapter Seven recounts early transatlantic satellite negotiations and U.S. efforts to show unilateralist resolve; Chapter Eight ends treatment of the negotiations and offers conclusions. Part IV shifts attention to Comsat's 1965-74 domestic industrial struggles; to set the scene, Chapter Nine provides an introduction and overview of the domestic setting, and Chapter Ten an analysis of the technical development of the satellite system; the next five chapters are accounts of Comsat's battles with the carrier industry before the FCC - Chapter 11 over U.S. earth stations, Chapter 12 over which entities Comsat would be allowed to sell its services to, Chapter 13 over new submarine cables, and Chapter 14 over domestic satellite service. In Part V the focus is again international, and the 1969-71 Intelsat re-negotiations are examined. Chapters 15 and 16 examine the issues raised by efforts to expand Intelsat's operational competence, first in the context of transatlantic relations, then in the context of metropolitan-Third World relations. In Chapter 17 issues associated with re-organising Intelsat are analysed, and Chapter 18 provides an account of the negotiations themselves. Chapter 19 offers a brief description of the historical aftermath, and conclusions to the work.
This chapter sets forth the theoretical perspective that will guide and inform this study, and the hypothetical model believed most appropriate to the political history of satellite communications. The chapter consists of the following: First, the structural arena within which satellite-related determinations were made is described, with reference to a new category of social activity. Second, determinants relevant to this history and deriving from the fields of long-distance communications and of technological innovation are listed and illustrated. Third, a specific process of technological development and application is proposed to account for the operation of certain of those determinants in response to the advent of satellite technology. Fourth, qualitative changes in the character of satellite activity are traced to changes in the importance and structure of the technology's political control. Finally, a historical precedent to the satellite history is recounted.

1. STRUCTURE: THE MODE OF TECHNOLOGICAL FORMATION

There is no readily available category of social activity or organisation to describe the dynamic area of convergence where the efforts of institutions and organisations to determine the development and application of a new technology meet. The nearest equivalent, the "innovating agent" of innovation diffusion theory, implies efforts to encourage the adoption of a given new technique.\(^1\) Furthermore, the innovation-adoption-diffusion schema shifts attention away from the active process of selection by which a 'given' technology is formed, toward the determ-
inants of the acceptability of an innovation. Our interest, in the satellite case, is in the relationships between the particular form in which a technology is developed and deployed, and the political character of its ownership and control. For that we need not a schematic process but a structural arena in which the precise disposition of a technological potential is negotiated.

We propose to call this structure the mode of technological formation, defined as the location of the negotiated adaptation and application of a technological potential. By formation is meant the integrated process by which a technical possibility is realised - including research and development and subsequent deployment - which is conceived as a sequence of search, selection and manipulation of design options to ensure a technical outcome that complies with predominant requirements. The mode of formation is the meeting-ground between aspects of ongoing social operations and political relations, and an emergent technology. This usage is informed by the Marxian tradition, a borrowing which is deliberate, since the central problematic in each is much the same - centering on the potential opposition between productive capabilities and the manner in which those capabilities are organised, applied and, when necessary, restrained. M. Godelier's description of the larger construct, the mode of production, is apposite:

A mode of production is the combination of two structures, irreducible to one another: the productive forces and the relations of production. The notion of productive forces designates the set of factors of production, resources, tools, men, characterising a determined society at a determined epoch which must be combined in a specific way to produce the material goods necessary to that society. The notion of relations of production designates the functions fulfilled by individuals and groups in the productive process and in the control of the factors of production.(2)

The principal theme of much of our analysis of satellite development likewise derives from an exploration of the formative transactions between Godelier's two structures: socio-political relations as fashioned within, and thereby constituent of the mode of formation, and
the technological potential whose precise disposition is the *raison d'être* for those relations. The inability of a quasi-monopolistic structure of political control to continue the constrained style of technological formation which derived from efforts to sustain that control, when the technology's own application had widened qualitatively the range of vital interest in its further development, provoked in the satellite case a decisive transformation in the mode of formation itself.

To clarify the notion of the mode of formation, certain assumptions are necessary as to the socio-political response to the advent of a new technology.

2.1.i.) A technological potential emerges from, threatens to modify and is subject to modification by ongoing contention over dominance among social organisations. (Dominance is considered as a greater relative capability to prevail over rivals in efforts to control and mobilise scarce resources in pursuit of independently selected objectives.) The precise expression to be permitted the technological potential may be at issue, to the degree that numerous applications and forms are equally feasible technically but respond to different areas of contention. Furthermore, the interest in a new technology may be only distantly related to the services it will ultimately provide: manufacturers, for instance, may be seeking to optimise conditions for supply of components, and prospective competitors to protect outstanding investments.

2.1.ii.) The new technological potential may implicate interests of numerous hitherto unrelated organisations, thus bringing them into direct relations with one another for the first time because of the recombination or rationalisation of activity its development and application appear to require. In this respect the technology can be viewed
as a medium of social interaction, precipitating creation of a novel array of socio-political relations. Before the advent of satellites, for example, there was no reason to suppose relationships between European aerospace efforts and Third World telecommunications development.

2.1.iii.) Whatever the precise reasons for interest, the possible responses to a new technology's emergence can be depicted schematically from the interplay of two parameters: its anticipated instrumental role for an organisation, and the position taken in its regard by the organisation. Concerning the first, the question is whether emergence of the technology is viewed as providing an occasion to enhance significantly the organisation's prospects, fortunes, relative advantage - in short, whether the technology promises to permit a more beneficial pursuit of interests. If so, the resulting response is offensive. If, however, the organisation is essentially compelled by emergence of the technology to try to preserve its existing interests in spite of the anticipated consequences of the technology, the response is defensive. As to the second parameter - the actual position taken regarding the technology - if its development, application, utilisation, in short its formation is favoured and assisted, the organisation's response is a positive one; but if the organisation acts to discourage, resist, suppress or restrain the technology's formation, the response is negative.

Using those parameters, four styles of response can be obtained:

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<td>positive</td>
<td>a.) classic inventor/entrepreneur</td>
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<td>c.) aggressive competition</td>
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To elaborate: (a.) describes a response where the new technology is, as in the case of the classic inventor/entrepreneur, seized upon as a means to improve substantially the pursuit of interests; the success of technological formation correlates strongly and positively with the agency’s success, and aggressive efforts to assist the process are made; (b.) the defensive-positive case, which is of greatest relevance to the satellite history, is where formation is assisted as a means of preserving — with little prospect of improving — the entity’s interests vis-a-vis rivals; few affirmative gains are anticipated, but failure to participate in and, to some degree, support formation may cede important advantages to potentially more enthusiastic competitors; (c.) in the offensive-negative case, there is both opposition to the new technology and a recognition that its introduction may provide opportunities for gains, opportunities that may for instance involve aggressive promotion of existing alternatives; a degree of success for the new technology may therefore be useful in stimulating creation of new markets or outlets, which could thereupon be satisfied by established techniques; (d.) the defensive-negative instance is where the technology’s advent is believed wholly inimical to the agency’s current position and future prospects, prompting — for example — efforts to secure suppression through litigation or state intervention, predatory price-cutting or substitutes or attempts to cut off supply sources.

2.1.iv.) It is in the convergence, then, of perhaps otherwise unrelated struggles over dominance among and within those organisations whose interests are implicated in the technology’s emergence that the politics of technological formation is located. The new technology provides a novel arena to which contention is extended. Moreover, the subsequent pace and character of development and application is determined by the relative success achieved by interested agencies in making
technological formation serve their respective requirements for new political instruments - that is, new means to enable dominance in the fields where each normally figures to be sustained or revised.

2.1.v.) The site of this convergence is the mode of technological formation, a novel social structure created by responses to the new technology's emergence. In general, the mode of formation can be analysed as to (a.) its own internal structure of dominance - i.e. which participating agencies prevail in securing preferential access to and influence over authoritative decisions, (b.) the subsequent character of the technology's formation - the degree to which known design potential is exploited, the pace and extent of deployment, and the extent to which the technology is, as deployed, utilised, and (c.) the relationships that obtain between those two spheres of socio-political dominance and technological development.

Thus the mode of formation represents the meeting-ground where existing organisations are drawn and manoeuvre for dominance in order to pursue or defend those of their interests which seem implicated in negotiations over the development and application of the new technology. We must now consider the determinants of those interests, two categories of which are pertinent to this study: determinants associated with long-distance communications requirements, and those related to the technological environment which is both the origin and destination of the new technology.

2. DETERMINANTS: LONG-DISTANCE COMMUNICATIONS REQUIREMENTS

It is our contention that certain political and functional requirements relating to long-distance communications systems, requirements whose fulfilment is normally a state responsibility, were stamped early and
decisively upon the emergent technology of satellite communications, resulting in pre-definition of the technology's application which informed the initial phase of technological formation. Furthermore, as will be argued later, the satisfaction of those requirements enabled a relaxation of U.S. state concern with further satellite development, which was a pre-condition for liberalising technological control and permitting other applications to be pursued.

2.2.i.) The communications systems of interest here can be termed instrumental ones, as distinct from cultural or 'mass media' systems. The terminology is inexact, but the distinction is important. The notion of 'instrumental' seems appropriate because it implies the overall functionality of such systems, replicating in their essentials the components of the Weinerian command-control model of communication: the exercise of control - defined as "nothing but the sending of messages which effectively change the behaviour of the recipient" - requiring input, output and feedback channels of largely equivalent design, capacity and reliability. The effectiveness of such systems is instrumental to the application of power, since the power exercised from policy-making centers can only be as effective as the structure of communications between the behavior-controlled and the policy-making power-holders.

The structural characteristics of instrumental systems, compared with cultural ones, include: linkages are point-to-point, not point-to-multipoint; channels are designed regularly to accommodate two-way message flows - essential for surveillance and feedback functions - instead of one-way flows; similarly, terminals have technically reciprocal, rather than asymmetrical, opportunities to communicate; and access to such systems is typically restricted and definite, instead of diffused and indefinite as with cultural systems.
2.2.ii.) The historical pattern has been that instrumental systems capable of rapid long-distance transmission have been created to satisfy new requirements occasioned by the geographical expansion or maintenance of extended military, administrative and commercial activities. Concerning pre-electrical systems, the work of F. Dvornik shows the deployment of rapid transmission networks — incorporating beacon relays, smoke signals, pigeon posts, postal roads staffed by runners or horse relays, semaphores or voice relays — by the Assyrian, Persian, Greek, Roman, Byzantine, Mongol, Arab and Muscovite empires. Europe's first postmaster-general was appointed in 1500 in order to link the scattered Hapsburg possessions via royal correspondence, and a high-speed optical telegraphy network created by Napoleon included by 1842 some 3,000 miles of semaphore relay towers.

Key to creation of such systems has been the clarification of need resulting from territorial expansion or consolidation of control over already extensive jurisdictions. The Roman Republic had, for instance, no organised information service or system, and the Roman roads were constructed and the posts organised only under Augustus and the empire. Likewise in the electrical era, despite the early development of undersea telegraph cables in the United States in 1842, the first American-owned transoceanic cable was not built until 1881, twenty-five years after the first British transatlantic line. British imperialism, which for Hobson began as a conscious policy in 1870 and accelerated in terms of territorial acquisitions in the 1880s, was accompanied by extensive and multiple cable layings to and across the Mediterranean, Red Sea, Atlantic, Indian Ocean, the Asian mainland and later the Pacific. Extensive American cable efforts coincided with commercial and political rivalry with the British over Latin America in the late 1870s and with territorial acquisitions in the Caribbean and Pacific due to the 1898 war with Spain.
The requirements of commerce have also occasioned new long-distance instrumental systems, once the emergence of money as a universal medium for transactions had furnished the basis for the concise messages such systems typically convey. Moreover, the incorporation of bigger segments of economies into stock exchanges, and the concomitant abstraction of resources and capital into exchangeable units subject to fluctuations in value, provided incentive to deploy signalling systems able quickly to transmit concise clues as to financial movements over considerable distances. Optical telegraphy systems were created in England and the U.S. for such purposes in the early 19th Century, and at least one major international wire service began by serving European financial markets in the 1850s. The ability of radio to interconnect mobile or remote fixed points with little capital outlays made it suited for commercial and industrial uses by companies with geographically dispersed productive, extractive or exploratory operations. Consequently, the overall relationship between long-distance communications facilities and efficient international commerce is clear, and has frequently been acknowledged.

2.2.iii) The general function of long-distance instrumental systems is to permit the effective and continuous direction of extensive military, administrative or commercial operations from a central locus of authority, while counteracting any otherwise consequent tendency toward attenuation of central power with increased distance - whether due to logistically necessary delegation, or to independent coordination among peripheral points. Accordingly, additional structural features can be identified in such systems: a.) they are coextensive with the geographical boundaries within which military dominance, political jurisdiction or commercial priority is asserted; b.) they offer continuously
available channels, availability and reliability being assured through deployment of redundant facilities and/or heterogeneous transmission modes; c.) their use for direct communication among peripheral points, unmediated by passage through the central mode, is either technically impossible or procedurally discouraged.

The notion of coextensiveness seems noncontroversial, and is supported by much of the historical data adduced above, where new facilities were established to link recently acquired territory or to accommodate the flow of commercial traffic to regions where trade was deemed important and preferential access was sought. (And it should be noted that in the electrical era, the traffic borne by long-distance systems comprised no small commercial boon in itself.) The notion also implies, however, that aggregate traffic volumes may be a poor indication of the importance of having facilities to link certain regions: the military vulnerability of an area, for instance, or the extremity of circumstance under which a communications system would be used, may mean very low capacity facilities are sufficient and very few messages are actually transmitted. Thus the fire beacon relays of antiquity and, as a modern example, the U.S. military's plan for a 'last ditch' satellite capability which, at a cost of several hundred million dollars, would furnish a global capacity of two voice circuits.(24)

As means to assure reliability and continuous availability, deployment of redundant facilities and heterogeneous transmission techniques is also evident in the historical record. Pre-electrical systems frequently incorporated combinations of techniques, according to Dvornik: fires at night, smoke signals during the day, and mounted relays at any times under the Assyrians; Muslim mideastern empires combined postal relays, voice relays, beacon towers and pigeon posts; the Mongols used horses, beacons and runners.(25) The different capabilities of the
techniques provide further reason for heterogeneity, as this consid-
eration of wireless vis-a-vis wired electrical communications suggests.

The radio supplements wire services by furnishing direct instanta-
neous communication with points to which the construction of
wire lines or the laying of cables would not be physically or
economically feasible, and by providing alternative or additional
facilities which may be used when wire facilities are interrupted
or overloaded. (26)

Likewise, routing the same device redundantly to the same terminal as-
sures continuous availability, especially where physical connections are
needed across regions outside the jurisdiction of the power responsible
for the facility. Britain, for instance, had by 1902 five different
cable routes to East Asia - two overland and three undersea - each
composed of several discrete lines. (27)

Efforts to prevent attenuation of central authority with increased
distance have generally been implicit in the structural lay-out of
instrumental systems, analogous to the converging spokes of a wheel -
minus the rim. If intermarginal communication was deemed necessary and
was physically possible, specific central authorisation was required.
Thus in the Roman posts, authority to use the roads for messages to and
from Rome was obtained more easily and at a lower level of officialdom
than was approval to communicate between other points. (28) J. Galtung
has identified a "feudal interaction structure" (29) characterised in
part by just this feature: subsidiary territories or states within an
imperial structure drawn more closely and more directly to the centres
of their respective imperiums than to one another and, moreover, are
linked to one another largely by way of imperial centres irrespective
of actual geographical proximity at the margins. (30) In the electrical
era, cable routings and consequent pricing policies have sustained this
selective isolation-integration. (31)

2.2.iv.) Rivalry among nations seeking to extend military, admin-
istrative or commercial activities geographically has found expression
in competitive efforts to create new instrumental systems linking them
preferentially or exclusively to regions of interest.

Such competition has been especially clear in the electrical era: at first because of the high cost of cable systems, and later due to the need for international agreement on radio frequency assignments, occasionally intense rivalry has surrounded establishment of long-distance international systems. Anglo-American competition was especially notable in Latin America between 1870 and 1900 and in regard to China and East Asia in the early 1900s. The British were successful in securing monopoly concessions to the east coast of Latin America, forcing U.S. firms to build along the less lucrative west coast, and the British monopoly on the rich Brazilian market remained unbroken until 1920. American interest in supplying nationally-controlled cables to Latin America intensified in the 1890s, when U.S. policy took an increasingly interventionist turn - with the dispatch of naval forces in 1893 to defeat Brazilian rebels, a lengthy intervention from 1894-96 in a boundary dispute with Britain over conflicting territorial claims lodged by Venezuela and British Guiana, and the war with Spain over Cuba and Puerto Rico. In the Pacific, Britain and Denmark wrested monopoly concessions in China after the 1900 Boxer Rebellion and used them to get 75 percent of the shares in the first U.S. transpacific cable; American interest in such a facility followed annexation of Hawaii in 1898 and acquisition of the Philippines, Guam and other islands from Spain, along with commercial and political competition over trade concessions in China.

British world long-distance communications dominance - based upon undersea and overland telegraph cables - prompted early international efforts to prevent extension of that dominance into wireless technology. A major reason behind the first international meeting
to deal with radio regulation, the 1903 Berlin Conference, was the threat of a global monopoly by the British Marconi interests; the resulting Protocol called for free competition in equipment supply and obliged signatories to interconnect facilities regardless of ownership, which Marconi had hitherto refused to do. Nevertheless, by 1912 Marconi held virtual monopolies on radio service in Britain, Italy, Canada and the United States, a situation which, as will be described later in this chapter, prompted the U.S. government to cause the Radio Corporation of America (RCA) to be formed in 1919.

2.2.v.) Responsibility for creating and operating long-distance instrumental systems is typically the state's, even when discharged through collaboration with private entities to which managerial and operational authority is delegated.

The notion of state responsibility is most controversial when applied to the electrical era and the United States. Although pre-electrical systems often were created and operated by central authorities with the essential collaboration of local interests, the centre's ultimate control was indisputable. In the electrical era, outside the United States communications, for the most part, "came to be regarded as a monopolistic function of the state rather than a preserve for private business." By the end of the 19th Century, an estimated 95 percent of the world's telegraphs - outside the U.S. - were in state hands. Even where formally supportive of private communications carriers, state intervention evidently served to assure industry's faithful compliance with officially-determined policies.

The United States, in the received wisdom, has been the great exception, where communications services have depended upon private initiative and virtual autonomy vis-a-vis the state. Traditional
state policy is said to have consisted principally of R&D subsidies to industry, government takeover of services under extraordinary circumstances and regulation of price and quality of services.\(^{(45)}\)

In sum, the dynamic underlying development of communications in the U.S. is located in the private sector, with the state reactively providing assistance, and subsequently influencing service modalities. This formulation derives, in our view, from an inadequate conceptualisation of the state's role and a misreading of the pertinent historical record.

In general, the potential modes of state and industry behaviour in the communications sphere can be schematised as follows. The state is a.) an authoritative instance when it defines and promulgates 'national interest' requirements and corresponding policies as to the technical adequacy of the country's communications capability; we shall return in a moment to this phase of activity, which is most important to our argument; b.) the state is an important customer of communications services when it elects to procure them from the private sector; and conversely c.) it is a major potential competitor with the private sector when it seeks to furnish itself with required services. Industry's role is similarly variegated: d.) private carriers function as an executive agency of the state when they comply with state-defined national requirements; e.) at the same time they are profit-seeking entities which cannot be indifferent to such requirements when satisfying them entails unprofitable activities; and f.) the private carriers are important industrial powers in their own right - as well as technically-qualified resources - and therefore bring their particular interests to bear on the process by which the state identifies 'national interest' requirements.
It is the authoritative aspect of state behaviour (a.) which is most important to demonstrate in order to sustain in the American case the argument for ultimate state responsibility in the long-distance field introduced above (2.2.v.) The historical evidence bears out the following constituents of that element: state leadership in identifying technical requirements and specifying services necessary for their satisfaction;\(^{(46)}\) state anticipatory activities to preserve the conditions for eventual private industrial exploitation even when private capital is not yet forthcoming;\(^{(47)}\) conditional devolution of managerial/operational authority to the private sector, subject to assurances that state-defined requirements be met;\(^{(48)}\) and intervention to cause private industrial reorganisations when believed necessary for the satisfaction of those requirements.\(^{(49)}\) Moreover, with the U.S. government retaining, as of the mid-1960s, around 70 percent of the total usable domestic frequency spectrum for its own uses,\(^{(50)}\) the potential scope permitted private exploitation was sharply limited from the outset. Indeed the historical pattern of development of the totality of communications services is more aptly formulated that the U.S. government has, in general, not provided those services which private firms were willing and able to furnish to the state's satisfaction and, in the main, that such services consisted of high-volume commercial and non-sensitive governmental traffic - the latter bulking large\(^{(51)}\) and further increasing state leverage over the private carriers.

3. DETERMINANTS: THE TECHNOLOGICAL DIMENSION

The second principal source of determinants are associated with the setting in which the new technology emerges and the specific characteristics of the technology itself. In the satellite case, the variety
and importance of the technology's potential applications, and the possibility of its deployment under the auspices of international political - or domestic industrial - rivals, attracted wide-ranging attention and intense concern to questions of its disposition. Early determinations pre-defined the technology as a supplementary means of intercontinental telecommunications carriage and established the requirement as virtually immediate. Both factors brought satellites in to conflict with industrial sunk costs in undersea cables. Once rival deployments had internationally and domestically been prevented, and outstanding investment in competitive plant protected, expanded application of an liberalised control over satellites was permissible.

2.3.i.) New technologies arise from a loosely coordinated search inspired by the agenda of requirements set, in this case, by the functional and political requirements associated above with the long-distance instrumental communications field. While 'accidental' discovery is not excluded, its importance is conceived as small when compared with technical activities deliberately directed toward seeking, refining or re-adopting means to satisfy known requirements.® The existing arsenal of knowledge is, in effect, surveyed and re-examined in light of new requirements: thus, pre-electrical signalling techniques known for centuries were deployed anew - and sometimes refined - by new empires.® Similarly, the principle of electromagnetic transmission was demonstrated well before its application to communications was sought.®

2.3.ii.) Partly as a result, the technical environment within which a new technology - or innovation - appears is likely to be cluttered with means which to greater or lesser degrees are functional
substitutes for the newcomer. Two causes of this clutter are noteworthy: non-obsolescence of existing techniques, and equivalent invention of new ones.

a.) "Rarely", as P. Cootner has written, "does a new technology make obsolescent all existing means of achieving a given end." In addition to straightforward competition with established techniques, the newcomer may displace older technologies from certain uses into new niches of limited but nonetheless definite usefulness.

Or the new technology may force improvements in existing techniques to render the latter more competitive. "It was", for instance, "the development of wireless that woke up the cable world from its somewhat somnolent condition", as a 1936 study observed.

b.) S. Gilfallan has observed the emergence of new techniques in "functional groups", a tendency he terms "equivalent invention":

Perceived needs are met by various unlike, as well as duplicate solutions, so that any great invention is simultaneously paralleled by other, often utterly dissimilar means for reaching the same end at the same time... Inventions may be seen as arriving in functional groups.

The notion implies that a prevailing interpretation of actual or anticipated need influences favourably technical activities directed toward its satisfaction, activities that may have little in common aside from that "equifinality". Of course, there may also be virtually identical inventions emerging simultaneously, as with the telephone; but the notion suggests common functionality to unlike innovations. R. Williams, similarly, has argued that domestic broadcast reception arose within a constellation of inventions - e.g. family automobiles, lightweight photographic equipment and various consumer durables - which together responded to a social requirement for "mobile privatisation", to domesticate or re-privatise a recently mobilised industrial population in the early 20th Century.
the long-distance communications field, the entire range of current broadband facilities - coaxial overland cable, transistorised undersea cable, overland microwave relay and satellites - comprises a functional group made operational in the 15 years between 1950 and 1965; six years separated the first transatlantic phone cable in 1956 and the first satellite-relayed transatlantic phone call in 1962.

Two corollaries are important: first, chronological sequence is no sure guide to technical superiority; second, functional equivalence is premised on accepted definitions of functional need. On the first, unlike the presumption implied in natural selection, in the technological realm posteriority does not entail superiority; the relative merits, for example of wired and wireless technology have been long debated, irrespective of the easy supposition that wireless as the later form was the better. (62) As to the second, where new needs have yet to be clarified and sanctioned, the precise expression allowed a technical potential may be limited to those needs which are clear and accepted. (63) One can, for example, identify a two-decade lead given point-to-point over broadcast applications of wireless technology - from around 1900 to 1920 - due to the importance accorded the former uses and the lack of precedence for the latter. The role, therefore, of the agenda of requirements mentioned above (2.3.i.) is central to the determination of which functions functional equivalence is evaluated by.

2.3.iii) Three factors are especially significant in determining the interest and attention a new technology attracts from state and private organisations: its importance, its 'volatility' and the presence of sunk costs in alternatives.

a.) In the communications field, innovations in transmission technologies are of crucial importance to the further development of technically subordinant representational modes (media) and discrete
linkages (channels). The means of conveyance set absolute limits to speed and capacity, thereby defining the technical possibilities of any systems incorporating them and, moreover, provoking changes in pre-existing media to enable these to benefit from the new transmission technology's capabilities. R. Houlton has, for example, charted the transformation of three independent communications industries - records, film and radio - into two interdependent dyads after the advent of television: film becoming a largely dependent resource of TV, and records of radio. (64) A cause of this transformation, we would argue, was the superiority of the electrical transmission technology around which radio and TV were constructed, when compared with the physical transport necessary for cinema films and records. Thus interest in transmission innovations is likely to be intense because of the modifications its introduction may precipitate in existing media.

b.) The volatility of a technology is the ease with which it can be developed and deployed, thus its capacity to proliferate under alternative auspices. Volatility is a determinant of the interest an innovation provokes to the degree that proliferative potential can be reduced by timely action. Within a private firm, for instance, a technical breakthrough whose parallel discovery by others is judged to be imminent will attract greater attention than one without that competitive dimension - especially if quick action would pre-empt rivals through patent claims. Similarly, Anglo-American competition over Latin American and transpacific cable concessions demonstrated an analogous concern with reducing the technology's volatility; and, if volatility has been adversely reduced, it is plausible for the loser to turn to a new technology, as the U.S. did with radio.
Finally, interest in an innovation is conditioned by the extent to which resources are already committed to a technology considered a functional substitute (unless those resources can easily and equally beneficially be shifted to the newcomer.) For the most part, sunk costs discourage interest in the innovation: the French were slow to proceed with electrical telegraphy because of their investment in an optical signalling system,\(^{(65)}\) and the British were likewise averse to global wireless deployment due to their vast submarine cable network.\(^{(66)}\) Sunk costs may also, however, imply considerable interest in an innovation; through participation in its development, refinement and application its impact on outstanding investments could be controlled and mitigated.\(^{(67)}\)

4. PRE-EMPTIVE UNDERDEVELOPMENT INTRODUCED

We shall now describe the model of technological formation we believe appropriate to the satellite case, and then gather together the points made in the previous section which are relevant to its explication. In general terms, pre-emptive underdevelopment refers to the rapid, constrained formation of a technology in order to secure its control. As an overall socio-political response, pre-emptive underdevelopment is defensive-positive, directed toward preserving rather than improving the pursuit of cominant interests through technological control and requiring assistance to the process of technological formation. The defensive orientation that predominates, however, suggests both goals for and constraints upon the process of formation, setting a permitted range of technological development: less than a minimum would endanger control by leaving too many avenues open to alternative efforts; more than a maximum would endanger the interests in whose
defence control is sought. The instrumentality of defence is preemption, or the prior appropriation of a position in order to deny it to a rival. And since control is the central objective of technological formation, the composition of the mode of formation itself is likely to be restricted, tending to consortia or cartels.

Hypothetically, rapid and constrained technological formation in pursuit of control may derive from any of a number of conditions faced by dominant participants in a technological formation: if existing plant is to be amortised smoothly and the future possibility of intensive development of the new technology is to be retained; if the innovation is thought immature, but limited application will ensure rights to proceed more exhaustively in time; if resources are lacking for the moment, or if the technology's usefulness is deemed uncertain; if the innovation is to serve as an adjunct to a well-established production process, and its use is therefore constrained by the qualitative and quantitative requirements of that process; if a stalemate exists between supporters and opponents of the technology limited development is a useful compromise; if, to comply with state requirements or dramatise industrial prestige, a degree of formation is desirable although wider application would harm outstanding interests.

In those circumstances, pre-emptive underdevelopment seems a useful way to characterise the likely response to the emergent technology. In the satellite case, it derived from the operation of the following communications - and technology-related determinants considered earlier. 1.) The general requirement for improved long-distance instrumental facilities associated with geopolitical and commercial expansion or consolidation (2.2.ii.) was acknowledged by the U.S. government at the outset. 2.) The structural features associated with such systems (2.2.i,iii) represented only a partial
expression of satellite technology's capabilities; hence a potential for underdevelopment can be attributed to the technically limited objectives which formation was undertaken to fulfil.

3.) Competition with a major international rival (2.2.iv.) prompted haste and urgency to create the system before similar facilities were created to link regions of common interest to the Soviet Union.

4.) The desirability of establishing heterogeneous transmission modes (2.2.iii.b.) meant state protection and encouragement of alternative technology - under-sea cables - and corresponding resistance to allowing full expression to the cost advantages of satellites. 5.) Similarly, the principal international partners whose operational collaboration - in the interest of coextensiveness (2.2.iii.a.) - was initially deemed indispensable showed much the same concern for retaining a heterogeneous transmission capability.

6.) The American government assigned immediate operational and managerial responsibility for the system's U.S. component to a quasi-consortium of private carriers, subject to assurances that state-sanctioned requirements would be met (2.2.v.).

From the technological realm, the following determinants were important. 7.) Through government R&D, conducted mainly by the civilian space agency (NASA) and the Department of Defence (DOD), and through private R&D directed by or toward state requirements, a technical orientation toward developing and refining communications satellite technology emerged in the late 1950s-early 1960s (3.3.1.)

8.) The field to which initial satellite application was assigned was characterised by the non-obsolescence and increased viability of undersea cables (3.3.ii.a.) and indeed, in a larger sense, by equivalent invention (3.3.ii.b.) in that both technologies can be considered as a functional group of contemporaneous emergence. 9.) Those two
factors coincided in yielding substantial sunk costs (3.3.iii.c.) in cable technology, the protection and expansion of which promised considerable private benefits to the carrier industry. 10.) The potential importance of satellite technology - as a flexible, low-cost and high-capacity means of conveyance - was considered great and its possible applications many (3.3.iii.a.) It therefore threatened modifications in, for example: the technical basis and pricing structure of intercontinental communications; the political dominance within that industry of the private carriers, since cooperation of foreign ministries, aerospace firms, broadcasters and others would be required; similar transformations might be provoked within metropolitan domestic communications industries; and in the Third World satellites offered cheap substitutes for conventional telecommunications and broadcasting plant, reducing cost barriers to modernisation of those sectors. 1.) Finally, the volatility of satellite technology was a factor of critical importance (3.3.iii.b.) Pre-empting first a Soviet system and later European satellite efforts contributed to American urgency to deploy satellites; similarly, the U.S. carrier industry's wish to prevent widely-based trans-industrial ownership of the American satellite entity stimulated early industry mobilisation to draft and promulgate organisational proposals. On the other side, the desire to avoid reduction in technological volatility meant opposition to urgent formation when it would foreclose the possibilities of rival deployments: such was true of the Senate critics of the 1962 Comsat Act, of European opposition to expansion of the U.S.-dominated system into regional, domestic and specialised applications, and of the U.S. carrier industry's militation against Comsat's entry into the domestic services market.
To sum up then, pre-emptive underdevelopment in the satellite case was a compromised process of technological formation, the result of a collision between urgency to secure control and a desire to restrain, contain and pre-define the likely impact of the technology upon outstanding interests. Technological formation was both a means to technological control and a threat to the interests on whose behalf control was sought. The centrality of control as an objective and axis of contention meant that rivalry over technological formation took the form of political controversy within the mode of formation: efforts to secure control entailed attempts to limit and concentrate the range of effective influence upon the technological process, even where the operational collaboration of relatively disenfranchised participants was essential.

5. PRE-EMPTIVE UNDERDEVELOPMENT AS UNSTABLE

Pre-emptive underdevelopment is susceptible to transformation, in general terms, depending upon the success of its limited style of technological formation in satisfying the objectives of dominant participants - in pursuit of which control was sought - and in thereby changing the technical environment within which further determinations as to formation are made.

Considering separately the determinants of the pre-emptive thrust and of underdevelopment, the pre-emptive motivation is unstable because: a.) urgent requirements, once secured, lose their urgency; b.) while control remains as the main axis of contention, if the concerns which predominated in early determinations have been satisfied the disposition of control may derive from the play of other
concerns; c.) the technology's volatility may either remain unchanged or indeed have been enhanced owing to initial successes suggesting its wider usefulness and attractiveness. The restraints that produced underdevelopment may be relaxed because: d.) sunk costs in a functional substitute have been adequately protected - either because time has been won for their orderly amortisation or because long-term preservation has been authorised - so the defence of outstanding investments is no longer a concern; e.) the suitability of the technology to applications other than those for which it originally was created may be more apparent thanks to early, limited success; f.) the entitlement and capability of hitherto subordinate participants either to pursue independently, or to compel the collective pursuit of, further technical applications may be enhanced by their initial roles in the mode of formation.

Pre-emptive underdevelopment may therefore eventuate as a preliminary and transitory technological formation - succeeded, in such a case, by its own successes in satisfying the objectives for which urgent and rapid formation was sought, incorporating in subordinate capacities otherwise rival interests and thus securing priority for dominant ones, and demonstrating the potential of the technology at issue. These successes may, as in the satellite case, provoke a de-coupling of control of the technology from the array of political concerns that had inspired formation in the first place; that is, the future development and application of the technology is no longer tied to initial objectives because those goals had been met. The mode of formation that succeeds pre-emptive underdevelopment is not clearly determined by that de-coupling, but depends rather upon the structure of dominance prevailing among those interests to which control over the technology's formation now devolves. What is clear is that the
interests that constitute the successor mode of formation, and consequently the internal dominance which they negotiate, will be different from those which prevailed under pre-emptive underdevelopment.

6. PRE-EMPTIVE UNDERDEVELOPMENT SUPERSEDED

In the satellite case, de-coupling allowed a more liberalised regime to emerge, where suppressed or ignored technical applications could be pursued by a wider array of national and industrial interests than had hitherto been influential in the mode of formation. The inauguration of this phase, after a decade of pre-emptive underdevelopment, can be dated from 1971-72, when within the international consortium a transition toward substantive multinationalisation was begun, a comprehensive monopoly over the satellite field was officially renounced and, consequently, the U.S. effectively agreed to lend indispensable technical assistance to independent satellite projects; at the same time, in the United States the efforts of the Comsat Corporation to secure a franchise on domestic services were defeated, and that field too was opened to wide-ranging industrial initiatives.

We propose to term the successor technological formation polycentric maximisation, not perhaps the most elegant of terms, but one which nonetheless implies both devolution of effective control to a greater number and wider variety of interests, and an increased intensity of efforts to exploit technological potential. In comparison with its predecessor, the features of polycentric maximisation have been: 1.) an expanded range of technical applications, including not just intercontinental satellite relays, but domestic broadcasting and
telecommunications, regional telecommunications and specialised services— aeronautical guidance and maritime communications;

2.) the absence of sunk costs in functional equivalents, since either no other available technologies could provide the services satellites were now being applied to furnish, or those who were undertaking satellite deployment had no outstanding reason to turn to the alternatives that did exist; 3.) widened substantive participation in the mode of formation, which henceforth comprised not only the original international organisation— whose internal procedures had in fact been liberalised— but independent cooperative endeavours fashioned to undertake specific projects as well; and 4.) tolerance of independent deployment: the technology's volatility was viewed as a positive benefit, not a political obstacle to be overcome through rapid pre-emptive efforts, and technical coordination to avoid operational interference or unnecessary duplication was to be virtually the sole restriction on independent satellite activities.

7. PRE-EMPTIVE UNDERDEVELOPMENT ILLUSTRATED: THE RCA CASE

An earlier instance from the electrical era which displays many of the same essential features of pre-emptive underdevelopment as does the satellite case involved the struggle for dominance in the long-distance radio field in the early 1920s between the U.S. government and the British-based Marconi interests. That history will now be outlined and significant parallels drawn.

Radio development had, as of the turn of the century, centered almost exclusively on maritime applications and, less exclusively, on the company Guglielmo Marconi had founded when he came to England
in 1896. Marconi interests - parent and subsidiary firms - had by 1912 virtual monopolies on wireless service in Italy, Canada, Britain and the U.S. Parallel development of land-based, fixed-point radio systems was, however, slower to emerge; Marconi's most ambitious plan, a chain of high-powered interconnecting the British Empire, was rejected or deferred several times during the period before the First World War, probably owing to concern for the viability of the undersea cable network.

In the United States meanwhile, notwithstanding the industrial dominance of the company Marconi established there in 1897, three countervailing developments - industrial, political and technological - were important. Industrially, a rival patent pool had emerged around inventions developed, or in most cases acquired, by AT&T, Westinghouse, General Electric and United Fruit. Politically, pressure for state intervention in the communications field was growing: AT&T was moving to consolidate its internal phone monopoly at the expense of independent operators; first regulatory legislation was passed in 1912 and, the same year, President Wilson was elected on a wave of reformism, his platform recommending state ownership of the entire electrical communications industry. Indeed bills to carry out this pledge were introduced unsuccessfully in Congress in 1917 and 1919. Technologically, in 1915 a General Electric (GE) engineer successfully demonstrated an important new device which helped produce a highly-concentrated, regular and far more efficient use of electromagnetic energy - for the first time making possible reliable low-frequency transoceanic radio communication. British Marconi representatives witnessed GE's first tests of the Alexanderson alternator, and Marconi himself came almost at once to
New York to negotiate purchase of 12 devices, for use by both his British and American companies. Early negotiations foundered, however, and were not re-opened until after the war.\(^{(74)}\)

When the U.S. entered the war in 1917, the government seized all commercially-operated radio stations, most of which were Marconi-owned.\(^{(75)}\) Moreover, the numerous pending patent disputes between Marconi and the American firms - and among the latter as well - were ordered deferred, and manufacturers were expressly instructed to meet military specifications regardless of which patents were necessary.\(^{(76)}\) State supervision thus permitted, according to E. Barnouw, "a vast coordinated development of radio technology",\(^{(77)}\) one which the Navy - principally responsible for its conduct - was especially reluctant to surrender after the war,\(^{(78)}\) and which had made the government not just owner of virtually all transmitters, but holder of numerous, possibly controlling patents resulting from devices developed during the war.\(^{(79)}\)

In 1919, British Marconi resumed negotiations with General Electric, this time in pursuit of exclusive rights to the Alexanderson alternator. The sale was nearly concluded when the U.S. government, concerned over indefinite loss of the device to American interests, intervened.\(^{(80)}\) Navy Department representatives visited GE to relay this concern, but the company's chairman pointed out that as a manufacturer GE had little choice but to sell its products to the highest bidder.\(^{(81)}\) The Navy lacked the Congressional authorisation it wanted to buy and deploy the alternator itself,\(^{(82)}\) and the solution devised was to get GE to help create a new American-owned operating entity in the - at first primarily - long-distance radio
field, which would be the alternator's customer and the repository of the various patents still held by the government and essential for long-range operations.

Thus in October 1919 the Radio Corporation of America was formed, with government representatives on its board of directors, limits on foreign stockholdings and the preponderance of its ownership vested in the four big pre-war holders of radio equipment patents.\(^{(83)}\) Faced with the American government's possession of its U.S. plant and with the government's evident disinclination to give those facilities back to a British company, Marconi sold its U.S. properties and patents to RCA a month later.\(^{(84)}\)

Internationally, RCA quickly began work toward creating "an American-dominated system of world communication",\(^{(85)}\) and by 1921 had arranged with Marconi a cartel in regard to Latin American operations: a nine-member international committee, including German and French interests, would oversee Latin American projects, while RCA retained final say.\(^{(86)}\) Those arrangements subsequently became part of what was essentially a two-way division of the world between RCA and Marconi, in which potential markets and patent rights were variously assigned.\(^{(87)}\)

At home, however, in spite of early success and some considerable government assistance, RCA soon encountered opposition from the telegraph companies which owned the U.S. undersea cables.\(^{(88)}\) Radio, having no need for physical connections among terminals, offered therefore substantial cost advantages and lower tariffs;\(^{(89)}\) with around 20 percent of transatlantic traffic routed by 1923 via wireless, cable owners were forced to cut tariffs.\(^{(90)}\) Although rate equalisation was agreed the next year for Atlantic and Pacific routes,\(^{(91)}\)
such a policy still - other factors being equal - could do no
more than guarantee the cables half the traffic. (92)

Other things, however, were not equal. Since radio carriers
did not offer domestic service, they had only a small number of
big city offices and transmission centres (93) and were otherwise
wholly reliant on the collection and distribution facilities of
their cable-owning competitors, who applied discriminatory rates
and restrictions on access for messages bound for radio transmission
overseas. (94) Consequently, during RCA's first nine years of oper­
ation the domestic telegraph firms handled 10 times more incoming as
outgoing radio messages, despite an overall equality in the two
categories. (95)

RCA's ultimate response was to expand its corporate operations
into two areas unrelated to the national dominance in long-distance
radio activities for which it was created: manufacture of receivers
and network broadcasting. Through its National Broadcasting Com­
pany subsidiary, RCA established two nationwide broadcast networks,
one of which it was compelled by the government to sell in 1941.
The growing importance of its manufacturing operations was acknow­
ledged in another anti-trust action in 1930, when the Justice
Department ruled that RCA's inter-locking patent agreements with
its corporate shareholders constituted an illegal restraint of trade
in the radio equipment industry. GE and Westinghouse accordingly
sold their holdings and withdrew from the RCA board. (96)

8. COMPARISONS AND CONCLUSIONS

Just as it was the reality of British dominance in the international
cable field (97) which prompted an American response in the radio
field, so it was the threat of a Soviet communications satellite
system - and the global dominance in the field that might sustain - which spurred U.S. satellite efforts in the early 1960s. Furthermore, the following elements are present in both cases:

i.) a new transmission technology or device of commercial and military significance, made available due to conditions of intense international rivalries, and whose disposition was significant in part owing to its putative value as a resource in those rivalries;

ii.) the innovation's formation was sought to prevent or mitigate the foreign domination of international communications which its deployment under alien auspices was believed to betoken;

iii.) U.S. state intervention to create a private consortium as a chosen vehicle for further development and application of the technology; in both instances the consortium - or quasi-consortium in fact - consisted of dominant institutions in the field whose hostility to the new entity might otherwise be expected; in both cases creation of the private consortium was acknowledged as an alternative to state ownership, and provision was made for government influence within the new organisation;

iv.) hostility and resistance to application of the new technology from domestic interests based upon an established alternative transmission mode - interests whose operational collaboration was nevertheless necessary to the newcomer;

v.) state assistance was forthcoming, but only to the point where a margin of superiority or comparability with regard to international rivals was assured; expanded exploitation of the technology into new applications was not a state objective, whereas maintaining a heterogeneous national transmission capability was;
vi.) the new technology forced improvements - in capacity and tariffs - upon the old; telegraphic cables in the 1920s and telephonic cables in the 1960s both underwent significant technical advance;

vii.) internationally, separate zones of commercial exploitation were negotiated, a process quickly concluded in the radio case but, due to unequal technical capabilities, later to emerge with satellites;

viii.) domestic industrial opposition led to a search for new technological applications whose pursuit would not encounter that opposition;

ix.) the initial consortium features of the state's chosen corporate vehicle were eliminated, again at the state's insistence; full corporate independence thus was achieved after the original consortium had outlived its usefulness.

In both instances, the essential features of pre-emptive underdevelopment are present. Pre-emptive characteristics common to both include: state-inspired urgency accorded to efforts to secure control of a technology believed crucial to the desired national role in long-distance communications; and a recognition that the technology's volatility - or susceptibility to rival deployments - could be conditioned favourably by timely action.

The technology's underdevelopment derived from: the state's interest in retaining a bi-modal national transmission plant, which implied support for industry's wishes to protect sunk costs in competitive plant. (In the satellite case, restraints on development derived as well from the desire of international collaborators to coordinate the timing of satellite activities with the development of related national industrial capabilities.) The technological formation's
instability is reflected in the modifications undergone in each case: new operational templates were devised, leading to restructuring of the mode of formation to accommodate entities interested in pursuing the new applications - and resulting in the demise or revision of the domestic consortium/international cartel arrangements through which early formation was achieved.

We shall now begin our history of satellite communications.
PART TWO

ORIGINS OF PRE-EMPTIVE UNDERDEVELOPMENT:
From Sputnik to the Comsat Act of 1962
1. OVERVIEW

Between October 1957, when the first Soviet Sputnik was launched, and July 1961, when President Kennedy formally announced his government's intention to see a worldwide communications satellite system created, the broad lines of American state policy on public satellite services emerged. The policy had two main components: first, the rapid establishment of the satellite system on a global scale—offering opportunities for participation and access, on non-discriminatory terms, to all interested countries—was embraced as a national objective; second, the U.S. role in the project would be carried forth by a privately-owned, commercial institutional vehicle, whose operations would be expected to conform to state policy guidelines, but which nevertheless would enter and compete within the existing international communications carrier industry.

The policy, as this chapter will show, was an attempt to respond to several areas of state political concern, both symbolic and substantive. (1.) From the international sphere of bipolar contestation with the Soviet Union came a requirement for dramatic and symbolically compelling initiatives incorporating impressive technological achievements which, it was hoped, would offset the gains in prestige won by Soviet space activities and thereby allay doubts attributed to allies and 'non-committed' nations over America's global posture. The apparent vigour, moreover, of Soviet progress in space suggested urgency in U.S. programmes, if new and further damaging 'firsts' were to be avoided. (2.) The U.S. military and civilian space programmes, then in their infancy, had need of projects to legitimate space endeavour in general as peaceful and broadly beneficial, in order to open the way formally to civilian space exploration and extensive military applications. Private satellite ownership would help dramatise the project's separation from the military sphere and, again, urgency was required in view of the need to secure international approval in 1963 of frequency assignments, upon which the entire U.S. space effort was thought to depend. (3.) With regard to state communications policy, the national overseas capability was judged inadequate
particularly to assure reliable linkages to remote areas, and generally to sustain a new strategic policy composed of a hierarchy of possible military responses—and therefore premised on dependable communications for their orchestration. Satellites were viewed as desirable, perhaps essential, additions to the national capability. (4.) In domestic political terms, dramatic space initiatives would reassure the electorate of the new Kennedy Administration's dynamism and, if satisfactorily organised, would also provide specific assurances to an uneasy business leadership of the good intentions of the Democratic government after eight years of Republican administration—thereby helping secure support for expansionary fiscal policies about which corporate leaders were skeptical.

Thus, emergent state policy was directed toward scoring a propaganda victory sufficient to eclipse Soviet space achievements, providing the state with an improved operational capacity and opening up the space field formally and durably for civilian and military applications—while catering to domestic political pressures.

A number of subsidiary policy elements remained to be elaborated at the end of this period, among them the ownership of the American satellite entity, the precise terms of its operational integration into the rest of the carrier industry, and the specifics of its future accountability to the state. These matters were addressed after the private communications industry began, in mid- to late-1961, to mobilise in order to insert its collective requirements into the policy-making process—a history recounted in the next chapter. Industry's proposals were then modified and formalised through passage of the Communications Satellite Act in August 1962, the subject of the succeeding chapter. Final resolutions came only after lengthy negotiations among the government, communications carrier industry and the new Communications Satellite Corporation (Comsat), which lasted until 1974 and which are described in Part Four of this study.

It is, however, our position that the two cornerstones upon which negotiation ensued—speedy and worldwide deployment as the ultimate technical goal, and private ownership and commercial operation as the twin principles of institutionalisation—were deliberate state policies, formulated and articulated before the time when pressure from private indus-
try began seriously to be mounted. Since both policy elements had enor-
mously important consequences on the future of the satellite system—in-
spiring urgency into the process of technological formation, while sub-
jecting the project to powerful influences from commercial and industrial
interests and rivalries in the private sector—their origin is of consi-
derable importance. The notion that commercialisation and private own-
ship were early and abiding components of state policy, and not elements
of a later accommodation forced upon the government by private industry,
is not accepted by other commentators, whose views will be treated in this
chapter's conclusions.

Nevertheless, in our view the key to the private ownership decision
lay in the overall consistency between state objectives in the satellite
field and devolution of control to the private sector. (1.) The peace-
ful intentions and beneficial possibilities the satellite system was
to dramatise in regard to space endeavour would be strengthened by its
institutional separation not just from military but from governmental
control as well. (2.) The project's utility as a Cold War propaganda
resource would likewise be enhanced if the system was associated with
private enterprise rather than the state. (3.) More concretely, the
urgency with which the state wanted the project imbued would be abetted
if control was shared with those private entities whose technical assis-
tance would, it was thought, be required, and into whose ongoing opera-
tions satellite service would ultimately have to be integrated. (4.)
And in the final analysis, formal private ownership would not prevent
the state from ensuring that its diplomatic and operational requirements
were met through satellite activities.

Accounting for that devolutionary movement is of particular impor-
tance in that the history that concerns us is one of "a subordinate and
vulnerable spinoff," as O.W. Riegel has written, from a technology that
has been overwhelmingly military in inspiration and application. (1) In
terms of numbers, sizes and technical sophistication, (2) "the importance
of communications satellites for peaceful purposes diminishes sharply in
the perspective of the military occupation of space." (3) It is then to
the determinants of the first phase of that spinoff that we now turn.
2. SPUTNIK AND ITS AFTERMATH

Until the launch of Sputnik in October 1957, the U.S. had virtually no space programme. Having emerged from the Second World War with an unscathed—indeed an enhanced—industrial capability, a world monopoly over atomic weapons and the cream of Germany's arms scientists, the U.S. had no compelling reason to develop the long-range missiles upon which a space effort would be based. Thus American rocket development in the 1940s was derisory and it was only after the Soviet H-bomb detonation in 1953 that the annual budget for long- and intermediate-range missile work exceeded one million dollars. Specifically scientific space-related R&D was accordingly limited, and efforts were made to keep this separate from the military effort. Thus when President Eisenhower announced in July 1955 that the U.S. would attempt to launch a small scientific satellite as part of the 1957 International Geophysical Year, the task was assigned to the Navy, whose principal launch vehicle, the Viking missile, was unsuited to military ballistics, having been designed as a scientific test rocket. The Army's Redstone and Jupiter boosters, both considerably more powerful, were rejected in order to underscore the project's peaceful intent, and to placate certain military opinion opposed to seeing resources diverted to scientific work.

There had, withal, been forewarnings as to the impact a successful satellite launch might have. A 1946 RAND Corporation report had noted the "consternation and admiration" Americans would feel if another country orbited a satellite first:

The achievement of a satellite craft by the United States would inflame the imagination of mankind, and would probably produce repercussions in the world comparable to the explosion of the atomic bomb.

Eisenhower had been told of the likelihood of a Soviet satellite in 1956, but assessing that eventuality in primarily military terms had seen no reason for an American crash programme. He certainly did not expect what he later called the "wave of near-hysteria" provoked in the U.S. by the October 4, 1957 launch of a 184-pound satellite by the Soviet Union.

Preceded by a first successful Soviet ICBM test in August, Sputnik made an enormous impression on American—and world—public opinion, an impact intensified by the launch soon after of a second Sputnik with a
dog aboard, the failure on the launch pad of the first American satellite attempt, and finally the comparative modesty of the U.S. success in late January 1958, when the grapefruit-sized Explorer I satellite was orbited. "A wave of mortification, anger and fresh determination swept the country," Secretary of State Dulles later wrote.\(^{(15)}\) Editorials spoke of "today's scientific Pearl Harbor" and "our generation's stock market crash,"\(^{(16)}\) and Werner von Braun later recalled:

Overnight, it became popular to question the bulwarks of our society, our public education system, our industrial strength, international policy, defense strategy and forces, the capability of our science and technology. Even the moral fiber of our people came under scathing examination.\(^{(17)}\)

Abroad, Soviet space achievements had "shaken confidence in American scientific and military capabilities;" an 11-nation survey found that the only event in recent history to match Sputnik in general public awareness had been the A-bombings that ended the Second World War.\(^{(18)}\)

The White House and Congress moved quickly to mobilise a response, and "an extensive revamping of the organization of science policy" ensued.\(^{(19)}\) In November a special presidential advisor on science and technology was named, and Senate majority leader Lyndon Johnson convened hearings on 'preparedness' that lasted until July 1958. Both the House and Senate created standing committees on science and aeronautics, the State Department established a separate office on space, and the Department of Defence (DOD) set up an Advanced Research Projects Agency (ARPA) to supervise military rocket and space projects.\(^{(20)}\) ARPA had also begun preliminary work on non-military applications when in July 1958 Congress passed the National Aeronautics and Space Act, which created NASA to pursue civilian space applications previously under the nominal control of a White House aeronautics advisory council.\(^{(21)}\)

### 3. DEFINING CIVILIAN AND MILITARY SPHERES

The distinction between military and civilian space applications provided for in the 1958 NASA Act was imprecise, and the overall urgency with which space endeavour was approached inspired both spheres indifferently. "Our space program," stated the U.S. Information Agency director, may be considered as a measure of our vitality and our ability to compete with a formidable rival, and as a criterion of our

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ability to maintain technological eminence worthy of emulation by other people. (22)

During the earliest congressional hearings specifically devoted to satellite communications, in March 1957, officials faced intense questioning as to who was ahead in space, to which the head of the Pentagon's APPA responded, in a way that reflected contemporary concerns: "I think our posture for the future would be better if we erred on the side of running scared [rather] than assuming that we are superior to the Russians."(23) The committee's chairman (24) concurred, "I don't believe in the space age there is any second place in a war between two major powers."(25) The strategic importance was believed to be clear and compelling since, as a senator later declared, "Space technology will eventually become the dominant factor in determining our national military strength. Whoever controls space controls the world."(26) NASA's administrator, however, justified the civilian space effort similarly:

If we permitted the Russians to surpass us, eventually we would almost certainly find ourselves on the receiving end of their advanced space technology, employed for military and economic aggression. (27)

The interpenetration of military and civilian objectives was reflected too in the creation of a White House body—the National Aeronautics and Space Council (NASC), chaired by the vice president (28)—to exercise unified supervision over both phases of the national space effort, and in the NASA Act's stipulation that the agency make available to the Pentagon "discoveries that have military value or significance," a courtesy DOD was to return in the case of findings of interest to NASA. (29) In the communications satellite field, for example, an assistant secretary of defense said of the civilian and military programmes, "They form parts of a total national communications satellite effort which are entirely complementary." (30) Furthermore, although the Act declared "that it is the policy of the United States that activities in space should be devoted to peaceful purposes for the benefit of all mankind," (31) some considerable semantic contortions were required to identify NASA specifically with those peaceful purposes without thereby indicting the military space effort as non-peaceful. (32)

Notwithstanding such logical, operational and administrative ambiguities, the NASA Act nonetheless formalized a division between military and civilian space endeavour, explicitly excluding from the new space agency's responsibilities work "associated with the development of weapons systems, military
operations, or the defense." \( ^{33} \) Both to sustain this distinction and to avoid duplicating R&D, differing fields of technical elaboration were assigned to DOD and NASA. In regard to launchers, the pre-Sputnik banishment of military boosters was judged ill-conceived, since it had finally been a military rocket—the Army's Jupiter—that put the first U.S. satellite into orbit after the Navy's scientific launcher had failed; moreover, it was alleged that the military programme could have produced an American success some years earlier. \( ^{34} \) Although NASA would henceforth use military rockets as and when necessary, their designs typically provided upper stages suited to relatively light payloads and capable of following fairly simple trajectories; NASA would therefore have to develop its own boosters to sit atop the powerful military first stages and provide the greater thrust and manoeuvrability needed for scientific projects—like geostationary satellites and manned orbital missions. \( ^{35} \) Accordingly, in late 1960 NASA got its own rocket R&D capability when the Army's Redstone team, under von Braun, was transferred to the civilian agency. \( ^{36} \)

In regard to satellite payloads, the first NASA-DOD division of responsibilities was agreed in November 1958, giving NASA charge of 'passive' satellites and the defence department responsibility for active ones. (Passive satellites have no on-board electrical components, and simply provide a surface against which radio signals are bounced; active satellites receive, amplify and re-transmit signals.) The passive programme had some limited success under NASA \( ^{37} \), but encountered technical disadvantages largely inherent in the concept; \( ^{38} \) it was taken on for a time by the military in 1961 and discontinued in 1963. \( ^{39} \) The active satellite programme, primarily under the Army, meanwhile yielded Project Score in December 1958 which, although considered the first active communications satellite, did little more than transmit Christmas greetings pre-recorded on the ground by President Eisenhower, and Courier IB in October 1960, which received and re-transmitted messages beamed from earth, although these had to be taped for subsequent relay. \( ^{40} \)

In August 1960 NASA reminded the defence department that their 1953 agreement had envisaged the possibility that the civilian space agency might "at an appropriate time" wish to enter the active satellite field \( ^{41} \), and the next month a coordinating board was established, co-chaired by
representatives of DOD and NASA, to provide for continuing consultation
between the two programmes and a more flexible division of labours than
the active-passive split had permitted. Consequently, by 1961 both
the military and civilian programmes were directed toward development of
active satellites: the Army, through its Advent Project, was working on
high-altitude geostationary spacecraft, while NASA developed low-altitude
random-orbiting satellites. The subsequent failure of Advent, growing
doubts over the usefulness to the military of synchronous satellites, and
NASA's interest in pursuing the geostationary design promoted by Hughes
Aircraft, led to another reshuffling after the 1962 Comsat Act was
passed, whereby DOD redirected its efforts to lower altitude satellites
and NASA took on development of synchronous spacecraft, an effort that
led—via the 1963-64 Syncom project—to the first operational commercial
communications satellite, Early Bird in 1965.

In sum, as the 1960 presidential election approached a national com­
mitment to wide-ranging, if as yet unfocussed, space endeavour had been
made, prompted by the Sputnik launch and the serious challenge to U.S.
technological self-image—and strategic capability—that the Soviet space
achievements were interpreted as posing. As one Comsat official later
reflected:

I've often thought what would've happened if we had put up the
first satellite. I suppose the whole space programme would've
languished for, who knows, another generation.

4. THE KENNEDY ADMINISTRATION: RENEWED URGENCY

Space was a good issue for the Democrats in 1960, encapsulating both the
national decline they sought to associate with the Eisenhower Administra­
tion and the New Frontier of vigour and imagination they proposed to
inaugurate. Sen. Kennedy campaigned hard on the fact that "the first
canine passengers to outer space who safely returned were named Stralka
and Belka, not Rover and Fido," and declared: "If the Soviet Union was
first in outer space, that is the most serious defeat the United States
has suffered in many many years." Emphasis was placed particularly on
the symbolic damage done to U.S. global standing:

Because we failed to recognize the impact that being first in
outer space would have, the impression began to move around the
world that the Soviet Union was on the march... that it was moving and we are standing still. This is what we have to overcome, the psychological feeling in the world that the United States has reached maturity, that maybe our high noon has passed... and that now we are going into a long, slow afternoon. (47)

Kennedy's rhetorical insistence on the value of space endeavour to dramatising national dynamism was echoed in the report he received shortly before his inauguration in January 1961 from an ad hoc group of academics and defence experts led by Jerome Weisner, strategic analyst and later M.I.T. president, whom Kennedy had asked after his election to recommend directions the new administration should take in its science and space policies. The Weisner Report listed five reasons for U.S. space efforts—in addition to the need to develop intercontinental rockets—the first of which was prestige:

Space exploration and exploits have captured the imagination of the peoples of the world. During the next few years the prestige of the United States will in part be determined by the leadership we demonstrate in space activities. (48)

The prestige rationale and its corollary—avoiding further Soviet damage to American world standing—remained an enduring and popular theme in U.S. decisions on space activities, even where the actual threat of another Soviet 'first' was remote, as, arguably, in the case of communications satellites.

Subsequent debate and discussion concerning communications satellites frequently referred to the impending prospect of a Soviet satellite system and to the harm America would therape upon suffer. As of August 1961, during House space committee hearings, one congressman declared it "quite evident that Russia and China will have their own communications satellites probably as soon as we do, give or take a year or two," (50) and the committee chairman observed: "I know of nothing that would be more disastrous to the United States and to the world in prestige at this time [sic]" than for the Soviets to do so before the U.S. (51) Actual evidence of Soviet intentions was, however, sparse (52) and as a State Department official acknowledged in February 1962, "We know very little about Soviet progress in this field." (53) Moreover, what was known—or could reasonably be inferred—as to Soviet satellite capabilities seems to have made serious competition with American efforts unlikely. First, the Soviets were not developing a geostationary launch ability and did not in fact put a satel-
lite into synchronous orbit until 1974. Since that orbit is equatorial, achieving it was thought to require tropical or semi-tropical launch sites—which the Soviet Union lacked—and the service that spacecraft can thereafter provide would be poorest in the extreme latitudes where most of the U.S.S.R. lies. Although the practicability of synchronous satellites was not demonstrated until 1963 and their operational deployment not decided until 1964, they were acknowledged during the Comsat Act debates (see Chapter Five) as ultimately the preferable design, and the absence of effort in that field argued against any putative Soviet intention to create a global satellite system. Second, the Soviets had relatively little international communications traffic and correspondingly little incentive to improve facilities for its conveyance. The U.S., however, was the source or destination of traffic accounting for around 70 percent of international revenues; its exclusion, therefore, from an international satellite system would make the system's economic viability dubious and deprive potential participants of access to a major communicating partner. "Even though," a senator observed during satellite hearings in early 1962, "Russia put up a satellite system and offered it for less money, they would still only be able to serve a small portion of the world."

To the degree, however, that the risk of real Soviet satellite competition was acknowledged to be slight, the incentive to accelerate U.S. efforts was argued to be that much greater. A Senate staff report of Feb-
5. **NEW CONCERNS, NEW OBJECTIVES**

Sputnik and its successors were believed by some to have had special impact in the Third World, where the peoples of newly independent or 'emerging' nations were thought particularly susceptible to identifying with the achievements of "the backward Russians." The concern was growing increasingly intense because in the view of the U.S. government the issue was not so much foreign sentiment as the disposition of a political and military objective of incalculable importance. If communications satellites could be used to help secure that objective, a global scope was required, regardless of the usefulness—let alone indispensability—of the satellites themselves to those whom they were to impress.

In the defence department's internal history of the Vietnam involvement—later called 'The Pentagon Papers'—1961 is termed a "peculiarly difficult year" for the United States owing to "the generally aggressive and confident posture of the Russians...and the generally defensive position of the Americans," a characterisation especially appropriate to the government's view of political tides in the Third World. On January 6 the President-elect had received a copy of a speech by the Soviet Premier in which Khruschev had said that the "analysis of the world situation as it appeared at the beginning of the Sixties" suggested conditions that "greatly exceeded the boldest and most optimistic expectations." In particular, the Soviet Union would accordingly display "a most favourable attitude" toward "wars of national liberation." To Kennedy, the speech "signalled the beginning of total conflict in the vital southern hemisphere," as R. Aliano has written, and in his State of the Union address later in January the President adduced it as a restatement of the Soviet desire for world domination.

Kennedy's determination to meet this perceived threat in the Third World remained a theme of considerable importance in his government's foreign policy. The creation of the Peace Corps and of an elite Army counter-insurgency force, the interventions in Laos and Vietnam, the 'Alliance for Progress' in Latin America and diplomatic overtures to new African states, all suggested a general attentiveness to the Third World which contrasted sharply with the restrained interest of his predecessors in the White House—Truman's Point Four aid programme and intervention in Greece, Eisenhower's flirtation with gunboat diplomacy in Lebanon. The consequent ill-preparedness and the stakes imputed to actions in the Third
World were both dramatised in the humiliating U.S.-sponsored attempt to invade Cuba in April 1961. Coming just a week after the April 12 orbital flight of Yuri Gagarin, as D. Halberstam has written: "All of the setbacks [of 1961] would seem minor compared to the Bay of Pigs, which was a shattering event, both within the Administration and outside." Nonetheless, for Kennedy the underdeveloped countries had truly become the cockpit of history. During his June 1961 trip to Paris he observed that because of the rebirth of Europe the principal theatre of conflict had shifted to the Third World where the threat came "not from massive land armies but from subversion, Insurrection and despair." A year later Kennedy similarly told a European statesman: "Today's struggle does not lie [in Europe], but rather in Asia, Latin America and Africa." Both to wage that struggle more effectively, and to improve the credibility of the American nuclear deterrent vis-a-vis the Soviet Union, a larger transformation in U.S. strategic policy was called for. The Eisenhower-Dulles doctrine of massive retaliation—"finite deterrence and no conventional war"—was believed insufficiently subtle to accommodate the variety of military contingencies the U.S. might now be required to address. In its stead emerged a policy supported for a decade or more by some academics—among them Weisner—of flexible response: "assured superiority and limited war." The new policy required, on the one hand, immediate steps to improve the U.S. nuclear arsenal, believed to be "lagging," through increased spending and consolidated control within the military. On the other hand, the need to prepare for non-nuclear conflicts meant strengthening conventional forces, not just for operations in the Third World but in Europe as well. To pressure the NATO allies into contributing more to the European effort, a plan was devised to withdraw the Jupiter missiles Eisenhower had installed in Italy and Turkey after Sputnik. This plan reopened the lingering issue of deciding a formula to assure roles for America's allies in the control of the 'common' nuclear deterrent—and, by extension, in the development of their own advanced aerospace capabilities, an area of considerable consequence later to the internationalisation of the communications satellite system.
6. COMMUNICATIONS: A COMMON THREAD

If the United States were to pursue effectively the new policy directions suggested by those wide-ranging revisions in its perceived political and strategic requirements, certain of its material capabilities would have to be improved. Prominent among these was its overseas communications complex. The gathering efforts to accelerate communications satellite development thus emerged from a larger reappraisal of the adequacy of the U.S. international communications capability, whose deficiencies were believed to demand urgent remedy and whose specific needs did not seem likely to be met through wider deployment of existing communications techniques.

In addition to the commercial facilities used for routine administrative traffic, the government's international communications plant as of the early 1960s consisted of undersea cables, tropospheric scatter and high-frequency radio. Cable and tropospheric scatter (or 'tropo') were considered reliable, but were available in only some two-thirds of the Northern Hemisphere and little of the Southern. Expansion was technically conceivable but very expensive, and unlikely to be justified by the traffic volumes they would thereupon carry. Otherwise the government—and military—relied upon high-frequency radio, which suffered from limited bandwidths per circuit (hence useless for wideband uses like high-speed data transmission) and notorious susceptibility to interference from atmospheric disturbances in "the capricious ionosphere," whose reflective properties are essential to propagating high-frequency radio waves over long distances, but which is adversely affected by factors like a decrease in the occurrence of sunspots—or by nuclear detonations.

Consequently, the government's overseas capabilities were inadequate both for routine and emergency operations. Delays of from 24 to 36 hours were frequently encountered when contacting certain remote diplomatic posts and in January 1962 Kennedy was told that it could take as much as 48 hours to communicate from Washington with some of the military units dispersed around Europe. In emergencies, as the head of the Defence Communications Agency later said:

[When]ever we have any kind of a contingency operation, either diplomatic or diplomatic-military, we find that we have inadequate communications if these fall within these areas that are not connected by cable and tropospheric scatter.
Work was beginning early in 1962 to improve the government's internal administration in the communications field and its technical facilities: in February the President created an Office of Telecommunications Management to coordinate policies and oversee the state system, and in March an interim network of tropospheric scatter relays was established in Europe.(81)

It was, however, the Cuban missile crisis of October 1962 that dramatised most forcefully the overall problem and led to a consolidation of administrative control over the government's communications capability within the military. During the crisis the Soviets encountered lengthy delays in their cable connections to Washington, and at a particularly anxious moment the Americans learned that one of their U-2 reconnaissance planes—whose flight was supposed to have been cancelled—had gone off course and was over Soviet territory.(82) Moreover, as a House subcommittee report later concluded:

This crisis sharply revealed the inadequacy of governmental communications in carrying a heavy load of high priority traffic under emergency conditions. This serious problem served to underscore the knowledge that conventional high frequency radio could not be fully depended on and that normal communications methods for reaching remote spots around the globe were inadequate. (83)

In the aftermath of the crisis, a Security Council investigation was ordered and its findings prompted Kennedy to create in August 1963 the National Communications System, under the defence secretary, to organise and manage the state's global network.(84)

Within that larger reappraisal culminating in the establishment of the NCS, communications satellites had figured as a highly promising means to supplement and extend the national overseas capability. The satellite's microwave beam is not subject to ionospheric disturbance; nor do nuclear explosions cause it serious interference.(85) Satellites could be used with mobile ground units that could be airlifted to wherever service was required. And since they would operate in the ultra-high frequency bands, they would not compete for spectrum space in the more congested lower frequencies.(86)
7. STATE REQUIREMENTS VIS-A-VIS PUBLIC SATELLITE SERVICES

Although it was clear that the state had communications needs of its own that satellite deployment could fulfill, a closer look at the government's specific requirements indicates that many were unlikely to be met by a communications system given over to public—i.e. commercial—operation and use. Assuring that creation of any such system would not abridge the government's right to establish other satellite networks precisely tailored to its needs became, therefore, an essential condition governing creation of a commercial system.

The exact relationship that the government and its traffic would have to the commercial satellite system was not fully addressed until 1964 and not finally settled until 1967. Full-scale reliance on the system was, however, recognised as unlikely in 1961, as an assistant secretary of defence testified in September:

It is probable that for circuits to remote areas having limited commercial traffic, [the] Defense [Department] will have to rely upon its own systems and certainly it must provide its own systems for mobile use. (88)

For its own purposes, the government's needs differed in at least four respects from those readily to be met by a commercial system: fully global service, separate earth station ownership, mobile capability and measures to safeguard security and reliability. 1.) As noted, the military was intensely interested in improved links with hitherto under-served areas of the Third World, where traffic—and accordingly commercial interest—was light. (89) The military also needed better service to polar regions, since numerous important defence installations are located in the Arctic and high-frequency radio transmission in the higher latitudes is particularly prone to ionospheric disturbances. (90) 2.) The military preferred "wherever practicable" to own, operate and fully control its own earth stations, which was believed difficult to guarantee if they were parts of an international commercial endeavour. (91) 3.) The insistence upon a system able to communicate with small, mobile ground terminals was firm and frequently reiterated. (92) As another assistant defence secretary said in 1964:

One of the essential elements of a military communications system, and I want to put this as clearly and as unmistakably as I can on the record, is the ability to take a ground station, put
it in a C-130 airplane, ship it to country X in town Y (sic) and be able to communicate in the next half day with Washing­
ton. (93)

Communicating with such units, however, equipped with necessarily small antennas, requires large amounts of satellite capacity to overcome the relative insensitivity of the ground apparatus. Whether commercial users would be willing to tolerate the pre-emption of satellite power and bandwidth that this might entail was unclear. 4.) Similarly, the government had need of encryption and anti-jamming features to protect much of its traffic, techniques which require considerable bandwidth— it was, for example estimated that the military would be able to derive around one-tenth the channels that commercial users could obtain from the same spectrum space—(94) and which might furthermore mean extensive modifications within the spacecraft itself. (95)

Those problems were not necessarily insurmountable. The government might, for example, be entitled to supply its own compatible ground sta­tions for service to remote areas, tying in to a commercial space segment from wherever it wished. (96) The government might also subsidise service provided solely for its purposes, like that to low-traffic regions. (97) And if the government were willing to finance spacecraft modifications and lease the specialised capacity thereby made available, the specific features the government required might too be provided. (98) Nevertheless, the particular nature of the government's communications needs suggested strongly that whatever facilities were made available to it commercially would have at least to be supplemented.

At the same time, however, the services the government could readily procure commercially were far from negligible. Around 27 percent of the state-controlled communications complex consolidated into the NCS consisted of circuits leased from the private carrier industry. (99) An improvement in commercial facilities would facilitate the flow of rou­tine administrative and diplomatic messages, and to underscore its own interest in such an outcome the Pentagon said in a September 1961 policy statement:

It is in the interest of DOD that industry be encouraged in the development and establishment of an operational communications satellite system as rapidly as economically and technically feasible. (100)
Hence, there were two certain points of contact between the state's communications requirements and public satellite services: the early availability of a commercial system would mean improved facilities for non-sensitive government overseas traffic, but the state wished to reserve the right to establish whatever other satellite systems it deemed necessary. Those two points were stressed by Secretary of Defence McNamara in Senate testimony shortly before the Comsat Act was passed, and they were contained in the President's July 1961 policy statement a year before, when Kennedy said the government would make use of the commercial system for general governmental purposes and establish separate communications satellite systems when required to meet unique Government needs which cannot, in the national interest, be met by the commercial system. That modest formulation did not, however, fully cover the potential usefulness of a public satellite system to the U.S. government. The future of the government's own satellite plans, and indeed of the space programme altogether, was also believed to be at issue.

8. INTERNATIONAL APPROVAL OF SPACE-RELATED FREQUENCIES NEEDED

In October 1963 an Extraordinary Administrative Radio Conference (EARC) was scheduled to be held in Geneva, under auspices of the International Telecommunications Union (ITU), to decide upon frequency assignments for space communications. Although the Soviets were thought, because of the size of their land mass, to be able to rely upon domestic frequencies in their space efforts, for the United States:

The success, not only of the communications satellite project, but of all U.S. space programs will depend upon the agreements reached at this international conference.

Without dedicated frequencies, American space activities would be subject to technical interference from other users and consequent international political discord as claims and counterclaims ensued. Moreover, the recent past suggested that approval of U.S. requests was not likely to be automatic.

From August to December 1959 the World Administrative Radio Council (WARC) had taken initial action on space frequencies. The U.S. had been preparing for the WARC meeting since 1957, and of the 13 frequency bands subsequently registered for space research, ten were the direct results
of American proposals. Due to opposition though from a number of smaller countries—led by Israel and France—which contended that too little was known as to the future needs of nations that did not yet have launch capabilities, the assignments were made solely for experimental purposes and were furthermore to be reviewed by an extraordinary conference in four years' time. The U.S. required firm frequency commitments for its various space projects—including exclusive bands (not shared with terrestrial usage) for military satellite systems—and began formal preparations for the EARC in May 1961. Although a Senate staff report subsequently observed, "Probably no more effective or early U.S. coordination of proposals for an international radio conference have ever been undertaken than that in preparation" for the EARC, final success would require "a clear exposition of the benefits to be realized from satellite communications services to all nations." Hence, there was a material reason for haste in planning for public satellite services, irrespective of the degree to which the ultimate system would be able to meet fully the state's instrumental communications requirements. The chief of the State Department's telecommunications division reminded House commerce committee members in July 1961 that foreign countries had to be involved quickly in planning for the satellite system in order to avoid a repeat of the disinterest and hostility shown at the 1959 WARC. And as the chairman of the Senate communications subcommittee remarked during hearings the next month:

Needless to say that the country that is successful in placing an operable communications satellite into the air will be in a strong position to exercise leadership leading to the acceptance of technical requirements and to the arrangements during the 1963 conference. That the public satellite services envisaged should, however, be privately-owned and commercially-operated has not yet been explained.

2. DEVELOPMENT OF STATE COMMERCIAL SATELLITE POLICY

The government's commitment to creating a privately-owned satellite system had clearly begun to emerge toward the end of the Eisenhower Administration's tenure, and was officially embraced during the first few months of President Kennedy's term. The earliest apparent reference
to such a policy was an oblique one, contained in a September 1959 Bureau of the Budget statement:

It is the general policy of the administration that the Federal Government will not start or carry on any commercial-industry activity to provide a service or product for its own use if such product or service can be procured from private enterprise through ordinary business channels. (111)

The statement was ambiguous insofar as it referred only to services required by the government—not, say, those furnished by the government to other users—and was arguably premised on the existence of "ordinary" business channels, of which there were none in the satellite field. Notwithstanding, interest in communications satellites within the private carrier industry—whose activities are described in the next chapter—was becoming evident, and during the summer of 1960 the State Department requested the carriers not to attempt to negotiate any satellite-related arrangements with foreign telecommunications entities until government policy had been further clarified. (112)

Clarification of state intent ensued, notably through an October 1960 speech by the head of NASA: "Traditionally," he said, "communications services in this country have been provided by privately-financed carriers competing with one another to serve the public interest under Federal controls and regulation;" furthermore, there was "no reason" to modify that policy when it came to communications relayed by satellite. Instead the government should promote and accelerate private efforts, making available the results of state-financed R&D and furnishing launch facilities on a cost-reimbursable basis. (113) These views were reiterated by President Eisenhower in his December farewell address when the President declared: "[T]he government should aggressively encourage private enterprise in the establishment and operation of satellite relays for revenue-producing purposes." NASA, furthermore, was instructed to intensify its satellite R&D and to initiate a programme of active support to private industry. (114) Accordingly, four days after the December 31 speech the White House asked for competitive proposals from industry for an experimental satellite communications system, and on January 19—the day before Kennedy's inauguration—the Federal Communications Commission (FCC) issued a licence to the American Telephone & Telegraph Co. (AT&T) for a test satellite, finally launched in July 1962 and named Telstar. (115)
Although Kennedy believed that the approach favoured by Eisenhower of competitive bids would likely culminate in an AT&T satellite monopoly, and although the administration acknowledged that continuing state oversight would be necessary and wholly justified—because of the satellite system's potential military uses, the need for "physical support" by the government in the form of launchers and the possibility that "extraordinary financial support" would also be required—private ownership of the system was not in principle opposed: "A new area of industrial opportunity for civilian use," said the Weisner Report, "is normally left by our Government to private enterprise." The administration's first action regarding public satellite services was therefore to help create conditions favourable to industry's activities.

On February 28, 1961 a 'memorandum of understanding' was agreed by NASA and the PCC, setting forth their respective responsibilities within subsequent satellite efforts. The "earliest possible realization" of a "commercially operable" satellite system was pronounced an "urgent national objective."

In accordance with the traditional policy of conducting international communications services through private enterprise subject to government regulation, private enterprise should be encouraged to undertake development and utilization of satellite systems for public communications services.

NASA, which hitherto had principal responsibility for all civilian space applications—under terms of its agreements with the Pentagon—, would henceforth serve primarily as a technical resource of the gathering commercial effort. Wide-ranging authority to develop and implement policy, however, was given to the PCC; and since the PCC was a regulatory and not normally an executive agency, a preferred form of commercial organisation was already implied: "the implementation and utilization of space telecommunications technology through the licensing and regulation of U.S. common carriers." It was not anticipated that a new entity would be needed, since the system's creation "may be accomplished through concerted action by existing agencies of Government and private enterprise," and it was not even clear that the necessary organisation could not be achieved administratively, without specific legislation. We shall return in the next chapter to the FCC and how it carried out its new mandate.
When Kennedy appeared before Congress on May 25, 1961 to announce the American commitment to land a man on the moon by the end of the decade, he also requested an increased interim budget for NASA of $50m "to make the most of our present leadership by accelerating the use of space satellites for world-wide communications." Although the funds would be used to speed government satellite R&D, NASA's new administrator James Webb insisted that the space agency sought to involve private industry "in the most rapid and expeditious manner." In a June 15 letter to Vice President Johnson, chairman of the National Aeronautics and Space Council (NASC), Kennedy directed the council to make the necessary studies and prepare policy drafts for creation of an operational system—while giving "particular attention to the [needs] of this hemisphere and newly developing nations throughout the world." A month later the NASC unanimously recommended that the system be privately owned, subject to the government's 1.) setting broad technical and operating standards, 2.) providing launch services and 3.) regulating rates and service modalities.

Kennedy's formal statement of communications satellite policy, released on July 24, emphasised speed and global deployment as objectives, and elaborated considerably upon the three conditions the NASC recommended be placed upon private industry's participation.

I am anxious that the development of this new technology to bring the farthest corner of the globe within reach by voice and visual communication, fairly and equitably available for use, proceed with all possible promptness.

While "private ownership and operation of the U.S. portions of the system is favored," the following conditions would have to be met: the system was to be created as rapidly as possible; provision—through ownership or otherwise—would be made for foreign participation; access on equitable terms must be extended to all U.S. private participants; equipment procurement would be through competitive bidding; antitrust laws must be complied with; operating economies must be reflected in the tariffs charged to customers; and service was to be extended "even where individual portions of the coverage are not profitable."
10. CONCLUSIONS: PRIVATE OWNERSHIP AND COMMERCIALISATION

During the interdepartmental meetings to draft the President's July satellite policy statement, attempts were made by middle-level State Department officials to raise the possibility that ownership and operation of the U.S. component of the global system might be retained by the government. The suggestions were summarily rejected, and by early August the head of NASA described the state ownership option as follows:

No consideration has been given to that except as an alternative in the event a commercial system cannot be brought into being by private industry. (128)

As we shall see in the next two chapters, however, government ownership did attract support in Congress, particularly as it became clear that the likely form private ownership would take would consist of a highly-concentrated arrangement of control by potential competitors—formulated by the carrier industry through the summer of 1961—and not the broadly-based private ownership implied in Kennedy's statement. Nevertheless, as far as the Kennedy Administration was concerned, state ownership was officially dead as a policy option by July 1961—if indeed it had ever been thought politically practicable or desirable. (129)

It is true that the new administration had not been given an altogether clean slate as concerned satellite policy, since officials of the Eisenhower Administration—and Eisenhower himself—had endorsed a privately-owned satellite system and had opened discussions with the carrier industry toward that end. Moreover, a definition that continued to be highly influential in subsequent debate had successfully—and virtually without challenge—been introduced under the Republican administration: that satellite communications represented a communications, and not primarily a space, activity and was therefore an appropriate sphere for private exploitation. The propriety of government ownership, on the other hand, required for its defence some demonstration of why the state should "get into the telecommunications business." (130)

Furthermore, even without these precedents specific to the satellite field, the new administration had reasons of its own for seeking to reafirm arguably traditional patterns of state-private relations. The goal was to reassure an uneasy and mistrustful business community and thus to secure support for various measures about which private sector leadership
was skeptical. To deal with an economic recession dating from 1959, the
White House was attempting to pursue expansionary fiscal policies; through­
out 1961 the battle was with the Treasury Department over an increased
government deficit, a fight succeeded by a similar struggle over a tax
cut—both of which measures business leaders believed inflationary and ir­
responsible. (131) Other White House actions, though less generally im­
portant, aggravated relations with corporate leadership and produced, by
the time the Comsat Act was before Congress, a very poor image for the
President within the business community. (132) Schlesinger, for one, has
placed the private ownership decision within the context of rapprochements
to attempt to heal White House rifts with business, noting that final pas­
sage of the Comsat Act came shortly after the Treasury liberalised depre­
ciation allowances and the chairman of the Council of Economic Advisers
had begun a series of briefings for business leaders:

By this action [liberalised allowances], along with Heller's good
will missions, the enactment in October of the investment tax cre­
dit and the President's decision—regretted by some of his associ­
atcs—to put the communications satellite system under private
ownership, the administration sought once more to overcome the mis­
trust of the business community, this time in order to win business
support for tax reduction... (133)

Allowing for the implied displacement of Kennedy's decision to mid-1962,
the passage nonetheless suggests the troubled context of relations with
the private sector—after eight years of benign Republican administra­
tion—into which a satellite ownership decision favourable to business
might be expected to play.

Moreover, private ownership could be defended as more generally
appropriate to the state's principal objectives in the satellite field
than government ownership, in terms of symbolising peaceful intents,
dramatising national leadership in the field, and securing the urgency
with which the state sought to inspire the project. The 1958 creation
of NASA would thereby emerge as a preliminary step toward separating en­
tirely certain space applications from military influence or control;
private ownership would be the ultimate guarantee of institutional inde­
pendence, and a compelling argument for participation in the communica­
tions system by 'neutral' or 'non-aligned' nations. At the same time,
as a Senate staff report argued:
The establishment of a communications satellite system will demonstrate to the world the vitality of the U.S. democratic system, in which private enterprise, in partnership with government, can mobilize its resources in providing a global communications network which can be commercially profitable and at the same time serve as an international public service. (134)

Fortune magazine declared similarly that "if the industry can settle its differences and join in a cooperative effort its can provide an enduring example of the capabilities of free enterprise." (135) Finally, although it was anticipated that service to light-traffic regions of the world might be commercially unattractive and subsidy might therefore be necessary, the speed and effectiveness with which the project was pursued was believed likely to be enhanced if private firms with demonstrated interest and technical capabilities (see Chapter Four) in the satellite field were fully involved. That urgency was, as we shall now see, used frequently to legitimate the precise form and industrial composition of the private ownership plan which was now beginning to emerge from discussions convened in the spring by the FCC.
CHAPTER FOUR: THE DEVELOPMENT OF U.S. INDUSTRIAL POLICY ON SATELLITE COMMUNICATIONS, 1959-61

1. OVERVIEW

Early private mobilisation in the satellite field, which began toward the end of the Eisenhower Administration and intensified soon after Kennedy took office, culminated in October 1961 with the release of formal proposals calling for ownership and operation of the satellite system to be entrusted to a new private joint venture which would regroup the small number of firms providing international telecommunications services. The ownership plan was formulated with, and supported by the Federal Communications Commission, under authority assigned to the FCC by its February 1961 agreement with the civilian space agency NASA. The proposal nevertheless ran counter to an emergent Administration policy favouring widely-based industrial ownership—including domestic communications carriers, electronics firms and aerospace manufacturers. Industry's plan subsequently inspired Congressional legislative proposals and attempts at reconciliation with the White House's approach, which comprised the history of the 1962 Comsat Act, recounted in the next chapter.

In this chapter we shall examine private satellite-related activities through autumn 1961, when an ad hoc group of U.S. international carriers, convened by the FCC after the President's July policy statement, released its organisational proposals. Three phases in the chronology can be distinguished: 1.) a period of uncoordinated manoeuvrings, from 1959 to early 1961, when various firms—acting as R&D or manufacturing contractors—advanced their satellite capabilities and standing in the field through individual transactions with the government; this, in the absence of state policy on public satellite services and without any effort to orchestrate collective industrial policy; 2.) a brief phase of rule-making, from late March to late May 1961, when the FCC formally invited participation from a wide range of industrial entities in the
Commission's efforts to establish policy-making procedures; 3.) a decisive period beginning in late May and lasting through summer 1961, when private entities other than the international communications carriers were excluded from FCC-industry policy discussions, an exclusion that had foreseeable consequences on the character of private satellite ownership subsequently proposed in October.

The chapter begins, however, with a consideration of two important areas of ambiguity—the first commercial and the second technological—relating to the degree and kind of interest industry had in the introduction of satellite communications. First, although there was ample evidence of growing commercial requirements for overseas circuits, there is little to suggest that satellites were viewed by the communications industry as uniquely or urgently needed to meet those requirements. Second, satellite technology was itself far from ready for operational deployment: at least two fundamentally different designs were thought potentially usable, but neither had been proven experimentally or operationally and little was therefore known of economics or profitability. Hence, with the ultimate form, usefulness and revenue potential of satellite communications for the moment unknowable, industry's evidently keen interest in securing influential roles in whatever decisions would be made seems based in a desire to share in the technology's control, and therefore to be able to determine the directions its design and application should take. While industry's response to those other concerns was equivocal, its recipe for control was not.

2. GROWTH OF OVERSEAS COMMERCIAL COMMUNICATIONS REQUIREMENTS

The introduction of voice-capacity transoceanic cables in 1956 soon provoked increases in overall international traffic volumes, changes in the media composition of those volumes toward heavier telephone usage, and consequent shifts in dominance within the U.S. international communications industry away from record carriers and toward the single American voice carrier, American Telephone & Telegraph Co. (AT&T). AT&T's 1956 cable to England was followed by similar over the next eight years to Hawaii, France, Puerto Rico, a second to England and a 1964 transpacific complex; Cable
& Wireless built a cable in 1961 to Canada and in 1963 from there to Australia and New Zealand, and was beginning work on a link from Australia to Hong Kong and Singapore, to be completed by 1967. While U.S. overseas phone volumes, hitherto using high frequency radio links, had been increasing—doubling between 1948 and 1954—the first year of cable operation saw a 90 percent increase in transatlantic phone traffic, and by 1965 the total was nearly three times the pre-cable volume.

For AT&T, notwithstanding its approximately 83 percent share of the incomparably bigger U.S. domestic telephone market, an expansion of international activities nevertheless promised to be lucrative. Thanks to its voice cables, AT&T's international revenues had increased sevenfold between 1947 and 1961, to nearly $42m. Furthermore, the anticipated shift in the composition of international traffic away from telegraph and record traffic to phone calls had not yet materialised: as of 1961, around 90 percent of American overseas traffic still consisted of telegraphy, in volume terms. In revenue terms, however, voice traffic already accounted for two-fifths of total international earnings. According to a 1960 study undertaken for Lockheed Aircraft, by 1970 U.S. overseas phone traffic would comprise one-quarter of the country's international traffic volume and one-half total overseas revenues. AT&T's monopoly over international phone calls would mean that the one-quarter of total overseas revenues deriving from telegraphy—and the final quarter from teletype and data—would be divided among the three principal international record carriers: Western Union International and subsidiaries of RCA and ITT.

The Sixties were anticipated as the era of the telephone in international communications, and the demand for voice circuits appeared virtually insatiable. Newly built transoceanic facilities were fully loaded with traffic in from 90 to 150 days after completion. As of 1961 industry's forecasts were for 15 percent annual increases in traffic volume over at least the next decade, which would soon outstrip existing capacities. An ITT official said that another thousand transatlantic voice circuits would be needed by 1965—in addition to the 180 then in service; by 1970 2,000 new circuits were required, and by 1980 between 4,000 and 6,000 new
circuits in the Atlantic and Pacific regions—the final projection
"several thousand circuits above the present and expected cable capaci-
ty." AT&T's forecasts were higher still, and the company believed
the U.S. would be needing 12,000 voice circuits worldwide by 1930. (11)

Thus, on the one hand, the apparent need for satellite facilities
from within the commercial sector seemed clear. "[T]he February 1961 NASA-FCC agreement,
"the spectrum probably cannot support the very substantial increases in
capacity to satisfy new services...or to satisfy the anticipated expan-
sion of ordinary types of services." The ITT official told the House
space committee in May that he had "little doubt" of the need for satel-
lite circuits, and a government interagency group reported that month
that existing international channels to many areas would be saturated by
1965 if satellites were not introduced. (14)

On the other hand, however, it was not just the anticipated increases
in traffic volumes, but the likelihood that existing techniques could ac-
commodate them that would be crucial in determining the ultimate require-
ment for satellites. A 1975 retrospective from a top official of the FCC
common carrier bureau made that point:

We had a situation in the United States where we had an existing
good, efficient, low-cost international communications plant, and
if we never had seen any satellites, we would have today a good,
efficient, well-designed, well-planned system... AT&T would also
have developed not merely its SG cable [an advanced generation],
but eventually an SH, SI and SJ cable which would be capable of
carrying television signals under the ocean. (15)

The carriers' projections of traffic and circuit requirements were disingenuous to the degree that they implied a willingness necessarily to rely
upon satellite facilities. In December 1963, for example, when AT&T an-
nounced that if they were available the company would prefer using satel-
lite to additional cable circuits in 1966-67, AT&T was in fact engaged in
developing new 720-circuit transistorised cables—with around ten times
the capacity of existing cable designs. (16) In 1967, when AT&T's prefe-
rence for satellite circuits was to take effect, the company was applying
for new cable authorisations, warning that foreign interests would "move
into the vacuum" if approvals were not given. (17) Indeed, in the first
five years after operational satellite service commenced, undersea cable
mileage worldwide trebled. (18)

Furthermore, even if cable construction and design had remained fixed, it is not clear that the kinds of capacity increments expected from satellites were warranted by the anticipated deficiencies in commercial facilities. While the private carrier industry forecast a requirement worldwide for 4,650 voice circuits by 1970, a low-altitude communications satellite system—consisting of perhaps 20 satellites and 24 earth stations—would make 7,800 circuits operational; a high-altitude synchronous system would furnish up to 13,000 circuits—or so one analyst predicted. (19) As it happened, by early 1971 satellites with from 4,000 to 6,000 circuits each were being deployed for the global system, helping not to remedy circuit scarcity but to increase already grave overcapacity in the international network, as is discussed below in Part IV. Hence, even if industry projections were accurate, both the likelihood of continued cable construction and improvement and the capability of satellites to provide channel capacities well in excess of those projections suggest that a direct connection between anticipated circuit scarcity and support for satellite development is a difficult one to establish.

3. THE STATE OF THE ART AND ITS INDUSTRIAL PATRON

The British science fiction writer Arthur C. Clarke is generally acknowledged as "the father of communications satellites" (20) owing to his 1945 article in which he assembled two technical advances arising from the Second World War—German long-range rocketry and the British discovery of microwave transmission—to prophesy orbiting radio relays. (21) Spaceborne relays would enable the rich information-carrying ability of microwaves to be exploited, while their principal disadvantage—the fact that they travel in straight lines and are unaffected by atmospheric layers (and would therefore require 475-mile high towers to be conducted across the Atlantic)—would be overcome. (22) The feasibility of the concept would require not just continued work on missiles and miniaturised electrical components but also, as it happened, "fortuitous" developments in earth station technology—largely derived in the late 1950s through work on radio astronomy and radar—to provide equipment capable of capturing
and amplifying the extremely faint signals from a satellite.\(^{(23)}\)

Although Clarke’s contribution was received with “monumental indif-
ference,”\(^{(24)}\) and notwithstanding his prediction that satellite communi-
cations was a half-century away, scientists in America—particularly in
AT&T’s Bell Laboratories and at RCA—had begun by the mid-1950s to look
closely at the practicability of the concept. John Pierce, the Bell en-
gineer considered one of the pioneers of satellite development, had not
seen Clarke’s piece when he gave his first lecture on the subject in
1954: “For me, satellite communications was in the air. It was some-
thing that should be looked into sooner or later.”\(^{(25)}\) AT&T later claimed
that as of 1962, out of a total of \$1,400m spent on R&D since 1949, around
\$1,000m had gone to “fields closely pertinent to today’s satellite commu-
ications.”\(^{(26)}\) AT&T’s attention focussed on development of low altitude
satellite, which not only seemed most feasible from the point of view of
launcher capabilities, but obviated an important difficulty associated with
higher altitude craft—the time lag experienced between transmission and
reception on the ground of a signal relayed by an extremely remote satel-
lite. That delay, totalling a half-second for each direction of a two-
way communication, was believed to render high-altitude satellites un-
suited to voice traffic.\(^{(27)}\)

AT&T’s misgivings were not however shared by Hughes Aircraft, the
company that must be accorded pride of place in the development of geo-
stationary satellites. Hughes was one of the country’s leading defence
manufacturers—and indeed the Air Force had in 1953 persuaded the com-
pany’s eccentric founder, Howard Hughes, to remove the firm from his di-
rect control in order to stop the flight of talented technicians being
driven away by intolerable managerial practices.\(^{(28)}\) By 1959 Hughes Air-
craft was suffering from cancellation of some big military contracts, which
had reduced the company’s backlog of orders from \$750m to \$200m and left
it with both the capability and incentive to look for new areas of tech-
nical activity. Harold Rosen, a young engineer whose military intercep-
tor project had been cancelled, and who later was credited with leading
the Hughes effort to develop synchronous satellites, has recalled:

This was a time of rethinking for the company. And the Russians
launching that Sputnik the previous year was a cause of rethinking
on my part. We were just generally looking for any other way to
apply our technology. Among other things we specialised in light-
weight transmitters and receivers and antennas. \(^{(29)}\)
Rosen's own field of interest was controlling missiles in flight, and after he discovered a 1959 article by Pierce and Rudolf Kompfner—the inventor of the travelling wave tube—he initiated a series of exchanges with Bell Labs. While "Kompfner and Pierce had made a tremendous contribution to communications," Rosen has said, "they were from a communications house. Our aerospace experience could match the mechanics to the communications."\(^{(30)}\)

The approach Hughes began to develop was conceptually simple and technically risky: a satellite placed in precise equatorial orbit at an altitude of 23,400 miles would have an orbital velocity equal to the earth's rotational speed, and would therefore remain stationary relative to the earth's surface. A number of immediate technical obstacles existed: insufficiently powerful boosters to lift and position a payload one-tenth the distance to the moon, a need for precise station-keeping instruments to prevent the satellite from straying from its orbital slot, a requirement to stabilise the satellite's attitude to keep solar cells pointed toward the sun and antennas directed at the earth. Nevertheless Hughes later claimed that the company had an operable design by 1959\(^{(31)}\) but that it was unable in 1959 and 1960 to interest either the Pentagon or NASA in its project. After deciding in March 1960 to invest money of its own in further synchronous satellite development, Hughes attempted unsuccessfully to interest AT&T, ITT and General Telephone & Electronics (GT&E), the country's biggest independent (non-AT&T) domestic phone system. Finally in October 1961 GT&E signed a joint agreement with Hughes to provide a modest $610,000 for further work.\(^{(32)}\)

Despite Hughes' optimism, and in spite of the inherent advantages promised by geostationary satellites, the first signs of the concept's practicability were inauspicious. A synchronous system would not require extensive tracking and telemetry equipment at each earth station, and a single antenna would suffice instead of the two or three each terminal would need to pick up and lock on to successive satellites. Hence a geostationary system was estimated by Hughes to cost $200m, as against more than $500m for a lower altitude system.\(^{(33)}\) Furthermore, if precise stabilisation could be achieved, greater effective radiating power could be obtained from the satellite; for the military, this would enable smaller ground stations to be used—hence the coveted tactical capability—and
for commercial users, a greater number of channels could be derived from a given satellite output.\(^{(34)}\) Hughes was developing a method of spin stabilisation, whereby the satellite would be de-spun and rotate around an axis perpendicular to the orbital plane—a notable departure from currently tested techniques which relied on the faint differences in gravitational pull upon two ends of a perpendicular spacecraft.\(^{(35)}\) The Pentagon had been sufficiently impressed with the synchronous concept to contract in 1960 with Lockheed Aircraft for an experimental geostationary system called Advent. It was found, however, that the project "was beyond the state of the art," as the director of the Defence Communications Agency later acknowledged, "that we were trying to go too far, too fast."\(^{(36)}\) Advent was dropped in 1961, after $170m had been spent and no satellite had been launched, and principal work on geostationary satellites was thereafter based in NASA.\(^{(37)}\) In August 1961 the space agency awarded Hughes a contract to build an experimental synchronous craft to be launched in late 1962, and called Syncom.

4. AT&T AND LOWER ALTITUDE SATELLITES

AT&T had in the meantime been attempting since 1959 to rally support for the subsynchronous design it favoured and for the company's suitability as institutional keeper of whatever satellite system might be established. AT&T (or Bell) first approached NASA in December 1959 with an offer to build, own and operate a commercial satellite system with $170m of its own funds. The offer was turned down, pending clarification of the relationship a commercial system would have to the government's own space programmes.\(^{(38)}\) Bell then turned to the FCC and in July 1960 submitted a plan for a satellite network consisting of 50 satellites in 3,000-mile polar orbits, furnishing 600 voice circuits to 13 pairs of ground terminals. Costs, again estimated at $170m, were to be borne by AT&T and its foreign correspondents under yet-to-be determined arrangements. That proposal was still on file when Bell applied in October for authority from the FCC to build and operate an experimental satellite.\(^{(39)}\) With a change in Administration imminent, AT&T stepped up its efforts to secure approval for at least the test satellite,\(^{(40)}\) requesting launch assistance for the experiment from the outgoing head of NASA in a letter.
in December, but receiving no reply. Nevertheless the FCC on January 19, 1961 issued Bell the experimental licence it sought for a low-altitude satellite, subsequently launched in July 1962 as Telstar.

AT&T attempted to capitalise upon its Telstar plans by promoting at the same time its proposal for a global system consisting of up to 50 random-orbiting satellites, and attempting to secure the contract for the next series of NASA experimental spacecraft. Bell's unilateral resolve doubtless impressed legislators, and during Congressional hearings, in the spring of 1961 company representatives insisted that it would continue to spend the $15m allocated to Telstar irrespective of the final disposition of the satellite ownership question. AT&T claimed it already had put some $25m of its own funds into space R&D, eliciting admiring questions like this one from a senator:

But you have already put [the money] in with no prospect of return, other than that you want this satellite to be launched so that you can improve the communications systems of the people of the world? (42)

Administration officials were likewise asked why the government should be involved at all in satellite communications, since AT&T was evidently willing to proceed with its "own" money—to which it was replied that for a company like Bell its 'own' money was inevitably and virtually automatically that of the public to which it furnished phone service. As far as NASA was concerned, the space agency seems to have been reluctant to prejudice the ownership discussions by collaborating unduly with AT&T's plans, and when the next major contract for an experimental subsynchronous series was let in May, the award went to RCA and not AT&T—partly in order to diversify the government's supply sources. (RCA's Relay satellite, launched in December 1962, turned out to be a considerably more successful craft than Telstar and set records for performance and durability.) NASA did not in fact agree to launch Telstar for AT&T until shortly before Kennedy's July 1961 policy statement, six months after Bell had secured FCC approval for the experiment, and NASA officials thereafter insisted that the agency's assistance would not provide AT&T with an advantage in any subsequent ownership decisions.

Bell's advocacy of a low-altitude satellite system injected a technological dimension into the debate over ownership. "AT&T," as one
congressman observed,

has proposed a low-random-orbit system which would require scores of satellites and ground stations in order to obtain worldwide coverage. This proposal is made at a time when there is general agreement on the ultimate desirability [of a synchronous system]. (47)

Representatives of RCA, ITT and GT&E indicated support for a geostationary satellite system, where three satellites would in principle be sufficient to furnish global coverage, and in spite of FCC testimony that the British were worried that high-altitude relays might impair communication between London and Australia, GT&E adduced studies indicating that time delays of up to two seconds were detected by only a small percentage of telephone users. The company further warned the FCC in a March 1961 submission:

The system should not be planned on the basis of currently available hardware, nor should easiest, early technical choices be permitted to freeze a system concept which precludes or makes more difficult the adoption of a much more suitable system at a not much later date. (51)

Hughes Aircraft's chief scientist later asked similarly, "Which of us would have won?" if the Soviets created a low-cost geostationary system after the U.S. had established a random-orbiting network whose high costs made it suited only to high-traffic areas of the world. (52)

Doubts over low-altitude satellites reinforced skepticism as to AT&T's intentions in the field, and fears that Bell would use the dominant ownership role it sought in order to prevent introduction of geostationary technology and thereby retard development of the system. Said one senator:

AT&T wants these vested legal rights now...Then Howard Hughes can develop his high-altitude satellite, but he will have to deal with the corporation by way of the legal instrument which is to be created by the [then-pending] bill. (53)

Bell's preferred system was described as "a lot of junk" by one senator, who pointed out that since AT&T would likely be permitted to include its satellite investment in its rate base of used and usable facilities, the company would still earn a profit, so "they don't have anything to worry about." (54) Furthermore, the high costs of a low-altitude system would pose a cost barrier to participation by smaller communications or aerospace companies, and it was noted that the single Andover ground station built by Bell for Telstar cost some $15m alone, suggesting probable AT&T
dominance over the system's ground segment as well. And in the background was Bell's growing investment in undersea cables, which made imperative denying the company the method by which the largest monopoly on earth could get control of a potentially competitive system, and the means whereby this monopoly could frustrate or prevent the rapid development of the system in the event it could not obtain adequate control to suit its purposes. (56)

The principal argument in favour of proceeding with a lower altitude system was the belief in its earlier availability. Although Hughes representatives insisted that a commercially operable synchronous system could be in operation within 18 months, NASA officials testified that it would be at least five years before geostationary satellites would be available. Thus, an RCA representative described the possible reason for creating a subsynchronous system as essentially non-commercial:

They are principally national prestige reasons. It is important for the United States at this juncture to move as quickly as possible to a satellite communications system for national prestige, and I would assume also for military purposes. (60)

An earlier RCA contribution recast the issue in terms of its impact upon private industry:

The ultimate advantages of a synchronous satellite system raise a practical economic question as to how much should be invested by industry in a low altitude commercial system primarily to gain a certain amount of time. This is further complicated by the fact that the pressures to pay a premium for time are based more on national, political and psychological factors than on commercial considerations. (61)

Hence, the principal standard against which technical options would be assessed was the national policy of urgent deployment, which ostensibly commercial activities were to serve. The precise nature of industry's satellite requirements remained ambiguous, but were in the process of receiving some clarification as the result of discussions convened by the Federal Communications Commission.

5. THE FCC AND CARRIER INDUSTRY SATELLITE CONTROL

The FCC had already, by the beginning of 1961, been promoting a degree of space-related activity on the part of the communications carrier industry, and indeed by February the industrial climate was deemed sufficiently favourable for General Electric to establish a million-dollar subsidiary, ComSat Inc., and apply to the Commission for autho-
risation to create—in cooperation with other interested companies—a
global satellite system. It was however the late February agreement
between the FCC and NASA which legitimated more intensive Commission ef-
forts to organise the carrier industry for entry into the satellite field.
While we shall have occasion in the next chapter to recount some of the
criticisms leveled at the FCC’s qualifications to regulate on a permanent
basis space communications, the most striking theme in the early history
we are about to describe is the essentially symbiotic relationship that
obtained between the regulatory agency and the industry that was its pu-
tative responsibility. This symbiosis pertained not, for the time being,
to the particular privileges and immunities the FCC would later seek to
secure for the carrier industry, but to the general appropriateness of
that industry’s central role—to the exclusion of other private claimants
—in satellite development. Others objected that airline development
might never have occurred had aviation technology been entrusted to rail-
way owners. The FCC’s insistence on the propriety of carrier satellite
control can, however, be in part attributed to the dependence of the Com-
mission’s own role in satellite development upon a dominant carrier industry role. There was, therefore, a fundamental identity of interest ex-
pressed in the FCC’s and carrier industry’s efforts to confine industrial
participation in the emerging system, since for both sides such exclusion
would widen the opportunities for respective responsibilities to be exer-
cised.

On March 29, 1961, a month after signing the agreement with NASA,
the FCC opened a docket—or formal inquiry and solicitation of views—on
the technical, organisational and regulatory questions pertaining to a
worldwide satellite system. The Commission’s notice of inquiry placed
these issues within FCC jurisdiction, while acknowledging:

A serious problem is presented as to the manner in which such a
system can be accommodated within the existing competitive frame-
work of our international common carrier communications industry
and within the antitrust laws.

Among the 10 private respondent organisations, those with interna-
tional common carrier operations or subsidiaries—AT&T, Western Union
International (WUI), ITT, and RCA—recommended that ownership of the U.S.
component of the satellite system be in the form of an unincorporated
joint venture whose participation would be limited to international carriers. AT&T argued that satellite operation could best be handled if integrated into existing carrier activities, and that the model of ad hoc ownership arrangements negotiated for submarine cables was appropriate; therefore, "a separate satellite company is not necessary." The two manufacturers with no carrier operations which responded, Lockheed Aircraft and General Electric, proposed creation of a new corporate entity to be owned by interested companies in the communications and aerospace fields. GE nominated its new subsidiary, ComSat Inc., as the basis of the new company, and suggested that participating firms be allowed to own no more than between five and ten percent each of the satellite company's total shares. GE admitted its lack of communications experience, but pointed out that since 1957 it had produced 350 space vehicles and argued:

For the first time, a problem has emerged in the communications field which requires drawing heavily on the skills of two major industries. The space industry and the communications industry have to marry.

Lockheed was ready for the ceremony, having by 1961 helped build more than 85 percent of U.S. payloads successfully orbited; the company proposed a separate ownership consortium consisting of manufacturers to co-own the satellite system along with a carrier operating consortium. As for GT&E, which with its subsidiary Hawaiian Telephone was the only strictly domestic communications carrier to submit proposals to the docket, participation by all carriers—international and domestic—was favoured in the new joint venture, but manufacturers were to be excluded, as long as sufficient capital could be raised without them. GT&E's proposal would nevertheless expand the range of potential satellite system owners to include the 1,800 independent telephone companies in the U.S. that had no international operations.

In reply, AT&T argued that participation by the domestic carriers would be unwarranted since these firms had no experience in international arrangements and in handling overseas traffic; besides, GT&E had been the only respondent to favour their inclusion in ownership of the satellite system. More seriously, Bell charged that participation by manufacturing firms would be "contrary to the public interest" since those companies had no operating experience, and their involvement might hinder
negotiation of arrangements with foreign operators. And notwithstanding the fact that only two manufacturers had submitted statements to the docket, AT&T contended that since around 60 major companies were then engaged in the production of missiles, satellites or related equipment, the GE formula "appears designed to vest control in the aerospace group" over the eventual organisational arrangements.\(^{(76)}\)

The government's contribution to this FCC docket was a submission from the Department of Justice, which set forth four conditions deemed necessary to satisfy antitrust laws through satellite activities. First, "all interested communications common carriers"—domestic and international—should be permitted to own shares in the system. Second, all carriers should be provided access to the system on non-discriminatory terms regardless of whether they elected to invest in it. Third, "all interested parties engaged in the production and sale of communications and related equipment" should be eligible to buy shares in the system. Finally, all manufacturers should be given equitable opportunities to bid on procurement contracts whether or not the companies had invested in the system.\(^{(79)}\) The recommendations were attempts to obviate two related monopolistic potentials: a restraint of trade in the provision of satellite services, which might result from concentrated ownership by companies owning competitive (cable) facilities, and which admitting domestic carriers was seen as preventing; and a restraint of trade in the supply of satellite-related equipment, deriving from the fact that RCA and AT&T—the latter through its manufacturing subsidiary Western Electric, the country's eleventh biggest manufacturer—were major electronics suppliers, which might be forestalled by permitting investment by other manufacturers.

Nevertheless, the FCC regarded the Justice Department submission as legal advice and substantially ignored its provisions in the Commission's first report on the satellite system, issued on May 24. "Some form of joint venture by the international carriers is clearly indicated as best serving the public interest," the FCC concluded.

By reason of their experience in and responsibility for furnishing international communications services, the international carriers are logically the ones best qualified to determine the nature and extent of the facilities best suited to their needs and those of their foreign correspondents, with whom they have long-standing and effective commercial relationships and who necessarily
will have a substantial interest in the operations of any satellite system. (80)

To pursue further its preferred approach, the FCC called a meeting of the international carriers—primarily AT&T, RCA, ITT and Western Union International (WUI)—for June 5, a move which according to The New York Times "closed the door for the time being on participation by the aerospace and communications manufacturing industries." (82) The conditions upon carrier activity set down at the meeting by the Commission skirted the ownership issue and dealt only obliquely with the issues the Justice Department's position had attempted to address. All international carriers, said the FCC, should be assured equitable access to and non-discriminatory use of the satellite system regardless of whether they purchased shares in it; no favouritism should be shown to manufacturers which owned or were owned by carriers holding shares in the system. The FCC also said that opportunities for investment participation should be extended to foreign telecommunications entities, but that all such entities that wished to use the system should be permitted access on equitable terms irrespective of their ownership shares. (83)

6. THE AD HOC CARRIERS COMMITTEE AND MOUNTING OPPOSITION

Notwithstanding the FCC's efforts, attempts by the carriers to produce a unified and detailed proposal for organisation and ownership of the satellite system had hitherto been hindered by the fear that such discussions among nominally competitive firms might represent prima facie evidence of conspiracy to violate antitrust laws. (84) The FCC decided accordingly to organise formally the discussions under its aegis, and on July 25—the day after the President's policy statement—issued an order to the international carriers to "organize promptly" in order "to speed plans for their joint development, construction, ownership and operation of a commercial satellite communications system." (85) The Commission voted unanimously to limit participation in the discussions to international carriers—explicitly rejecting applications to participate by General Electric and GT&E—and the first meeting of the new Ad Hoc Carriers Committee took place on August 3. (86)

A degree of opposition to the apparent direction of FCC policy was meanwhile beginning to emerge both within the Administration and, more
vocally, in Congress. Dissatisfaction from within the government came principally from the Justice Department, whose ownership recommendations seemed in the process of being ignored, but whose criticisms appear nonetheless to have been tempered by a desire not to impede industrial discussions that might prove useful. At the FCC's June 5 carrier meeting, the Department's representative cautioned: "As the plan for joint action is developed we urge that the Commission consider the desirability of expanding the base of ownership of the...system." He was, however, unwilling to say whether that advice was based upon law or policy, suggesting it was both, and he added that it was still possible that the Department's antitrust division might approve even a restricted ownership plan, thus obviating the need for specific legislation.

A similar ambiguity characterised congressional testimony by Justice Department officials in July and August. The chief of the antitrust division Lee Loevinger explained the rationale for widely based industrial ownership in a comment on AT&T's Telstar project: "There are more billions of public money invested in the development of that missile than AT&T will be paying millions for the specific costs" of using it. Loevinger described the Department's position on ownership, as submitted to the FCC in May, as "a little too doctrinaire," and suggested that provisions to prevent domination of the venture by any one company might suffice to satisfy antitrust laws. Asked whether the Ad Hoc Committee's composition was prejudicial to the interests of domestic carriers and manufacturers, the antitrust chief replied, "Well, it certainly does not help them," although: "I think that it does not preclude the adoption of a plan for a broader based ownership." The legal situation might, however, change if the Ad Hoc Committee became "the blueprint for a permanent consortium to operate a commercial system." In House testimony a few weeks later, Assistant Attorney General N. Katzenbach explained that the Department was not "insisting" that its original ownership guidelines be met, but was rather "urging" that they be adopted.

Both the head of NASA and the FCC chairman, under congressional questioning, staunchly defended the Ad Hoc Committee approach, although they did so in contradictory ways—one claiming the group's composition was wise because it reflected the form in which the satellite system was likely to be organised, the other maintaining that the Committee's
exclusiveness was momentarily prudent but not necessarily related to the system's eventual ownership. According to NASA chief James Webb:

My own view is that you will get further if you begin to get the operating entity into a form where it can organize and be prepared to make the important decisions. (94)

For FCC Chairman Newton Minow, however, "nothing is foreclosed" (95) in regard to widening industrial participation, and manufacturers were kept out of the Ad Hoc Committee solely in order to expedite deliberations and to ensure a manageably small group. (96) Minow did acknowledge though that only three manufacturers—Lockheed, GE and GT&E, the last of which was itself a domestic carrier—had actually expressed interested in participating, (97) and the FCC chairman had trouble explaining why an international carrier like the South Puerto Rico Sugar Co. could have been judged qualified to join in the discussions while firms with proven aerospace expertise—like Lockheed, Westinghouse, Bendix, Hughes, GT&E and GE—were not. Minow replied that the requirements of manufacturers would still be satisfied through rules guaranteeing procurement through competitive bidding, (98) thereby ignoring the thrust of the question.

The FCC further sought to allay fears that the Ad Hoc Committee would serve as a preliminary step toward AT&T domination of the satellite venture. Commissioner Craven testified in July, "I want to assure this committee it is the absolute intention of the Commission to insure that there will be no dominance of any one party in a joint venture," (99) adding:

We will not approve a plan where there is domination by AT&T. I know there are several ways in which a combine can be operated without voting domination by the majority stockholder, (100)

a statement interesting for its implication that the FCC already was looking ahead to the probable distribution of satellite ownership. In all, the Commission was optimistic that events would continue to proceed smoothly under its auspices, and consequently that an industrial organisation managed administratively—rather than mandated legislatively—would be sufficient to produce a satellite system. (101)

Notwithstanding those assurances, the Commission's apparent determination to rely upon a limited number of private firms—all arguably under the shadow of AT&T—was giving rise to discontent on Capitol Hill.
The desirability of authorising the government to develop and own—for the foreseeable future, if not indefinitely—the satellite system was raised several times during July and August, and on August 24 a group of 33 legislators, led by Senate Majority Whip Hubert Humphrey, sent a letter to the President urging a deferral of organisational decisions until after the system itself had become operational. The technology, they wrote, was still untried and the system's ultimate design uncertain; technical development and refinement should therefore be kept separate from issues of ownership during an interim period, while satellite activities remained in government hands.

After such a system has become fully operational, but not until then, can decisions be intelligently made as to whether such a system should be publicly or privately owned and under what circumstances.

If however it was decided to continue trying to devise private organisational arrangements, the letter's signatories saw "no justification" for excluding aerospace and electronics companies; concern was expressed about the possible extension of AT&T's "monopoly position" into the new field.

Only by insisting upon the widest possible participation by all interested communications and aerospace manufacturers and operators can there be any hope that such a monopoly can be forestalled...

Similar views were expressed in the report of the House space committee, whose satellite hearings had lasted from May through August. "Government must retain maximum flexibility regarding the central question of ownership and operation of the system," the committee concluded. "No final decision should be made during the early stages of development which might prejudice the public interest or U.S. international relations."

The possible damage to foreign relations, interestingly, was associated with private satellite ownership: "Although profitable operation is a legitimate goal of the free enterprise system, the appearance of American exploitation simply for profits must be avoided..."

The response to these concerns took the form of stressing the urgency of continued satellite activities and linking their success to swift resolution of organisational matters; Industry had previously criticised suggestions that technical and organisational arrangements could be separated; in May a GTE vice president had told the House space committee...
that "any delay in the resolution of the question of ownership...will substantially delay the establishment by this country of a common carrier satellite communications system and prejudice its leadership in this field." (107) The connections between the two spheres remained, however, better asserted than explained. Formal creation of a private satellite entity, it was said, would provide a focal point for further R&D, (108) although there was little question that NASA would remain central to technical activities and the space agency's head insisted that such work would not be hindered by ownership indecisions. (109) Firm ownership decisions were also claimed to be necessary to provide assurances abroad as to U.S. intentions in the satellite field, and ultimately to forestall development of other satellite systems (110)—although the incompatibility of those objectives with continued state control was never elaborated. Nevertheless, the White House reply to the August 24 letter from legislators reiterated the belief in a close relationship between technical success and organisational resolution:

"It is not possible, if we are to move swiftly, to delay decisions as to ownership and control under after the entire system becomes operational. The development of a fully operational system will probably require a decade or more..." (111)

The apparent illogic of insisting that provision be made immediately for ownership of a system that would not be fully operational for another decade seems explicable primarily in terms of a resolute and poorly differentiated urgency attached to virtually all aspects of the satellite issue—an urgency moreover that could not help but work to the advantage of the most effectively mobilised private aspirants in the field.

7. THE INTERNATIONAL CARRIERS' PROPOSALS

On October 12 the Ad Hoc Carriers Committee issued its report, calling for creation of a non-profit satellite corporation to own and operate the U.S. portion of the international system. The new corporation would be owned exclusively by the U.S. international carriers; each company that bought shares would have two seats on its board of directors, the president of the United States would appoint three directors, and an
additional director would represent those carriers which although using the system had not bought shares in it. The corporation's property would consist solely of the satellite system's space segment; carriers could build and operate, individually or jointly, earth stations for use with the space segment, or they could lease ground facilities. Little was said of the ultimate form the international system would take, except that it would be run according to principles of equitable access and non-discriminatory use for foreign participants, regardless of whether they purchased stock, and that the international system would be owned in undivided shares—i.e. irrespective of which specific satellites a particular nation required, whatever shares it bought would represent parts of an aggregate total space segment investment. (112)

The provision that the new satellite corporation would be 'non-profit' appears curious, but in fact had no substantive meaning because carrier investments in the company would, according to the recommendations, be eligible for inclusion in the carriers' respective rate bases. Hence satellite investments would be treated no differently from the companies' other holdings of 'used and usable' facilities, and would entitle the carriers to the same administered rate of return they were guaranteed on other assets; they could therefore adjust other international tariffs to ensure recovery of their satellite corporation outlays. As a Senate report observed:

If ownership of a 'common carriers' common carrier' were to be restricted to the using carriers the distinction between 'non-profit' and 'profit-seeking' would appear to be of little consequence. (113)

Moreover, the new satellite corporation would not in itself have to earn profits in order to make money for its owners—nor would it even have to recover its costs, since the carriers' satellite holdings would be guaranteed in any event.

Virtually risk-free investment was not the only inducement to carrier financial participation in the satellite corporation, since the future business volume from satellite services was being forecast as considerable. Although General Electric had, when it was trying to interest the FCC in its ComSat Inc. subsidiary, predicted $30m per year in profits from satellite operations by 1970, (114) the Ad Hoc Committee had heard testimony from a member of the National Academy of Science that
global satellites revenues might total $100,000m annually by the 1970-75 period;^115^ the head of NASA likewise had spoken of $100,000 to $200,000m by 1980.\(^116^\)

In spite of the apparent financial attractiveness of satellite investment, the carriers did not immediately indicate great interest in putting money into their own plan. In the committee's report, AT&T pledged $65m, but only four of the other seven committed themselves to investing at all, and the total pledged by the carriers was less than $78m. It was not yet known how much the system would cost, but estimates ranged from $45m to as much as $500m.\(^117^\) The carriers appear to have been unwilling to commit themselves further to the satellite venture until precise organisational arrangements were decided,\(^118^\) and the consequences of a shortfall in capital subscription were not clear. The prospect might argue for elimination of any limits on the maximum holdings any one firm could purchase in the satellite corporation, thereby favouring further concentration of control;\(^119^\) it might also suggest, however, that the ownership base should be widened—to admit investment from domestic carriers and manufacturers—to ensure that enough capital would be raised.\(^120^\) Notwithstanding that ambiguity, the immediate tactical consequence was to retain for the carriers an important source of leverage over further determinations concerning satellite organisation.

The Ad Hoc Committee report attracted little response from industry, and only two companies filed formal replies with the FCC. GT&E, although generally favourable, reiterated its position that domestic carriers be permitted to co-own the new corporation; and, citing its own work on synchronous satellite components, the company urged that any final decision on the system's design be deferred until more was known about high-altitude satellites. Hughes Aircraft opposed the main thrust of the report, and suggested that a new independent public stock company be formed instead of a carriers consortium. Both companies agreed that earth stations and satellites should be owned by the same entity, rather than leaving to the carriers the construction and operation of the ground facilities.\(^121^\) Of apparent concern to GT&E and Hughes was the possibility that AT&T—and to a lesser degree RCA—might use its influence within the new corporation to favour manufacturing subsidiaries with contracts.
In Congress and the Administration, the Ad Hoc Committee report confirmed and justified the opposition to allowing the PCC to handle satellite communications administratively through informal cooperation among the carriers. The monopoly subcommittee of the Senate small business committee, which had already held hearings on antitrust aspects of satellite communications, re-opened hearings in early November; its chairman, Sen. Russell Long, denounced the carriers' plan as a disguise for AT&T domination and charged that the report "does not benefit the people. In fact it does just the opposite." The prestigious liberal pressure group, Americans for Democratic Action, similarly declared the report "totally unacceptable" and announced support for government satellite ownership. During the hearings it became evident that the Kennedy Administration was not satisfied with the carriers' proposals; Justice Department antitrust chief Loevinger spoke of the need for a decision "at at least cabinet level" and since the report was "not adequate" in view of the Administration's preferred ownership approach, "legislation might be desirable." Although the FCC chairman tried to meet criticisms by announcing that the Commission was considering formation of an ad hoc manufacturers committee to supplement the carriers' position, the White House ordered the interdepartmental group under NASC Executive Secretary Edward Welsh which had prepared Kennedy's July policy statement to reconvene and draft legislative proposals. In spite of an early and short-lived resurgence of interest in the government ownership option on the part of Welsh and Justice Department representatives, the group's efforts soon became focused on preparing a White House satellite bill to dilute carrier control through widely-based private ownership.

Notwithstanding continued FCC support, the emergent shift in location of discussions to Congress obliged the carriers to seek their own channel into the legislative process, which they found in the person of Robert Kerr, chairman of the Senate space committee, a wealthy and powerful senator who was a confidant of Vice President Johnson and a former business associate of NASA chief James Webb. On November 28 Kerr announced he would file a bill providing for private satellite system ownership when Congress reconvened in January. "Congress can," he said,
by enacting legislation during 1962, set the stage for the first
dramatic worldwide distribution of a consumer product directly
resulting from the space research and development of U.S. scien-
tists, engineers and technicians. (128)

Advance reports in the trade press suggested that Kerr's proposal "fol-
lows closely" the lines of the Ad Hoc Carriers Committee recommendations. (129)

Meanwhile however reports circulated on the Administration's deter-
mination to take policy and planning authority away from the FCC by pro-
posing its own legislation. (130) In his State of the Union Message to
Congress on January 11, 1962 the President said he would soon send a
White House satellite bill to Capitol Hill, and on February 7 he did so.

Those two legislative initiatives, accompanied by an increasingly
vocal opposition to the private satellite ownership proposed by both,
provided the terms of the ensuing battle over the Communications Satel-
lite Act of 1962.

8. CONCLUSIONS

The carrier industry moved skillfully under FCC auspices throughout 1961
to exploit the vagueness of the government's commitment—reaffirmed by
the Kennedy Administration—to private satellite ownership. Industry
successfully forced the pace of policy definition: the carriers were
first to prepare a definite ownership plan, and first to have their po-
sition translated into a legislative proposal. Moreover, the carriers' leading policy role reinforced the propriety of the central and exclu-
sive organisational role they sought in the satellite communications
system. Subsequent opposition to the carriers' plan—from the White
House and within Congress—would therefore be obliged to acknowledge
the success of carrier actions in pre-defining the scope permitted to
further policy modifications and in pre-empting prerogatives notionally
belonging to the state.
1. OVERVIEW

The legislative battle over the Comsat Act was apparently a three-way contest among the carrier industry's congressional allies, the White House and dissident Democrats primarily in the Senate. Industry supporters favoured Sen. Robert Kerr's satellite bill and creation of a satellite corporation wholly owned by the carriers and operated subject to FCC regulation. The Administration bill provided for a corporation owned partly—and perhaps predominantly—by the carriers, but with some provision for non-industry investors and substantially stronger government oversight than allowed for in the Kerr bill. A small group of liberal Democrats opposed both private ownership schemes and wanted the government to establish its own satellite agency to develop, own and run the system. By late March 1962 however a compromise between the White House and Kerr versions was fashioned which retained for the carriers voting control over the new corporation while eliminating some of the more objectionable features of industry proposals. The government ownership faction was left to wage an increasingly isolated and finally unsuccessful struggle against what they considered a scandalous giveaway of a publicly-developed and enormously valuable technology.

In the final analysis, negotiation over the bills was believed to concern ultimate control over the satellite system. The Administration's response to the Kerr version, which made clear that control would rest with the carrier industry subject only to FCC regulation of uncertain effectiveness, was three-fold: widening the base of industrial control by hinting at possible antitrust action if opportunities for co-ownership were not widened; making corresponding provision for representation of non-carrier interests on the new company's board of directors; and urging inclusion of a variety of governmental levers upon the corporation's policy-making procedures—NASA consent on technical matters, State Department supervision of international negotiations, and final presidential
discretion over company actions believed to impinge upon state policies.

Although the critique of carrier control advanced by Administration spokesmen to support their desire for greater safeguards than those contained in the Kerr bill coincided in important respects with the criticisms put forth by the government ownership faction in the Senate, the White House was restrained in part by a wish to improve its poor legislative record from developing the anti-carrier position to the point where the possibility of compromise would be harmed and the eventual passage of a satellite bill jeopardised. The field was regarded by July 1962 as offering "one of the few remaining possibilities for an administration victory on Capitol Hill,"(1) and legislative elections would be held in November.

The July launch of AT&T's Telstar increased the impatience of some legislators with the Administration's efforts to introduce anti-carrier safeguards, and raised the possibility that the propriety or necessity of continued government involvement in the field might be questioned,(2) since business had demonstrated an independent capability. Furthermore, the White House had to consider the importance of Sen. Kerr, the carriers' chief Senate ally, to the future of its legislative programme.

As one senator later observed:

This was a Bob Kerr deal all the way. Bob ran some important committees and Jack Kennedy couldn't afford to offend him if he expected to get any New Frontier legislation through a Senate that was wobbly in the first place. The feeling at the time was that the President made a list of priorities and decided that satellites weren't as important as some other things, such as Medicare.(3)

The Administration therefore entered the legislative fray with significant disadvantages: its legislative ambitions obliged cooperation with Sen. Kerr and industry's other allies; its commitment to private ownership prevented use of the Senate dissidents as negotiating leverage against the pro-carrier forces by securing unified support for greater statutory safeguards; and its own insistence on urgent resolution of ownership issues implied compromise wherever necessary to ensure expedition.

Industry showed few corresponding inhibitions. One congressman declared in March 1962 that "AT&T has been boldly picketing the halls of Congress advancing the argument that the communications companies should be the sole beneficiaries of the communications satellite system,"(4) and a senator described in June "a lobbying activity the likes of which the
Congress has never seen before." Standing behind the carriers' efforts was a larger recognition within business leadership that a private ownership decision in regard to satellites could set a favourable precedent for future private activities in space, as Business Week magazine observed:

> The final decision on whether government or business shall operate the communications system will set a pattern for future commercial space activities, such as freight shipment by rocket. (6)

The carriers were in this respect the vanguard for the private exploitation of a realm whose eventual economic potential was incalculable.

What is, however, most striking in the legislative debates we shall now describe is the way in which formalistic concerns predominated: technological control was accepted as reducible to ownership—as, admittedly, conditioned by the various mechanisms for continuing state oversight that could formally be inserted into the new corporation. Scant attention was paid to the commercial context into which satellite operations would be introduced, where the new corporation's reliance on its carrier competitors would be so great that the precise internal arrangements adopted for the satellite company—and the elaborate checks and balances among carrier interests, public shareholders' interests and governmental influence—would be of little consequence in comparison. The emphasis on organisational subtleties served, in effect, to obscure the real problems posed by the satellite system's commercial operation amidst powerful rivals which would have the means and incentive to hinder its development, irrespective of their presence on the satellite company's board of directors or the size of their shareholdings.

2. THE KERR AND WHITE HOUSE SATELLITE BILLS

There was, a Senate staff analysis found, "little substantial conflict" between the proposals of the Ad Hoc Carriers Committee and the satellite bill introduced in January 1962 by Sen. Robert Kerr. A closed corporation, wholly owned by the carrier industry, would undertake U.S. commercial satellite development, serving exclusively as a "carriers' carrier" and leasing overseas circuits to the carriers for subsequent retailing to ultimate users. The Kerr bill introduced several changes, however, in
regard to the new corporation's mode of financial operation, the extent of its properties, composition of its board of directors and ownership. The company was to be profit-seeking in the Kerr version, although carrier holdings would still be counted in their rate bases. It would also own and operate all U.S. earth facilities as well as an undefined portion of the international space segment, instead of leaving to individual carriers the American ground stations. There would be no government-appointed directors sitting on its board, as the carriers had proposed. And Kerr left to the FCC the task of deciding precisely which carriers would be entitled to co-own the corporation: the Ad Hoc Committee had recommended limiting ownership to those companies "authorized by the Commission to provide communications services by satellites"—thus narrowing eligibility to satellite users, in practice the international carriers—while the Kerr bill said only that the company's owners would be "U.S. communications common carriers who are determined by the Commission to be eligible to participate in such ownership." Kerr also detailed the means of financial participation, a single class of five thousand $100,000 shares totalling $500m.\(^8\)

A letter from the President accompanying the text of the White House bill stated that the satellite field "by nature, is essentially private enterprise in character but of vital importance to both our national and international interests and policies."\(^9\) To enable the government to oversee its interests, the State Department was empowered to "conduct or supervise" negotiations with foreign countries, and the president was given wide powers to "plan, develop and supervise the execution of a national program" in the commercial satellite field.\(^10\) Like the Kerr bill, the Administration version would permit the new corporation to build, own and operate all U.S. earth facilities.

The main difference between the two bills lay in the degree of formal control the carrier industry would be entitled to exercise through ownership of shares in the new corporation. The White House bill sought to dilute carrier control by diversifying the sources of capital for the venture: 100,000 shares of Class A stock, at $1,000 each, would be sold as dividend-paying, voting shares to individuals or corporations; 10,000 shares of Class B stock, providing neither dividends nor votes—but eligible for inclusion in the rate bases of international carriers—would be issued at a price to be determined later.\(^11\) The introduction of two categories
of stock seems to have been a White House innovation, decided upon without consulting industry. (12) Assistant Attorney General Katzenbach explained:

The Administration is convinced that those who have paid the taxes should in all fairness have equal opportunities to invest in and profit from the system, and that the system should not be turned over to a favored few. (13)

Nevertheless, it was considered likely that the carriers would still predominate in the satellite corporation's ownership, since they would have exclusive access to the Class B stock and would not be barred from buying Class A dividend-paying shares. Hence, said Katzenbach, "under these circumstances the administration proposal would result in substantially the organizational form proposed by [the Kerr bill], and supported by the telephone companies." (14)

Reaction from industry to the White House proposals was restrained. While AT&T President E.J. McNeely said the company was "pleased" with Kennedy's re-endorsement of private ownership, it remained nonetheless "hopeful" that the carriers would be permitted to build, own and operate earth stations for the system. (15) Another Bell official however deplored the "proliferation of governmental supervision" contained in the Administration version, and said AT&T was fully confident that the government's legitimate interests could be protected by the FCC alone. (16)

Notwithstanding the similarities in the two versions—due in part to the fact that both were drafted within the Administration, suggesting that they reflected differences of opinion within the Executive Branch (17)—a concerted effort to reconcile discrepancies was required, especially since hearings on the Kerr bill were scheduled to begin on February 26. The trade press predicted "an ultimate combination of both in a way aimed at satisfying the members of the Ad Hoc Committee." (18) Kerr agreed to co-sponsor the White House bill in return for having it assigned to the Senate space committee, which he chaired, thereby enabling Kerr to oversee consolidation of the two versions.

3. THE COMPROMISE BILL EMERGES

During hearings in early March the FCC led the attack on the White House bill, reiterating support for the ownership provisions of the Kerr bill and terming the Administration version "impracticable." Commission
Chairman Newton Minow argued that non-carrier investors would, unlike the carriers, seek to maximise immediate financial return from their satellite holdings and would therefore try to keep tariffs high to ensure dividends. The Administration bill would produce lower satellite utilisation, whereas carrier ownership would "expedite maximum use of the system on a worldwide scale." Minow did propose providing for "class" representation on the corporation's board for domestic communications carriers—not, however, because their routine activities would be indispensable to ensure overseas service nationally, but because "it is conceivable that the system may eventually be used for domestic purposes." The PCC also criticised provisions in both White House and Kerr bills to give responsibility for earth stations to the satellite company, and asked for ownership of ground facilities to be left to FCC discretion.

Representatives of AT&T and ITT agreed with the Commission position on earth station ownership, and furthermore declared themselves opposed to sales of stock to the general investing public. An ITT vice president noted the high risk of satellite investment and the long delays considered likely before dividends would be paid, and also argued that if the corporation owned properties abroad small investors might eventually find themselves obliged to suffer losses from expropriation by nationalist regimes. Hughes Aircraft and NASA expressed support for integrated ownership of space and earth facilities by the corporation, in order to ensure coordinated technical development.

The Senate space committee was known to prefer its chairman's bill over that of the White House, and the so-called compromise version approved unanimously by the committee on March 28 reflected the preference, although Administration representatives had participated in the final negotiations and said they were satisfied. Gone were the provision for non-voting carrier stock, the corporation's franchise over U.S. ground facilities and the enhanced presidential and State Department oversight. A single class of voting stock would be divided evenly between the carriers and the general investing public; the carriers' holdings would not be included in their rate bases for international services, but the new corporation would be authorised to issue non-voting securities which, if purchased by carriers, would be eligible for rate base inclusion. (Provision for these so-called Type II securities was intended to lower the
cost of borrowing to the satellite corporation since, in principle, they could be offered even at a zero rate of return and still be financially attractive to the carriers, who could raise tariffs on other services to assure themselves the same return they were guaranteed on their other assets. The price of the corporation's equity, which had not previously been fixed, was set at $100 per share and later cut to $20.

Provision for those Type II non-voting securities, likely to be of interest solely to the international carriers, is important because it offers a clue as to why the corporation's equity was not to be eligible for inclusion in the carriers' rate bases—as it had been in both the Kerr and White House bills. Kennedy had previously justified rate base inclusion as the principal advantage to be gained from permitting the carriers to co-own the satellite corporation at all: high initial costs could be dispersed over other carrier operations and customers of international services could in effect be taxed through higher charges to compensate the carriers for early satellite losses. Kerr now explained that if the carriers could not count on an assured return from their satellite stock, they would be obliged to "see to it that the corporation operates at a profit." A more convincing explanation as to why the carriers agreed—as the absence of industry protest suggests—to elimination of a provision that was unquestionably to their advantage lies in creation of the Type II securities, favourable resolution of the earth station ownership question and the probability that the total cost of the space segment would be insufficient to require large-scale industry investment. The equity issue itself was believed by some to prove inadequate to capitalising the corporation, partly because the venture's risks would discourage investors and partly because ultimate costs were unknown; consequently the non-voting securities offered to the carriers might end up comprising a predominant part of the company's capital. Furthermore, the compromise bill stated that the FCC should "encourage" ownership and operation of U.S. by the international carriers; this was subsequently contested by Administration officials and changed to give the FCC discretion without implying legislative intent. For the moment however, since it was considered probable that foreign participants would want opportunities to invest in the space segment—thus reducing the total American stake to perhaps "less than half," as an AT&T official predicted—
support for carrier earth station ownership promised a considerably
bigger increment to the companies' rate bases than would be lost through
excluding holdings in satellite corporation equity. (The ground facili-
ties furthermore would entitle the carriers to operating revenues besides.)

The compromise version reinstituted government representation on the
new company's board of directors—as originally proposed by the Ad Hoc
Committee report and dropped in the Kerr bill. The board would consist
of three directors appointed by the president, six elected by non-carrier
stockholders and six chosen by the carriers in proportion to their respec-
tive holdings. This apparent plurality of constituencies was essential
to the Administration's attempt to obviate antitrust problems, as a Jus-
tice Department official testified in April:

...[W]hat we are doing is trying to achieve many of the benefits
and objectives of competition by virtue of the automatic opera-
tion of the company through its internal structure. And we be-
lieve that automatic operation in general is to be preferred to
an attempt to secure economic performance by Government regula-
tion. (36)

Similarly, Attorney General Robert Kennedy explained that "the possibility
of domination by this single large corporation [AT&T], through its supe-
rior financial resources, is virtually inevitable unless we open the cor-
poration to investment by the general public." (37)

Aside from the reintroduction of presidential appointees on the cor-
porate board, the compromise bill reduced the government's opportunities
for overseeing company activities. In regard to international negotia-
tions, instead of submitting to State Department supervision the corpora-
tion would now have to inform the Department in advance of any such undei-
takings and receive advice. State Department officials had conceded that
the pertinent section of the White House bill "could be revised,"(38) and
the Senate space committee subsequently reported:

While it [the committee] recognized the essential role of the
Department of State in matters affecting foreign policy, it
felt the corporation's business negotiations with foreign en-
tities, as such, are not in that category. (39)

Similarly, the president's power to provide "general supervision" over
international negotiations was changed to "such supervision...as may be
appropriate to assure that such relationships shall be consistent with
the national interest and foreign policy..." (40) As to overall presidential
authority over the corporation, while the White House bill empowered the
president to "plan, develop and supervise" the national programme the com-
pany was to serve, the compromise version amended this to "aid in the deve-
lopment and foster the execution" of the policy.\(^{41}\)

Although AT&T spokesmen maintained the company still supported the Ad
Hoc Committee's recommendations, Bell was said to be particularly pleased
with two features of the Senate space committee's compromise version: the
recognition of the adequacy of FCC regulation, as signalled by the weaken-
ing of other governmental influences; and the decision not to assign
earth station ownership exclusively to the new corporation.\(^{42}\)

4. THE OPPOSITION CASE

While the mainstream of the legislative process continued through hearings
on what was now called the 'amended Administration bill' in the House and
Senate commerce committees, a small and colourful coalition of liberal
Democrats—informally led by Sen. Estes Kefauver\(^{43}\)—had begun organising
in the face of opposition from their party's leadership in the White House
and Congress to block the existing proposals.\(^{44}\) Their aim was either
to get their own legislation authorising state ownership of the satellite
system passed, or to prevent congressional action from being taken—in
which case satellites would by default remain in government hands for the
time being. As the prospects for approval of state ownership became more
remote, the dissidents pressed for eliminating carrier holdings in the
satellite corporation; as that became increasingly unlikely, they urged
enhanced provision for government oversight, and when that failed they
resorted to filibuster to keep Congress from acting until they could mobi-
licate greater public support behind their opposition.

Introduction of the White House bill had done little to mitigate the
liberals' discontent with the Kerr version. "Two plans have been submit-
ted to Congress which propose the establishment of a private monopoly," said Sen. Ralph Yarborough. "They differ somewhat in detail. They are
essentially the same in the term of ultimate consequences."\(^{45}\) In late
February Kefauver introduced his own bill to create a Communications Satel-
lite Authority empowered to "acquire, own and operate as an agent of the
United States Government" both the American portion of the global space segment and all domestic ground facilities. The Authority would be run by a nine-member governing board: four named by the president—among them representatives of the State Department, NASA and the FCC—and five private citizens also appointed by the president but subject to Senate confirmation. The carriers would be nothing but customers of the Authority, and perhaps equipment suppliers. The set-up was likened to the Federal Reserve Board—which, observed Sen. Long, had never "been accused of being socialistic as a group"—and to the Tennessee Valley Authority (TVA), a successful New Deal project that had revitalised an impoverished region of the southeastern U.S. "The interesting thing," said Sen. Morse,

is that the TVA's, and the McNary's and Dalles' and Grand Coulee's and all the great multiple-purpose dams that we have developed have been great incentives to the development of private enterprise within the economic environment of those great publicly owned facilities.

Since the government was in any event the "backbone" of the satellite communications programme, according to Sen. Kefauver—who adduced a figure of $470m spent by the government since 1959 on related fields—there was no reason why we should hasten to open a Pandora's box of difficulties by establishing a private monopoly which will merge competing enterprises under the domination of AT&T.

Such an action would be "shocking and unconscionable," and would "constitute the biggest giveaway in the history of the United States," as Sen. Yarborough said.

The compromise bill only stiffened the resolve of the dissidents, since it was seen as essentially a reincarnation of the Ad Hoc Committee's recommendations: voting weights would largely be determined by carrier usage, earth stations would probably be owned by the carriers, central oversight power was to be vested in the FCC and supervision by the president and State Department would be curtailed. Carrier ownership participation had to be eliminated, the opposition claimed, and the Administration's attempt to reduce carrier control by widening the corporation's ownership base would do little more than make carrier domination more likely: "The more widespread the ownership," said Sen. Morse, "the smaller percentage is necessary to dominate it. Only
five percent would be needed. "(53) Interestingly, the possibility that
the carriers would be able to exercise considerable control over the sys-
tem without owning any stock was raised by Administration supporters of
the compromise bill to argue for the unimportance of the concern over
shareholdings. In a July letter to the Senate majority leader, Katzen-
bach wrote of the carriers: "Either they will dominate the system through
ownership... or under a government-owned system they will dominate it
through contract," since they had the personnel, expertise, traffic and
general capability to stamp their requirements on the system. (54)

The record and inclinations of the FCC were subject to special vil-
fication by the opposition, particularly since the adequacy of the Com-
misson's regulation of the carrier industry was a cornerstone of the
compromise bill. The FCC was blamed as "the originator of this whole
idea of turning this matter of international satellite communications
over to a monopolistic combine." (55) Dallas Smythe, formerly FCC chief
economist, testified before the Kefauver antitrust subcommittee:

...[The FCC] has been and is using its public role to foster the
interests of the communications common carrier companies, especially
those of the Bell System, in their efforts to obtain a private mono-
poly... [A] shellgame is being played on the rest of the administra-
tion, the Congress and the American public in which the alleged
'regulation' which the FCC is said to practice on the companies is
the shell beneath which lies private monopoly. (56)

The results of a 1959 House investigation of FCC regulation were recalled;
the Commission had, by permitting AT&T an excessive rate of return on
domestic telephone service, presided over Bell's accumulation of $985m
in excess revenues over a seven-year period. The subcommittee reported
that FCC actions "reflect a singular receptivity to the AT&T point of view
and a patent indifference to the public interest." (57) In the interna-
tional field, the Commission was accused of acting as a manager rather
than a regulator; (58) indeed it had never since its creation in 1934 held
formal proceedings on international telephone rates. (59) As Rep. Celler,
who chaired the 1959 House investigation, concluded: "It appears almost
impossible to regulate AT&T on earth. We would need divine guidance to
regulate AT&T if it is permitted to capture the space communications
system." (60)
If the PCC's record in its traditional role of regulating prices and quality of services inspired little confidence, its qualifications for overseeing the steady technical development of a new technology seemed poorer still. Administration officials acknowledged that the Commission had little experience in assuring equitable contracting practices, which promised to be a sensitive area thanks to the extensive manufacturing activities of several carriers, most importantly AT&T. The PCC's performance as guarantor of technical progress seemed especially dubious since Commission representatives were unable to cite a single instance during the past 25 years when the FCC had compelled a carrier to introduce technical improvements or to abandon obsolete equipment. Some of the testimony given by Administration officials in support of widely based ownership of the satellite corporation appeared to reinforce the opposition's case against carrier-PCC control which the White House believed the compromise bill would prevent, but which the opposition was convinced the bill would facilitate. Katzenbach, by then a deputy attorney general, declared that a corporation controlled by the carriers "unavoidably has the possible motivation to lag in development and actual use of means for making their present equipment obsolete." The specific subject of that warning was the undersea cables co-owned by the carriers, and while the FCC chairman acknowledged that cable owners might seek to protect their investments, he maintained that "the interesting situation here is that demand is rising so rapidly that these [cable] facilities are overtaxed," a contention echoed by industry representatives. Nonetheless, to the opponents of carrier control, permitting satellites to be included within the existing communications industry was analogous to having defined aeroplanes as part of a transportation industry and therefore allowing airline development to be undertaken by automobile manufacturers.

5. FILIBUSTER AND PASSAGE

If the supporters of government ownership did little else, they appear to have made criticism of the compromise bill more difficult to justify. The House commerce committee, reporting favourably on that bill on April 19, concluded its report:
If this instrumentality is not created at the earliest possible date, all planning for U.S. participation in the international system will have to be done by government agencies...[The carriers] will be prevented from cooperating effectively with each other and with the government agencies. (66)

The attempt to associate criticism of the bill with implicit support for state ownership seems to have been largely successful in the House, where the commerce committee made only two minor changes—limiting carrier equity holdings to 50 percent of the total, which already was implied in the draft, and strengthening the instruction to the FCC to encourage earth station ownership by the carriers. Two committee members dissented from the report (67) but the bill as amended went to the floor of the House on May 2 and was passed the next day by a vote of 354 to nine. An amendment to delete the provision promoting carrier earth station ownership was defeated 116-33; the House version of Kefauver's government ownership bill lost by voice vote, and an amendment to require the corporation to reimburse the government $471m for missile and satellite development costs over a 10-year period beginning in 1969 was similarly defeated. (68)

In the Senate, the commerce committee reported out the compromise bill in late May with one significant amendment pertaining to earth station ownership. Katzenbach had testified that the Justice Department considered leaving the question of station ownership open as "indispensable," adding: "There is a real danger that ground stations if separately owned by the carriers may because of their high cost represent an obstacle to technical growth so as prematurely to freeze the type of system." (69) FCC Chairman Minow and NASA Administrator Webb agreed, and in spite of objections from AT&T, ITT, Hawaiian Telephone and NASC Executive Secretary Welsh (70) the FCC was authorised to assign earth station ownership to the satellite corporation or the carriers as it saw fit.

Senate opponents of the bill had been threatening since March to stage a filibuster to block final action. (71) Their leverage was enhanced by the fact that action on a critical bill to raise the ceiling on the government's borrowing was required before the fiscal year ended on June 30, but although some members of the opposition were willing to use this deadline to their advantage a majority was not, and the filibuster did not begin until July 26. In the meantime the opposition received a setback when AT&T's Telstar was successfully launched by NASA on July 9, which
made a considerable impression at home and abroad and which, by bolstering AT&T's image, was termed in the trade press the satellite bill's "biggest booster." (72)

...[T]he complete success of the Bell System's Telstar experiment, ...and the tremendous public and press reaction, unquestionably have given the satellite communications legislation pending before the Senate a shot in the arm which it may have needed. (73)

The bill's opponents nevertheless began their extended debate, hoping to take advantage of what they believed to be lukewarm congressional support for the legislation and poor public awareness of the bill's implications. (74) They also wanted further hearings to be held on the measure—particularly regarding its foreign policy implications—and after a week of filibuster the Senate's leadership agreed on August 1 to refer the bill to the Senate foreign relations committee.

Administration ranks had, however, long since closed around a desire to have the bill enacted, and the opposition got little satisfaction from the eleventh-hour hearings. Attorney General Kennedy praised the legislation, said that presidential authority over foreign relations would not be affected and denied any similarities between the bill and the Ad Hoc Committee proposals that the Justice Department had condemned:

I am perfectly satisfied with this bill... We drew up this bill; this bill is perfectly satisfactory to us. I don't believe that AT&T dominates or controls the commercial satellite bill as it is presently constituted. (75)

The FCC's representative contended that "this legislation is necessary in order to help us maintain our present leadership." (76) Secretary of State Rusk said the measure contained ample provisions to safeguard foreign policy interests and predicted that the new corporation would be "an effective instrument for U.S. participation in a global communications satellite corporation." (77) The State Department, Rusk said, had neither the expertise, personnel nor inclination to conduct the necessary negotiations itself, and he assumed "that it will be in the elementary self-interest of both the corporation and the Government to work together harmoniously..." (78)

For the Pentagon, defense secretary McNamara reiterated a two-fold wish to have the commercial system deployed as quickly as possible, and "to insure that the development of such a system would not preclude the development of a military system." (79)
The foreign relations committee referred the bill back to the full Senate on August 10 without amendment, and the next day a resolution was filed to impose a limit on subsequent debate. Although cloture had not been enacted in the Senate for 35 years, the resolution was passed by the necessary two-thirds majority and on August 17 the Communications Satellite Act was approved, 66–11. President Kennedy signed the measure into law on August 31, commenting:

The benefits which a satellite system should make possible within a few years will stem largely from a vastly increased capacity to exchange information cheaply and reliably with all parts of the world by telephone, telegraph, radio and television. The ultimate result will be to encourage and facilitate world trade, education, entertainment and new kinds of professional, political and personal discourse which are essential to healthy human relationships and international understanding. (81)

6. THE COMSAT ACT—OBSERVATIONS

Much was left unresolved by the Comsat Act: the question of who would own the U.S. earth stations was not settled for another four years; the Act did not specify which entities would be entitled to transact business with the Communications Satellite Corporation; the government's own right to lease capacity directly from Comsat was ambiguous; and Comsat's role in providing domestic satellite services was not defined until 1971. It was also true that the state's ability to ensure on a routine basis the corporation's compliance with government policy or 'the public interest' was unclear: the creation of three positions on the corporation's board to be filled by the U.S. president has been described as a "venerable device" for countering criticisms that public domain was being given away to the private sector (82) and the Attorney General made clear by October 1962 that the presidential appointees would in any case have the same fiduciary obligations to the corporation as any other directors. (83) In these respects the Act itself does seem to provide evidence of a congressional tendency to "go right on functioning as a political body seeking to bypass storm centers of controversy through the deliberate utilization of vagueness." (84)

The Act was, however, unambiguous as to a central commitment to entrusting development of public satellite services to a profit-seeking corporation that would operate within a commercial industry (85) and it was, we would argue, that commitment to commercialisation—rather than the particular ownership arrangements adopted—which would have decisive
impact on the future of the satellite system. Subsequent criticisms of Comsat's international counterpart Intelsat have contended that "the animus lucrandi cannot be the aim of a universal organisation dedicated to the welfare of humanity," and that Intelsat was becoming a restricted commercial organisation for conventional communications traffic...Possibly the destiny of Intelsat had been determined from the start, in 1962, when the United States Congress put the responsibility for satellite development into the hands of a private, profit-making corporation. It is not, however, clear to what degree a different decision as to the formal organisation of the American component of the satellite system would—in the absence of a total reorganisation of the U.S. international communications industry—have substantially affected the commercial basis on which satellite services were to be furnished. The American communications industry would have to have been compelled to permit the creation of perhaps its most powerful competitor along non-commercial lines—which presumably would have entailed state subsidies, either transferred from domestic telecommunications revenues or from general tax coffers, or sharply discriminatory pricing on overseas services to aid the spread of services to under-served, low traffic regions of the world. In the latter case, prices on services among metropolitan regions would have to be raised to cover operating deficits in the Third World, thereby reducing the competitiveness of satellites vis-à-vis cables in the heavy traffic areas and making the need for subsidy that much greater. In short, the problem of attempting to introduce a single non-commercial operator into a field of commercial companies would be great, quite irrespective of its internal institutional character.

The Comsat Act was intended to provide a framework for the accommodation of national policy to the requirements of private operation. Comsat, as H. Levin has written, was preferred to other options as a better way to reconcile speedy growth, wide diffusion, service to unprofitable areas, and private ownership. It was not expected to maximize each of these goals; it was always clear that some other option could promote one or more of them effectively. Resolution of the ownership question was of central importance to securing industry collaboration, since the carriers were henceforth mandated
to continue a process of deciding the disposition of public satellite services, subject to assurances that the state's general policy requirements would be met. The corporation was believed to have sufficient independence from its competitors to ensure that satellite technology was developed quickly and efficiently; at the same time though Comsat's autonomy would not be unconditional, and satellite operations would be prevented from threatening the survival of undersea cables, about which the FCC was particularly concerned:

...[I]f we try to establish a separate system by satellites in competition with existing things, I am quite certain that ultimately the existing means of communications which are going to be necessary are not going to be able to survive economically. (90)

In this respect, integrating satellite services into the commercial industry was a step toward ensuring the maintenance of a diversified national overseas transmission capability.

Where commercial conditions were believed likely to be inadequate to guaranteeing the satellite system's compliance with state requirements, additional safeguards were introduced to accompany the apparent devolution of control to the private sector. Notwithstanding the efforts to eliminate provisions for government oversight, the president retained the power to coordinate the activities of the various federal agencies with telecommunications responsibilities to ensure their cooperation in carrying out the policies set forth in the Act. (91) The Secretary of State was also empowered to request the FCC to order Comsat to establish communications links between the U.S. and specified foreign points. (92) This provision implies that regardless of the system's private ownership and irrespective of the eventual degree of foreign participation, the satellite system was in the final analysis to be an American communications resource. A 1963 White House directive stated:

It shall be the policy of the United States in time of war or national emergency, as proclaimed by the President, to have available to the government of the U.S. the total telecommunications resources of the nation for utilization... (93)

7. THE COMSAT ACT AND PRE-EMPTIVE UNDERDEVELOPMENT: CONCLUSIONS

Two distinct sources of pre-emptive urgency—one state and the other private—inform the early phase of technological formation culminating in
the Comsat Act. For the state, asserting control over international satellite communications before a rival Soviet system could be created was an enduring motivation behind satellite efforts. The state's urgency was not, it is true, reducible to that pre-emptive motive, since there were also instrumental communications requirements and an international deadline—suggested by the 1963 radio frequency conference—which had to be met. Nevertheless the government's satellite effort drew considerable energy from the vigour of the larger national space programme, in which regaining symbolic ground believed lost to the Soviets was a principal objective and the need to achieve an American 'first' beyond question. For the communications industry, the goal of establishing satellite communications as a legitimate area for private exploitation required early and sustained insistence that ownership issues be resolved and satellites be defined as the exclusive responsibility of what was in reality a small fragment of those industries whose practical cooperation would be essential to the satellite system. In all, the government's push for rapid satellite deployment coincided with the carriers' requirement for an even more rapid resolution of organisational issues. Industry's success finally lay in having its particular objectives identified with the overall achievement of the state's satellite goals, so that deferring the ownership question was believed likely to endanger government objectives.

At the same time the possibility—though not yet the certainty—of technological underdevelopment was created. A process of technological definition—beginning with the state's concern with impressing foreign publics and with improving its own overseas linkages, and continuing with the carriers' self-serving insistence on satellites as an international communications technique—had commenced. The government's actual requirements as concerned the public satellite system were, as we have seen, relatively few: rapid deployment with special attention to low-traffic regions, and no interference with specialised governmental systems. Beyond those, the degree of technological development achieved was implicitly to depend upon determinations within the private sector.

Here, there were two different schools of thought on satellite development. The FCC and the carrier industry argued that satellites were
no more than an alternative means of long-haul transmission; as the FCC reported in May 1961, "Communications via satellite will be a supplement to, rather than a substitute for, existing communication systems operated by the international common carriers..." The carriers likewise contended that satellites would be "natural extensions of present systems," "necessary extensions[s] of existing communication facilities," and "another way to discharge [our] responsibility." Industry's view was of a supplemental technology of real but limited usefulness which would improve, but need not otherwise alter, existing operations.

The alternative conception was that satellites offered, as RCA's board chairman David Sarnoff said, "a revolutionary possibility of global communications, the limits of which no man, in my judgment, is competent enough to place at the present time." Sen. Kefauver declared:

"Only the narrowest possible view would conceive of this satellite system as nothing more than a means of relaying long-distance communications. As we stand on the edge of this new technology only a complete lack of imagination could allow us to think of it as providing just another means of performing existing communications functions." If satellites were "a unique new development with unimaginable possibilities," it followed that "the communications companies' experience is of little significance in these areas," and satellites were "not just a simple extension of technology which they are currently using." The combination of technical novelty and unforeseeable social consequences made space communications "too important to be left to the communications industry."

The contending definitions of satellite technology—as "revolutionary breakthrough" or "engineering application" as J. Galloway has characterised the dispute—were clearly rooted in different political conceptions as to the appropriate means of institutionalising the satellite system. The victory of the carriers-FCC satellite formula therefore meant an endorsement for the Commission's belief "that the principal value of communications satellite systems is to provide long-distance communications, particularly for intercontinental use." Along, then, with the success of the international carriers' efforts to secure exclusive statutory rights over satellite formation came the implication that the technology was primarily suited to a sphere of application which—although satisfactory to the state—might not begin to exhaust its wider potentiality.
PART THREE

INTERNATIONALISING THE SATELLITE SYSTEM

U.S.-European negotiations, 1962-64
CHAPTER SIX: BACKGROUND TO THE CREATION OF THE INTERIM INTELSAT

The United States has provided the initiative, the technology, the manpower and the bulk of the money on which Intelsat was built. In 1964 we were able to negotiate a controlling position for the United States because we negotiated from strength. At that time it was necessary to negotiate with less than twenty nations. We achieved agreement on interim arrangements by stressing the need to establish the system and get it going before debating the questions of permanent organizational structure.

- U.S. State Department(1)

No international organisation has intervened to set right this pre-emption of the exploitation of space...A throw-back to 'unequal treaties', these accords sanctify on the one hand an international co-operation dominated by a private national corporation, and on the other the commercial exploitation of a public service.

- French commentary.(2)

1. OVERVIEW OF PART THREE

Pre-emptive underdevelopment, which we have proposed as the most appropriate characterisation of the initial phase of commercial satellite activity, displays both aggressive and restrained features: technological formation is undertaken urgently and effectively, ultimately however in order to sustain control over the technology rather than to exploit fully its known and technically feasible applications. The political dimension is therefore the primary focus of attention and contestation; alternative or additional technical projects are evaluated for their likely utility as instruments of political advantage.

From this perspective, the principal significance of the international negotiations examined in the next three chapters—which culminated in the July 1964 creation of a temporary International Telecommunications Satellite Consortium (Intelsat)—lies in the way in which incentives to support intensive technological development were distributed among signatory countries. The agreements gave participants
widely differing interests in the overall effectiveness of the organisational arrangements and in expanding or limiting the scope of collective endeavours. This maldistribution of incentive was in large measure a result of the success of the American strategy of pre-empting the field of commercial satellite development and securing its institutionalisation under conspicuously American auspices: the U.S. chosen vehicle Comsat was majority shareholder and manager of the international system, and European proposals to mandate an international spread of procurement contracts were rejected, thus assuring dominance in the equipment supply market for American manufacturers, at least in the short term. Hence to an important degree the better the system did, the more efficiently it operated and the quicker the spread of its services—and the more applications of satellite technology it undertook—the worse off the non-U.S. participants would be: the international management entity they desired would be difficult to support on efficiency grounds, fields of independent aerospace development would be foreclosed and the American umbrella over commercial space activity would be broadened. Thus the Europeans turned down U.S. efforts to bind the 1964 signatories from undertaking satellite applications other than those the consortium might pursue collectively, providing an early indication that Intelsat's evolution into "an integrated and global system of satellite communications, taking into consideration the coordination of existing or projected systems" was unlikely. (3)

Furthermore, since the agreed basis of Comsat's dominance was not the stock of U.S. aerospace hardware and expertise which stood behind the Corporation, but rather the American share of international telecommunications traffic, the Intelsat arrangements sanctioned the process of technological definition that had begun in spring 1961 when the U.S. carrier industry first put forth what became the dominant conception of satellite services—as primarily a communications, not a space, activity. Just as that definition served the carriers politically in the U.S., so it was thought to serve the U.S. politically abroad, enabling the emergent structures of regional European aerospace endeavour to be ignored in favour of negotiating with national telecommunications entities, which were believed more amenable to operational business-like arrangements and
less susceptible to the political concerns which inspired and informed space efforts. At the same time, however, the national posts and telecommunications entities (PTTs) would have little institutional interest in seeing satellites used to facilitate activities that were normally the responsibilities of quite distinct state organs or private companies—e.g., broadcasting, aeronautical guidance, maritime communications.

Hence the pattern whereby assuring narrow political control runs counter to intensive technological development was replicated: while the reliance on national shares of world telecommunications traffic guaranteed Comsat dominance within Intelsat, it also implied seeking collaboration of foreign PTTs with little interest in an expanded range of satellite applications.

Interest, then, in the overall success of the satellite system was maldistributed, as it were both quantitatively and qualitatively: quantitatively because rapid creation of the system, even if confined to conventional telecommunications traffic, promised greater benefits to Comsat and the U.S. aerospace industry than it did the other signatories; qualitatively, in that the expansion of Intelsat out of this service base offered little but an extension of American dominance into attractive areas of independent satellite development and was not, furthermore, in the institutional interests of the PTTs that constituted Intelsat's national representatives. Delaying the pace and restraining the scope of Intelsat activity would appear attractive political strategies for Comsat's foreign partners in the venture.

The process by which agreement was reached was determined largely by the weakness of the European negotiating position and by the limits on the strength of the American one. The Europeans' main leverage was non-cooperation, which would have deprived the satellite system access to the rich transatlantic telecommunications market and made a self-financing operation difficult to assure. The American response to European reluctance was a display of unilateral resolution mounted by the U.S. government, AT&T and Comsat: the government, through the Defence Department, opened negotiations with Comsat over the possibility of joining the proposed initial military satellite system to the commercial one, which would have assured Comsat an enormous amount of traffic;
AT&T announced a preference for using satellite facilities in the Atlantic region as of 1966-67, implicitly threatening possible disruption of working relationships with European PTTs if they continued relying on cables; and Comsat contracted with Hughes Aircraft for an initial synchronous satellite, later launched as Early Bird. To a degree, each of the elements of that unilateralist display derived from domestic concerns. The Pentagon believed a joint satellite system would be cheaper, AT&T was interested in proving its entitlement to a large block of Comsat shares (the disposition of which had not yet been decided by the FCC), and Comsat was under some pressure to reassure prospective investors and to take over from NASA technical work of primary value to the commercial system. Nevertheless, the prospect confronting the Europeans as a result was of an operational satellite system, built by American contractors to Comsat specifications, virtually born half-loaded with U.S. military traffic and with American private carriers eager to begin filling the remaining available circuits.

Notwithstanding the unilateralist posturing, the United States had important technical, commercial and political reasons for seeking the collaboration of its main communicating partner. Technically, at the time of the negotiations the number of possible participants was limited by the capabilities of the satellites that were likely to be used. As Comsat stated in an August 1964 report to the UN General Assembly:

"Use of more than a small number of ground stations could...raise the cost of satellite-derived circuits to unacceptable levels. For this reason it is likely that the space segment in its early phase of operation will be used by a small number of ground stations."

The so-called multiple access problem thus reinforced the commercial impulse to seek access to the greatest international communications market. Furthermore, the U.S. remained concerned with promoting "the image of a technologically advanced, competent and dynamic country with which other countries can increasingly identify their interests," an image difficult to reconcile with a hasty and arrogant rejection of the evidently justifiable concerns of potential partners. Enlisting European participation would help counter charges of American domination of the field, possibly encourage channeling of European aerospace efforts
away from development of rival satellite systems, and win support for U.S. frequency requests at the forthcoming EARC in 1963. Achieving those objectives without surrendering control of the satellite system was the task the Americans had set for themselves in the international negotiations.

2. EARLY U.S. VIEWS OF INTERNATIONAL SATELLITE ARRANGEMENTS

Since the primary concerns debated during the legislative course of the Comsat Act had been the domestic issues raised by the Corporation's ownership and its likely relationship to the state, little attention was paid the eventual character of the international arrangements and the Act prescribes almost nothing. One section seems to leave open the possibility of no substantive foreign participation, authorising Comsat to "plan, initiate, construct, own, manage, and operate itself or in conjunction with foreign governments or business entities a commercial communications satellite system." An important reason why the legislation was vague was that any attempt to anticipate or prescribe the international set-up was likely to have slowed the bill's passage. The New York Times later observed:

While there was always an underlying assumption that ownership of a global system could not be restricted to the American corporation, the possibility of international ownership was never stressed for fear it would complicate Congressional acceptance of the legislation.

The anti-Soviet impulse was one complicating feature. The House space committee's chairman declared at one point that the U.S. should set up the satellite system itself and only then deal with foreign participation. "We held our Army up on the Elbe while the Russians moved in and took over," he said. "Are we going to hold our men back on this until the Russians get a chance to mobilize their scientific groups?"

There was talk from industry about a "worldwide communications system that will link all the free world together," and a House commerce committee member ventured that he could "see no point in spending American dollars from American citizens for the purpose of providing better communications between Communist countries." Hence any substantive attempt to clarify the significance of the 'global' system would have invited similar comment—and perhaps formal amendments—which might have made international negotiations more difficult, particularly with...
'non-aligned' nations.

To the degree that legislative intent can be inferred, however, it seems to have ranged along a spectrum of unilateralism-multilateralism. The extreme multilateralist position foresaw a central organisational role either for the UN or the ITU. (12) Sen. Hubert Humphrey suggested:

The UN could be given exclusive authority not only to license and regulate, but also to tax this and other types of space traffic. Outer space belongs to no nation. It is international. (13)

Comsat, presumably, would serve as promoter and technical guarantor of the project, which would otherwise invite international participation at foreign or aerospace ministry levels. At the other end of the spectrum would be a 'global AT&T', where Comsat would establish and own the space segment, leasing circuits to foreign telecommunications entities; earth stations might either be owned by Comsat or by individual countries, but Comsat would set technical specifications for them in either event. (14) It is likely that congressional opinion tended to favour the more unilateral options—"anyone can ride, but it's our railroad"—(15) and it certainly would be difficult to show that by the provision authorizing cooperation Congress intended to have the corporation participate in an international body in which the United States could be theoretically outvoted. (16)

Indeed certain provisions of the Act—for instance requiring FCC approval for Comsat's rate-making and investment decisions, or empowering the Secretary of State to order service to be established with specified foreign points—would be impossible to square with the fully internationalised approach.

On at least two levels contradictory foreign policy requirements were in play. In regard to operational control, the evident need for foreign ground stations had to be reconciled with the desire to have the satellite system serve as an American communications resource. And with respect to the national image the U.S. wanted to project through satellite activity, the wish to provide a demonstration of a national commitment to international technological cooperation had to be reconciled with the desire for central American leadership in the project.

The plan proposed by the U.S. carrier industry during the pre-
Comsat Act period seemed to offer a promising way to accommodate these divergent policy requirements by applying the model of international cable-owning arrangements to the satellite field. The accepted principle of ownership in proportion to usage would enable American international traffic weight to be translated into voting control of the satellite system—without any need to refer to the degree to which U.S. space technology and launchers would be required as further justification for American political dominance. The outcome would be the same, but the basis less contentious. Satellites, as the FCC common carrier bureau chief later explained, "could be integrated with the present network pretty much relying upon the existing framework and conventions and business relationships." (17) The system, furthermore, could be created through a series of bilateral agreements between the U.S. and its main communicating partners.

Among government agencies, the FCC had however said little about the international arrangements it envisaged. The subject was omitted from the Commission's first report in May 1961, and at a June meeting with the international carriers the FCC chairman observed only that it was "essential for any joint venture to provide for ownership participation and equitable access...by all interested foreign countries." (18) The President's July policy statement had also mentioned investment opportunities for foreign participants, and State Department representatives indicated that they viewed the cable analogy as appropriate inasmuch as countries would share in control in proportion to their space segment investments. (19)

The State Department also, however, pointed out that satellites unlike cables were "multilateral in concept" and therefore raised "problems which can be resolved only in the context of multilateral negotiations." (20) Indeed simply transposing the cable model to the satellite field posed a number of practical difficulties: cables were owned as discrete linkages in shares determined by actual usage of the specific cable, so geographical location in effect held down the number of co-investors. With satellites though, since access could be had irrespective of geography, a great many bilateral agreements—not only between the U.S. and its foreign partners, but among the foreign entities too—might be necessary, arguably requiring multilateral accords to ensure that the bilateral agreements would be sufficiently uniform to guarantee operational continuity. (21)
The cable analogy also could not resolve satisfactorily the question of undivided space segment ownership, which the Ad Hoc Committee had recommended, and which would mean that co-owners were purchasing shares in the entire space segment regardless of which satellites they were actually interested in using. Undivided ownership had both technical and political justification. Technically, it would be particularly suited to non-synchronous satellites, where users would not know which satellite or satellites they would require. Politically, undivided shares would help maintain the integrity of the global system if synchronous satellites were used by discouraging 'federalisation' by regional co-owners of a specific satellite; it also would enable America's overall traffic preponderance to be translated into worldwide satellite control—including spacecraft serving regions where actual U.S. traffic was relatively light.

So while the Comsat Act was not prescriptive and the concrete alternatives discussed during the legislative process vague, it is possible to get an indication of the international arrangements the U.S. favoured by examining the objectives they would be expected to serve—or balance. The arrangements would have to facilitate creation of an operational system as soon as possible without ignoring commercial considerations. They would "achieve broad and meaningful international cooperation" while sustaining American dominance in the field and without compromising expedition. They would help prevent "for political as well as economic and technical reasons, wasteful rivalries"—independent systems. The model of conventional arrangements within the international carrier industry seemed to be useful for reconciling national dominance with international cooperation. It remained to be seen however how satisfactory this would be to the satellite system's other prospective participants.

3. EUROPEAN REGIONAL AEROSPACE ORGANISATION AND U.S. POLICY

The American aerospace mobilisation of the late 1950s and early 1960s had been paralleled formally by several multilateral efforts within Europe, notably the formation of a European Launcher Development
Organisation (ELDO), the European Space Research Organisation (ESRO) and several private industrial consortia. For the main participants—Great Britain, France, Germany, Italy and to a lesser extent Belgium, the Netherlands and Denmark—regionalism offered a means of matching the scale of resources available to the Soviets and Americans for aerospace R&D to stimulate industrial investment to meet internal requirements and compete for foreign sales. Although the efforts were ostensibly undertaken with a view toward peaceful space applications, suspicion remained that scientific and commercial objectives served largely to justify technical work that could not fail to find military uses. When, for example, the head of the European Preparatory Council for Space Research, an early coordinating body, was asked why regional launcher development work was not simply sponsored by NATO, he first replied that military and non-military space efforts needed to be carefully distinguished, but then added:

It does not mean at all that defence programmes have nothing to do with ELDO and ESRO...I think it can even be said that there would be very little scientific work in space without the existence of the defence programmes. (25)

The potential emergence of a 'third force' in space, with consequences not just for competitive commercial efforts but more importantly—especially after the French announced in late 1960 their intention to develop an independent nuclear weapons capability—(26)—for the future of the U.S. monopoly over anti-Soviet strategic forces, remained an active concern on both sides of the Atlantic.

American policy toward European regionalism in space fields was ambivalent. On the one hand, as an early 1962 Senate report stated, "A European cooperative space effort would have merit for the same reasons that the Common Market and the European Centre for Nuclear Research have both political and economic merit."(27) Regionalism was seen by some as a modernising and moderating force, which would strengthen Europe vis-à-vis the Soviet bloc, permit reductions in U.S. military spending on NATO, and make negotiations over transatlantic aerospace cooperation easier by transforming them into essentially bilateral discussions. Furthermore, even if a pooling of resources made the development of advanced weaponry more likely, it would also diffuse control among participants and thus moderate the more nationalistic propensities of certain countries, notably France.
Hence in a later report by the U.S. Arms Control and Disarmament Agency, for instance, support for ELDO was explicitly declared as a vehicle for controlling the proliferation of rocket technology at national levels. (28)

On the other hand, the policies of NASA and the State Department suggest an appreciation of the competitive threats posed by European regional collaboration. The space agency was careful to limit its assistance to areas believed inapplicable to military uses, like cryogenic rocket fuels and certain low-grade guidance technology. The State Department stipulated furthermore that any help should be multilateral in destination, and should be limited to fields that either were of direct interest to the U.S. or promised to yield a net contribution to the overall Western technological capability, (29) a formulation which apparently envisaged an evolution of European efforts into an integral extension of American R&D resources.

The European position was less reluctant about pursuing work in evident competition with the U.S. A March 1961 Anglo-French report on aerospace efforts stated: "If we have a technically competitive solution it would be worthwhile developing it so that it would take its place at the appropriate time." (30) This divergence in developmental objectives could assume greater importance in the context of a unified European front: the same strength the U.S. hoped to see deployed against the Soviets could be turned to forcing concessions from the Americans, and any attempts by the U.S. to restrain European aerospace development — whether for strategic or commercial reasons or both — would become a challenge to a continental effort, unlikely to be absorbed in isolation by disparate national industries or aerospace ministries. The U.S. therefore recognised that the success of the global satellite system would depend in part on the ability of the U.S. to persuade the Europeans that it offered sufficient scope for their aerospace ambitions to be realised:

The high-cost, high-capacity U.S. communications satellite system would serve the communications needs of all nations in the foreseeable future. Yet, unless the United States provides sufficiently attractive opportunities for foreign participation, competitive systems may emerge. (31)

For the moment, however, there was little evidence of any European space achievements comparable to those of the Soviets and Americans. ELDO had developed out of the April 1960 cancellation by the British government...
of their Blue Streak missile project, and subsequent efforts to salvage some of the £70m outlay by stimulating a cooperative rocket programme into which Blue Streak R&D could be channeled. The French expressed interest in designing and building a second stage rocket, with Blue Streak serving as the first stage of a bi-national launch vehicle. The two governments decided at the end of 1960 to call a Europe-wide organisational meeting to consider wider collaboration, which was held in Strasbourg in February 1961. Encouraged by interest expressed, a second conference was held in Lancaster House, London in November, attended by representatives of Belgium, Denmark, the Netherlands, West Germany, Italy, Spain, Norway, Sweden, Switzerland and Austria, and observers from Canada, Greece and Turkey. Germany had meanwhile signed on to the bi-lateral project in July, after five months of hesitation while the U.S. attitude was gauged, and agreed to work on the rocket's third stage. In April 1962 the ELDO Convention was signed by six of the Lancaster House conference's participants—France, Britain, Germany, Belgium, the Netherlands and Italy—its Protocol stipulating a further national distribution of launcher R&D: satellite test payloads to be built by Italy, downrange ground guidance equipment by Belgium and long-range telemetry facilities by the Netherlands. Australia had meanwhile indicated that ELDO could use its firing range at Woomera, although at least two years of preparation were anticipated before tests would be conducted there. The $200m estimated costs over the next five years would be borne principally by Germany (22 percent), France (24 percent) and Britain (39 percent).

In Britain concern was expressed that such an apparently vital field should be entrusted to a multinational effort, and when the Strasbourg meeting was called Tory backbenchers complained that a strictly Commonwealth satellite system might earn as much as £450m for Britain over the next two decades, while the European regional approach would do little but assure the Americans unrivalled aerospace superiority for years to come. The Commonwealth system alternative was promoted notably by elements of British industry which in February 1961 organised the British Space Development Co., representing nine aerospace and electronics firms and endowed with £20,000 in initial capitalisation to enable
a united front to be presented to the government. The company's first
director put their case in glowing terms:

We who have formed this company believe the money in space is
more than any man ever dreamed of. It is colossal. We believe
the gentlemen adventurers of space have a much bigger chance of
vast wealth than ever did the adventurers of the Hudson's Bay
Company or the East India Company. It is the real Eldorado of
the future. It we are not in space, London ceases to be the
centre of the world as far as communications are concerned. (37)

Support for a Commonwealth system continued throughout the period of
the interim Intelsat negotiations. In March 1963 a Commons resolution
called upon the government to announce plans for such a system, and
insisted the matter be treated with urgency. The aviation minister
responded obliquely: "We do not mean just to buy time in any system."
(38) The main direction of British state and industrial efforts re­
mained, however, European and the aerospace firm Hawker Siddeley was,
with the French company SEREE, founder of Eurospace, an industrial
association which grew to include 146 aerospace and electronics firms
largely unified in support of a regional approach. Space activities
were, according to Eurospace's first president, "a matter of survival"
for Europe: "Unless the European countries wish to join the ranks of
the backward and undeveloped countries within the next 50 years, they
must take immediate steps to enter these new fields." (39)

Along with ELDO was a second major multilateral intergovernmental
effort in the field, the European Space Research Organisation (ESRO),
which due to its focus upon R&D unrelated to missiles attracted wider
European participation. ESRO developed from a preparatory study com­
mission formed in December 1960 to examine potential areas of collective
research, (40) and in February–March 1962 a formal convention was nego­
tiated. Initial signatories that June included the six ELDO members
and Denmark, Spain, Sweden and Switzerland. A total of $306m was to
be spent over the next eight years on a number of explicitly non-mili­
tary scientific projects. While an obvious possible relationship be­
tween ESRO and ELDO would make ESRO a customer for the other's launch
vehicles, and although ESRO's convention authorises it to "procure
launching vehicles and arrange for their launching," nothing was for­
mally stated as to the terms of coexistence between the two organisa­
tions. (41)
4. TRANSATLANTIC RELATIONS IN THE AEROSPACE FIELD

The salience and effectiveness of international space arrangements within Europe were less impressive than those between European and other nations and the United States. NASA had been the chief U.S. instrument of technical—and political—pioneering, and performed services indispensable to preparing the way for the commercial satellite system. A top space agency official later claimed that NASA had "stimulated a dozen countries to build ground stations to test communications satellites, contributing directly to the establishment of Intelsat." Early NASA activities were such that by July 1961 an FCC commissioner testified that Britain, France, Germany, Brazil and Japan already appeared interested in participating in the commercial system. NASA encouraged the British and French governments to build their first satellite earth stations, at Goonhilly Downs and Pleumeur-Bodou respectively, in order to participate in AT&T's Telstar experiment. For its own Project Relay, the space agency negotiated agreements in February 1961 with Brazil (in fact with ITT's subsidiary there) for operation of a transportable antenna near Rio de Janeiro, and in April with Britain and France. Accordingly, by the time Relay was launched in December 1962 earth stations were under construction in Italy, Germany and Japan, and a total of 40 countries were participating in NASA projects.

A considerable number of the projects that by 1965 NASA had undertaken with 69 foreign countries had direct or indirect bearing on satellite communications. The agency had helped dramatise the technology's potential uses through intercontinental TV relays: Relay I handled 11 spot news telecasts, eight to Europe and three to Japan, during the three-day period after President Kennedy's death; Brazil's participation in the Relay project made possible the first three-continent television hook-up. NASA furthermore indicated who its heir apparent was in regard to satellite communications by inviting Comsat—which had not yet launched a satellite of its own—to coordinate international TV coverage of the 1964 Tokyo Olympics via NASA's Syncom III satellite.
Hence two distinct patterns of international aerospace cooperation were discernible, the one intra-European and the other consisting of bilateral arrangements with the U.S.; the degree to which space would offer opportunities for regional collaboration independent of American influence—or reinforce existing transatlantic ties—was controversial and negotiable. That uncertainty was in part an expression of larger uncertainties within the 'Western alliance': the eventual impact of Gaullist foreign policies ("one Europe from the Atlantic to the Urals"), Britain's relationship to the Common Market, and the ultimate relationship of the U.S. to an apparently unifying European community. In August 1962 France rejected the nuclear test ban treaty concluded in July by Britain, the U.S. and the Soviet Union. French efforts to isolate Britain won unexpected assistance in the autumn when the Kennedy Administration cancelled aid for the British Skybolt air-to-ground missile programme, which was to have been the basis for an independent U.K. nuclear deterrent. A Sunday Times (London) correspondent, reporting from the subsequent Kennedy-Macmillan meeting in Nassau in December, wrote of "resentment and suspicion of American intentions such as I have never experienced in all the Anglo-American conferences I have covered over the past 20 years."(50) Proposals for a NATO multi-lateral nuclear force continued to be made through the spring of 1963, partly to draw potential German support away from DeGaulle. France had, at the beginning of the year, declared its opposition to British membership of the European Economic Community and to its own further integration into NATO: the former was to prevent formation of "a colossal Atlantic community under American domination and control;" as for NATO—"France intends to have her own national defence...In politics and strategy, as in economics, monopoly naturally appears to him who enjoys it as the best possible system."(51)

Such then was the setting of suspicion amidst opportunities for practical cooperation, and of divergent pulls toward European and transatlantic integration, within which the negotiations on the formation of a global commercial satellite system would take place.
CHAPTER SEVEN: INTERNATIONAL SATELLITE NEGOTIATIONS THROUGH 1963

1. PRELIMINARY CONTACTS AND COMSAT'S ENTRY

The two-year process by which the interim Intelsat accords were negotiated began soon after passage of the Comsat Act with a visit to Washington in late October 1962 by representatives of the British Post Office and Foreign Office and of the Canadian Transport and External Affairs ministries, who met with U.S. State Department and FCC officials to discuss satellite plans. The possibility of a Commonwealth satellite system seems to have figured in the talks, provoking the first formal declaration of American policy on the 'single global system.' The State Department reported afterwards that its representatives had emphasized the desirability of a unitary network "as opposed to competing systems developed by different nations or regional groups." The U.S. position was that "with a single global system, there would be avoidance of duplicate stations, avoidance of major problems of interference, and more efficient use of the frequency spectrum," although the degree to which unitary ownership was necessary to assure these largely technical objectives was not clear.

The British and Canadian participants reportedly expressed interest in "participating fully" in the proposed system, and the British representatives offered to report on the discussions to a forthcoming meeting of the telecommunications committee of the European Conference of Posts and Telecommunications (known by its French initials CEPT) in Cologne in December. The State Department wanted to conduct the briefings itself, and a team of U.S. diplomats held bilateral talks with PTT officials in France, Germany, Italy, Switzerland, the Netherlands, Belgium and the Scandinavian countries in preparation for the December meeting. The Americans returned believing that the European PTTs were anxious to join in the proposed system and wished to have significant roles in
determining its design, ownership, management and equipment procurement practices.\(^{(4)}\)

These early discussions involved officials of the State Department and the FCC, but the Communications Satellite Corporation (Comsat) was meanwhile being organised to the point where its own representatives could begin to take part. In mid-October 1962 President Kennedy appointed 12 lawyers, bankers and industrialists to serve as temporary incorporators for Comsat;\(^{(5)}\) Philip Graham, publisher of The Washington Post, was selected as their chairman and on February 1, 1963 Comsat was formally created as a corporation. At the end of that month, two top appointments were announced: Leo Welch, former chairman of the board of Standard Oil of New Jersey, was named company chairman and chief executive officer, and Joseph Charyk, a former undersecretary of the Air Force, was appointed corporation president.\(^{(6)}\)

The broad lines of Comsat's ownership were decided by the FCC on November 28, when the Commission ruled that all U.S. communications common carriers—including in principle the 2,700 non-Bell domestic phone companies—were eligible to purchase Comsat carrier stock. While this hotly contested legislative issue was apparently settled smoothly by administrative edict—aside from a cautionary note from AT&T warning that shares would be oversubscribed the FCC decision went unopposed—the Commission still retained authority to decide on the final apportionment of shares among those theoretically authorised carriers, and it would be the precise formula the FCC promulgated which would determine whether the apparent expansion of Comsat's carrier ownership would be sustained in substance.\(^{(7)}\)

The Commission also was prodding Comsat's temporary incorporators to issue and sell the company's stock before they—as presidential appointees—would be obliged to take decisions that the FCC believed were the proper responsibility of duly elected officers. Approval from the Commission was necessary before Comsat could raise temporary capital until shares were sold, and on February 27 a $5m line of credit was authorised.\(^{(8)}\) Although a loan of $1.9m to enable Comsat to operate was approved at the same time, the FCC soon made it clear that the corporation's obligation to secure authorisations on further loans would be
used as leverage to force the incorporators to sell shares and thereby incorporate the company fully. In July the FCC chairman wrote to Comsat Chairman Welch expressing the Commission's "concern" that no firm plans had been made to issue stock, and reminding Welch that Congress had intended the numerous important decisions on technology and policy confronting the Corporation to be taken by representatives of its owners, not by presidential appointees. It was further implied that the FCC might, in the absence of definite moves toward incorporation, find it difficult to approve any more loans to Comsat. Welch replied that "sound preparation" for a stock offering was being made, defended the need for the R&D contracts which Comsat had begun to let—and which the FCC had particularly criticised—and charged the Commission with an "invasion of managerial functions of the corporation." Comsat's report to Congress in September stressed the need to settle such issues as frequency assignments, the attitudes of prospective foreign partners and the type of technical programme the Corporation would pursue before investors could be expected to buy shares.

2. COMSAT'S NEGOTIATING POSITION IS FORMULATED AND MODERATED

Comsat's newly appointed officials were meanwhile formulating their own views on international arrangements, which clashed with the State Department's preference for sharing ownership participation with foreign partners. Comsat Chairman Welch believed that leasing arrangements could be negotiated bilaterally by Comsat, and that the company should retain exclusive ownership of the space segment if not of the entire integrated system. After they took office in February, Welch and Charyk were briefed by State Department officials and in May and June presented the Corporation's position to PTT officials in France, Britain, Germany, Italy, Denmark, Norway, Switzerland and Sweden. Comsat also briefed Canadian representatives, and the Japanese Embassy requested its own session. Although the company "advised" the State Department of the results of these talks, the Department's own role in the emerging negotiations had not yet been clarified and Comsat appears to have been unwilling to concede a co-equal role to the professional diplomats.
Thanks, however, to a combination of domestic and international pressures, Comsat's more extreme unilateralist position was by and large accepted as impracticable by the end of 1963.\(^\text{14}\) Domestically, erosion of the position preferred by Welch began in June, when the President named an ad hoc communications satellite group, chaired jointly by Deputy Attorney General Katzenbach and Jerome Weisner, to coordinate government policy toward Comsat. The group supported the State Department's negotiating position, where ownership of the space segment would be held in undivided shares and some kind of multinational body where votes would be distributed according to investment would oversee the system.\(^\text{15}\)

Although the government had no clear authority to dictate Comsat's negotiating position, the State Department made known its opinion, first by distancing itself from Comsat's approach. Commenting on the Corporation's draft negotiating principles in September, for example, the Department told the House commerce committee:

The principles will be presented as those developed by the Corporation, and the reactions of the Europeans will be considered highly important in the formulation of the final Government positions on the same subjects. \(^\text{16}\)

The State Department was, in effect, fashioning for itself a mediating position between Comsat's and that likely to be taken by prospective foreign participants. This effort did not endear the Department to Comsat, for whom its loyalty was already suspect due to its brief advocacy of government satellite ownership, and Comsat believed—not without justice—that the State Department was colluding with the Europeans to undermine the company's position. A Department participant in these encounters—Abram Chayes, then legal adviser—has acknowledged that an effort was made "to contrive repeatedly to expose the officers of the company to situations, meetings and conferences where they could experience, as uncomfortably as could be arranged, the international realities of the situation."\(^\text{17}\)

State Department collusion, however, was not necessary to produce a near-failure for the U.S. at the Extraordinary Administrative Radio Conference (EARC) in Geneva that autumn, which appears to have driven home the point that some form of international power-sharing would be
necessary for the satellite system's success. Comsat recognised that approval of American frequency requests was "of fundamental importance to the program of the Corporation,"(18) as it reported to Congress in September, and the U.S. was represented by a 30-member delegation which included congressmen, FCC commissioners, officials of NASA, the Navy, State Department and Comsat. The conference lasted from October 7 to November 8, and the U.S. lost no opportunity to draw attention to the potential uses of satellite communications.(19) The Americans were requesting a total of 2,725 megacycles (mcs) be set aside for space communications, most of which was to be shared with existing terrestrial services. Sharing would permit satellites to use lower frequency bands, offering better propagation features, but would require other countries to accept American assurances that joint usage would not interfere with existing operations. The U.S. also, with support from Britain, France and Canada, wanted two 50-mcs bands to be reserved for the exclusive use of space communications services, and therefore exempt from certain technical criteria and coordinating procedures applied to shared usage. (20) The reason for the requests for exclusive wavebands was initially given as their value for civil mobile applications—like maritime navigation(21)—but Comsat's president later said that the proposals originated in the National Communications System, which was unwilling to agree to the need for international consent on military-related mobile terminal use.(22)

The Soviets were asking for a total of 1,600 mcs of bandwidth to be reserved for space activities, opposed the U.S. request for exclusive frequencies and, most importantly, wanted whatever assignments the conference made qualified as temporary ones. The notion that the space assignments should be interim—pending the decisions of another planning conference to be held later—received support initially from the ITU's International Frequency Registration Board and from a number of smaller countries. The Israeli delegation introduced a resolution to that effect which attracted considerable backing, to the dismay of the Americans. A Yugoslav delegate explained:

Except for a very limited number of countries which have the necessary means and economic power, the large majority of the countries of the world—and especially the new or developing areas—are not in a position either to make the necessary studies on the possibility of coexistence in the same frequency bands of space radio
services and other very important radio services, or to make the studies and tests indispensable to decide on the manner in which their existing telecommunications networks could be inte­grated to telecommunication systems by satellites.\(^{(23)}\)

The Americans successfully persuaded the Israelis to withdraw their resolution, explaining among other things that its passage would endanger the commercial system in which Israel would be welcome to partici­pate, and worked out a compromise with the Soviets—which later reinforced the belief of some Americans that a Soviet satellite system was still likely.\(^{(24)}\)

As a result, a total of 2,800 mcs in bandwidth was assigned to space communications, including the two exclusive bands the U.S. military wanted and four other 500-mcs bands contained in the original American proposal, which were believed sufficient for commercial satellite traffic until the 1975-80 period.\(^{(25)}\) The overall proportion of the international frequency spectrum assigned to space uses was raised from one to 15 percent of the entire allocated spectrum.\(^{(26)}\)

U.S. officials applauded the outcome of the conference; President Kennedy on November 20 pronounced it "one of the most successful of its kind in recent times," and said work could now proceed "to develop a single global commercial space communications system."\(^{(27)}\) The American delegation chairman reported that "the overall objectives of the United States were approved by the Conference, which adopted the major­ity of the U.S. proposals in substance."\(^{(28)}\) Comsat President Charyk concluded, "There is now a basis...for investment based on some assurance that the whole thing isn't going to be upset by another look at the matter in a few years."\(^{(29)}\)

It also was true, however, that the conference "nearly got out of hand," as one U.S. diplomat put it,\(^{(30)}\) since the success of the Soviet and Israeli proposal would have jeopardised not only Comsat's plans but the eventual deployment of the American military system as well. The belief, still entertained by Comsat's leadership, that the commercial network could be presented to the world as a fait accompli which they would be fortunate to be invited to use, received a set-back from the EARC. It was also appearing increasingly untenable owing to the positions being developed by the system's prospective European participants.
3. THE EUROPEAN POSITION HARDENS

The warm initial response the Americans believed they had received during the early round of post-Act briefings was meanwhile being transformed into a more cautious and, in the U.S. view, dilatory approach as the Europeans both broadened and deepened their participation in satellite negotiations—first through multinational organisation at the PTT level and then through the involvement of foreign and aerospace ministries.

The first collective European response to the U.S. proposals had come at the December 1962 meeting in Cologne of the regional PTT association's (CEPT) telecommunications committee, where an ad hoc group—with representatives of Britain, France, Italy, Belgium, Germany, Switzerland and the Scandinavian countries—was created to study the problems of participation in the "single world network" of satellites. Establishment of the group was to a degree welcomed by the U.S.: President Kennedy viewed it as a step forward in the discussions and as a prelude to formation of a European 'Comsat' that would be the "regional participant in the global system." At the least, the move indicated the seriousness with which the American proposals were being viewed; it also suggested a likely source of pressure upon the British to forego plans for a Commonwealth system—since satellites were being transformed into a 'European' issue, with corresponding pressures upon Britain to be "a good European"—and it was thought possible that regional mobilisation would simplify transatlantic negotiations by shifting the burden of formulating common positions partly onto the Europeans. At the same time, however, the European group approach was acknowledged as a means to enhance the collective negotiating position, as a State Department participant later observed:

There were obvious difficulties from our side in negotiating with a group, and I think I can say we had no choice. The group approach was adopted very strongly by the West Europeans, and I think it is quite fair to say that they did this in order to increase their negotiating strength with us. (35)

Not only was the negotiating front broadened into a multilateral effort, but it was soon deepened too, as the political and industrial implications of the satellite project began to be appreciated and the limits to confining national representation to PTT officials recognised.
The institutional containment upon which the first American approaches were premised was unlikely to endure, since it implicitly denied to the Europeans much the same concerns with national image, technical prestige and industrial advancement that had helped push the U.S. into space. The French were early to recognize a need to evaluate satellites politically and after a first meeting of the CEPT's new satellite group in Paris in mid-March 1963, France called for an intergovernmental meeting in Paris in May; there delegations were led by senior foreign ministry officials, whose growing involvement in the satellite discussions was in some cases resisted by PTTs. At the May meeting two firm common principles were adopted: "group negotiation..., absolutely avoiding any bilateral contacts, and participation in the planning, ownership, direction and furnishing of material to the global system." A second intergovernmental meeting was held in London in mid-July, where a new regional entity—the European Conference on Satellite Communications (also known by its French initials CETS)—was created. The earlier CEPT ad hoc group was accorded a role as adviser to the new CETS on technical and operational matters, meaning in effect that the part to be played by national telecommunications operating entities was that of a consultative resource within a higher level political consideration of collective policy.

Preliminary transatlantic meetings continued through 1963. American representatives met with the CETS' steering committee in London in mid-October and in Bonn and London in November. At these talks, the U.S. proposed linking ownership shares to usage, possibly thereby creating different categories of membership in the system with various rights assigned to each; they also announced a preference for dual agreements, one among nominated operating entities from participating countries and the other among the governments, and for a consortium joint venture arrangement in which Comsat would be operational manager—instead of a new, formal international organisation. CETS members however wanted an enhanced governmental role in the arrangements, especially in regard to financing, which they wanted assigned to an intergovernmental commission. Rather than the fixed investment quotas the U.S. proposed, CETS preferred periodic payments, which presumably would have given them continuing oversight and intermittent opportunities to influence the
running of the system. At a GETS plenary session in Rome in late November, a hardening of the European position was expressed in the decision to create a new regional organisation to represent Europe officially in the satellite system and to serve as a formal counterpart to Comsat. GETS would continue for the time being to act in the place of this organisation, and would represent Europe at the first official negotiating session with the United States, scheduled for February 1964 in Rome.

The American position too had been consolidated, with the more unacceptable elements of Comsat's initial approach eliminated. The U.S. continued to insist upon a predominant role for the Corporation in the arrangements, including voting control and status as the system's administrative, financial, technical and operational manager. Indeed Comsat would be the consortium's sole legal representative. In turn, however, the company had agreed to submit to State Department guidance—if not supervision—in the coming negotiations, and to the need for dual arrangements, which Comsat had felt would legitimate unwarranted government interference. Most important, it was agreed that foreign participants would be permitted to co-own the space segment, in yet to be determined shares.

4. THE AMERICAN UNILATERALIST DISPLAY: AT&T'S INTERVENTION

While the Europeans were clearly moving toward participating in the system, the pace at which the process was moving was not satisfactory to the Americans. A then-official of Swedish broadcasting has recalled "an extraordinary mixture of conventional, traditional attitudes, couple with a fear of and a wish to get into the new technology—all in the midst of an all but total lack of institutional arrangements." Within GETS there were disagreements over which countries should have their own earth stations and continuing friction between PTT and foreign ministry officials, the former eager to join in order to improve overseas linkages while the latter preferred to use the threat of non-cooperation to improve the collective bargaining position. Furthermore, the Americans also suspected that the delays represented an effort to put off satellite deployment until another generation of transatlantic cables was built, and the operational need for satellites reduced accordingly. All in all, The New York Times reported in November 1963 "growing indications that the
negotiations may be even more difficult than had been expected," noting in particular that Britain was "making moves that are being widely interpreted as designed to stall inauguration of the commercial system."(47)

Then, however, came a series of actions by the Americans which seemed to comprise a demonstration of a national commitment to press ahead with creating the system irrespective of European reservations. In early December AT&T announced through a letter from a company vice president to Comsat Chairman Welch that it would rather use satellite circuits in the North Atlantic region as of 1966-67 than build further cables:

If suitable satellite circuits are available to meet our additional needs at that time in the North Atlantic, which is an area where high-capacity cables could be attractive, we would prefer, for diversity reasons, to use satellite circuits instead of placing additional cables. (48)

This apparent commitment is worth examining. The letter foresaw a need for both satellites and cables due to the expected increases in traffic and the desire for diversity in transmission modes. Bell's preference for satellite circuits would continue until the North Atlantic region had approximately equal numbers of cable and satellite circuits available, although AT&T was not committing itself to using equal numbers of each for its own needs.

Furthermore, AT&T was addressing itself only to "additional needs" in a single region, albeit a very important one. Nothing was said of the possibility of sharing out existing traffic levels between the two modes, and it could therefore be inferred that Bell was reserving the right to keep its cables fully loaded—withstanding the number of satellite circuits remaining idle—and channeling the overflow via satellite until such a time when available satellite circuits and cable circuits were equal. In discussing service between North and South America, AT&T forecast a requirement for 80 phone circuits by 1966 and said it might defer its current cable plans in favour of "using satellite facilities initially, with cables possibly coming along later."(49)

AT&T therefore was not promising to consider satellites as indefinite replacements for further undersea cables.

We expect to continue development of improved undersea cable systems and undoubtedly other organizations can be expected to do the same...The high capacity cable will have many important applications
but we see no basic reason why it should prevent satellite usage from reaching an economical and profitable level. (50)

Indeed during congressional hearings earlier in 1963 the author of the December letter, AT&T executive vice president J. Dingman, had reported that work had begun in 1962 on installing transistors instead of electron tubes in Bell's cables, and had predicted a 720-circuit transistorized cable by 1966. (51)

Nevertheless the letter represented a signal to the Europeans that they would not be able to count on AT&T support in any attempt to deny satellites a niche within the international telecommunications industry. "We would," the letter had said, "take all reasonable steps to assist in obtaining this [satellite] agreement." The New York Times at least reported that Bell's apparent commitment was crucial to persuading the British to join fully with GCTS in the negotiations:

This decision by AT&T—long a commercial partner of the British Post Office in cable communications—was believed to have had a direct influence in swinging Britain over to participation in the satellite system. (52)

Just what lay behind Bell's timely declaration is not clear, inasmuch as there is no evidence that the government requested or otherwise prevailed upon the company to make the announcement. Three points seem, however, reasonable to surmise, related to Bell's cable ambitions, its desire to purchase a big share of Comsat stock and the possibility of congressional intervention. AT&T had at this time a request pending before the FCC for authorisation to build a fourth transatlantic cable and, as mentioned, the company was developing new high-capacity cables which it would naturally want permission to deploy. The Commission would very likely have found it difficult to issue cable authorisations if these would, in effect, be undermining the national policy in favour of rapid creation of a self-financing satellite system. AT&T's offer to share further traffic increases in the Atlantic with the satellite system would therefore blunt criticisms that new cables would necessarily rob the space system of business. Also, the FCC had not yet decided on the precise disposition of the 50 percent of Comsat shares reserved to the carrier industry. In spite of indications that the Commission favoured in principle allowing purchases by the entire domestic and international carrier industry, AT&T still hoped to maximise its holdings and would seem poorly qualified to do so if the company seemed headed toward becoming Comsat's chief
commercial competitor. Finally, there appears to have been some congres
gional concern over AT&T's intentions: indeed, in spite of the December letter the chairman of the House commerce committee warned ear
ey in January that Congress "can act effectively and expeditiously" to protect the national interest.

It is my sincere hope that such action will not be necessary in order to bring about agreement on the part of the domestic groups who may have divergent interests with regard to the establishment of an early global satellite system. (53)

AT&T's declaration thus can be seen in part as an attempt to pre-empt a potentially embarrassing set of congressional hearings, which moreover might have succeeded in exacting a more rigorous pledge from the company regarding satellite use than the letter in fact provided.

7. COMSAT BEGINS LETTING SATELLITE CONTRACTS

A second source of pressure upon European--in U.S. eyes--recalcitrance lay in Comsat's growing technical activities. On December 22, 1963 the Corporation published a request for bids from contractors willing to provide a worldwide "basic system" by 1967-68. At the time the request was announced, various British and French telecommunications and aerospace officials were in Washington for discussions with Comsat, (54) so it can safely be assumed that the point was taken: the United States did not intend to await the outcome of the international discussions before proceeding with creation of the satellite network. Comsat asked 15 American aerospace firms to submit proposals for either a low-altitude random, a medium-altitude phased, or a high-altitude geostationary orbiting system. (A phased system would consist of multiple satellites passing at regular intervals.) The contract parameters were softened for the synchronous option: this was to be ready for global deployment by 1968, while the non-synchronous systems had to be ready a year earlier; (55) similarly, Comsat asked for satellites to have guaranteed useful 'lives' of five years, at a time when specialists in non-synchronous craft were promising ten years and Hughes was only willing to guarantee two to three. (56)

Although Comsat had previously voiced its intention to launch a prototype satellite early in 1966 with full global operation to follow the next year, (57) the December request for bids doubtless put this talk
in a considerably more serious light. By the February deadline, Comsat had received five concrete proposals for systems of all three types, and on June 8, 1964 the Corporation informed the FCC that it had awarded five contracts: two to Hughes, totalling more than $17m for continued work on synchronous satellites; one to AT&T and one to RCA, each for more than a million dollars for random systems; and another jointly to Space Technology Laboratories and ITT, for nearly $1.3m for a phased satellite system.

Comsat also was proceeding with plans for an "early capability system," which it hoped to have operational by spring 1965. On January 21 the Corporation asked NASA to agree in principle to launch an initial experimental/operational satellite to serve the North Atlantic, and on February 28 the space agency agreed. FCC approval was asked in early March for a prototype synchronous satellite to be launched in a year's time, a project distinct from the basic system. Comsat noted the success of the NASA Syncom satellites, built by Hughes, and said that the design of its proposed 'Early Bird' satellite was "derived primarily from that of the Syncom II satellite," which had become the first successful geostationary satellite after its launch by NASA on July 26, 1963. The FCC approved Comsat's application in mid-April, and within a week an $8m contract had been signed with Hughes for a 240-circuit synchronous satellite. Comsat also was granted permission to modify AT&T's Telstar earth station in Maine, and to make necessary arrangements for operations with British, French, German and Italian earth stations.

The decision that Comsat should press ahead with firm plans for the satellite system, regardless of the international negotiations, was apparently reached with the full support of the State Department, now freed by the American success at the EARC from undue solicitude for foreign opinion. The Department soon made it clear that it regarded the tactic as a very fruitful one, as this extract from April 1964 House testimony by its legal adviser shows:

We have made it clear...to the foreign governments that the timetable was set by the Corporation's program and that the foreign governments and entities by failure to agree would not delay the Corporation's program.

British interests and other European interests had thought at one point, that by delaying this and deferring this, they could get in with...another generation of cables and put this whole thing off...
It was the fact that the Corporation was able to mount a pro­gram for Early Bird which would supply this North Atlantic ca­pability in 1965, and the Department and AT&T backed them up on it, that broke the resistance of these certain European countries and resulted in what we regard as a highly favorable climate for cooperative participation in an early system. (65)

The message therefore was: "We were going to have that thing up and we were going to be using it, and if anybody else wanted to get on board they could, but if not, we would see them later." (66)

Comsat's position that, as its president put it, "we do not in­tend to let [the international] discussions delay our plans to establish a global satellite system as soon as feasible," (67) must also however be understood in its domestic context—of congressional pressure on the Corporation for it to assume certain technical responsibilities, of the forthcoming sale of Comsat stock and, arguably, of a corporate interest in asserting a degree of independence from AT&T. NASA had been drawing considerable criticism in Congress for continuing to conduct R&D be­lieved to be of principal benefit to Comsat. The space agency's expla­nation was equivocal, and although officials testified in early 1963 that none of their projects were specifically intended as assistance to Comsat, (68) they also acknowledged that without NASA's continued work on satellite communications creation of the commercial system would probably be delayed—an admission that prompted one senator to complain that it had been precisely because of his belief that "private industry would have more flexibility, greater speed, more initiative, greater risk-taking" that he had voted for the Comsat Act in the first place. (69) Similar questions of the propriety of apparent NASA assis­tance to a private company were raised during hearings on Comsat in March 1963 and on NASA's own appropriations in March 1964. (70)

Comsat also had its prospective domestic investors to consider since, as mentioned, its temporary incorporators were under pressure from the FCC to issue and sell the company's stock. It presumably would furthermore be valuable in the international negotiations if Comsat had at its disposal the full $200m it was authorised to raise—enough, it was thought, to create the space segment alone if needs be—and some firm indication of the company's technical direction would be desirable before Comsat went to the capital market, especially if the 'public' shares were to be fully subscribed.
As it turned out, Comsat had no trouble selling its stock. The five million shares reserved for the carriers were fully subscribed by May 27. A total of 163 communications carriers had asked FCC authorization to purchase more than 6.5 million shares in all, AT&T alone requesting 4.25 million. The Commission's distribution formula set aside, notably, nearly 2.9 million for Bell, thereby assuring the company three seats on Comsat's board and just under 29 percent of its total stock; 1.85 million shares went to ITT, which got one seat on the board; 350,000 shares went to GT&E and 250,000 to RCA. And despite warnings in the company's Prospectus, issued by its incorporators on June 4, that "No dividends will be paid on the common stock for an indeterminate period," the public shares were readily sold as well. On May 14 the governors of the New York Stock Exchange approved Comsat's stock for listing before it was actually listed, an unprecedented action explained by the president of the stock exchange by reference to Comsat's creation by Congress as "an instrument of national policy." That confidence contributed to a rapid oversubscription of shares in what The New York Times called the biggest underwriting of its kind since Ford Motor Company had gone public in 1956; within minutes Comsat's share price rose from $20 to $27, later settling to $21.50 by week's end—indeed the price went as high as $70 by December. Public holdings were widely dispersed, since by the end of 1964 more than half those investors owned 10 shares or fewer, and 95 percent 50 or fewer; nearly 12 percent of all accounts were held for minors, suggesting Comsat's attraction as a growth stock enabling "a starry-eyed role as owners of a piece of the first private business in space," as one account described participants at Comsat's first stockholders' meeting.

Finally, Comsat's apparent haste in taking on technical activities and letting R&D and equipment contracts may also be explained by a desire to push ahead with synchronous satellite technology, notwithstanding AT&T's continued preference for a random orbiting system. Abram Chayes has suggested that the Early Bird decision and the contracts for the basic system were "dominated by the AT&T problem:"

Once you had Comsat set up as a new group... they had two choices. One was to become an appendage of an appendage of AT&T. And one was to have at least some independent, substantial role, position, prestige in the international communications arena. If you took
that AT&T bid...then AT&T dominated you: they had all the traffic, they had all the hardware, they had two sources of public shareholders. There was nothing then that Comsat would be but a messenger boy for AT&T. As it was AT&T had a lot of whip hand over [Comsat]. But if they took the AT&T hardware, they would have been dead. (75)

Although Bell Labs' satellite pioneer John Pierce later acknowledged that "the success of Syncom makes one wonder why anyone was ever interested in low-altitude satellites," (76) AT&T had nevertheless been preparing a fallback position around the issue of rapid deployment: a company vice president testified in Congress that he foresaw Comsat's establishing an initial random system by 1966-67, and only in time replacing it with synchronous satellites. "It will be very unusual," he said, "if the ideal system will be the first one." (77) Comsat's contracting suggested a rejection of Bell's prediction.

8. COMSAT AND THE DEFENCE DEPARTMENT DISCUSS A JOINT SYSTEM

The third component of what was in effect a U.S. demonstration of its intention to proceed with development of the satellite system without the Europeans, if necessary, pertained to a joint civil-military network. In an October 11, 1963 letter to Comsat President Charyk, Secretary of Defence McNamara asked whether the Corporation might be interested in providing specially tailored telecommunications services to the Pentagon. (78) The Department of Defence (DOD) had just completed the 'project definition phase' of a military satellite system that would consist of around 60 spacecraft in medium-altitude random orbits, to be built at a cost of $50-60m by Philco's Space Technology Labs. (79) It will be recalled that during the Comsat Act debates DOD officials had consistently said that a separate military system would be necessary—a view endorsed by industry (80)—and again in April 1963 Gen. Alfred Starbird, director of the Defence Communications Agency, told a House subcommittee that the military would be needing its own system as soon as possible. (81)

Nevertheless, DOD had now decided to pursue the possibility of creating at least its initial system jointly with Comsat's commercial network and in January 1964 the Defence Communications Agency (DCA) set up an interagency group to study the feasibility of sharing certain
satellite components with commercial users. Interest at first focussed on the satellite’s transponders, which are the basic units of its relay equipment, each consisting of a discrete bank of carrier wave transmitters which are in turn used to derive actual circuits. Since the interagency group determined that it would be technically impossible to share transponders with public users, attention shifted to the possibility of designing the satellite to house separate transponders designated for military and commercial uses.\(^{(82)}\)

The scheme seems in retrospect obviously doomed, but through the winter and spring of 1964 a succession of DOD witnesses appeared before the House military operations subcommittee to contradict one another and exasperate subcommittee members and staff on the possibility of a joint project with Comsat. In February McNamara told another committee that DOD’s requirements might be met through Comsat’s system\(^{(83)}\) but in March Harold Brown, then Pentagon director of research and engineering, testified that DOD would insist upon a lower altitude—preferably random—system, since geostationary satellites were considered vulnerable and susceptible to tampering from the ground; their potential usefulness was confined to heavy traffic regions, which would also require non-synchronous satellite coverage.\(^{(84)}\) Hence at the same time Comsat was headed toward approving a geostationary system, DOD was saying that such a system would by definition be unsuitable.

Both sides nevertheless showed keen interest in working out an accommodation of some kind. In March Comsat’s president confirmed that tentatively at least the company preferred a synchronous system, but indicated that since it also wanted to lay hold of the high volume of DOD traffic a combination of synchronous and non-synchronous satellites might be possible.\(^{(85)}\) DOD, for its part, was willing to make its design specifications “definitely softer and easier,” according to one witness,\(^{(86)}\) for a joint system than those it had insisted upon when plans for an exclusive military system were developed 18 months earlier.

There appear to have been two main reasons why the Pentagon sought a merged satellite system—cost savings and international politics. First, it was claimed that such a system would cost DOD less, although just how much less was unclear. Assistant defence secretary Dr. Eugene Fubini said
that the Pentagon would finally pay around one-sixth of what its own system would cost, but that estimate was scrutinized and challenged by Wilbur Pritchard, a satellite expert then with the Air Force's 'think tank' Aerospace Corporation and later with Comsat, who said that a 'gain factor' of three was more likely than six, since the Pentagon would not want to operate its facilities at the lower—shared—commercial frequencies and would therefore lose carrying capacity by functioning in the higher exclusive bandwidths where attenuation of signals was greater.

The second reason for pursuing a joint system, according to Dr. Pubini,

is that it seems to us that if we could prove by this agreement that it is indeed possible to make a single communications satellite system work for as different a set of purposes as the commercial purposes and the defense purposes, it would be, I think, unmistakably proven and almost beyond doubt that the idea of the Communications Satellite Act for a single worldwide system open to all may be indeed even more feasible than our fondest hopes could lead us to believe.

DOD, in other words, was willing to modify its requirements in order to contribute to a national demonstration of the practicability of a single global system deployed under nominally commercial auspices. And, in fact, the U.S. would show that even without international agreement it could finance and use at least half the proposed capacity of the system, since the Pentagon was considering utilizing one of the two transponders aboard each of the first-generation satellites.

If the proposal impressed the Europeans, however, it also infuriated them. In early March Comsat officials Welch and Charyk, along with DOD representatives, visited Britain, France, Italy and Germany to brief them on the status of Comsat-Pentagon discussions. There could be no doubt that the scheme, in the State Department's view, "adds an additional complexity into the arrangements that are projected for foreign participation. DOD after all wanted two entirely separate transponders in each satellite, a random orbiting system, and the right to use spare capacity from the commercial transponder as and when needed; furthermore, the foreign partners would not be allowed to bid on any contracts to equip the Pentagon's half of each satellite. And any international role in running the satellite system could not extend to authority over DOD earth stations—their necessity, location, technical compatibility with the rest
of the network, or their design specifications. Charyk later said:

Basically what the Department of Defense sought was for us to attempt to negotiate with the other countries an arrangement whereby although the other countries were going to put up 40 percent of the money that they would have no say whatsoever in the design of half of the satellite. (94)

By mid-May "distinct conflict" with the Europeans on the issue of ground station control was reported, and a basic "incompatibility" was recognised between the joint system scheme and the commercial negotiations; it was later said that the changes in the latter which the Pentagon wanted would have "gravely endangered" success of the discussions. (95)

While the State Department thought the joint scheme impossible to negotiate—it would have "cut the international participation so thin that nobody would have bought it"—and consequently feared that the proposal would delay creation of the commercial system, the House military operations subcommittee was afraid the commercial negotiations would delay establishment of the military system. (98)

Finally, after a meeting in the White House on July 8, the State Department summarised its objections to the plan, writing James O'Connell, White House director of telecommunications management: "Many countries would find it impossible politically to participate in a system one part of which would be reserved for U.S. National Communications System use." Accordingly a week later McNamara announced "much to my regret" that DOD would resume work on its own satellite system—having lost, it was later estimated, between 12 and 18 months because of the discussions with Comsat—due to unresolved questions of security, technical compatibility and diplomatic necessity. Comsat, however, was still unwilling to forego the estimated $25m in annual revenues the Pentagon would have been furnishing and at the final plenary session of the commercial negotiations Corporation Chairman Welch delivered a general statement to the effect that the satellite system would be available to serve the unique governmental requirements of any participating country.
CHAPTER EIGHT: THE 1964 INTERNATIONAL NEGOTIATIONS CONCLUDED AND ANALYSED

1. THE DYNAMIC SHIFTS

With necessary frequency allocations secured, the American carriers apparently committed to using satellite circuits, Comsat beginning to let satellite construction contracts and the Pentagon interested in leasing perhaps half the system's capacity, the pressure at the beginning of 1964 was certainly on the Europeans.

The first real indication that the U.S. strategy might be working came in January, during a meeting in Karlsruhe, West Germany of the ad hoc satellite group established by the European Conference of Posts and Telecommunications (CEPT). Great Britain officially announced that it would join in the European multilateral effort, and became the first country to offer an actual capital contribution, tentatively 10 percent of the total. Postmaster General Reginald Bevins explained, in a February speech in London, that Comsat's projections of 1966 for creation of the initial global system were "some years earlier than we have hitherto thought likely." He further cautioned, however:

Whatever form our participation takes it will obviously cost money and we should commit ourselves only if we can secure satisfactory terms which give us a real chance to influence the design and character of the ownership and opportunities to participate in development studies and, in due course, in the provision of material. (2)

The CEPT ad hoc group had reported favourably on the U.S. proposals to the European Conference on Satellite Communications (CETS) after the Karlsruhe meeting, and indicated that the group's members wanted to join in creating the early capability satellite system. (3)

These sessions were, however, preliminaries to the meeting scheduled for February 10 in Rome, which was the first formal negotiating session between Americans and Europeans—described in the trade press as "a fork in the road." (4) As set forth in this meeting, the main U.S. proposals on international arrangements were that Comsat should serve as the system's manager, and that ownership should be shared among participants in
proportion to their anticipated usage. A total of 120 officials from 17 European countries and Canada, plus observers from Australia and the Vatican, met for three days with representatives of Comsat, the FCC and the State Department. A communiqué issued February 12 indicated two main areas of agreement: Comsat would be the system's manager, and the system would be directed by a steering committee of representatives from the major national users of international telecommunications channels. The Europeans had thus largely surrendered their initial preference for a multinational organisation consisting of a general conference—which would exercise ultimate authority and where each member country would have one vote—a governing board and an international technical and administrative secretariat. They were instead moving toward acceptance of the U.S. proposal for a two-tiered structure—a governing body with restricted membership and weighted voting, and a manager—within a joint venture that in itself would have no independent legal identity.

There still remained the question of how the shares in the venture would be allocated. The United States had been aware that the offer of ownership participation might help draw the French and British away from attempting to protect their cable investments. Now, however, not only was the increasingly likely prospect of the satellite system beginning to take its intended effect in, apparently, influencing European attitudes on cable construction, but GETS members were interested in putting up more money for the satellite system than the U.S. believed them entitled to. At one point the Swiss delegation, perhaps facetiously, suggested that Switzerland pay the entire $200m cost of the project, since it would be less than the Swiss government's annual communications budget. For their part, the Americans could afford to hold back in the face of apparent GETS eagerness, and after the Rome meeting Comsat's president said "we are completely flexible" as to whether foreign participants invested in or simply used the satellites. The U.S. position in favour of weighted voting had been accepted by the Europeans, who were now trying to maximise their investments and thus their voting weights.

Notwithstanding the issues that remained, it was clear that the dynamic in the negotiations had shifted, and press reports suggested that
most of the 17 CETS members were now eager to sign an agreement "as soon as possible in order to gain an early say in the development and management" of the system. They know," Chayes said, that every day that passes, we are making more decisions, we are learning more, we are foreclosing other options about the ultimate characteristics of the system. (15) The U.S. delegation meanwhile held talks in early March with Japanese and Australian officials; both countries reportedly were enthusiastic about participating and investing in the system. (16)

2. VOTING PROCEDURES AND DURATION OF AGREEMENTS

At the next full U.S.-CETS negotiating session in London from April 6 to 8, the issues of precise voting weights, dual agreements and duration of the organisational arrangements were addressed. With regard to voting, the Europeans wanted a limit placed on the number of votes any one member of the governing body could cast—preferably a maximum of three or four votes out of the projected total of 12—regardless of the member's investment shares. The Americans insisted upon a strictly proportional translation of shares into votes, but accepted that some check would be needed on Comsat's ability to out-vote unilaterally all its partners on the basis of the 60 percent shareholding it was then proposing for itself. Discussion therefore centred on adopting a two-thirds majority rule for major issues, which would oblige Comsat to enlist the support of at least one of its partners on the board to sustain its proposals—although leaving unchanged U.S. veto power. (17)

The American proposal that there be two agreements, one intergovernmental and the other among nominated operating entities from each country, ran into heavy opposition at this session. The notion originated with the U.S. government, not Comsat, and was seen as a way of further defining the state's relationship to the private entity. The government would be able to circumvent the treaty-making process—which would require Senate ratification and which would have been more or less compulsory had the government been taking on financial obligation—and would in a general sense be able to distance itself from commercial satellite operations. (16) "It was," according to a State Department
official, "an effort to try to define a whole area in which the concerns were predominantly if not exclusively those of Comsat Corporation." (19) The governmental representatives of the CETS members, however—unlike the PTT officials—found the arrangement hard to accept, since they were as governments being asked to undertake firm commitments with a private U.S. corporation. Finally at a mid-June meeting, the nominal head of the American delegation Ambassador David Bruce delivered a strongly worded statement threatening to break off further discussions unless the notion of dual agreements was accepted, and it was. (20)

It was during the early April sessions in London that the CETS members introduced their most important counter-proposal to the American package introduced in February in Rome, that concerning the duration of the arrangements then being negotiated. The Europeans were in effect willing to defer, but not surrender, their preference for a new international entity, with multinationalised management and a general assembly of all participants. They therefore proposed making the arrangements interim ones, to be re-negotiated in as little as three years, to coincide with Comsat's current estimates of when the global system would be operational. Since it was also foreseen that membership in the system would meanwhile be growing, some modification of the agreements seemed desirable in order to offer equitable—or at least acceptable—terms to new participants. The Americans however wanted the interim period made as long as possible, preferring 10 years from the entry-into-force of the arrangements. (21)

Two further issues, both of which continued to have considerable impact upon Intelsat during its interim period, were introduced at this time: the nature of the 'single global system' and procurement policies. The U.S. wanted to insert binding language in the agreements to obligate signatories to adhere to the single global system concept, and therefore to refrain from creating their own national or regional satellite networks. CETS members, however, supported a French proposal that participants retain the right to create additional systems "if required to meet unique governmental needs or if otherwise required in the national interest," (22) language strikingly similar to that contained in the Comsat Act. The Europeans also were not satisfied with the American position on procurement—that contracts for equipment should be awarded solely according to the competitive criteria of quality, price and time and conditions of delivery.
This conflicted with a CETC desire for a statutory guarantee that contracts would be distributed among signatories in approximate proportion to the investment shares each held in the joint venture—the principle of *juste retour* adhered to by ELDO, notably.

Nevertheless, the negotiations seemed to be moving toward a smooth conclusion. The British raised the amount they were willing to contribute to £15m,\(^{(23)}\) reiterating their rationale in remarks to the Commons by the Postmaster-General:

> The Government's view is that the only way of preventing an American monopoly in this sphere is to join a partnership with the United States and other countries and so secure the right to influence the course of events.\(^{(24)}\)

An additional £1.5m would be spent on modifying the Goonhilly earth station to enable it to work with the Early Bird satellite.\(^{(25)}\)

### 3. THE SOVIET INTERLUDE

Transatlantic meetings continued, notably including a gathering of 13 countries in Montreal at the end of April, where a set of ITU 1962 projections of estimated world traffic shares for 1968 were used to determine an investment participation formula that would reflect anticipated satellite usage.\(^{(26)}\) Significantly, it was decided that traffic between geographically separated territories under single national jurisdictions was for investment purposes to be considered as international. This included, at the time, traffic between East and West Pakistan and, more to the point, between the continental United States and Hawaii. On May 25 a full session was reconvened in London to compare drafts prepared by both sides and attempt to agree on language. Negotiations resumed in London on June 13, only to recess two days later to allow U.S. representatives to meet with Soviet officials in Geneva.

This brief and inconclusive encounter grew out of a history of mutual overtures dating from President Kennedy's January 1961 State of the Union Message to Congress, when he said: "This administration intends to explore promptly all possible areas of cooperation with the Soviet Union and other nations to invoke the wonders of science instead of its terrors."\(^{(27)}\) The
theme was repeated in the President's address to the UN General Assembly in September, and after the orbital mission of U.S. astronaut John Glenn in February 1962 telegrams were exchanged between Kennedy and Khruschev, followed by more detailed letters in which the Soviet premier suggested that priority be given to cooperative work on space communications. (28) Between March and June 1962 a total of 10 days of meetings were held in Geneva among American and Soviet space officials, and it was decided that "separate but coordinated" work would be conducted on meteorological satellites, mapping the earth’s magnetic fields and experimental satellite communications. (29) In a December report to the UN Committee on Peaceful Uses of Outer Space, although only passive satellite experiments were listed—scheduled to begin in August 1963 with the Echo II spacecraft—both sides promised "to give further consideration to the possibility of joint cooperation" in active satellite development as well. (30)

The Soviets nevertheless ignored a December 1963 invitation from the U.S. to join in the commercial negotiations until the following March, when they requested the meeting with U.S. officials in Geneva, timed to coincide with a forthcoming session of the UN space committee. (31) The resulting two-day encounter was, however, little more than a "pro forma exercise," (32) and a joint communique issued on June 16 described an "exchange of opinions," the conventional description of unproductive diplomatic talks. (33) The Soviets spoke about their space programme and indicated that they chose to regard the U.S. satellite scheme as equally experimental, while expressing hope that further cooperation might be possible at some unspecified point in the future. (34)

It could hardly be surprising, however, that the Soviets showed little interest in joining the commercial negotiations. They could not have been unaware of the strident Cold War rhetoric that had accompanied passage of the Comsat Act. Furthermore, as early as March 1962 the Soviet Union had announced its conviction that only states—and not private companies or profit-seeking consortia—should be permitted to engage in space activities. (35) They also objected to what they saw as a deliberate American policy of bypassing the ITU—and the UN—both of whose claims to authority over an international space effort were at least arguable—and to the U.S. preference for weighted voting, (36) which suggested that the Americans were arranging "with a small group of Western countries for the
sharing out of the profits from the operation of the system on American terms." Indeed if the criterion for determining investment shares were strictly applied, the Soviets would have ended up with fewer votes within the consortium than Switzerland, due to the low volume of Soviet international traffic. Hence both the institutional form and commercial basis adopted for the venture appear to explain the Soviet reluctance to participate.

Whether Soviet participation was—however many the apparent invitations—actually in the interests of the U.S. is quite another matter. Attempts to tailor ownership quotas to reflect likely Soviet technological contributions would undoubtedly have opened a number of issues safely settled by reliance on national traffic volumes. The Soviets also would have found a Comsat veto—if, that is, they had consented to deal with a private American company—unacceptable, and the U.S. might consequently have had to bear the political costs of forcing a Soviet withdrawal from negotiations in which they were already engaged. Soviet interest, furthermore, came extremely late in the discussions, when little but details remained to be settled. Their actual participation, in the view of one American negotiator, "would have been a disaster," probably delaying for months conclusion of the accords and perhaps endangering the outcome altogether.

4. THE NEGOTIATIONS ARE CONCLUDED

When the discussions reconvened after the Americans returned from Geneva, investment quotas and the duration of the arrangements were agreed. Comsat was to get just over 61 percent of the venture's stock and, more important, prevailed on the question of which participants would be obliged to surrender parts of their holdings to accommodate new members who might wish to invest. Comsat had insisted on a pro rata arrangement, while the CETS members had sought a guarantee that, up to a point, all the re-distribution of holdings would be at Comsat's expense. A 1969 deadline was decided as the maximum duration of the arrangements before a conference of all participants would be called to consider a permanent organisational structure. This represented a compromise of the U.S. position in favour
of a 10-year interim period, but still seemed to promise Comsat at least a full year's experience in managing the global satellite system. The Americans held fast to the essentials of their procurement policy, but they acceded to the proviso that where bids were comparable in terms of price, quality and delivery conditions, the manager should try to ensure that contracts were awarded with consideration given to national stockholdings.

Conferees agreed to meet again in Washington on July 17 to resolve the final areas of disagreement: the exact voting procedures the governing board would follow, and the fate of the U.S. attempt to impose a ban on creation of other satellite systems. The Europeans were to hold among them 18 votes on the Interim Communications Satellite Committee, the system's governing body, and wanted major issues to require the votes of Comsat and at least 15 of the 18; the U.S. insisted that two votes in addition to Comsat's should be sufficient. It was not until July 23, the day before the agreements were initialled, that the American position was accepted: on significant questions — such as the choice of space segment design, major budget decisions, launching programme, approval of investment quotas — Comsat 61 percent of the votes on the committee would have to be augmented by another 12.5 percent, meaning at least the votes of Britain (8.4 percent) and one other member.

On the question of the integrity of the 'single global system', ambiguity remained until conclusion of the agreements and indeed was little diminished even then. The CNS bloc continued to insist upon the position advanced at the London meeting in April: that nothing in the accords could stop signatories from creating additional systems as they saw fit. In Washington in July the U.S. delegation proposed a new paragraph barring participation in "any commercial communications satellite system other than the single global system which is the subject of this Agreement," while adding:

Nothing in this Agreement shall preclude the creation of additional communications satellite systems if required to meet the unique governmental needs of any of the Parties...

The French delegation, however, objected to this addition, and after assurances from Italian representatives that all parties understood and would adhere to the single system concept — which remained formally in the Preamble to the accords — the U.S. withdrew its proposal.
5. AMERICAN DOMINANCE—FUNCTIONAL OR POLITICAL?

Under the interim agreements, initialled in Washington on July 24, 1964, the International Telecommunications Satellite Consortium (Intelsat) was created as an unincorporated joint venture under the general direction of an Interim Communications Satellite Committee (ICSC), composed of representatives of those participating countries whose investment in the system's space segment came to 1.5 percent or more of the total capital outlay. Membership was to be restricted to members of the ITU, which at the time excluded mainland China, North Korea and North Vietnam. Comsat was named operational, financial, technical and administrative manager of the consortium, as well as the venture's sole legal personality—authorized to contract and carry out other legal transactions on its behalf—and was majority stockholder and U.S. representative on the ICSC. Comsat's initial 61 percent holding could not fall below 50.6 percent under the interim agreements; 17 percent of Intelsat shares were reserved for signatories beyond the original 19.\(^{(45)}\)

The collective dominance of the original signatories would remain unshaken throughout the interim period, since no provision was made to re-compute shareholdings on the basis of changes in national percentages of world traffic occasioned by, say, the introduction of satellite service or the advent of new services made available for the first time by satellites. As a Comsat official later acknowledged:

The traffic data incorporated an inherent bias in favor of countries with cable interests and tended to penalize users which had no submarine cable facilities to provide basic data, irrespective of their subsequent actual use of Intelsat satellite facilities to meet international telecommunications requirements. Frequently, these are developing countries.\(^{(46)}\)

The agreements stipulated, however, that within a year after global service was operationalised, or in any event by January 1, 1969, the ICSC was to issue a report to all participating governments on its recommendations on permanent organisational arrangements. The report was to consider, among other things, "whether the interim arrangements should be continued on a permanent basis or whether a permanent international administrative and technical staff should be established.\(^{(47)}\)
The terms offered to and finally accepted by the Europeans were clearly far from generous, and there is much to Schiller's acerbic observation:

The problem for the American side was to establish an international commercial communications system that would satisfy the Europeans sufficiently to enlist their membership and support as customers and participants, while at the same time it prevented their interfering with American control. (47)

A sharply limited degree of power sharing seemed to be provided for, at least among the small number of major communicating countries, but the role of further members was to be held to a minimum compatible with the system's functioning. (48) Even for the original members, their statutory role was that of minority participants on the I OSC, "a steering group for a number of joint venturers" with "no legal personality as such." (49)

The significance of this unquestionable American dominance under the interim arrangements has been variously assigned, and there are two principal interpretations that deserve examination and, in our view, rejection: that the dominance was functionally required and therefore appropriate, and that the dominance signalled a victory of commercial over political forces and was therefore inappropriate.

The main line of American legitimation has been that U.S. control was suited to the prevailing distribution of technical competence and ultimately to the functions the satellite organisation was to perform. A 1963 RAND Corporation consideration of non-U.S. participation noted the strong interest the Europeans had in developing space technology but concluded:

Even if, in the long run, other nations could make a useful technological contribution to the satellite system, we feel that their voices in decisions relating to research and development of the first system should be kept to a minimum; otherwise there will be a risk that the inauguration of the system will be delayed. (50)

Here, the presumed absence of R&D capabilities in Europe is adduced as reason to reduce foreign influence over decisions made in regard to the early system. Whether the gap in aerospace development between the U.S. in Europe is supposed to mean that the Europeans were not capable of participating more fully in decision-making, or that they did not deserve to do so, is not clear.
That ambiguity poses no problem to the functions-related justification for the agreements, however, since it is the substantive admission of a multiplicity of perspectives that is believed to threaten the system's success:

The fast-moving world of communications satellite technology is not compatible with the slow process of political accommodation necessary for action to be taken by most of the international agencies with which Intelsat is frequently compared. (51)

R. Colino, the head of Comsat's international arrangements division, has similarly contrasted the European "organisation-oriented" approach with the pragmatic American "agreement-oriented" one, (52) arguing that the U.S. desire to assign priority to streamlined direction, unhindered by competing nationalistic policy tendencies, was destined to yield a more effective system. Real internationalisation was best relegated to broad regulatory arrangements: "Agreement on principles, adherence to such principles, and development of cooperative arrangements with respect to specific functional problems should provide the requisite order." (53)

Consequently, the reasoning goes, practically all the features of the 1964 agreements that might be criticised as glaringly advantageous to Comsat and the U.S.—if not humiliating for their foreign partners—can be justified by their indispensability to assuring rapid and effective satellite deployment and operation. Comsat's positions as manager and majority stockholder were due to its technical expertise and its custody of U.S. overseas telecommunications traffic. If the system were to be created quickly, there could be no place for policies that would deliberately—and because of abstract principles—channel equipment contracts to European firms that might then only have to be brought up to date on research already performed in the U.S. "The goal was fundamentally incompatible with notions of artificial allocation of contracts and procurement activities to nurture or subsidize foreign industries," Colino has written. (54) The interim agreements therefore were determined by functional requirements of satellite activity, and "political considerations, while present, did not significantly affect the outcome." (55) The formation of Intelsat, as E. McWhinrey has concluded, "was a functions-based decision in direct response to perceived scientific-technical exigencies." (56)
There are two major defects to this line of legitimation: first, the very definition of functional efficiency and its subsequent consecration as an overriding objective were expressions of American national policy, not self-evident global requirements; second, the various specific modalities of American dominance had only a specious relationship to this objective. Concerning the first point, it is clear that the firm commitment to the earliest practicable realisation of the satellite project was an American policy goal. The history of early international negotiations and of the pivotal role played by the U.S. display of potential unilateralism suggests strongly that the Europeans fully associated themselves with this objective only when it became evident that efforts to delay satellite development would either be futile or would incur unacceptable costs. The functional requisites that are held to have determined the negotiations' outcome were assigned considerably lower priority by the Europeans, who initially attached greater importance to the fate of cable holdings, the possibility of independent satellite work and the desire to secure development of their own aerospace industries. So even if one accepts the defence of the accords as functionally appropriate to the expeditious development of the satellite system, it is nevertheless necessary to locate that objective within a conspicuously American set of policy priorities. Indeed, any desire for expedition on the part of the Europeans was aimed primarily at the United States, since rapid accession to American desires was a means of blunting the edge of U.S. pre-emption of the field.

Second, even given the priority assigned to functional efficiency, it is necessary to question seriously the degree to which the precise elements of American dominance formalised in the agreements materially related to that objective. Comsat's nomination of itself as the system's manager is an excellent case in point. The Corporation was actually in a barely post-embryonic state, its technical staff sparse and its proven competence utterly nil; it had never launched a satellite and never leased an overseas telecommunications circuit. That Comsat should have been proposed as uniquely qualified to manage the satellite system—defining technical options, programme choices, tariff policy and all the rest—is difficult indeed to explain by the Americans' purported functions—
orientation. Comsat's value was exclusively as a gatekeeper to the essential stores of U.S. aerospace expertise, rocket launchers and overseas telecommunications traffic. The argument for its unique qualifications rests on the tacit promise that these resources would be made readily available to the global system if Comsat were manager—and on the equally tacit threat that the U.S. would lock up its treasures if the Europeans balked at the terms of admission. So the logic is circular: having decided that Comsat's managership was non-negotiable and that the system's access to American resources depended on its acceptance, compliance became in fact functionally necessary.

It was furthermore implied that Comsat should get the managerial job because a single national entity could carry out the responsibilities more efficiently than an international staff recruited expressly for the purpose. The Americans rejected the latter option on grounds that such a set-up would introduce particularistic national policy goals deep into the scientific and technical interstices of the project, making more difficult the definition of collective objectives. There is, however, a decided ambiguity to this proposition. Either, on the one hand, the manager's bailiwick is properly apolitical: if so it does not seem unrealistic to believe possible the formation of an international staff with an active and primary allegiance to their common employer—and with appropriate extra-territorial incentives like those enjoyed by UN employees to ensure loyalty. While participants could be expected to retain special sensitivities to the concerns of their homelands, such a plurality of experience might enrich and improve the effectiveness of the overall managerial effort. If, on the other hand, it is being suggested that politics could not be kept from colouring supposedly technical judgments, then the U.S. insistence on Comsat as sole manager was not a way of banishing politics writ large, but simply a means of pre-selecting which politics would intrude on managerial tasks.

Thus, it is very difficult indeed to defend or explain the American insistence on Comsat's managership through reference either to the company's inherent qualifications or to the argument that its serving in that capacity would keep 'politics' out of Intelsat. Since the issue of management should provide the clearest demonstration of the functions
orientation that American dominance is alleged to have sustained, it seems necessary to look further for the explanation of the character of technological control thus created.

6. BUSINESS AND POLITICS

A somewhat different interpretation is that the interim Intelsat accord signalled a victory of commercialisation over political control. Schiller at points seems to subscribe to this notion; although he clearly locates Intelsat's formation within the context of state-directed American expansionism, he nevertheless attributes its "retrograde structure" to the determining role assigned to "market considerations emphasizing capital contributions, volume of international communications, and expectations of profitability."[57] Chayes too, since leaving the State Department, has tended to favour this line, as when he blames Kennedy's preference for private ownership for ultimately creating a situation where "U.S. foreign policy objectives and perceptions would be filtered through a private entity with divergent goals and perspectives."[53] Similarly, Kildow has written:

Two often opposing forces attempted to guide U.S. communications policy: the foreign policy-makers, whose principal concerns were political; Comsat, whose corporate interests placed efficiency as its number one priority. (59)

The Corporation "pursued a narrow, single-purpose objective—to establish the single global system by the most efficient means possible and with the least possible interference."(60)

The argument becomes very close to that associated above with the mainstream American legitimation, except that in this variant the concern with speed and efficiency is both criticised and identified as a goal particular to Comsat. In a perverse way, however, Comsat's own position is endorsed: that there existed a trade-off between economic efficiency and widely-based international participation in exercising effective control over the project. Hence the same objections raised above to the functions-orientation defence apply equally here, and the problem lies in explaining the purported trade-off. Either the non-American participants were ill-qualified to exercise influence upon
collective decisions—meaning that they could not field technicians suffi-
ciently skilled to participate in scientific and engineering R&D and
to help advise the various national political representatives—or the
reason for the trade-off lies in the absence of consensus over policy
and the corresponding need to prevent dissension from actually having
impact on collective activities. The former proposition—of a lack of
technically qualified staff in Europe—seems unquestionably false, es-
pecially considering the extent of the British and French international
communications networks and the vigour of European electronics industries.
The latter possibility, that consensus was or might be lacking, simply
leads back again to the conclusion was not between efficiency for profit
and politically satisfactory due process, but between two different modes
of political operation. By limiting the roles to be played by those who
held, or who might in the future hold, differing views, the organisation's
overall efficiency—defined in terms of its ability to carry out American
satellite policy—was believed improved.

It appears, therefore, better to formulate the supposed conflict
between politics and commerce as a contest between two sets of inter-
penetrated commercial and political objectives. The Europeans did not
seem to have any illusions as to the separability of the realms, and were
well aware that improving the political terms of their Intelsat partici-
pation would bring commercial and industrial awards through greater shares
of the system's revenues, enhanced aerospace capabilities and improved
export prospects. For the Americans, Comsat's dominance in the interim
accords was not pursued in spite of official government policy—it was
official government policy, executed through a private corporate vehicle.
The props with which Comsat swayed the negotiations through a demonstra-
tion of unilateral determination were each assembled with state assistance:
the spectre of congressional hearings and the FCO's denial of Comsat shares
in the case of AT&T's declaration that it would use satellite circuits;
the Pentagon proposing a joint system to Comsat; State Department support
for the early satellite contracts let by Comsat. Comsat's commercial domi-
nation, in the interests of efficiency and rapid deployment, was an expres-
sion of the highest levels of government satellite policy. To claim
otherwise is to mistake relatively minor friction between the State
Department and Comsat over negotiating strategy for a miniature coup d'état in which fundamental state policy was re-directed by an infant company with no assets other than $5m in credit—conditional on government approval. It is also to overlook entirely the unremitting and indispensable assistance provided by NASA to Comsat in the latter's alleged subversion of state policy: the space agency spent nearly $270m on communications satellite R&D between fiscal 1960 and 1964, more than half after Comsat was created—and NASA was committed to furnishing launcher services to Comsat at prices that would not reflect the costs of developing the rockets thus used. The fact that the interim Intelsat accords could specifically envisage "an experimental and operational phase in which it is proposed to use one or more satellites to be placed in synchronous orbit in 1965" is almost entirely attributable to NASA's satellite R&D, a fact which decisively contradicts the notion that Comsat imposed a self-generated set of uniquely commercial objectives upon an unwilling, 'politically' predisposed American government.

7. THE INTERIM ARRANGEMENTS AND TECHNOLOGICAL DEVELOPMENT

Of greater interest, for our purposes, than the dominating role the U.S. secured for itself in the interim negotiations were the conditions placed upon unilateral action by the obligations of even formal international cooperation. If the United States had managed to enlist the major communicating nations of the world—and the 1964 signatories accounted for some 90 percent of world international telephone traffic—it had also recruited a set of countries by and large keenly aware of much the same political rewards promised by aerospace endeavour as the U.S. had acknowledged when the Comsat Act was developed and enacted. For them, an enhanced global communications capability was the icing on the cake. The underlying prize was access to hardware, expertise and funds, and the prospect of accelerated national or regional space efforts that would engender far-reaching scientific and technical research, while spilling over into the military realm by improving the infrastructure upon which a modern strategic capability could be sustained.

From the perspective of these goals, it would seem that Intelsat's
overall success in fulfilling its constitutional—American—objectives would bring non-U.S. participants as many problems as rewards. Expedients development would mean that increasingly sophisticated components of the space segment would be deployed during a period when European voting strength was low; even urgent injections of funds into European aerospace industries would be unlikely to produce results quickly enough to permit them to compete successfully with their American commercial rivals, particularly since the competence of the latter would be continuing to grow thanks in part to Intelsat procurement contracts. Europe would in effect be re-directing some of its own funds into the already dominant U.S. aerospace industry. Similarly, to the degree that rapid deployment and efficient operation strengthened Comsat's case for its own qualifications as the system's manager, Intelsat's success would pose obstacles to the European goal of an internationalised managerial entity. And, the U.S. objective of a single integrated global system, which in time might encompass an array of national, regional and domestic telecommunications services as well as various specialised applications—e.g. maritime and aviation services—threatened to channel some very attractive lines of aerospace work through Intelsat's organisational circuitry. The American position that "the rationale and purpose of Intelsat dictate that it respond and provide all types of services which are possible by means of communications satellites,"(6) might even include a specifically European facility. So Intelsat's success—considered in terms of the goals of fast and efficient deployment and an expanding organisational competence—would likely prove a mixed curse for the Europeans.

Whatever the lack of consensus over objectives, however, the question remained as to how effectively contrasting goals could ever be pursued—or dominant goals frustrated—considering the limits to real power sharing incorporated into the agreements: did not Comsat's dominance preclude material restraints upon U.S. discretion in determining the character and pace of satellite deployment? The short answer would have to be no. If the creation of the ICSC did anything, it established a structure of accountability for Comsat—meaning, as Gouldner
has defined the term, that Comsat could be constrained to reveal what it has done and justify why it has done so. While this is far from requiring Comsat to secure a consensus, let alone a majority, from its fellow ICSC members—and additional Intelsat participants would not even be admitted to this body—it is also far from a framework for unbridled unilateralism. The votes of at least two other ICSC members would be necessary for major actions, and Comsat’s future as Intelsat manager would presumably be at stake if and whenever it was obliged to rely on even this statutory minimum. Thus some concern with mobilizing a more generalised mandate would have to inform Comsat’s actions, and efforts to appease, cajole or otherwise rally support would be a practical necessity.

Moreover, and in the long term of greater importance, the basis of American dominance had been formalised in a quantitative manner, transformed into component questions of degree whose values could themselves be further transformed. As P. Batailler has observed:

> The requirements inherent in all public services will not lend themselves for long to an orientation so fundamentally non-egalitarian. In effect, the framework exists to assure the victory of the majoritarian principle, which alone conforms to international law. (68)

Comsat was first among equals, but the basis of its primacy was not immutable: its financial participation, and voting strength, was due to fall during the interim arrangements from nearly two-thirds to just over half. While advantageous to Comsat in 1964, the notion of tying financial participation to system usage might not prove to be the same boon as the system developed, and as countries that were unable to divide their international traffic between cables and satellites began using satellite circuits, thus increasing their traffic shares and, in principle, their voting strengths.

Hence, the justification of American satellite policy by the efficiency it promised suggested an interesting problematic for the continuance of U.S. Intelsat dominance. For it would seem that the very success of the satellite system in achieving global service and attracting worldwide membership would create conditions inimical to American dominance, or at least to the form of that dominance written into the interim arrangements. The precedent for widely-based ownership participation had been established, and the 17 percent of Intelsat stock reserved for further members would not go very far; likewise, the rule that a 1.5 percent
shareholding was needed to qualify for representation on the governing board stood a poor chance of withstanding the pressure of perhaps dozens of new members. Also, as manager Comsat would undoubtedly be faced with demands that it admit and integrate technical cadres seconded from new members, whose adherence to the satellite system might well have been partly motivated by a desire to provide advanced technical training to talented engineers. Whether a process of informal internationalisation would be compatible with a unitary, nationally-based manager was a question that could only be answered in time. It would seem nevertheless that Comsat would be running grave risks to its own position within Intelsat to the very degree that it succeeded in pushing through its aggressive programme of satellite deployment, over whatever objections or obstacles its initial partners in the venture might raise.
PART FOUR

DOMESTICATING THE SATELLITE:
Comsat, the U.S. carrier industry and the state, 1965-74
1. THE NATURE AND IMPORTANCE OF THE DOMESTIC STRUGGLES

In spite of the contention of one study that Comsat's "commercial strengths were dependent on its retention of a leadership position in Intelsat,"(1) the fact was that Comsat's dominance within Intelsat could guarantee a successful future neither for itself nor for the satellite system that it managed and largely owned. The amount of money Comsat could expect to make from international operations as such was modest: its management fee from Intelsat was $150,000 per year,(2) the tariffs it could charge for leasing satellite circuits to American carriers would depend largely on the size of its investment in facilities within the United States, and the return on its initially commanding share of Intelsat stock would be determined by the cost of the space segment and by the profitability of the operation itself—and seemed likely moreover to be diluted by the number of nations that joined the venture. Indeed the synchronous satellite system turned out considerably less hungry for capital than had been expected, and Comsat earned until 1970 more money from temporary cash investments than from satellite operations.(3) Comsat therefore sought to expand its satellite-related investments, both to utilise its substantial surplus capital and to justify a large proportion of the revenues from users of satellite circuits. For Intelsat too, the viability of the satellite system and its prospects for continuance beyond the interim period required tapping into the huge volume of American overseas traffic—and therefore diverting it from competing undersea cables. In large measure then the immediate future of communications satellites would be determined in the United States by the battles for commercial success forming between satellite technology's institutional custodian Comsat and its carrier industry rivals.

In the next six chapters these domestic struggles will be examined and their role in shaping, carrying forth and finally exhausting the possibilities of the style of technological formation we have termed
pre-emptive underdevelopment will be assessed. (An analogous process paralleling those domestic events internationally is the subject of Part Five.) The domestic section begins with two preliminary chapters. In the present one, an overview to Part Four is presented and background provided concerning the U.S. industrial and regulatory setting into which satellites were introduced. A context of turmoil in the communications industry occasioned by the advent and growing importance of teleprocessing and specialised forms of communications hardware and services is described, not only to make comprehensible the legal and institutional framework for subsequent discussion, but also to combat the notion that there was something automatic and inevitable in the way that the existing structure of industrial dominance was sustained by the state in the satellite case by showing important instances of highly discretionary and anti-monopolistic state intervention contemporaneous with the satellite decisions.\(^4\) Then in Chapter 10, the development and use of the Intelsat system is described and analysed, with special attention paid to the determinants of underutilisation, a critical index of the technology's underdevelopment.

The four major struggles pitting Comsat against the U.S. carrier industry are then examined. The first three—in order of presentation, not necessarily chronological occurrence—concerned the terms upon which international satellite services were to be integrated into the American communications industry: first, who would own and operate the Intelsat earth stations and related ground facilities within the U.S.; second, with whom would Comsat be permitted to conduct business directly; third, should continued construction of undersea cables to the detriment of satellites be permitted and, as a corollary, should satellites be allowed to compete directly with and perhaps attract traffic from the cable network. The cumulative effect of the outcome of these struggles was a \textit{de facto} merger of satellites with the rest of the carrier industry—accompanied, paradoxically, by a formal divestiture of Comsat stock held by the carriers, such that by 1974 virtually all the carriers' satellite holdings had been sold.\(^5\) The fourth struggle concerned the creation of domestic satellite services, and adjudication of the conflicting claims of Comsat and the carriers to authorisation to enter the home satellite market.
At stake in all of the first three conflicts were Comsat's opportunities for commerce and investment and, consequently, the satellite system's possibilities for self-financing growth, reduced tariffs as scalar economies were realised and qualitative expansion of services. Nevertheless, each pertained to a distinct structural level within the overall process of accommodation to and by the new technology: the earth station decisions to Comsat's independent power vis-a-vis the carriers, Comsat's permitted sphere of commercial transaction to the relationship between the satellite system and the U.S. government, and the cable decisions to technological dominance within the carrier industry.

1.) In the earth station ownership decisions the structure of institutional dominance within the U.S. international carrier industry was at issue. The questions were: how would control over satellite facilities be organised and distributed among the existing private carriers? would additional leverage over Comsat be given to its carrier rivals—among whom AT&T, ITT and GT&E already sat on Comsat's board—through ownership participation in domestic earth stations? would the pattern of consortium formation under AT&T dominance be re-applied and the role properly attributable to Comsat further diminished? and of greatest importance, would Comsat be provided a technical beachhead from which to mount future incursions into domestic telecommunications markets? Thus the conflict over ground station ownership was internal to the carrier industry, and subject to FCC jurisdiction.

2.) In contrast, the second area of contention was essentially between the private communications industry and the state. The Apollo, 'Authorised User' and '30-Circuits' cases each ultimately raised the question of whether Comsat would serve primarily as a dependent resource of the carrier industry or of the state. All three involved not, as some accounts have stated, Comsat's right to transact directly with private users of satellite circuits without dealing through the carriers, but rather the conditions under which the government could use the satellite system. Since the FCC was not empowered to regulate state communications, the dispute could not be settled by Commission edict; the FCC instead served as the carriers' emissary, encouraging them in effect to buy off the state with offers of
substantial rate reductions on a wide range of services in exchange for the state's foreswearing its intention to deal directly with Comsat for satellite circuits.

3.) The cable authorisations involved a third structural level, of technological dominance within the international carrier industry. Comsat was virtually alone in opposing new cables; within the U.S. the government for reasons of diversification and the carriers for reasons of profit were agreed that more cables would be desirable, and European consent—motivated partly by similar considerations of technical diversity, partly by a desire to put pressure on Comsat in the forthcoming Intelsat renegotiations and partly as a hedge against Intelsat's possible disintegration—reinforced that domestic entente. Comsat's basis for contesting the cable approvals was its confidence that intensive satellite use would be cheaper and no less reliable, a contention that was not so much refuted as ignored in favour of a policy of inter-modal diversity, notwithstanding the arguably unnecessary costs the policy would impose on users. To sustain a parallel development policy where one technology would depend for customers on its competitor's owners, however, the FCC tried with little success to administer traffic quotas—instead of letting the relative costs of each mode be reflected in the tariffs its users paid. Although the alternatives were either allowing satellites to undersell cables and quite possibly force the latter out of business, or letting the cable-owning carriers use their control over overseas routing to starve the satellite system of traffic, the FCC by setting uniform rates reflecting composite industry investment used satellite economies to reduce cable tariffs, thus subsidising the inefficiency of the one at the expense of the other.

Hence the earth station ownership decisions, by forcing Comsat to share ground facilities with the carriers, extended the form of consortium control already present in Comsat's boardroom and parcelled out the company's investment opportunities, thereby reducing Comsat's independent strength vis-à-vis the rest of the carrier industry. The second set of cases eliminated the state as a source of extraordinary patronage and installed Comsat as a wholly dependent component of a private industry, thereby nullifying the practical significance of the popular but ambiguous notion that the Corporation was a public-private hybrid, subject to state supervision
and protection. The reconciliation of cables with satellites expressed and confirmed on a technological level the structure of industrial dominance implied by the earth station decisions.

The resolution of these issues, which made of satellites a vassalage within an industrial fiefdom—obligating Comsat in effect to provide the carriers with services while leaving it dependent upon their largely discretionary custom—bears a curious relationship to the 1962 Comsat Act. What seems clear is that the law did little more than set off a battlefield, formalising not a body of prescriptions but an array of possibilities whose realisation could not but be the result of further, extended and intensified conflict. It authorised the FCC to award earth station ownership to Comsat or the other carriers "without preference to either," (7) empowered Comsat to lease circuits to "authorized users, including the United States government"(8)—leaving specific authorisations to the FCC—and made no attempt to address the overriding question of whether the creation of a separate satellite corporation implied provision for substantive competition between Comsat and its rivals.

In each of those areas, though, wherever the options existed to encourage Comsat's evolution either toward a fully competitive entity or toward a quasi-governmental agency, these possibilities were rejected. The result was a situation very similar to that originally sought by the international carriers and the FCC—a satellite operation wholly internal to the existing communications companies—and supposedly turned down by the White House and Congress through the Act: the costs of rival technologies were averaged out and concealed, and relative economies would not be allowed to determine respective rates of development or even usage. The international carrier industry and Comsat would be treated as a unitary entity, even though the actual burdens of what for a truly merged entity would be internal adjustments to policy and opportunity were instead borne unequally by the separate companies concerned.

Finally, dangling over all of these struggles over international satellite service was the biggest plum of all—the domestic satellite market, whose final disposition would, we would argue, depend in good measure on limiting Comsat's technical and commercial activities and deepening its rival carriers' involvement in international satellite operations. With Comsat's corporate independence made all but nominal,
any claim it might make to exclusive technical competence compromised by its forced collaboration with the carriers, and its lack of experience—ensured by FCC decisions—in providing through-service directly to domestic customers, Comsat could plausibly be denied the franchise it sought on domestic satellite services. The way was therefore clear to opening and liberalising that field, permitting the carriers—especially AT&T, the dominant international and domestic entity—to extend their national operations into space as and when they saw fit.

Hence, the principal significance of the major carrier holdings\(^7\) of Comsat stock seems to lie in their desire to establish the legitimacy of their involvement in the satellite field, with a particular view to domestic operations. It has been suggested that share ownership enabled Comsat's managerial independence and corporate security to be seriously compromised by the three carriers—AT&T, ITT and GT&E—present on its board.\(^8\) It is notable, however, that Comsat at least strenuously denied this when in 1972, with only AT&T remaining, the FCC suggested that Bell's continued representation would prejudice the two companies' competitiveness in the domestic satellite field.\(^9\) Indeed if Comsat had been restrained by boardroom subversion it is hard to see how the Corporation's bitter and extended conflicts with carriers would ever have come about. Contemporary reports suggest that the common practice was for the carrier directors to abstain from voting or to leave board meetings when their loyalties were clearly divided,\(^10\) and in any event the carriers' half-ownerships in ground stations gave them a more powerful hold over Comsat than did the 40 percent they wielded on the Corporation's board.\(^11\) Similarly, any access to internal Comsat plans the carriers may have had did not prevent Comsat in 1966 from secretly concluding an agreement to lease satellite circuits directly to the Pentagon, which cost the carriers millions in rate reductions to undo.

In sum, our view is that carrier interest in Comsat stock declined apace with a recognition that the holdings could do no more to improve their earnings from international satellite operations or to enhance their entitlements to participate in domestic satellite activities.\(^12\) Thus, while apparently contradictory, Comsat's formal independence from and substantive merger with the carrier industry both reflected the carriers' success in subduing the independent threat the Corporation posed.
2. THE ROLE OF THE STATE: REGULATION

While the state's authority to adjudicate the Comsat-carrier disputes was clear, the role it would play was not. Ultimately the state had four distinct areas of interest, and corresponding modes of intervention, in the struggles: 1.) as promotor and benefactor of satellite technology, 2.) as a customer of satellite services, 3.) as regulator of the carrier industry, and 4.) as final guarantor of the technical adequacy of the national communications capability.

The first two roles can be summarised briefly. It is clear that the Kennedy and Johnson governments had committed the state to promoting satellites, at least internationally, and to providing whatever technical and operational assistance that would be required and appropriate to Comsat's status as a private commercial entity. The commitment seems to have been unconditional: there was, for instance, no mention in the 1962 Act of the possibility that satellite communications might prove impracticable or too costly. The combined desires to pre-empt the Soviets and to have satellites available for state communications produced an insistence that they be built, launched and used—almost regardless of the disinclinations of the communications industry. The state—particularly the Department of Defense (DOD) and NASA—was also interested in becoming an important customer of satellite circuits, and would therefore support policies that would result in lower tariffs and increased efficiency, such as might for example derive from unifying responsibility for both space and ground segments of the system under Comsat. Taken together these promotional and instrumental aspects of state satellite interest would seem to cast the state in the role of Comsat's ally in the company's struggles—which to a degree it was.

Through its regulatory conduct, however, the state also contributed to Comsat's most serious difficulties. The central principle with which Comsat was obliged to contend was rate base regulation, whereby a carrier's total revenues were determined by the value of its outstanding investment in used and usable facilities, plus an administered rate of return. Rate base regulation aims to stimulate administratively behaviour believed to characterise a firm subject to competition by attacking the twin tendencies
to which an unregulated monopoly is thought prone: depressing output and inflating price.\(^{(13)}\) In fact, by guaranteeing the monopolist a fixed return on investment, rate base regulation directly affects only one distortion—the output restraint—while treating price levels as wholly dependent variables: the firm is encouraged to invest and expand its facilities and is permitted to adjust its prices on services to support such expansion. As a result—since the sole production factor considered is fixed plant and the actual production function through which the value of equipment is realised is ignored—rate base regulation reverses the presumed sequence of micro-economic determination. Instead of running from effective demand for services as offered at specific prices, through the efficiency of a firm's resource utilisation, and finally to the determination of investment profitability, in the regulated firm profitability functions as a given, efficiency is not formally considered, and demand is defined—or acknowledged—as largely insensitive to price levels. Output is priced directly according to investment decisions through translation of the latter into 'revenue requirements', which are fixed not by demand for services or productive efficiency but by the prevailing rate of interest on the money market. Furthermore, if the firm's total revenues do not rise enough to support a new investment, prices can be raised on services unrelated to the new facilities to maintain the authorised rate of return—while the public is, in effect, made to suffer from the indis­pensability of the existing services as expressed in their demand in­elasticity.

Perhaps paradoxically, the advantage of rate base regulation as a policy derives from the fact that specific costs are ignored. Since certain basic facilities are indivisible and are used to sustain many different services—intercity broadband cables, for example—disaggre­gating and assigning costs appropriate to each service may be very dif­ficult.\(^{(14)}\) Also, it may be desirable to offer certain services—like local telephone service—at uniform tariffs regardless of which specific equipment has to be used. Furthermore, rate base regulation may encourage certain kinds of innovation by guaranteeing that the outlay will be recovered on new facilities regardless of their operational success.
Likewise, the acceptability of innovations may be enhanced because their costs are averaged in with the outstanding costs of existing plant. If the new facilities are more expensive, the difference is distributed among a number of services, resulting in mild overall price rises instead of sharp localised ones which might hinder the innovation's acceptance; if the new plant is cheaper, the innovating firm is assured that the cost savings will not prevent the orderly amortisation of current facilities.\(^{(15)}\) Savings, like excess costs, are diffused.

The practical problems of surveillance and inspection in administering the scheme have long been acknowledged,\(^{(16)}\) and the FCC has frequently and, it would appear, quite correctly been criticised for devoting inadequate staff and insufficient attention to an independent appraisal of industry's investments and consequent pricing policies.\(^{(17)}\) Although in principle the Commission has followed a "used and useful" guideline in deciding whether plant may be included in a carrier's rate base, in fact no carrier had ever had obsolescent facilities disallowed in the 35 years of federal regulation up to the Comsat Act debates.\(^{(18)}\) No formal inquiry on domestic telephone rates had been conducted since 1938,\(^{(19)}\) and the overall price of international phone service had not been reduced since 1946, in spite of the introduction of three transatlantic cables and enormous increases in traffic volumes.\(^{(20)}\) The FCC had normally negotiated informally with the carriers over rates, and as a 1961 RAND Corporation memo concluded:

> Under present-day domestic regulatory policies and practices, only a tenuous relationship exists between rates charged for particular services and costs incurred in performing those services.\(^{(21)}\)

Even if adequately administered, however, rate base regulation would still give rise to at least four sets of problems: 1.) a general tendency to overinvest, 2.) favouritism to expansion by established firms into secondary markets, 3.) the 'cream-skimming' and 'competitive necessity' controversies, and 4.) a systematic preference for costlier capital alternatives. The first two difficulties are treated in the 1962 Averch-Johnson critique,\(^{(22)}\) where it was noted that the regulated firm would tend to utilise more capital goods than was socially optimal, since it would have no compelling reason to equate the marginal rates at which various production factors were utilised to the actual ratio of factor costs; the two
authors also argued that the regulated firm would have an incentive to expand into other regulated markets even if it would be obliged to operate there at a long-term loss, since expansion would automatically be rewarded regardless of whether competitors were in fact lower-cost producers.

Furthermore, since rate base regulation seeks to avoid the problem of assigning specific costs where plant is used for different services, the problem of 'cream skimming' arises—where a new entrant is alleged to seek to draw off revenues from services hitherto offered at prices admitted to be well in excess of roughly disaggregated costs, but where the surplus is said to enable overall revenue requirements to be met while other necessary services are offered at prices below costs. The problem of determining which service is the cream and which the skimmed milk may however be insoluble, and the right to enter secondary markets may therefore be settled with reference not to costs at all, but rather to the demand elasticities of various services—what the market will bear. The FCC has thus accepted the principle of 'competitive necessity' in permitting regulated carriers to reduce prices on services exposed to competition, in effect allowing them to assign costs so as to justify pricing those services at lower levels than they otherwise would do. This solution essentially cuts the principal carrier in on its own cream and causes distributive damage to the consumer, whose general services will be more expensive to the degree that they bear a bigger share of costs common to services subjected to competition. And the new entrant is obliged to compare his costs not to the costs borne by the established firm but to the rates it is permitted to set. Entrenched companies therefore are not only entitled to use their reputations in marketing and their existing plant in producing, but can juggle costs to undercut opposition and claim to be performing a public service to boot.

Finally, as is implicit in the overinvestment criticism, rate base regulation not only encourages capital intensive solutions but tends to favour the more expensive fixed plant alternatives, a consideration of special relevance to the satellite-cable controversies. Part of the reluctance to use satellites subsequently attributed to the carriers has been blamed on the Comsat Act's having forbidden them from including satellite holdings in their rate bases. The contention re-surfaced
when the carriers were arguing for ownership of the domestic earth stations, which they claimed would give them a greater incentive to use and encourage expansion of satellite services. The logic of rate base regulation, however, dictates that inducements are identical only where capital costs are equal, and that to the degree that satellites were less expensive than cables the former would be less attractive and less remunerative, (27) even if the carriers owned both.

3. COMSAT AND RATE BASE REGULATION

Comsat argued that rate base regulation was inappropriate to satellite technology, and was suited to the long-term amortisation of high-cost, low-capacity facilities—not to a technology which provided ever-increasing capacity at very little rise in per unit costs. Since total capital outlay would increase much slower than the value of services thus offered, "Our economic success," as a company financial officer said in a 1967 speech, "would...be in inverse proportion to our technical success." (28) Comsat tried unsuccessfully to persuade the FCC that the time had come to modify regulatory practice so that the company's operations would be treated more equitably, and argued for application of "an operating ratio, return margin rule" like that used as a pricing yardstick for interstate transport carriers: some operating ratio, perhaps the 93 percent used by the Interstate Commerce Commission, would be used to determine what proportion of total revenues should be attributed to costs; earnings would thereby be pegged to business volume and not to capital outlay. (29) More conventionally, Comsat contended that because of the unusual risks involved in the satellite system it was entitled to a higher rate of return on its fixed plant than was applied to other carriers—an argument formally rejected by the FCC when it finally ruled on the matter in December 1975, but effectively sustained since the Commission did not make its decision retroactive, leaving Comsat with an 18 percent return on investment for the preceding period, as against 10.8 percent for the other carriers. (30)

Nevertheless, the fact that it was subject to regulation by the size of its rate base made Comsat extremely vulnerable from the outset, since its business volume and its investments had to expand apace to do the
company any good: if Comsat were permitted to expand its rate base through, say, investing in domestic adjuncts to its international plant, but was unable to attract a proportionate increase in traffic, its tariffs would have to remain high because the return on the new investments would be coming from a static business volume—and further traffic growth would be inhibited accordingly; if however Comsat's rate base were, in effect, frozen or prevented from expanding as rapidly as its traffic grew, the company would in principle be obliged to cut its tariffs so as not to exceed its permitted rate of return, whatever that turned out to be.

Comsat's prospects therefore required parallel expansion of rate base and traffic, thus permitting a gradual reduction in tariffs, which in turn would stimulate more custom and justify still more investment to accommodate it.

The carriers' opportunities were equally clear. If they succeeded in securing a share in Comsat's intended rate base—through earth station ownership—Comsat's net revenues would suffer regardless of traffic volume. And if traffic growth were inhibited—by diverting a portion onto cables—Comsat's investment plans would be difficult to justify before the FCC and, even if permitted, would likely result in higher tariffs and further depressed business levels. Furthermore, since Comsat had so many technical and operational matters of its own to address quickly—e.g., the choice of a space segment, refinement of multiple access techniques, demonstrating the public acceptability of satellite-relayed phone conversations—its opponents need not even be successful to do Comsat harm, since the duration itself of adversary proceedings might make firm planning difficult and produce delays in the company's deployment schedule.

Comsat's only real weapon was the technology with which it was entrusted: if satellites could be quickly shown to be cheap, reliable and versatile the national commitment contained in the Comsat Act might be sustained and broadened to permit the technology's intensive exploitation. Denying or frustrating Comsat's requirements could, however, make impossible its use of even this relatively feeble weapon.

In spite of the advantages regulatory policies would seem to give the carriers, the state's role was not necessarily limited to administering those policies. The overriding question was whether Comsat's plans accorded
with the state's definition of the national communications capability's technical adequacy.

5. THE ROLE OF THE STATE: OVERALL MANAGEMENT

Although rate base regulation tends inherently to favour the protection and stabilisation of an existing industrial structure—as well as its incorporation of new markets into a 'universal services' monopoly—the state's willingness to sustain those tendencies appeared increasingly during the 1960s to depend upon its evaluation of the consequences upon the technical adequacy of the national communications plant. In at least three instances—broadband home-destined cable, specialised long-distance facilities for teleprocessing, and specialised terminal devices—the state demonstrated a capability for recognising emergent requirements, defying the wishes of the dominant force in the communications industry, AT&T, and ratifying a "segmentation process"(31) whereby those high-growth areas were spun off from the Bell monopoly and opened up to substantive competition. In a fourth instance, concerning merger of the U.S. international carriers, the state's preference for a merged entity was made clear, but decisive action was not taken.

None of these cases put at risk control of the basic national telephone industry, which accounted for 85 to 90 percent of AT&T's revenues.(32) Switching facilities and local loops—which connect callers to their nearest switching centres—comprised between them around 60 percent of the Bell System's costs, and were not under challenge; and although terminal equipment, constituting 23 percent of Bell's domestic rate base, was theoretically at issue, the monopoly's practice of issuing 'free' phones to subscribers was likely to prevent serious erosion of its current position there.(33) Nevertheless the sectors involved were among the fastest growing in the telecommunications industry, which itself led the U.S. economy in annual investment in new capital goods and was growing at double the rate of the GNP,(34) and they would not be surrendered readily.

Home broadband cable: The so-called cable television industry was growing at around 25 percent yearly as of the mid-1960s, and the number of homes connected to broadband cables rose from 450,000 in 1958 to six
million by late 1971. AT&T had, in principle, been prevented from entering the field by a consent agreement signed with the Justice Department in 1956, which settled an antitrust suit begun in 1949 to force Bell to divest itself of Western Electric. Bell kept its manufacturing subsidiary, but agreed not to enter non-common carrier communications markets (those where the operator is permitted discretion over the messages carried, like broadcasting), which included broadband cable—then used almost exclusively to convey TV signals to areas out of reach of airborne transmission. The increasing popularity and declining cost of cable systems however threatened Bell's hitherto near-monopoly over communications wires into American homes, a threat all the more potent due to the enormous capacities of the newer cables: sufficient as of 1971 to carry 50 TV channels, or 100,000 voice circuits. Hence, as one FCC commissioner concluded: "If a real broadband network is ever constructed its operators could virtually provide conventional voice telephone service for nothing."

Although that possibility was remote—and would moreover make cables a common carrier service, open to legitimate Bell participation—AT&T was nevertheless trying during the 1960s to circumvent its formal exclusion from the field. Its regional phone companies refused or delayed permission to cable firms seeking to use rights-of-way onto private properties which had previously been granted to Bell for phone lines. The Bell companies would instead propose to the cable firms that they request Bell to supply them with the cables, in which case AT&T would retain title to the facilities, secure leasing revenues and expand its rate base—without formally operating the cables. In some instances the local cable company was part-owned by the resident Bell subsidiary. Thus denied access to potential customers, aggrieved cable firms appealed to the FCC and in February 1970 the Commission ruled that 'lease-backs' to cable companies part-owned by Bell were illegal, and that phone companies had to offer use of their rights-of-way to cable owners without undue delay and at reasonable rates.

Specialised common carriers: The fastest growing sector of the communications industry consisted of interconnections for computer systems, and the number of telecommunications-based computers increased six-fold between 1963 and 1966. It was estimated in 1968 that half of all U.S. computers would require telecommunications links within ten years, and a total of five million time-shared terminals was forecast for 1980.
In spite of rising demand, AT&T's capability and willingness to capture the teleprocessing market were as restrained as its insistence on monopolising it was vociferous. Technically, Bell's extensive phone network offered neither the variety of transmission speeds, the rapidity of connections nor the maximum error rates the newer computer systems required. Compounding those technical limitations was AT&T's policy—unchanged until 1969—forbidding small users to pool private lines and insisting upon one- and three-minute minimum usage periods, which made the company's facilities unreasonably expensive for many users.\(^{[41]}\)

Although the FCC had earlier upheld AT&T in protecting the unity of the national network from proposals for specialised intercity microwave systems—sustaining Bell's right to refuse to interconnect such facilities with its own—\(^{[42]}\) the Commission was unwilling to affirm the need for monopoly when it came to computer linkages, thereby obliging Bell to undertake pre-emptive manoeuvres of its own. In 1960 the FCC ruled that users could create their own private microwave systems for their own use, and in 1966 virtually unlimited time-sharing of such private lines was authorised, which extended access by small users.\(^{[43]}\) AT&T had meanwhile begun introducing data transmission services at suspiciously competitive rates, taking advantage of regulatory difficulties in assigning costs among different services using common plant; Bell filed rates on Telpak service—broadband intercity—in 1960 which contained discounts of from 50 to 85 percent off the normal tariffs for equivalent voice circuits, an offering intended for computer customers.\(^{[44]}\)

Three years later however Microwave Communications Inc. (MCI) proposed to create a microwave system between St. Louis and Chicago primarily to serve the teleprocessing market. Because MCI would not itself be a user of the facilities, but was instead proposing a specialised common carrier system, the case was destined to be a watershed. AT&T contested the application strenuously, pointing out that MCI was not seeking to duplicate the full range of Bell services and wanted only to provide high-volume, lucrative service among a small number of points with facilities tailored to the requirements of a small number of users. Bell's complaints of 'cream-skimming' were however undermined by revelations that its own Telpak pricing policies had been achieving essentially the same thing it was accusing MCI of proposing: AT&T had priced its
Telpak services, where competition was feared, to provide a rate of return one-thirtieth of that derived from non-competitive services—thereby shifting an unwarranted cost burden onto the general public—and in 1964 the FCC ruled two of the Telpak rates illegal and requested further information to continue studying the other two.\(^{(45)}\)

Finally in 1969 the Commission approved by a 4-3 vote MCI's application, and the specialised common carrier industry was born. Applications soon began to be made not only for other leased line carrier services, but for full-fledged intercity switched networks as well to parallel for the teleprocessing industry the services Bell provided for phone customers.\(^{(46)}\)

**Terminal equipment:** Early in the 1960s AT&T forbade an inventor named Thomas Carter to secure access to the public phone network for a device that enabled two-way mobile radios to interconnect by way of Bell's system. The so-called Carterfone case went to the FCC and became a test of the AT&T monopoly over equipment on the customer's end of the telephone line; at issue not only was Carter's invention, but the whole gamut of tape recorded answering devices, private switchboards, extensive intra-office mini-networks, fancy telephones and other terminal paraphernalia which Bell had hitherto refused to interconnect as 'foreign attachments.' The threat was compounded by the fact that suppliers wanted actually to sell their equipment to customers, so that Western Electric stood to lose manufacturing contracts with its parent firm, and AT&T's own rate base would be threatened with relative shrinkage.

Nevertheless in 1968 the FCC ruled in Carter's favour, ordering Bell to interconnect foreign attachments owned and supplied by customers. Bell was empowered to require special adaptors to be leased from its companies to ensure technical compatibility and, it was argued, might eventually benefit from the additional traffic that availability of the various terminal devices could generate. Opening to competition, however, a market estimated to be worth as much as a billion dollars a year in sales could hardly be considered a gain for AT&T.\(^{(47)}\)

**Merger of U.S. international carriers:** The desirability of merging the various American carriers providing overseas communications services has been debated repeatedly since at least 1929 and supported primarily as a means to ensure the viability of a technically diversified capability
the components of which would otherwise be competitively owned. Attention until the mid-1950s focussed on the rivalry between telegraph cables and long-distance radio, where the latter enjoyed a cost advantage but was hampered by having to rely on cable-owning firms for assembling and delivering messages. After AT&T introduced undersea phone-capacity cables, concern shifted to the prospects of survival of the so-called record carriers, and their merger was endorsed as a way to enable them to afford to build similar cables—whose capacity was sufficient to handle voice and record traffic. Instead the FCC ruled that the record carriers must be permitted to co-own future transatlantic voice-capacity cables.

The advent of satellites restored the merger debate to its original technological reference, and it was argued that cable-satellite rivalry would never be resolved rationally until the decisions on deployment of each transmission mode were made by a unified company. President Johnson said in a 1967 policy statement that divided ownership put the U.S. "in a relatively poor bargaining position" vis-à-vis foreign Intelsat members, and that it "has resulted in the construction and maintenance of expensive, duplicating communications facilities which increase operating costs and result in higher rates for the user." Johnson's appointed task force on communications policy recommended merger in late 1968, but the proposal got no further than it had in the past.

The merger case differs from the preceding three because AT&T's position was in effect endorsed—Bell opposed merger since it stood to lose lucrative assets and growth prospects to the unified entity—and not defied. It also differs formally, in that merger could not be effected administratively but would require possibly controversial congressional action to amend the 1934 Communications Act, which specifically outlawed merger unless the FCC determined that competition would not be diminished. Above all, however, the case differs because it involved rationalisation to eliminate waste, not reorganisation to guarantee adequacy. In the latter respect, the Comsat Act—which denied the carriers uninhibited control of satellites—represents the instance in the international communications field most fully comparable to the cable TV, specialised carrier and terminal devices cases domestically: in all four the state either defined or ratified basic service requirements and insisted they be met notwithstanding the wishes of the dominant force in the private communications industry, AT&T, thereby acknowledging that to sustain AT&T's position might
jeopardise fulfillment of needs which the state considered pressing or legitimate. What is of special interest then, in the chapters on U.S. satellite controversies which follow, is why the state's definition of need did not entail blocking the carrier industry's efforts to weaken Comsat and thereby restrain the development of satellite technology.

First, however, an account of the technical evolution of the Intelsat system is provided, with special attention paid to the causes and consequences of underutilisation and overcapacity. This treatment sketches the framework within which the American satellite controversies were enacted, and which they helped to shape.
CHAPTER TEN: AN ANALYSIS OF THE TECHNICAL DEVELOPMENT OF THE SATELLITE SYSTEM

1. OVERVIEW

Intelsat’s first satellite, Early Bird, was launched into synchronous orbit over the Atlantic on April 6, 1965. Although it was quickly found to be functioning near-perfectly, half of the satellite’s design capacity of 240 voice circuits was intentionally blocked out, since there were no earth stations yet in the Southern Hemisphere and its feeble 31 watts of power could thereby be used to increase the effective strength of the remaining circuits for the four existing ground terminals in the U.S., Britain, France and Italy.\(^1\) Because of a lack of traffic, Early Bird was operated 16 hours a day, and because it did not offer round-the-clock service the U.S. Department of Defence—potentially an important customer—did not use it. Eleven months after its launch only 75 of its transatlantic circuits were regularly used, prompting one newspaper to ask, "Was Early Bird too early?"\(^2\)

Nevertheless the satellite signalled the start of a period of swift and extensive growth in the availability of satellite services, and of rapid technical refinement. In the less than six years that followed—through 1971—Intelsat’s membership increased from 38 to 82 countries. From the original total of four earth stations in as many countries and a single transatlantic communications pathway, the system grew to comprise 63 ground antennas at 52 stations in 39 countries, and offered 200 different pathways.\(^3\) From a single 240-circuit satellite, the space segment consisted by 1971 of four on-line spacecraft with a total capacity of 9,000 circuits, and two other satellites with 1,400 circuits serving as orbiting spares—and three further satellites, each with a 5,000-circuit capacity, were scheduled for service within the next year.\(^4\)

In this chapter the technical development of the Intelsat system through its first four generations of spacecraft—deployed between 1965 and 1975—is examined. The hardware that was developed and selected for use is analysed in order to identify the service priorities that underlay and were expressed in apparently technical determinations.
Intelsat's initial concern, we conclude, was in operationalising a technology suited to the requirements of heavy traffic metropolitan regions; only later were technical features of particular benefit to users with low and intermittent capacity requirements introduced. The advent of the latter capability was a response to the success of cable competition in the Atlantic and Pacific, space segment overcapacity and the growth of Intelsat membership among Third World countries.

Next the questions posed by underutilisation and overcapacity—which together comprise the quantitative side of underdevelopment—are addressed. It is found that the satellite system was far from fully loaded during this period, and we conclude that the relatively low levels of use resulted from the conjuncture of: state policies compelling parallel development of cables and satellites in heavy traffic regions; organisation of the satellite system as a commercial enterprise, obliged to compete for traffic where its technological rival was strongest; the central role in Intelsat played by Comsat which, as a regulated U.S. carrier, was subject to systematic incentives to overinvest; and the technical monopoly held by American manufacturers, whose outstanding interest in eventually serving high-technology domestic markets makes it practically impossible to determine with precision whether an appropriate level of technology was deployed internationally.

Finally, we argue that whatever its causes, underutilisation became a powerful reason to diversify and make more widely attractive Intelsat's service offerings—in order to earn revenues from otherwise empty circuits. Hence, in the post-1971 period Intelsat spacecraft came available for domestic uses, use of smaller and cheaper earth stations was promoted, and members were permitted to lease at quasi-concessionary rates large blocks of satellite capacity which had hitherto been priced prohibitively. On this technological level, therefore, the products—indeed the waste products—of underdevelopment were transformed into the infrastructure of a more universalised and more thoroughly developed satellite communications capability.

2. THE SYSTEM'S TECHNICAL ELABORATION

The principal aims toward which development of Intelsat's space segment
was directed were initially to establish the suitability of satellites as reliable instruments of intercontinental point-to-point transmission, and subsequently to permit economies of scale from satellite operations to be exploited. These objectives required determining the suitability of synchronous satellites, and then improving the space segment to provide greater communications capacity at declining per circuit costs. The overall technical achievement represented by Intelsat's first four spacecraft generations is summarised below.

Table I: Technical profile of Intelsat space segment, 1965-75

<table>
<thead>
<tr>
<th>Satellite series</th>
<th>I ('65)</th>
<th>II ('67)</th>
<th>III ('68-9)</th>
<th>IV ('71-5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>voice circuits</td>
<td>240</td>
<td>240</td>
<td>12-1500</td>
<td>3-9000</td>
</tr>
<tr>
<td>useful life (yrs)</td>
<td>1 1/2</td>
<td>3</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>transponders</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>power (watts)</td>
<td>31</td>
<td>85</td>
<td>127</td>
<td>500</td>
</tr>
<tr>
<td>circuit-years</td>
<td>360</td>
<td>720</td>
<td>6,000</td>
<td>42,000</td>
</tr>
<tr>
<td>investment per circuit-year (US $)</td>
<td>15,300</td>
<td>8,400</td>
<td>1,450</td>
<td>500</td>
</tr>
<tr>
<td>bandwidth (mHz)</td>
<td>50</td>
<td>130</td>
<td>450</td>
<td>480</td>
</tr>
<tr>
<td>in-orbit weight (kgs.)</td>
<td>37</td>
<td>81</td>
<td>127</td>
<td>700</td>
</tr>
<tr>
<td>satellite cost (US $ millions)</td>
<td>4</td>
<td>4-4.5</td>
<td>6</td>
<td>13.5</td>
</tr>
<tr>
<td>launch vehicle</td>
<td>Delta</td>
<td>Improved</td>
<td>Long-tank Delta Centaur</td>
<td></td>
</tr>
<tr>
<td>launch cost (US $ millions)</td>
<td>3.7-4</td>
<td>3.7-4</td>
<td>5</td>
<td>16</td>
</tr>
</tbody>
</table>


Suitability of geostationary satellites: The immediate technical success of Early Bird enabled Comsat in May 1965 to narrow the possible design options on the 'early capability system' to either a phased or a
synchronous space segment. The sole remaining reservation concerning a geostationary system was the acceptability of the unavoidable time delay and the adequacy of techniques to suppress the echo a speaker may hear from his own utterances after a half-second lapse. Tests conducted through 1965, however, suggested that AT&T's continued insistence that phone customers would not tolerate these drawbacks was without basis. Meanwhile, during the summer of 1965 Comsat concluded an agreement with NASA to provide synchronous satellites for the Apollo programme; but since it was NASA that had specifically requested such a space segment, and since the services required were not primarily voice traffic, the arrangement was not a firm indication of Comsat's own commitment to the design. In late February 1966 Comsat finally informed the FCC that "the quality of telephone communication via satellites in the synchronous configuration has been demonstrated to be clearly satisfactory," and requested authorization to build six such satellites for launch beginning in 1968. Approved by the FCC in June 1966, those satellites subsequently became the Intelsat III series—Intelsat I consisting of Early Bird, and the IIIs the spacecraft intended primarily for NASA's use.

Increased capacities: Communications capacity, according to the principle known as Hartley's Law, is a function of power and bandwidth: higher power levels permit more usable circuits to be derived from a given bandwidth, while increasing the bandwidth size per circuit permits lower power levels to sustain the same capacity. Initial efforts by Intelsat were premised on limited on-board power, and sought to raise capacity through use of wider bandwidths. The Intelsat IIIs, three of which were orbited between January and September 1967, used more than 2.5 times the bandwidth of Early Bird, enabling them to offer twice the geographical coverage, to communicate with mobile ground and shipboard terminals equipped with relatively inefficient antennas, and to serve several pairs of stations simultaneously—thus inaugurating multiple access service.

The Intelsat IIIs represented an attempt to increase the effective radiating power of the spacecraft by replacing the on-board antenna design of the first two satellite generations—where the antennas rotated
with the satellite hull, spilling around 96 percent of signal strength into space\(^{10}\)—with a 'despun' antenna which turned in a direction contrary to that of the satellite body and thus remained pointed toward earth. The III series, built not by Hughes as had Early Bird and the IIIs but by TRW Laboratories, was put into service between December 1968 and January 1970, and it was one of them that was re-positioned over the Indian Ocean on July 1, 1969 to complete Intelsat's global coverage. Although a mixed success—three failures in eight launches—they nevertheless proved the practicality of the 'earth coverage' antennas.\(^{11}\)

With the Intelsat IV series, antenna directivity was improved dramatically through incorporation of two pairs of antennas: two global coverage beams and two steerable spot beams, the latter to concentrate signal power with precision to meet heavy traffic requirements of limited areas. The importance of this directivity introduced by the IVs—the first of which was put over the Atlantic in January 1971—was manifold, permitting simultaneous re-use of the same bandwidths by different antennas on the same satellite and thereby increasing capacity, enabling either more circuits to be derived from existing ground stations or smaller ground stations to be used, and increasing the number of satellites that could be positioned in adjacent orbital slots without mutual interference.\(^{12}\)

**Multiple access techniques:** The multiple access problem—or the loss of capacity with increases in the number of earth stations using a satellite at the same time—remained through the 1960s among the "most notable" technical difficulties.\(^{13}\) The technique used was based upon earth stations' picking out the transmission destined for each by detecting differences in frequencies (frequency-division-multiple-access or FDMA), which required 'buffering' to be inserted between carrier waves—which wasted bandwidth—and which obliged on-board amplifiers to be operated at less than full strength—which wasted power. Consequently, although a single Intelsat IV transponder could supply as many as 900 voice circuits between two terminals, if five terminals were served capacity fell to 420 circuits and if 14 were served, 336 circuits. FDMA furthermore required fixed, pre-assigned frequencies for each earth station, which were standardised so that the smallest bandwidth a station could have was the equivalent of 24 voice circuits. Stations only paid, however, for circuits actually used, so a good deal of capacity was being
tied up uselessly and without remuneration to Intelsat.

Although Comsat had begun work on a method of assigning capacity on demand in 1965, the proliferation of satellite services to light traffic regions of the Third World made the need imperative: traffic projections for the Atlantic region—which included large parts of Africa and South America—forecast that by 1973 some 213 different pathways would be required, 75 percent of which would need fewer than the 24-circuit minimum capacity provided by FDMA. The successor technique, SPADE (Single-channel-per-carrier Pulse-code-modulation multiple-Access Demand-assigned Equipment), was finally made available in late 1971, and permitted an effective capacity of 800 circuits for each Intelsat IV transponder to be maintained, regardless of the number of stations using it at once. By early 1974 fourteen Intelsat Atlantic region members had installed SPADE and 10 more were expected by year’s end.\(^{(14)}\)

Decline in tariffs: The fall in per unit space segment costs produced by these technical advances—and noted in Table I above—was reflected in steadily declining charges on satellite use. In the first five years after global service was introduced in 1969, tariffs were reduced an average of more than 14 percent per year, or 45 percent up to 1974. Unit prices—the monthly lease of a voice-equivalent ‘half-circuit’, from earth station to satellite or from satellite to earth station—fell from $2,667 in 1965 to $705 in early 1975. Nevertheless between 1969 and 1974 Intelsat revenues more than doubled, due to a nearly four-fold increase in the number of circuits leased. Satellite-relayed telephone traffic was by the early 1970s increasing by 15–20 percent annually, and was expected to double every five years.\(^{(15)}\)

1. THE UNDERUTILISATION PROBLEM

However impressive, those figures are not by themselves sufficient to decide a controversy over the degree to which satellite facilities were underutilised during Intelsat’s first decade. Utilisation is, in our view, a critical indicator of the system’s overall success and of the wisdom with which technical components were selected for incorporation, implicating questions of appropriate technological levels, overinvestment,
adequacy of service offerings, cable competition, pricing policy and demand elasticity, and earth station design.

Evidence of underutilisation: Commentaries are not agreed on the fact of underutilisation, in part because data are adduced selectively if not capriciously by both sides. S. Levy denies the problem's existence by asserting that by the early 1970s some 95 percent of the system's capacity was being leased full-time, when in fact 95 percent of what satellite service there was consisted of full-time leases—which says nothing about the proportion of total capacity this use comprised.

Kinsley, on the other hand, writes:

Comsat faces the problem that most of its available satellite circuits have been unused. In 1974 Comsat was leasing barely 3,000 circuits, three-fifths the capacity of a single Intelsat IV satellite, even though the corporation had several satellites of all four generations in orbit.

In fact, Comsat's circuit leases represented only 31 percent of Intelsat's total leases for that year, and did not include rental of a full satellite transponder—rated at 900 circuits. Furthermore, the number of usable satellites was rather less than implied, since all four spacecraft of Intelsat's first two generations had exhausted their fuel supplies and though orbiting were useless, and three of the remaining eight satellites were spares approaching the end of their useful lives.

In spite of assurances from some Intelsat officials that underutilisation did not exist, however, other studies have confirmed Kinsley's basic position. Any attempt to determine their accuracy is complicated by the variability of satellite capacities, and by the practical requirement that Intelsat deploy considerable spare capacity. Fluctuations in satellite capacities with different patterns of use can however be provided for by employing average capacity figures, as we have done in Table II below. We have also eliminated from consideration satellites that were either classified as back-up facilities or had out-lived their nominal life expectancies, so as not to penalise Intelsat for attempting to ensure continuity of service.

Nevertheless, as the table suggests, it is difficult to defend as desirable or optimal the levels of utilisation registered by Intelsat during its first 11 years of service. Our calculations indicate an
### Table II: Worldwide international satellite usage, 1965-75

<table>
<thead>
<tr>
<th>Year</th>
<th>Available space segment capacity (a)</th>
<th>Equivalent full-time circuits leased (b)</th>
<th>3. % increase from previous year of leases</th>
<th>4. % of capacity used in full-time leases</th>
<th>5. Total % of capacity utilised (c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>'65</td>
<td>240</td>
<td>75</td>
<td>-</td>
<td>31.3</td>
<td>32.9</td>
</tr>
<tr>
<td>'66</td>
<td>240</td>
<td>86</td>
<td>14.7</td>
<td>35.8</td>
<td>37.7</td>
</tr>
<tr>
<td>'67</td>
<td>960</td>
<td>524</td>
<td>509.3</td>
<td>54.6</td>
<td>57.5</td>
</tr>
<tr>
<td>'68</td>
<td>2160(d)</td>
<td>762</td>
<td>45.4</td>
<td>35.3</td>
<td>37.1</td>
</tr>
<tr>
<td>'69</td>
<td>4320</td>
<td>1492</td>
<td>95.8</td>
<td>34.5</td>
<td>36.4</td>
</tr>
<tr>
<td>'70</td>
<td>5520</td>
<td>2194</td>
<td>51.1</td>
<td>39.7</td>
<td>41.8</td>
</tr>
<tr>
<td>'71</td>
<td>9800</td>
<td>2917</td>
<td>33.0</td>
<td>30.0</td>
<td>31.3</td>
</tr>
<tr>
<td>'72</td>
<td>21200</td>
<td>3763</td>
<td>29.0</td>
<td>17.8</td>
<td>18.7</td>
</tr>
<tr>
<td>'73</td>
<td>20000</td>
<td>4907</td>
<td>30.4</td>
<td>24.5</td>
<td>25.8</td>
</tr>
<tr>
<td>'74</td>
<td>20000</td>
<td>5753</td>
<td>17.2</td>
<td>28.8</td>
<td>30.3</td>
</tr>
<tr>
<td>'75</td>
<td>20000</td>
<td>6689(e)</td>
<td>16.3</td>
<td>33.5</td>
<td>35.2</td>
</tr>
<tr>
<td>Averages</td>
<td>-</td>
<td>-</td>
<td>84.2</td>
<td>33.2</td>
<td>35.0</td>
</tr>
</tbody>
</table>

(a) Estimated, in voice circuits as of December 31, from data in Communications Satellite Corporation, Annual Report to the President and the Congress, 1966-75, "Status of satellites in the global system" annual summaries.

(b) 1974 Comsat Annual Report, pp. 3-4; 1975 Comsat Annual Report, pp. 4-5. Figures are adjusted to include use of non-standard earth stations.

(c) Full-time circuit leases are normally estimated as 95 percent of total system usage. Column 5 therefore provides Column 4 figures as divided by 0.95.

(d) This figure includes 1200 circuits from the Intelsat III-P2 satellite, which began operations in the Atlantic on December 24, 1968. If that spacecraft is excluded, total available space segment capacity falls to 960 voice circuits and leases to 498, resulting in a Column 4 percentage of 51.8 and a Column 5 percentage of 54.5. (See 1968 Comsat Annual Report, pp. 36-39.)

(e) Source is R. Parthasarathy, "Commercial satellite communications," Paper delivered to 13th Space Congress, Cocoa Beach, Florida, April 8, 1976. Figure 2A.
average utilisation of around 35 percent of available space segment capacity, ranging from a high of nearly 58 percent in 1967, when the system comprised only four 240-circuit satellites, to a low of less than 19 percent after deployment of the high-capacity Intelsat IVs had commenced in 1972, more than doubling the number of available circuits.

**Direct impact of cables on satellite use:** At least two studies have linked the low level of satellite utilisation to the space system's coexistence with the undersea cable network, the first to justify satellite overcapacity as necessary to provide back-up circuits in the event of cable breakdowns, the second to condemn satellite traffic levels as the result of self-seeking traffic diversions by cable-owners. Although Snow adduces utilisation figures similar to our own—yielding a 1965-74 average of around 34.3 percent of capacity—he argues that "most of the deviation...can be confidently attributed to back-up capacity for use during satellite (or cable) failure," since "common engineering practice" required furnishing capacity double the level of normal anticipated traffic. Even if the latter assertion is true, however, overcapacity on the order of 30 percent still remains to be explained. Concerning the need for back-up capacity, it would appear that emergency requirements were accommodated easily with modest numbers of spare circuits; the category of temporary service, which includes TV relay as well as cable restoration, required for instance an average of 32 circuits per day worldwide in 1969 and 81 per day in 1974—out of global satellite capacities of 4,300 and 20,000 circuits respectively. Satellite back-up capacity was provided by designated in-orbit spares, which were excluded from our estimates of space segment circuits. There seems therefore little reason to accept Snow's assurance that the excess capacity simply reflected sound planning and was not excess at all.

Kinsley, on the other side, contends that underutilisation directly resulted from the continued construction and preferential use of submarine cables, which both deprived the satellite system of traffic and kept per circuit satellite rates high, further dampening business growth. Although the argument as to the cable-owning carriers' strategy seems sound, the linear connection between cable construction and satellite underutilisation is difficult to draw, since the hypothesis implies that use should be at its lowest where cable competition was most intense—in the Atlantic.
In fact, as Table III shows, utilisation was highest in the Atlantic and lowest in the Indian Ocean region, large sections of which—like the Indian Ocean itself—have no undersea phone cables at all. The declines in Pacific region satellites in 1974 and 1975 were due not to cables, but to competition from U.S. domestic satellites and loss of Hawaii-mainland traffic.\(^2\)

**Cables and higher satellite tariffs:** It has also been argued that cables indirectly depressed satellite traffic levels by needlessly inflating the overall rate base for international services and thus preventing satellite charges from falling to a level adequate to support a primarily satellite-based capability.\(^26\) There are two problems with this position: first, space segment charges are only a relatively minor component of the overall tariffs levied on satellite use;\(^29\) second, telecommunications demand is generally considered fairly insensitive to price fluctuations.\(^30\) Hence, even if Intelsat was enabled to reduce its space segment charges as a result of greatly increased traffic loads, the reductions would make relatively little difference to the overall prices to the customer of satellite service; and even if those final prices came down proportionately, the impact on traffic levels would not be great—unless of course satellites were permitted to undersell cables, which is not the question here.

The preceding discussion of the direct and indirect effects of cables upon satellites is not, however, meant to exonerate cables from contributing to satellite underutilisation. Directly and immediately, virtually all cable traffic was potential satellite traffic, while because of the higher costs and greater threshold traffic requirements of cables, the reverse was not the case. If, as we saw, Atlantic satellites were not as underutilised as those in the Pacific and Indian Ocean regions, this is due not to the benignancy of the numerous cables linking North America, Europe and the Caribbean, but to the overall vigour of regional service requirements. Similarly, the contention that demand for overseas circuits is largely insensitive to price—and therefore that cable construction did not restrain growth of aggregate international traffic by adding needless costs—implies at the same time that financial penalties were being imposed on those who could not afford not to pay what was demanded. Cable construction compelled payment of subsidy from countries which benefited not at all
Table III: Percentage of available capacity utilised, and rates of increase of circuit usage, by region 1965-75

<table>
<thead>
<tr>
<th>Region:</th>
<th>Atlantic</th>
<th>Pacific</th>
<th>Indian</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% rise in circuit leases</td>
<td>% of available capacity utilised</td>
<td>% rise in circuit leases</td>
</tr>
<tr>
<td>'65</td>
<td>-</td>
<td>31.3</td>
<td>-</td>
</tr>
<tr>
<td>'66</td>
<td>14.7</td>
<td>35.8</td>
<td>-</td>
</tr>
<tr>
<td>'67</td>
<td>143.0</td>
<td>43.5</td>
<td>-</td>
</tr>
<tr>
<td>'68</td>
<td>72.3</td>
<td>21.4</td>
<td>56.3</td>
</tr>
<tr>
<td>'69</td>
<td>154.2</td>
<td>63.5</td>
<td>114.2</td>
</tr>
<tr>
<td>'70</td>
<td>43.9</td>
<td>49.9</td>
<td>45.1</td>
</tr>
<tr>
<td>'71</td>
<td>33.4</td>
<td>23.7</td>
<td>33.7</td>
</tr>
<tr>
<td>'72</td>
<td>35.1</td>
<td>23.7</td>
<td>5.5</td>
</tr>
<tr>
<td>'73</td>
<td>32.5</td>
<td>31.5</td>
<td>21.6</td>
</tr>
<tr>
<td>'74</td>
<td>22.3</td>
<td>38.5</td>
<td>-17.4</td>
</tr>
<tr>
<td>'75</td>
<td>15.4</td>
<td>44.4</td>
<td>3.7</td>
</tr>
</tbody>
</table>

Average annual increases in full-time leases: 56.7% 32.8% 78.4%

Overall rise in full-time leases: 581.7% 613.3% 2425.5%

Average use of capacity in full-time leases: 37.0% 32.2% 15.7%

Average use of capacity adjusted to include other uses: 39.0% 33.9% 16.5%

Sources: Capacity estimates from "Status of satellites in global system" summaries in Communications Satellite Corporation, Annual Reports, 1966-75. Usage figures from following Annual Reports: 1966, pp. 25, 27; 1972, p. 83; 1975, p. 83. For 1975 usage, see Table II note (e.)
from availability of the alternative technology, first because Intelsat applied uniform satellite rates worldwide in order to encourage the spread of services to light traffic areas whose space segment costs were partly paid by surplus revenues from metropolitan regions, and second because even non-cable-owning countries would be obliged to pay satellite charges to communicate with cable-owning countries which reflected the latter's overall outlay on cables.

Cables and the spread of satellite services: That subsidy was the displaced cost burden of a policy of 'parallel development' of satellites and cables, a policy premised on a definition of satellite technology—as an alternative mode of point-to-point intercontinental service—made dominant by the satellite venture's senior partners and suited to their requirements for technically diversified overseas capabilities.

Efforts to enforce satellite-cable parity in metropolitan regions and therefore to keep satellite traffic levels from harming cable viability suggested strongly, however, that the most promising fields for satellite service would be those unsuited to cable exploitation: geographically to areas with insufficient traffic to warrant undersea links or with traffic patterns too dispersed to be served economically by fixed-point facilities, and in terms of kinds of services toward those which cables could not provide. Inauguration of SPADE multiple access service, introduction of promotional rates for leases of bulk satellite capacity for domestic telecommunications and bilateral television exchanges, and tolerance for smaller and cheaper earth stations represented attempts to diversify Intelsat's service offerings and to facilitate geographical spread. Although Table IIIa

<table>
<thead>
<tr>
<th>Table IIIa: Regional proportions of Intelsat full-time circuit leases for selected years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>1969</td>
</tr>
<tr>
<td>1972</td>
</tr>
<tr>
<td>1975</td>
</tr>
<tr>
<td>Source: Table III</td>
</tr>
</tbody>
</table>

suggests the continued predominance of the Atlantic region in Intelsat usage through 1975, several qualifications must be noted: much of South
America and Africa is served by Atlantic region spacecraft; the usage figures from which the percentages are derived include only leases of circuits, not of bulk capacity used, for example, for domestic telecommunications by Algeria and for regular TV exchanges between Spain and Mexico; and the proportions conceal the absolute increases in use of the space segment, which itself expanded nearly five-fold in capacity between 1969 and 1975. While the considerable increase in the proportion of total satellite usage attributable to the Indian Ocean region has been largely at the expense of the Pacific region—probably reflecting in part increasing traffic between East and Southeast Asia and Europe as against transpacific traffic—the overall percentage increases in circuit leases in both Indian and Pacific regions was through 1975 greater than that registered in the Atlantic, as Table II indicates. Hence the impact of severe tranatlantic cable competition seems not to have been wholly disadvantageous to the satellite system, since it encouraged geographical and service diversification.

**Earth station delays:** A final determinant of satellite underutilisation seems to have been slippage in the anticipated availability of ground stations, which deprived the system of traffic the space segment was being deployed to accommodate. As Table IV shows, Comsat's 1967 estimates of the opening dates of the 61 new terminals expected by 1972 turned out to be not especially accurate.

Table IV: Accuracy of earth station availability forecasts, 1967

<table>
<thead>
<tr>
<th>Region</th>
<th>Atlantic</th>
<th>Pacific</th>
<th>Indian</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forecasts</td>
<td>28</td>
<td>11</td>
<td>22</td>
<td>61</td>
</tr>
<tr>
<td>Correct</td>
<td>13</td>
<td>8</td>
<td>9</td>
<td>30</td>
</tr>
<tr>
<td>Incorrect</td>
<td>15</td>
<td>3</td>
<td>13</td>
<td>31</td>
</tr>
<tr>
<td>(Incorrect by two or more years)</td>
<td>(11)</td>
<td>(2)</td>
<td>(9)</td>
<td>(22)</td>
</tr>
</tbody>
</table>

Less than half the 1967 estimates forecast the correct year of earth station operation, and more than a third were wrong by two years or more—all having erred on the side of underestimating the length of time construction would take. Where underutilisation was most severe, in the Indian Ocean region, forecasts were least accurate.

It is difficult to determine the reasons for this apparent delay in earth station availability, in part because their rapid establishment probably offered more widespread political and commercial rewards than any other feature of the satellite system. The U.S. government encouraged ground station construction abroad through NASA, the Pentagon and the official and quasi-official foreign aid apparatus, to help carry out President Johnson's 1967 policy statement that "satellite ground stations should be an essential part of the infrastructure of developing nations." (32) Comsat offered technical assistance and conducted feasibility studies to enable national telecommunications entities to evaluate the proposals of manufacturers who, as one Comsat official put it, "were on them like fleas," (34) attracted to an export market estimated in 1966 to be worth from $300m to $500m by the end of the decade. (35) Although that estimate turned out to be high, by mid-1970 worldwide investment in ground stations was nevertheless said to be between $250m and $350m, around twice the $135m cumulative outlay on the Intelsat space segment; (36) a "conservative" estimate by the State Department that year put the American-supplied total of earth station goods and services at half the worldwide outlay. (37)

Abroad, among potential rival suppliers Britain offered the most aggressive competition for construction and technical assistance contracts. The head of Post Office external telecommunications told a Commons committee in 1966:

Our own view is that there really is an opening for Britain in the export market for earth stations, because in our view, and I really do think it is a correct view, we are probably ahead of the world, including the United States, in the design of earth stations at the moment. (38)

Standard Telephone & Cable—albeit an ITT subsidiary—became the world's biggest supplier of ground station equipment, (39) and Cable & Wireless built earth stations in Bahrein, Hong Kong, Ascension Island, Jamaica and, in partnership with the three-nation communications entity, in Kenya. (40) For countries purchasing earth stations, they proved by and
large to be good investments, providing "significant return" within two to three years of operations\(^{[41]}\) and in some cases generating surplus revenues—through high tariffs—for domestic telecommunications expansion.\(^{[42]}\)

Nevertheless, delays may have been the result of any or all of the following: opposition within Comsat's board to the company's providing foreign assistance; politically-inspired opposition abroad to the extension of Intelsat services; uncertainty over the future of Intelsat; and, simply, unrealistic expectations as to the speed of earth station completion. Although Kinsley quotes a former Comsat employee that carrier board members "often refused" permission for technical and financial aid, because the proliferation of ground stations might harm cable holdings,\(^{[43]}\) this seems unlikely to have had much impact—cable and satellite rivalry was of little importance in the Third World, where technical assistance would be required; and Comsat's usual service was to steer foreign entities toward U.S. manufacturers, among whom its carrier owners figured prominently.\(^{[44]}\) Political opposition abroad to Intelsat expansion similarly appears to have been confined to the French; France cables et radio, the firm which operates alone or in partnership the national communications systems of certain nations of francophone Africa is said to have been slow to develop external links that might have prejudiced French plans for its own satellite network.\(^{[45]}\)

Of greater importance, however, were probably uncertainties as to Intelsat's prospects for surviving the forthcoming transition into a permanent enterprise. As is discussed in Part Five,\(^{[46]}\) construction of earth stations and addition of antennas accelerated after the 1971 definitive arrangements were concluded, and after the range of services offered by Intelsat was widened, making material investment in satellite communications less risky and more attractive. Finally, it is true that unavoidable problems—in assuring timely delivery of supplies and recruiting sufficiently skilled workers—inherent in introducing and assembling highly sophisticated components in underdeveloped societies may not have been fully appreciated by Comsat when its earth station forecasts were made. Whether or not the company had an interest in encouraging overly optimistic projections, and in deployment of an overly sophisticated and capacious satellite system, is the issue we shall now address.
4. OVERCAPACITY

Even if restraints on traffic growth related to cable construction and use and to tardy earth station proliferation contributed to satellite underutilisation, it may also be possible that discrepancies between traffic and capacity resulted from a systematic oversupply of satellite circuits, attributable to efforts by Comsat to inflate its rate base and to test out overly sophisticated space segment components intended ultimately for U.S. domestic applications.

In Comsat's defence, two preliminary observations are appropriate as to the sources of its traffic forecasts and its selection of basic earth segment and space segment configuration. First, Comsat was largely obliged to depend on the projections provided by the U.S. carriers—whose relations with foreign entities were presumed to be close and whose knowledge of trends within the domestic market was supposed to be accurate—in order to forecast levels of international traffic. In retrospect, however, carrier predictions appear to have borne a suspicious relationship to the companies' own satellite ambitions—forecasts were higher when satellite control was sought, and lower after Comsat was created and cable protection emerged as a more attractive policy than satellite use. (47)

Second, Comsat selected a system configuration combining relatively small satellites and costly earth stations when, in principle—because Intelsat owned only the space segment and Comsat owned initially 60 percent of Intelsat—the company's rate base would have benefited from deploying bigger and more expensive satellites to operate with smaller ground stations. (48) More powerful spacecraft and the boosters to put them in orbit were available, (49) but Intelsat kept to this basic design and although substandard ground stations were tolerated their operators were made to pay premiums for taking up a greater share of satellite capacity to derive usable circuits. (50) It was true that Comsat might expect to compensate itself at home—through ownership of a half-dozen U.S. earth stations at $5m each—for the investment opportunities abroad surrendered through selection of the cheaper space segment. More important, however, seems to have been concern with the system's overall reliability and a desire to keep the irreparable satellites as simple as possible, as Comsat stated in a 1964 submission to the UN General Assembly:
As reliability is the controlling factor in establishing a communications satellite system, it is likely that the major electronic components of the satellites in the early system will be relatively simple. It follows that the associated ground equipment will probably carry the burden of any complexity involved.

(51)

In effect, Comsat recognised that simply applying its investment ambitions to fundamental system choices might jeopardise the entire project.

Notwithstanding those two extenuating factors, there were indications that Comsat's plans for the global system were more ambitious—requiring higher technology, higher costs, more satellites and greater capacity—than others believed necessary, and concern that more capacity was being operationalised than could readily be used accompanied virtually every decision taken on successive satellite generations (with the exception of Early Bird, which was in any case partly experimental.)

**Intelsat I:** Although Early Bird, whose approval was expedited to hasten conclusion of the 1964 international negotiations, did not attract sufficient traffic to exhaust even its low capacity, Comsat attempted to rally support within Intelsat's governing board, the ICSC, for a second satellite of identical design to permit transatlantic television relay without the need to pre-empt telephone circuits. European ICSC members opposed the project as unnecessary and expensive, and Comsat relented. (52)

**Intelsat II:** Because of the central and direct role played by the U.S. government in creating and using the Intelsat II series, concern over the adequacy of commercial demand for satellite services was muted, notwithstanding the insufficient numbers of ground stations available to use satellite capacity in excess of state requirements. NASA and the Defence Communications Agency between them accounted for more than 60 percent of the circuits leased in 1967 on the three IIs then in service. (53) Nevertheless the European ICSC members objected to an early launch of the first Intelsat II, to be placed over the Pacific, since as of late 1966 the only commercial earth station operating in the region was in Japan and a severe shortage of customers was anticipated. (54)

Thanks to the launch failure of the first II in October 1966, the satellites were first made operational in January 1967; even so, aside from the substandard-size terminal in Japan and two American earth stations in Washington State and Hawaii, satellite service in the region relied
entirely on mobile terminals furnished by NASA and the Defence Department in the Philippines, Thailand and Australia.\(^{(55)}\)

**Intelsat III:** Late in 1965 Comsat opened negotiations with TRW Aerospace over construction of a satellite series to be interposed between the IIIs and the high-capacity multipurpose satellites that would officially inaugurate the global system.\(^{(56)}\) Controversy ensued over the timing of and need for an expanded interim satellite capability. Hughes Aircraft objected strenuously to the $40m deal before the FCC, claiming that its multipurpose satellites could be ready by 1969 and that an interim generation was unnecessary. In May 1966 Comsat countered that the TRW satellites would be an "appropriate transition" and would assure global coverage by mid-1968. Although the Corporation had said the previous December that the Hughes' satellites would be put into operation beginning in 1969-70, Comsat now claimed that they would not be needed until 1972 which, in spite of Hughes' assurances was, it said, a more likely target date for their availability. In the interim, a system that combined the IIIs with the TRW spacecraft would provide the required capacity with four fewer satellites than if additional Intelsat IIIs were deployed until the Hughes' satellites were ready.\(^{(57)}\)

Although the Europeans were reportedly reluctant to approve the TRW contract—in hopes, according to one account, of deferring additional satellite approvals until after Intelsat renegotiations and thereby to "provide a delay during which Europe could advance its own communications satellite programs"\(^{(58)}\)—Comsat won ICSC approval notwithstanding in February 1966, before the FCC had been asked for its authorisation. The FCC was not convinced that Hughes' objections were unfounded, and was uneasy about approving what might be a needless outlay; but the Commission was even more unwilling to block, as a domestic U.S. agency, a nominally international initiative, and reluctantly gave its approval in June,\(^{(59)}\) stating:

> While certain questions respecting the economic aspects of the proposal have not been resolved at this time, the Commission, upon consideration of the foreign policy considerations called to its attention by the Department of State, should act promptly in this matter...\(^{(60)}\)

Comsat was, however, instructed to return for specific FCC authorisation before actually using any of the TRW satellites—henceforth the Intelsat
IIIIs—and the FCC added the unusual proviso that Comsat would not necessarily be permitted to include the IIIIs in its rate base simply because the Commission had approved construction and purchase. (61)

Intelsat IV: Suspicions of unnecessarily expensive and hasty investment were strengthened when in November 1967 Comsat asked for FCC approval to contract with Hughes for the multi-purpose Intelsat IVs. Comsat modified for a second time its forecasts as to the satellites' availability dates, alluding to recent studies that "effectively dispelled" its previous doubts and claiming that the spacecraft would and could be ready by late 1969—as Hughes had said a year-and-a-half before—although Comsat contended that 1970 was a more reasonable target. The Corporation said that an Intelsat IV would be needed over the Atlantic by 1969, but the step-up in scheduling was viewed as in part a response to the then-pending carrier application to construct a fifth transatlantic cable, (62) and thus as an attempt to assure the FCC that the satellite system could handle anticipated traffic growth unassisted.

The need to accelerate deployment of the IVs was challenged within the ICSC, where some members believed Comsat's real interest was in testing a satellite suitable for U.S. domestic deployment. (63) Indeed Comsat's original request for bids issued in late December 1965 had specified, for instance, that the spacecraft should have a "nationwide or international" television distribution capability. (64) Two other possibilities for meeting international traffic requirements were considered: first, since Comsat held options on 18 more Intelsat IIIIs, some ICSC members believed further deployment of the TRW satellites would be adequate to meet Intelsat needs through 1975; (65) second the IIIIs could be up-graded to 2,000 circuits through adding a directed antenna array to maximise capacity between Europe and North America, where traffic growth was greatest. The Intelsat IIIIs, as they were called, would be ready for service by mid-1969, thus assuring service continuity at lower cost until the IVs were operationalised. (66)

Comsat prevailed within the ICSC, but the actual procurement of the IVs suggests that Comsat was in-fact keeping one eye on the U.S. domestic market while ostensibly dealing on Intelsat's behalf. In September 1968—before the first successful Intelsat III launch—Comsat ordered four IVs from Hughes for $72m. (67) Although it was anticipated that at least eight of the satellites would ultimately be needed, Comsat justified ordering
only four by saying it wanted to retain the possibility of buying a different satellite from Lockheed. Comsat allowed Hughes' original price bids to expire without taking up the options it held, and then opened negotiations not with Lockheed but with Hughes for a modified 'Intelsat IV\(^2\)' spacecraft, the design of which was said to be remarkably appropriate to the domestic satellite proposals Comsat was then floating.\(^{68}\) The ICSC rejected purchase of the IV\(^2\)s, however, and Comsat was obliged to order four more IVs from Hughes in late 1969 at prices higher than those of the original options Comsat had let lapse.\(^{69}\)

After the first Intelsat IV was launched in January 1971, Comsat continued to press for deployment of a higher-capacity intermediate satellite series derived from the IV design. In late 1972 Comsat finally signed a contract with Hughes for the Intelsat IV-As, which would be equipped with 20 transponders—as against the IVs' 12—and would provide around two-thirds greater capacity. Intended for service in late 1975, the IV-As also incorporated advanced antenna directivity features and an ability to re-use frequencies through extremely narrow beam separation, which would double the range of frequency suitable for simultaneous use.\(^{70}\) Such features were also present in the design of the four domestic satellites which Comsat ordered from Hughes through a $65.9m contract signed in September 1973.\(^{71}\)

5. CONCLUSIONS

The fundamental determinant of the chronic discrepancy between satellite system capacity and utilisation was the system's orientation toward the requirements of heavy-traffic metropolitan regions. That orientation resulted from the conjuncture of state policies favouring diversified national overseas capabilities, the system's commercialisation—which similarly encouraged pursuit of the most available sources of traffic—and Comsat's dominance, which both enabled its particular objectives to be transposed onto Intelsat activities and justified opposition to satellite system expansion on grounds of political inequities. To a greater or lesser degree, these three determinants are present in each of the five factors immediately responsible for the capacity-usage discrepancy: cable
competition, the technical relationship between earth and space segments, the rapid succession of satellite generations, an outstanding interest in metropolitan domestic satellite applications and, arguably, defence of the 'single global system' policy.

Cables: Cable construction and use appear to have aggravated both underutilisation and overcapacity of the satellite system, by diverting potential traffic and perhaps providing a pre-emptive reason for rushing deployment of the high-capacity Intelsat IVs. While continued cable building unquestionably served the 'parallel development' policies of the metropolitan countries, the satellite system's vulnerability to cable competition was premised on the commercial necessity to attract some of the heavy-volume traffic flows, instead of establishing a base of operations within hitherto deprived regions. Comsat stood particularly to gain from success in battling the cables, since reduced cable expenditures would diminish the U.S. international carriers' rate bases and entitle them to smaller shares of satellite operating revenues.

Earth-space segment configuration: Increases in the effective radiating power of successive satellite generations, achieved through higher raw power outputs and focussed on-board antennas, were potentially of benefit to big and small users, depending upon the constitution of the earth segment: larger and more expensive ground stations would translate improvements in satellite power—and hence capacity—into a greater number of usable circuits, while smaller earth stations would enable fewer circuits to be derived but at lower capital costs. Intelsat opted for the bigger end of the range of antenna sizes, making 85 feet the standard diameter and from $3m to $6m the usual ground station cost. The decision affected both overcapacity and underutilisation. Capacity was obviously higher in the technical sense that the ratings of satellite circuits were premised on use of the more efficient 85-foot antennas; less efficient antennas would necessarily have meant that satellite circuit capacities would be lower. In regard to utilisation, although antenna costs comprised only around 30 percent of total ground station construction costs, it is nevertheless likely that the increment discouraged proliferation of satellite services, as one Intelsat official acknowledged in this 1976 passage:
While the growth in the number of standard earth stations has been impressive, there are indications that Intelsat has yet to cater to a large number of countries or areas with relatively small traffic potential who find the [standard ground] station too expensive. (76)

The extent of interest in cheaper ground stations—which Third World Intelsat members sought for domestic purposes—was reflected in 41 applications between 1974 and 1976 for approval of substandard antennas, 33 for domestic applications. Intelsat formulated a second antenna standard—36-foot diameter—and as a result, whereas at the end of 1974 only seven of the satellite system's 104 antennas were non-standard, by 1976 some 57 hitherto non-standard antennas were forecast for "the immediate future."(77)

Nevertheless, users of smaller antennas were charged penalty factors for the greater amounts of satellite capacity they required,(78) which meant in effect that additional payment was exacted in defence of a technical standard that had produced a large amount of excess capacity. For metropolitan Intelsat members, however, the original earth station standard had established the reliability of satellite communications when the space segment was considered the more doubtful element; higher terrestrial costs could, furthermore, be readily amortised against a greater traffic volume. Comsat's own interest in bigger earth stations was, as mentioned, dubious, although the undivided ownership the company sought of U.S. ground facilities would have more than offset the rate base loss represented by a somewhat cheaper, internationally-owned space segment.

The pace of satellite deployment: It is indeed difficult to see why a 5,000-circuit satellite should have been deployed to provide service to a region that had hardly made a dent in the 1,200-circuit capacity of its existing satellite. The quick succession of satellite generations, however, assured metropolitan regions the continuity of coverage upon which they insisted and was, moreover, generally geared to anticipated circuit requirements in the North Atlantic. Comsat's rate base certainly benefited, and European ICSC members at least believed that the company's prospects in the Intelsat re-negotiations would be improved to the degree that its qualifications in managing an advanced, high-capacity network
were established. (79)

Domestic applications: It is impossible to determine the truth in contemporary suspicions that Comsat was deliberately manipulating specifications for Intelsat spacecraft in order to test out components ultimately destined for U.S. domestic uses. (80) In any event Comsat would not have been the sole ICSC member to benefit from such activities: Intelsat IV procurement was distributed internationally much more widely than its predecessors—the British Aerospace Corporation for instance assembled an entire IV in Bristol (81)—and the persistent interest in European regional and domestic satellite development paralleled Comsat’s in the American market. (82) Thus, what is noteworthy is the very impossibility of determining how appropriate the Intelsat IVs and IV-As were to wider international requirements, so skewed was the system to serving heavy volume users.

Overcapacity and the single global system: Although there is no evidence to suggest that this was a determinant of overcapacity, the large amounts of excess satellite capacity nevertheless provided Intelsat with the means to discourage, through promotional pricing of surplus, creation of rival satellite systems. After the Intelsat permanent arrangements were concluded in 1971, bulk satellite capacity—whole and half-transponders—were made available for long-term lease at rates considerably less than were justified by the numbers of voice-circuits the capacity could have yielded. (83) Brazil, the first country to take advantage of the offer for domestic uses, had previously been actively seeking assistance and advice on establishing a satellite system of its own, as had Algeria, which subsequently created a domestic network of ground stations to operate with Intelsat spacecraft. In explaining the cut-rate lease to Algeria, the ICSC finance committee stated in September 1973:

It seemed reasonable...to expect that by this means traffic could be attracted to, or retained by, the Intelsat system on a scale which would improve the financial position of Intelsat as a whole and effect a reduction in the space segment cost for each user in the whole system. (84)

Pricing policy thus took on a pre-emptive cast, made possible precisely because of overcapacity. Addition of new ground antennas enabled countries as separated as Nigeria and Malaysia to gain access to most gravely
underused satellites in the system—in the Indian Ocean region—for domestic purposes; indeed by mid-1976, of 11 bulk leases of capacity which were either in service or had been approved by Intelsat's governing board, seven involved use of spacecraft in that region. The ready availability of large amounts of capacity, coupled with the willingness to offer them cheaply, stood as a persuasive argument against creation of separate satellite systems.
The conflict over ownership and control of the U.S. Intelsat ground stations took nearly two-and-a-half years to resolve. In August 1964, soon after the interim Intelsat accords were concluded, Comsat asked the FCC for sole authorisation to own and operate the first three American ground stations and related facilities. In May 1965, a month after Early Bird was launched, the Commission agreed under a two-year interim policy. Nineteen months later, however, the FCC in December 1966 revised that ruling to provide for consortium ownership: Comsat would own half of each station and the other half would be divided among authorised U.S. international carriers. Although the last decision was formally an interim one as well, it was still in force a decade later and had been applied to subsequent earth station dispositions.

A great deal was believed to be at stake in the earth station controversies. "It is on the outcome of this legal conflict," wrote one journalist, "that Comsat's fortunes principally depend, and perhaps also the concept of a single comprehensive global communications system." Although Comsat supplied technical and political arguments to support its bid for exclusive ownership, the company's economic position was of greatest importance. Comsat initially contended that the multiple access problem required restrictions on the number of domestic earth stations—and thus ruled out simply opening the field to whichever carriers wanted to build their own stations—and that a single repository of integrated technical responsibility was appropriate to the unproven technology. Later the company also argued that most of the operational problems Early Bird had encountered were due not to the satellite or earth station, but to interconnections with the national grid, and that Comsat should be empowered to assure comprehensive through-service. In all, earth station ownership was technically "vital" to the Corporation's programme, as
Comsat's president stated in a January 1966 Senate appearance:

It is there where satellite power is converted into channels of communications, and, hence, it is there where the real exploitation of satellite technology for communications purposes takes place. Only by integrating all the essential elements of the system can one hope to derive and demonstrate the full economic and technical benefits of this new technology. (4)

Politically too, Comsat maintained that its congressional mandate and Intelsat responsibilities required it to hold exclusive control over the U.S. portions of overseas satellite links so that it could compel adherence to Intelsat standards and service requirements, and thereby represent itself as a fully authoritative entity. (5)

Economically, ground facilities were both the most promising are for Comsat to expand its rate base and, as Business Week observed, "the cash registers of a satellite communications system." (6) On the first count, the $50m that Comsat sought to invest in the first set of U.S. earth stations would comprise around half of its total rate base; a 50-50 ownership split with the carriers would therefore reduce its anticipated revenues by one-quarter, irrespective of traffic growth. Loss of the ground stations would harm Comsat more than it would aid its rivals, since the same $50m would constitute only eight percent of their combined international rate bases. (7) Carrier ownership or co-ownership would, however, reduce Comsat's chances of closing the gap between its charges to the carriers and their charges to ultimate users of satellite circuits by strengthening the justification for substantial carrier 'middleman' cuts of total revenues; even if Comsat's prices fell, the ultimate costs to satellite users need not be reduced as quickly and reliably to the degree that carrier earth station investment entitled them to set charges that reflected not just that investment but parallel holdings in cables as well.

On the second point, Comsat's control of ground facilities would put it in an excellent position from which to develop a technical capability to serve customers directly with international and, in time, domestic satellite circuits. Exclusive authorisation might also enable the company to secure a dynamic advantage in earth station technology, perhaps the pivotal technical field in the emerging struggle over who would handle internal satellite operations.
The carriers argued that Comsat earth station control would, by enabling the company to offer services directly to the public, prejudice future decisions as to who the 'authorised users' of satellite circuits would be, and permit Comsat to stifle competition by shutting the carriers out of any meaningful role in overseas satellite service. The real threat was to the record carriers—Western Union International (WUI) and the subsidiaries of RCA and ITT—since if Comsat owned and operated the earth stations and through-links to the domestic network, and AT&T controlled the national grid, they would have virtually no opportunity to handle traffic and claim revenues, apart from minor collection and distribution functions at final terminal points. AT&T's position was determined less by solicitude for its fellow carriers than by fear of the precedent a Comsat franchise might set, possibly an important step toward expanded domestic operations and securing recognition as a national 'chosen instrument' in space communications—which might in time strike at the heart of Bell's monopoly, the domestic long lines. AT&T had also to consider the future of its submarine cables—ownership of which was now shared with the record carriers. The carriers would be better able to exert leverage over the totality of Comsat's activities if they held a veto over earth station decisions than they had already thanks to their seats on Comsat's board of directors.

2. THE FIRST EARTH STATION OWNERSHIP DECISION

On August 14, 1964 Comsat asked the FCC for exclusive authorisation to own and operate the first three U.S. ground stations, tentatively to be located in the northeast for transatlantic service, the northwest for the Pacific region and the southeast for Latin America. Although Comsat at first based its application on the "multiple access problem," urging the Commission to limit the proliferation of earth stations by putting Comsat in charge, subsequent submissions through the autumn argued: 1.) exclusive ownership would enable Comsat to control the quality and volume of satellite traffic; 2.) the main improvements in satellite system capacity would derive from advances in terrestrial equipment, and Comsat must be able to pursue and exploit these; 3.) Comsat had no conflicting interest in other means of communication, so its dedication to
satellite use was unambiguous; 4.) carrier participation in earth station ownership would result in compromises over design and operating policy which "would almost certainly hinder prompt and effective action;" (10a) 5.) because Comsat owned no domestic facilities it would better be able to assure non-discriminatory access to the system by all U.S. users, thereby eliminating an anti-competitive potential of carrier ownership; 6.) because Comsat had no manufacturing operations of its own, it enjoyed "freedom from built-in biases in favor of 'in-house' products and technology;"(11) 7.) finally, the "status and effectiveness" of Comsat internationally would be harmed if it were denied exclusive ownership: "...[T]he corporation would be the only [Intelsat] member with no responsibility for the terminal stations in its country."(12)

Comsat's contentions were rejected and its application opposed by the rest of the communications industry. AT&T, with support from GT&E's Hawaiian Telephone and the U.S. Independent Telephone Association (representing a number of non-Bell domestic carriers), proposed that Comsat be given 50 percent ownerships of domestic earth stations and be named as manager for planning, designing, building and operating the facilities. The other 50 percent would be divided among carriers to be selected by the FCC in proportions to be decided. ITT and the American Communications Association (representing the smaller non-Bell carriers) wanted individual earth station applications to be treated separately and ownership awarded to those carriers likely to make most use of a particular facility. RCA and Western Union International (WUI) supported Comsat ownership for a strictly limited period, with holdings later transferred to a carrier consortium—apart from stock the carriers elected not to buy, for which Comsat would be eligible. WUI charged that Comsat ownership—if coupled with the right to serve customers directly—would very likely force the record carriers out of business.(13)

In its First Report and Order on earth station ownership in May 1965, the FCC sustained Comsat's position: "The most important consideration" was the system's operational availability at "the earliest practicable date." Hence "time pressure" was the "basic reason for our interim policy:"(14)
In sum, we believe it is essential that, to the extent possible, diffusion of responsibility, with the risks of delays or compromises which could adversely affect the efficiency of not only the earth stations in the United States but also of the system as a whole, must be avoided. (15)

The FCC rejected the carriers’ argument that their presence within earth station supervisory bodies would enable them to share expertise with Comsat, and said their seats on Comsat’s board should suffice. (16) “The need for centralized administrative control and close technical coordination between the earth station and space segment programs” was of paramount importance. (17)

The decision, by a 5-2 vote, (18) applied only to the first three U.S. ground stations, which by now were planned for the northeastern and northwestern parts of the continental United States and for Hawaii, since it was not expected that Latin American earth stations would soon be operational, while NASA’s Apollo programme would quickly require service in the Pacific. Disposition of the southeastern U.S. earth station was therefore left open. Surprisingly, however, Comsat was also given ownership and control of the facilities through which traffic between earth stations and so-called gateway points—where overseas-bound messages were gathered to and from the domestic network—flowed: included were cable and microwave facilities between the usual points where international traffic was processed, multiplexing (channel-deriving) equipment for processing messages for satellite transmission, and the links between earth station and the nearest points of interface with the domestic grid. (19)

3. CARRIER MILITATION CONTINUES

Comsat naturally welcomed the FCC decision which, the company’s chairman said, “strengthens the corporation nationally and internationally.” (20) Preliminary work began on establishing stations in Washington State and Hawaii, and in July Comsat requested approval to purchase from AT&T the earth station in Andover, Maine that had been used for Telstar and Early Bird. (21) The facts that the Commission’s ruling had been interim—pending better information from operational experience—and that a decision on the fourth U.S. station in the southeast was awaited, (22) gave Comsat an incentive to fulfill its responsibilities well and quickly.
Those same provisos, however, also meant that the issue was still negotiable and the carriers continued to criticise Comsat's activities. RCA and ITT accused Comsat in September of trying to expand into domestic common carriage under the protection of the interim policy. RCA charged:

A review of developments thus far reveals an evolving pattern in which Comsat apparently seeks to exert its direction and control over all phases of satellite communications,(23) which would not have been far from the FCC's intentions. ITT predicted the demise of the record carriers and warned that such an eventuality would ultimately work to AT&T's advantage and could only be avoided by permitting the record carriers to merge.(24) Without earth station participation, ITT said,

The traffic could be carried by the domestic carriers to the gateway interface and interchanged with Comsat without the need for the provision of facilities and services by the international carrier. (25)

While ITT attacked what seemed to be the rationalising and cost-reducing consequences of the FCC decision, AT&T maintained the set-up was technically irrational. In September, when Bell joined with the three record carriers in asking the Commission to turn down Comsat's applications to proceed with the Washington State and Hawaii earth stations, AT&T described the operational consequences of the interim policy upon the Andover earth station as follows: traffic had first to be brought to New York, the gateway point nearest Andover; it was gathered in Bell's plant and relayed to Comsat's interface centre for reprocessing and multiplexing; the traffic was then routed back to Bell's long lines office and sent over its cables to Andover. Thus, it was alleged, not only did the interim decision reduce the carriers' control over overseas routing—or, presumably, their freedom not to use satellites—but it also encouraged duplicate terrestrial facilities.(26)

Alarmed by the vigourous opposition to the two western earth stations, the FCC convened an 'interface conference' of Comsat and the carriers on September 9. Bell reiterated that the interfaces between domestic network and satellite system should be defined as being at the actual earth station sites, and that Comsat's ownership rights should accordingly be confined. At issue were some considerable transmission facilities—some 300 miles from New York to Andover, perhaps
600 miles from San Francisco to the Brewster Plats, Washington earth station—ownership of which would mean rate base and revenues. Bell, however, was unable to offer estimates of savings if the waste it associated with Comsat's title to those connections were eliminated, and could not say whether backhauling would be necessary for record as well as voice traffic. (27)

Although nothing was decided at the conference, it was growing clear that the FCC's first earth station decision had offered a political solution which, though responsive to the fundamental urgency which informed satellite determinations, was unacceptable to important participants in the technological formation process. Carrier opposition—for instance to Comsat's proceeding with the Pacific region stations—was threatening to hold back the very developments which the carriers' exclusion was intended to expedite.

Nonetheless, in October the Commission approved Comsat's construction of the urgently-needed Hawaii and Washington State stations—service to the Apollo programme was scheduled to begin within 18 months (28)—while the carriers moved to head off any further expansion Comsat might envisaged on the basis of the May 1965 policy declaration. In November a Puerto Rican subsidiary of ITT re-filed a request first made the previous March to build and operate an earth station there. The action was not altogether to AT&T's liking, since Bell and ITT had been planning jointly to build an advanced 720-circuit transistorised cable to link the Caribbean region to Europe via Lisbon and to Capetown via Ascension and the Canary islands. (29) To support its earth station application, ITT now claimed that satellite service would be the better way to accommodate regional traffic growth—on the order of 29 percent annually since 1960. (30) While Bell continued to insist that the cable would be more economical, (31) ITT was apparently more concerned with using its telecommunications dominance in the Caribbean to justify exclusive ownership of the satellite station. RCA and WUI challenged ITT on just that basis, arguing that if Comsat got the three mainland stations and ITT the Puerto Rican, "geographical monopolies" would in effect have been created. They asked for equitable ownership provisions for all international carriers. (32)
4. THE SECOND DECISION

When in January 1966 Comsat asked for permission to build the southeastern U.S. ground station, the carriers unleashed what the trade press called "a full-scale attack" on the whole of the FCC's interim policy, now scarcely eight-months-old. They alleged that Comsat's proposed location in West Virginia would cause technical interference with existing microwave facilities, and nominated themselves to build, own and operate the station. Comsat countered that opposition to various outstanding construction permits to link approved earth stations to gateway points already was jeopardizing the satellite service NASA would soon require, urged the FCC to reaffirm its interface decision, and dismissed carrier interference claims as groundless.

The Commission's response came in a second decision in February 1966. Its previous ruling on ownership of the first three stations was re-stated; indeed, in view of NASA's pressing requirements the advantages of "a centralization of responsibility and control in Comsat are even greater than appeared when we first considered the matter." However, the FCC accepted AT&T's position on re-locating the interface between satellite system and domestic network to the earth station site itself. Interface points could, the Commission said, be wherever efficiency dictated; the increased use of customer-to-customer leased lines tended to make the entire gateway concept obsolete—since gathering points could be by-passed—and Bell's alleged plans to introduce direct overseas dialing would similarly obviate gateway maintenance. Finally, "national security interests" were said to oblige circumventing large population centres in favour of routing traffic directly to overseas transmission points. Although the continued value of Comsat's interface control was acknowledged—since it put Comsat "in a position to assure equitable access to the system"—actual or anticipated changes in AT&T's operations "substantially decrease the importance of the gateway concept." The interface with the national network therefore "should be at or near the physical site of the earth station itself."

In this first revision of the FCC's earth station ownership policy, Comsat was forced back to the station sites themselves, deprived of any
opportunity to maintain a presence at the critical points of contact with the domestic network, and thus stripped of effective power to control access to the space segment by potential traffic sources. This second Commission action, as H. Schwartz has observed, reversed half of its original decision and neatly sliced in half the 19 months that would elapse between the initial policy statement and its complete reversal.  

Despite this setback Comsat pressed on, opposing both AT&T's application to build a new cable link between the U.S. Virgin Islands and the mainland and ITT's request for a Puerto Rico earth station with an earth station application of its own—to be located on St. Croix, U.S. Virgin Islands—which was immediately attacked by the four international carriers. All agreed that this May 1966 Caribbean earth station application represented an attempt by Comsat to widen and exploit the provisions of the FCC's interim policy: "It now becomes increasingly clear," WUI charged, "that Comsat's 'single-minded interest' lies in its complete dominance of international communications facilities." ITT pushed for approval of its satellite station in Puerto Rico, noting with AT&T that most of the region's traffic originated and terminated there. Bell, however, went further in order to defend its cable proposal against both earth station applications, and observed that the vast preponderance of the region's international traffic was with the United States, and therefore the promise of global interconnection via satellite was of little value: "Vague reference to television transmission or of possible traffic to other parts of the world cannot supply this deficiency" in hard evidence of requirements.

Comsat countered that approval of the cable would mean "frozen investment in a specified capability for a 20-year period," while satellites were continually being improved and replaced and would, besides, connect the region to a worldwide network. The company's answer to the ITT earth station proposal was that Comsat's rates for satellite service worldwide would be lowered substantially if it had ownership of the Caribbean earth station; while its five-year revenue requirement would increase around 11 percent to reflect the amortised outlay on the facility, Comsat forecast that its satellite circuit leases would
rise by 52 percent thanks to Caribbean-U.S. traffic. The tariff re-
ductions that would result, according to Comsat, are noted in Table V.

<table>
<thead>
<tr>
<th>Monthly rate per half-circuit</th>
<th>With Caribbean station</th>
<th>Without Caribbean station</th>
</tr>
</thead>
<tbody>
<tr>
<td>To Hawaii</td>
<td>$2,500</td>
<td>$2,700</td>
</tr>
<tr>
<td>Caribbean</td>
<td>1,250</td>
<td>-</td>
</tr>
<tr>
<td>Europe, Africa</td>
<td>3,500</td>
<td>3,800</td>
</tr>
<tr>
<td>South America</td>
<td>4,500</td>
<td>4,900</td>
</tr>
</tbody>
</table>

Source: Telecommunications Reports, 11 July 1966

5. DELAYS FEARED, INCENTIVES SOUGHT

Opposition to Comsat's expanding plans continued on all fronts through
the summer of 1966, regarding a second antenna for its Andover station,
another earth station on the West Coast in California, a second antenna
in Hawaii and the still-pending West Virginia earth station proposal.(42)
The persistence of the carriers' objections was effectively inundating
the FCC with so many contending applications and pleadings—any one of
which might find recourse to full judicial review—that the fate of the
satellite system itself appeared increasingly to be at risk.(43)

Comsat seems to have been growing fast indifferent to the precise
ownership modalities adopted, such as for instance the "urgent need"
for a second East Coast earth station for Latin American traffic, and
in August the company asked for an immediate decision on the West Vir-
ginia station irrespective of ultimate FCC policy.(44) The White House
director of telecommunications management similarly observed that month
during a Senate appearance that the satellite system's "biggest problem
in the period immediately ahead" was getting sufficient ground facili-
ties in operation to utilise the increase in space segment capacity.
He said the "conflicting filings" before the FCC "may bring about protracted delays" and noted that the new earth stations that would be needed on the West Coast and Hawaii should already be under construction and were not. For his part, the White House official said he favoured joint ownership by Comsat and the carriers as a prelude to an eventual merger of all the international carriers.

During those same hearings, before the Senate communications subcommittee, the FCC indicated that a change in its interim policy was being considered. The Commission's chairman spoke sympathetically about the carriers' rate base concerns:

I think a major question is the...interest which the conventional carriers will have in a satellite system, if they are not permitted some participation in the ownership of the earth stations. The common carrier bureau chief likewise observed that without ownership shares, the carriers are merely performing a function of an interconnecting carrier in a sense, merely recover, in their rates, the charges for rental and lease fees that they pay to Comsat for these facilities. They have nothing to make a profit on.

Western Union International (WUI) now revived the plan first proposed by AT&T before the FCC's first ownership decision, for a consortium composed of Comsat and the international carriers to own jointly the earth stations while Comsat served as manager—a set-up, WUI said, modelled on Intelsat. Comsat's willingness to negotiate was signalled at a conference it called in early August of government agencies and the carriers, where the company warned that without the East Coast facilities it had proposed U.S. satellite traffic might have to be routed via Canada.

The FCC convened a series of carrier–Comsat meetings starting on August 22, ostensibly to work out arrangements for the West Virginia station. Held behind closed doors and attended by what were described as "very much first string" negotiators, the sessions soon extended their mandate to considering overall earth station policy. Under prodding from the FCC, Comsat itself came forth with the proposal for a 50-50 ownership split to be applied to pending applications: earth stations in the Caribbean and in West Virginia or Georgia, and a second antenna at Andover, which would permit use of the Atlantic Intelsat II. The
carriers pronounced the plan broadly acceptable, but were unable to de­
cide on a precise distribution of ownership shares by the October 1 dead­
line set by the FCC. (53)

In the absence of an agreement, RCA and ITT pressed for further con­
cessions from Comsat, reversing the willingness they had indicated to sup­
port Comsat's application for a second Andover antenna and announcing in
early November that their cooperation depended on the joint ownership
scheme's being extended to that earth station too. (54) Comsat, having
formally requested authorisation to build a station in California to use
with a Pacific Intelsat II, now had three major applications pending—
West Virginia, St. Croix and California—along with requests to modify
the Andover and Hawaii installations. (55) The company was especially
concerned about the Caribbean earth station, since both AT&T and ITT
were pressing for action on their cable—promising to use equal numbers
of satellite and cable circuits—and Comsat was anxious not to lose the
region for the satellite system. (56)

6. THE FINAL DECISION

On December 7, 1966 the FCC issued its revised interim policy, effective
through 1969, to supersede its first two-year policy, which still had six
months to run. All U.S. ground stations—including the three given to
Comsat under the first decision—would be owned by a carrier-Comsat con­
sortium, which would exercise overall control of the stations and of
Comsat in the latter's capacity as operational manager. The Commission
noted that the carriers had failed to decide on apportioning their half
of the shares, ruled that AT&T should own a total of 28.5 percent, RCA
10.5 percent, ITT seven percent and WUI four percent.

The FCC justified its final decision by rejecting much of the ra­
tionale for its first two policy pronouncements. Indeed, as Schwartz
has pointed out, the Commission now implied that its first ruling had
been illegal in that a Comsat ground station monopoly was now said to
"be contrary to the spirit and intent of Congress," (57) although the
apparent intent of the legislative changes by which carrier earth sta­
tion ownership was deleted from the Comsat Act had been precisely to
leave the FCC with complete discretion in the matter. Similarly, whereas the Commission had in its first decision asserted that carrier representation on Comsat's board would be sufficient to ensure that their contributions to the ground station effort were made, it now stated that Comsat station ownership would mean the carriers would not, for the extended period of time, be in a position to make meaningful contributions to the development of the art and their incentives to aid in the growth of satellite communications would be severely limited...[They] would be driven to seek alternative means not necessarily dictated by efficiency but by need for survival. (59)

The FCC argued that "ownership participation and investment would provide powerful incentives to maximize use," and "the inherent advantages of [both cables and satellites] could be exploited to the maximum." (60)

Although, as Kinsley has pointed out, the FCC seemed unable to justify its decision consistently—on the one hand arguing that carrier involvement was necessary to the satellite system's success, while on the other contending that without the carriers the system might be so successful as to threaten their survival—in fact both points were valid. If the carriers did not get the shares they wanted there might not be a satellite system, since their capacity for obstruction had been demonstrated. And if they were not positioned to help assure a continued flow of cable traffic, and authorised to expand their rate bases and revenues with the aid of satellite investment, the smaller record carriers might go out of business. (62)

The new Earth Station Ownership Committee submitted in March 1967 its proposals for financial participation and operational control of ground facilities. In late May the FCC approved the consortium's request to establish the West Virginia station, and the next month the Commission applied the 50-50 formula to four other stations: a new station in Jamesburg, California to serve South America, Hawaii and transpacific routes, and transfers from Comsat of the stations in Washington, Andover and Hawaii. None of the rancour that had accompanied earlier earth station actions was evident and, as the FCC chairman remarked in an April 1968 report:

It is interesting to note that a whole series of claims and contentions about interference, which the proposed earth stations might cause the terrestrial facilities of the other carriers, were quickly resolved [after the revised ownership policy was issued]... (64)
Similarly, while in their previous capacity primarily as customers of Comsat the carriers had strenuously objected to the 12\(\frac{1}{2}\) percent return Comsat had sought on its earth station holdings, the carriers now were "not only silent on this but have adopted it as a figure reasonably applicable to their investment in the earth stations."(65)

The consensus remained, however, an uneasy one and Comsat was involved in further earth station controversies with RCA over service to Guam (a U.S. Pacific island possession), with ITT over another station in the Caribbean and with RCA over an earth station in Alaska.(66) When in 1970 the FCC began a review of its 'interim' policy, Comsat argued that shared ownership had been necessary to expedite the system's development but that it was now possible to provide for unified control and management unhindered by conflicting interests in rival technologies.

Broadly speaking, the other carriers' dedication to the development and optimum use of the stations has been hedged by a primary emphasis on their greater ownership of competing cable facilities.

(67)

AT&T, Hawaiian Telephone—which held a 30 percent share of the Hawaii ground station—and WUI said they were by and large satisfied with the existing policy, although Bell believed itself entitled to a greater ownership percentage: while its holdings comprised 57 percent of the carrier shares overall, its usage of the stations was 78 percent of the total. ITT, trying once again to secure control of the Caribbean station, proposed that individual station ownerships should be awarded to the carrier making greatest use of each. RCA argued that all the stations should be owned and operated by a carrier consortium, minus Comsat.(68)

The FCC review of its ownership policy continued, and as of 1976 had not been completed.(69)
CHAPTER TWELVE: COMSAT AS AN INDUSTRIAL DEPENDENCY--
THE 'AUTHORISED USER' AND 'THIRTY CIRCUITS' CASES

In a long series of controversial decisions, the Federal Communications Commission has reduced Comsat's role to little more than...a brokerage service for leasing satellite circuits to its would-be competitors for resale to the ultimate consumer.

- Congressional Quarterly, March 1968

1. OVERVIEW

The FCC's policy on Comsat's right to compete with the rest of the international carrier industry by offering satellite services directly to users was announced, contested and confirmed between June 1966 and February 1967. There had never been a question of Comsat's entering the retail business and providing, say, satellite-relayed telephone service to the general public in competition with cable-relayed calls. What the FCC's June decision did was to formalise hitherto implicit restrictions on direct access to satellite circuits by those private users with enough traffic to require long-term leases of capacity, who would henceforth have access to satellites only by contracting with the international carriers. The real stakes however were the U.S. government's massive overseas traffic, for which Comsat believed itself entitled to compete unhindered by carrier industry mediation. Since the FCC is not empowered to regulate state communications, its June ruling on 'authorised users' could formally only advise against direct transactions between Comsat and the government. In fact, however, the decision was part of a continuing effort by the Commission to insert the carriers between Comsat and all U.S. satellite users, and should therefore be read in tandem with the '30 circuits' controversy which lasted until early 1967, when the Pentagon's attempt to lease trans-Pacific capacity directly from Comsat was thwarted by substantial rate reductions offered by the carriers under prodding by the FCC.

Both cases, in our view, should be located conceptually within an abortive process of operational integration between major components of
the U.S. government's overseas communications capability and the commercial satellite system, a process marked not just by the 30 circuits case but by Comsat's 1965 agreement with NASA to furnish Apollo programme services and by the Pentagon's self-imposed limits on the capacity of its own proposed satellite system as well—limits that would have made reliance on Intelsat routine and would therefore have strengthened the justification for state supervision of the commercial operation. The net effect of the authorised users and 30 circuits controversies was decisively to check that process, compel Comsat's independence from the state and confirm instead its vassalage within the private carrier industry—rendering the company more profoundly than hitherto subject to the restraints imposed upon satellite development by its competitors.

2. COMSAT, THE RECORD CARRIERS AND DIRECT SATELLITE SERVICES

Although the Comsat Act had empowered the Corporation to serve directly "authorized users, including the United States Government," it was not clear whether—with the exception of the government—'authorised users' was to be an alternative term for the international carriers. In two speeches by FCC commissioners in 1963, the phrase "common carriers' common carrier" was used to describe Comsat's envisaged relationship to the rest of the industry, but as the common carrier bureau's deputy chief noted in 1966 that formulation could be construed as defining Comsat's main, not its sole, function:

It is clear, from the Communications Satellite Act, that Comsat was intended to serve primarily as a carrier's carrier—that is, to construct, install and operate communications facilities to be leased to the interested common carrier, which would use them to provide service to the ultimate users. Note the word 'primarily'. The statute does not specifically state this to be its exclusive function.

In January 1965, even before Early Bird was launched, prospective users of satellite circuits—including the press wire services, television networks, IBM and the Pentagon—were expressing interest in securing low-cost, and preferably direct, access to the system and in mid-April the Associated Press became the first entity to apply formally to the FCC for certification as an authorised user, citing "bitter lessons on the hazards of dependence upon carriers, who have commercial responsibilities of their own, for desirable channels or frequencies." AP was soon joined by
The question of how to handle transatlantic television relay gave the FCC an opportunity to issue an initial, deceptively favourable ruling to the direct access aspirants. As a novel international service, TV was not readily classifiable as voice or record traffic. The record carriers asked for exclusive responsibility to handle television, but on June 22—soon after the 'authorised users' docket was opened—the FCC approved a request from the three U.S. TV networks to lease circuits directly from Comsat on a strictly temporary basis, pending a formal inquiry into TV relay procedures to begin in October. The decision was not intended to suggest a precedent and it certainly did not, since the FCC reversed it three weeks later and awarded TV relay service to the international carriers on a rotating basis—apparently, the CBS network charged, because the carriers had in the meantime reconciled their differences and the record carriers had dropped their insistence on exclusive rights.

Interest in direct satellite use was considerable, and by the November 1 deadline on filings in the authorised users docket 27 different entities had submitted views to the FCC, most of them favouring lenient rules on access to satellite circuits. Comsat's own submission was apparently modest in contention, consisting essentially of a request to deal directly with users in the following instances:

[If] (i) the carriers fail to provide a requested service via satellite although capacity is available; (ii) there is a need for development of technology or provision of new satellite services and then only during the early developmental stages; ... (iii) in which case and any other case there is a finding that the public interest would be served by the authorization.

Finally though Comsat asserted that it was "authorized by the Satellite Act to provide service directly to the Government in any instance when the Government requests service." Representing the government, the General Services Administration—which oversees the internal requirements of the state apparatus—supported Comsat's contention that the government was under terms of the Comsat Act a fully authorised user.

The four international carriers, joined by the industry trade union, opposed permitting any entity other than themselves to lease satellite capacity. AT&T cited a comment made by Sen. John Pastore, the Comsat Act's floor manager, in 1962 that "the market to be served by the corporation consists of the carriers who will use its facilities," and
later charged that the non-carriers "are not attempting to interpret
the Satellite Act but to rewrite it." ITT tried to profit from
the drift of the FCC's earth station deliberations by asserting that
an entity had to be eligible to build and operate an earth station in
order to qualify as an authorised user. Notwithstanding the apparent modesty of Comsat's own requests, the
position of those entities which sought to deal directly with the com-
pany for satellite capacity posed a serious threat to the record car-
rriers, whose vulnerability was already an active concern of the FCC's.

At issue was the leased line market which, while accounting for
16 percent of the carriers' overall 1965 international revenues, com-
prised nearly one-fifth of the earnings of the three main record car-
rriers. As concerned voice traffic, although leased overseas lines pro-
vided less than 13 percent of international earnings and Bell, with the
preponderance of traffic, received less than 10 percent of its interna-
tional revenues from leases, the other 'international' phone carrier—
GT&E's Hawaiian Telephone Co.—earned nearly one-third of its revenues
for external service from leased lines. Opening up the market for
leased service to Comsat would therefore expose the weakest members of
the carrier industry to satellite competition, while leaving AT&T rela-
tively unscathed.

Although Comsat did not itself propose to enter the leased line
market writ large, the Corporation did assert itself wholly entitled
to accept government business, which accounted for 70 percent of the
leases of all commercial circuits industry-wide and 90 percent of leases
of voice-grade circuits, much of which were handled by the record carri-
ers as alternate voice-record traffic. The dependence of the small-
er international carriers upon government business is summarised in
revenue terms in Table VI (next page.) For the four carriers consi-
dered, revenues from government leases comprised more than 60 percent
of their total earnings from leased service and nearly 13 percent of
their overall international revenues. If Comsat were empowered to charge
leasing customers—whether private or governmental—the same rates at
which it made satellite capacity available to the record carriers for
resale, the latter would unquestionably have lost considerable business
Table VI: Dependence of carriers upon government revenues, 1965

<table>
<thead>
<tr>
<th></th>
<th>Total revenues</th>
<th>Total leased revenues</th>
<th>Revenues from government leases</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITT Globcom</td>
<td>29,808</td>
<td>5,952</td>
<td>3,200</td>
</tr>
<tr>
<td>RCA Worldcom</td>
<td>51,054</td>
<td>11,438</td>
<td>6,433</td>
</tr>
<tr>
<td>WUI</td>
<td>18,124</td>
<td>1,924</td>
<td>1,407</td>
</tr>
<tr>
<td>Hawaiian Tel.</td>
<td>14,280</td>
<td>4,741</td>
<td>4,606</td>
</tr>
<tr>
<td>(overseas)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>113,266</td>
<td>24,055</td>
<td>14,646</td>
</tr>
</tbody>
</table>


...and might have been unable to survive. Of particular concern would therefore be the switched or exchange services which comprised the bulk of their traffic and the principal services provided the general public. If the record carriers survived, normal telegraph service for instance would have to bear a bigger proportion of overall costs than hitherto, and rates would rise due to the loss of leased traffic; if the record carriers disappeared, Comsat would be in no position to replace the services that would disappear with them.

3. COMSAT AND GOVERNMENT SATELLITE PROGRAMMES

That Comsat nevertheless was asserting its right to state traffic with the full support of the government was one indication that the failure of the 1963-64 discussions on formally joining Comsat's and the Pentagon's satellite programmes had in no way spelled an end to the search for a mutually acceptable formula of cooperation between the two. Indeed in spite of the fact that the Department of Defence (DOD) was outspending Comsat on communications satellite R&D for fiscal years 1964 through 1967 by nearly three to one—and with NASA's outlay the government's total expenditure
was more than four times Comsat's — the state's interest in relying upon Comsat to meet a considerable part of its satellite communications requirements not only produced the 1965 NASA-Comsat agreement on Apollo services and the 1966 thirty circuits case, but was influencing the content of the government's own satellite programmes as well.

The government owned or leased around 13.5 percent of the total national overseas communications plant as of 1965. Three-quarters of that was operated by or for DOD, and with military communications needs growing at 10 percent yearly Pentagon usage was expected to comprise between 75 and 90 percent of all government space communications.

The first phase of DOD's communications satellite programme consisted of Syncoms II and III which, although nominally part of the civilian NASA's projects, were put to good use by the Pentagon to relieve congestion on the Hawaii-Southeast Asia route. Phase two of the military programme was to be the Interim Defence Satellite Communications Project (IDSCP), to consist of from 16 to 23 satellites in sub-synchronous equatorial orbits — the precise number would depend on the success of launches with up to eight satellites per rocket — and to involve use of mobile terminals on land and at sea. The first seven IDSCP spacecraft were orbited on June 16, 1966 and the DOD said the project would be "the world's first truly global satellite communications system." Work continued meanwhile on Tacsatcom, the tactical system considered "the most challenging and the most important program of all in military satellite communications," which would involve giant high-powered satellites and portable ground sets the sizes of rucksacks. The final phase of the Pentagon programme was to be the Advanced Defence Communications Satellite Project (ADSCP), which was approved in November 1965 and expected to be fully operational by 1970.

Comsat was naturally interested in getting as much business as it could from these projects. In February 1965 the company tried to secure for itself and Hughes Aircraft the $14m contract to supply components for, and manage, the IDSCP; but Philco had all but won that contract, and Comsat's proposal was rejected. Comsat had also been concerned about DOD's operational use of the NASA Syncom satellites, and sought assurances that NASA's follow-on satellite series, the ATS', would not be used so as to deny Comsat Pentagon traffic. NASA had asked the FCC to permit the ATS
spacecraft to use the desirable frequencies set aside for commercial usage. Comsat objected that NASA's proposed use would interfere with commercial satellite traffic, to which NASA replied that any interference "would at the very worst be minimal." It evidently was not however technical interference that worried Comsat, since the company agreed to the FCC's decision in March 1965 to allow NASA to use the frequencies as long as the ATS satellites were not utilised to carry administrative communications either for NASA or for any other government agency.\(^{(27)}\)

More important was the fact that Comsat was attempting to use the government's policy of providing its own satellite services only to meet "unique and vital" requirements in order to encourage strict limits on the usefulness of the proposed DOD systems. President Johnson had reiterated in his March 1966 message to Congress on Comsat that "it is the policy of the United States to support development of a single global commercial communications satellite system," adding:

The United States Government may establish and maintain separate satellite communications facilities including surface terminals to meet its unique and vital national security needs which cannot be met by commercial facilities.\(^{(28)}\)

When the Pentagon's satellite programmes came under the scrutiny of the House military operations subcommittee in August, however, the precise scope of the military's systems was defined by the head of the Defence Communications Agency as follows:

We interpret a requirement as being unique and vital if it must be fulfilled under all conditions, even nuclear attack, and if no other means would be readily available to fulfill adequately that need.\(^{(29)}\)

Consequently, the subcommittee found, the IDSCP was being designed to provide at a cost of $115m a total of two voice-grade circuits, intended as a 'last ditch' facility in case of nuclear war or some such contingency. Although after the hearings plans were announced to up-grade the system to 11 voice-grade circuits by mid-1967, the subcommittee insisted that a ten- or twentyfold expansion would be more to the point. ADSCP was similarly intended to furnish a modest increment in Pentagon capacity, and the subcommittee urged that it be up-graded to between 100 and 200 voice-grade circuits, concluding:

The military needs its own hard-core system of secure, reliable, flexible and survivable communications, not affected by business, labor, and international complexities and incidents of commercial operations.\(^{(30)}\)
The "uncertainty" apparent in the government's satellite plans was attributed by the subcommittee to Comsat's "eagerness" to sell the state its services. (31)

4. THE APOLLO PROGRAMME AND INTELSAT II

The first major instance of Comsat-state operational collaboration was, however, suggested by the government and proved to be of tremendous importance to the commercial satellite programme. Without the contract with NASA for Apollo-related services, according to one Comsat official, "in all likelihood there would not have been an Intelsat II program." (32) Comsat's forecasts as of 1966 of the availability of global satellite coverage were advanced—over-optimistically as it happened—by from one to three years as a result of the deal, which appeared to make service over two-thirds of the world certain, and global service possible, by the end of the year. Comsat's president testified in January 1966:

This early activation of an expanded communications satellite coverage is directly related to the interest of NASA in commercial communications satellite capacity to meet its communications requirements in connection with the Apollo program. (33)

With Early Bird stationed over the Atlantic, an Intelsat II in the same region would provide service for the first time to the South Atlantic, bringing Latin America and even western portions of the Indian Ocean into range; another II over the Pacific would double the number of circuits hitherto available between the U.S. and East Asia and make trans-Pacific television possible. Only coverage of a band between Pakistan and Thailand would remain before service was global. (34) Furthermore NASA, which would be paying $27m over a three-year period, was enabling capacity in excess of its needs to be created: in the Pacific, for instance, the space agency was interested in using 75 voice-equivalent circuits and the Pentagon a further 85, leaving 80 circuits aboard a single Intelsat II for assignment to commercial traffic. (35)

The National Communications System, acting on NASA's behalf, first approached Comsat in July 1965 to suggest that Comsat might be willing to meet NASA requirements for circuits to link Houston with points in Australia, Grand Canary and Ascension islands and a number of tracking
vessels.\(^{36}\) NASA would pay the $27m over a three-year period to Comsat and to the overseas telecommunications entities of Britain, Spain and Australia for their assistance. Although delays in satellite deployment later reduced NASA's obligation to $21.2m, the space agency nevertheless accounted for more than 28 percent of Intelsat's total revenues and nearly 27 percent of its traffic from 1967 through 1969.\(^{37}\)

Comsat initially tried to assemble a package deal for NASA by negotiating on its behalf with the foreign entities, but Australia and Britain insisted on dealing directly with NASA—probably because the space agency had hitherto relied mainly on the Commonwealth cable system for Pacific service and they saw no reason now to transact NASA business through Comsat.\(^{38}\) Under pressure from the foreign entities, the U.S. conceded an early preference for retaining surplus capacity for governmental uses and agreed to let the excess be used commercially by Intelsat.\(^{39}\) After terms were agreed by NASA and the four national entities—including Comsat—the latter worked out arrangements with Intelsat on NASA's behalf.

There remained, however, the critical question of whether the FCC would permit the arrangement, involving as it did direct access to satellite circuits by the U.S. government. In effect, as a House report later observed, the Commission was "presented more or less with a fait accompli."\(^{40}\) By the end of the summer of 1965, the telecommunications entities of Britain, Spain and Australia had signed on; on September 30 Comsat applied to the FCC for authorisation to serve NASA directly and to contract with Hughes for construction of the satellites;\(^{41}\) on October 5 Secretary of Defence McNamara—as executive agent of the National Communications System—instructed NASA to finalise its arrangements with Comsat;\(^{42}\) and on October 29, before the FCC had acted on Comsat's application, Intelsat's governing body approved the contract with Hughes for four satellites to be ready by autumn 1966.\(^{43}\) An adverse decision would therefore put the FCC in opposition to NASA, the Pentagon, three foreign PTTs and Intelsat itself. On November 10 the Commission approved, while noting that the action would not imply a precedent as to the eventual disposition of the government's standing as an authorised user of satellite capacity.\(^{44}\)
5. THE PENTAGON SEEKS 30 TRANSPACIFIC SATELLITE CIRCUITS

On January 21, 1966—while controversy continued over the FCC's authorized users docket—the Defence Communications Agency (DCA) was instructed by Cyrus Vance, then deputy defence secretary, to "proceed immediately to conduct negotiations" with Comsat toward procuring 30 transpacific satellite circuits to link military headquarters in Hawaii to installations in Japan, Thailand and South Vietnam. (45)

Despite its disclaimer of precedence, the FCC's approval of—or acquiescence in—the Apollo affair seemed to "bode well for this attempt by the Pentagon to lease satellite circuits directly from Comsat. DOD's requirements were urgent and exceptional: they were directly related to the escalating war in Southeast Asia (46) and later in 1966 the Army's chief of R&D described the need for terminals in the Pacific as in "the highest military priority category." (47) The Pentagon assumed it was authorised to deal directly with Comsat on the basis of a 1947 procurement act, which empowered government agencies to dispense with publicly-tendered competitive bids where "it is impracticable to obtain competition," (48) and on the basis of the Comsat Act, in which Section 201a(6) authorises the U.S. president to

> take all necessary steps to insure the availability and appropriate utilization of the communications satellite system for general governmental purposes except where a separate communications satellite system is required to meet unique governmental needs or is otherwise required in the national interest.

The application of that passage was, of course, precisely the issue in the continuing authorized users inquiry.

Why the government, whatever its authority to do so, should have wished to procure necessary satellite services commercially is another matter. In the Apollo case it was not a matter simply of NASA's leasing capacity from an existing network—indeed the government was in effect going to set one up for Comsat on NASA's behalf, notwithstanding the facts that NASA had developed the Syncom satellites upon which the Intelsat IIs would be based, was outspending Comsat by a handsome margin on satellite R&D and had a sufficient in-house capability to send men to the moon. NASA's explanation was that "we felt it was national policy to have a commercial entity responsible for communications using
satellites," according to the agency's deputy administrator.\(^{(49)}\) Congressional approval of the scheme was based in part on a desire to strengthen Comsat's position internationally in view of the Intelsat re-negotiations beginning in 1969.\(^{(50)}\)

The Pentagon's interest in using Comsat appears to have derived from a larger desire by the government to secure the satellite system as an accessible resource. The government had, as a matter of policy, committed itself to confining its own space systems to meeting highly specialised, 'command-control' requirements while relying on commercial facilities for most of its administrative and logistical traffic,\(^{(51)}\) although spokesmen were at the same time attempting to preserve "sound cost efficiency and other management considerations" as additional factors which might yield a preference for in-house facilities,\(^{(52)}\) whatever the technical adequacy of commercial circuits. Relying upon Intelsat would likely be cheaper than constructing a fully comparable military satellite system and might even be more secure since, as the White House director of telecommunications management noted:

> Vast international communications, commercial communications, have not been jammed as a rule. Technically, all electronic radiating systems are vulnerable, fundamentally. But we think that the inclination to jam an international association of 52 nations would be somewhat remote, more remote than if only one nation were involved.\(^{(53)}\)

Precisely how attractive the government would find reliance upon Intelsat depended, however, on the terms on which its circuits were made available—which was the subject of the ongoing FCC inquiry.

In February 1966 the White House, through its Director of Telecommunications Management James O'Connell, began an effort to influence the authorised users docket while retaining for the government discretion over commercial communications dealings. O'Connell circulated to the Pentagon, FCC and other parties the draft of a proposed state policy on procuring commercial satellite services. The draft asserted that the government was by law an authorised user and could therefore deal directly with Comsat whenever the president decided it would be in the national interest. Notwithstanding that right, however, in order to enable the FCC to finish its investigation, conduct studies on optimal arrangements and establish a basis on which a definitive policy could
be decided, O'Connell proposed a one-year moratorium on direct dealings. During that time the government intended "to exercise its rights as an authorized user and to seek services from Comsat only in those cases where exceptional and urgent circumstances exist"—as in the Apollo affair. Otherwise the government would operate on "a comparative basis," soliciting and evaluating proposals from all the commercial carriers including Comsat.

O'Connell's draft was rejected out of hand by the Pentagon and the FCC. DOD issued a one-page reply which agreed that the government was an authorised user and said that state agencies could therefore contract with whomever they wished "to the end that the procurement will be to the best advantage to the Government, price and other factors considered." The FCC, through common carrier bureau chief Strassburg, said that Comsat would need Commission approval before transacting business with anyone. The White House's suggested criterion of national interest was "too vague and indefinite" to serve as a policy guideline, and the government's concerns as a potential customer of satellite services had to be put in the context of broader policy interests. Curiously, Strassburg concluded, "I see no compelling reason to depart from existing policies," of which officially at least there were none.

In spite of its apparent reception, the White House intervention had the important effect of getting the Pentagon to open up bids on the 30 circuits to other international carriers in order to compare Comsat's offer with those of its rivals. The move was also a concession to the carriers, who were growing restive at Comsat's alleged abuse of its state paternity and at the company's presumption in concealing from them its negotiations with DOD. Although Comsat later claimed to have informed the carriers during a January board meeting, RCA and WUI—not represented on the board—claimed they knew nothing until April, and Comsat appears to have taken pains to get firm commitments from foreign entities before the carriers had been fully apprised.

In any event, after Comsat had enjoyed a four-month headstart and had all but concluded the arrangements with foreign correspondents to handle the Pentagon's traffic, a request for competitive bids was published on May 2. DOD then "went through the motions" of evaluating
the bids, as a House report concluded, and on June 1—two days after the closing date—signed a master contract with Comsat. Although not finally binding, this action appeared to confirm DOD's intentions.

6. THE AUTHORISED USER DECISION

In the face of the Pentagon's apparent determination, the FCC took the unusual step of releasing on June 24 a public notice of its authorised users decision before the formal opinion and order were ready for issue. Comsat was not, the FCC said, "a full service carrier." Although the Satellite Act "clearly empowers the Commission to authorize Comsat to provide service to entities other than the carriers," such service had to be decided subject to the "objectives and purposes" of the law. Prominent among these were the requirements that the FCC guarantee "non-discriminatory access" (Sec. 401) by all approved users and that it "maintain and strengthen competition" (Sec. 102c) in the provision of overseas services. If Comsat were allowed to serve bulk private users directly, both objectives would be "frustrated": the record carriers would be unable, if offered services at the same tariffs as many of their customers, to re-sell satellite capacity both competitively and at a profit, and would be deprived "of the opportunity to serve segments of the public under fair and equitable conditions." Sound policy indicates that...[the carriers] should not be required to depend solely on Comsat for satellite circuits while Comsat is simultaneously allowed to siphon the most profitable part of the business from them...

Furthermore, since only "a very small part of the using public" had enough traffic to warrant bulk leases and since this was "not a situation where a proposed competitor would meet all or even a major portion of the essential public needs should it supplant the other carriers," permitting Comsat to enter the direct leasing market would oblige its rivals to raise their charges on switched services to the "detriment to the vast majority of users for the benefit of a few large users..." Comsat was therefore forbidden to deal directly with private users unless the carriers refused to furnish them with requested satellite capacity.

In regard to government-Comsat transactions, the FCC conceded that by law "there is no question that the Government is to be included in the
category of authorized user."(66) As a matter of policy, however, and because government traffic figured so prominently as a source of carrier revenues, the FCC would not approve direct service unless the government stated that it was required in a particular instance in the national interest:

Comsat may be authorized to provide service directly to the Government whenever such service is required to meet unique governmental needs or is otherwise required in the national interest in circumstances where the Government's needs cannot be effectively met under the carriers' carrier approach. (67)

There was, as a congressional report later observed, a "fine irony" to this aspect of the ruling, "for it closed a cycle of argumentation which boomeranged on the Government"—the same criterion of 'unique and vital needs' that the government had promulgated in regard to separate satellite systems had been adopted by the FCC to restrict the government's entitlement to deal directly with Comsat. (68) If the state was legally empowered to treat Comsat as an in-house resource, then the conditions under which it could do so would be no different than those governing creation of the state's 'own' systems.

Finally, included in the FCC's formal decision—issued in full on July 21—were instructions to the international carriers to submit proposals for wide-ranging tariff reductions. Though ostensibly to reflect the savings anticipated from satellite operations, these price cuts were also explicitly to include reductions on overseas services for which satellite facilities were not then available or even likely to be available in the immediate future. The reductions were intended to reassure the government and other customers who required "redundancy and diversity" in international linkages—cables as well as satellites—that rates would be cheaper all round if the carriers were permitted to absorb satellite services into their ongoing operations.(69)

7. THE 30 CIRCUITS CONTRACT CONCLUDED—AND CHALLENGED

Such price cuts would, however, have to be substantial to make up for the enormous difference between the carriers' rates and Comsat's, which came to light when five days after the FCC's decision was issued the Defence Communications Agency (DCA) awarded Comsat the 30-circuits contract for a
three-year period. Indeed the gap was so wide that the Pentagon had invited the carriers in June to submit new bids, to little avail. Comsat had offered DOD a rate of $4,200 per month for each voice-grade circuit—as against ITT's $10,000, WUI's $11,195, Hawaiian Telephone's $12,500 and RCA's $11,000. In short, Comsat was willing to provide service to the Pentagon at less than half the price of its nearest rival.

The FCC's power to prevent Comsat from honouring its contract with the Pentagon—though arguable in view of the government's statutory rights as an authorised user—led all parties to submit claims and counterclaims to the Commission. The carriers protested the 30-circuits contract, AT&T contending that it "looks upon satellites and cables as complementary and not competitive," and RCA arguing that the contract would "weaken the competitive position" of the carriers. The government had already warned in June that if the authorised users decision were sustained, "it would appear important to review the general question of whether the government should continue the policy of relying upon the common carrier/regulatory system for the provision of the bulk of its services." In mid-August the government and Comsat submitted "almost identical filings" arguing that the authorised users ruling should be amended but that the Pentagon-Comsat contract was valid regardless. Said Comsat:

There is not a shred of evidence in the Satellite Act, or in its legislative history, for the proposition that the government is to be limited in direct access to Comsat only to those unique situations in which the government would be justified in having its own satellite system.

Furthermore, if satellite and cable services were to be priced uniformly—as the rate reductions ordered in the FCC decision presupposed—satellite tariffs would be kept artificially high, expansion would be inhibited and cable technology would be shielded from competition.

The impasse was not, however, soluble before the FCC but in the course of hearings called by the House military operations subcommittee in August a way out emerged. Unbeknown to the carriers, and disclosed only during the hearings, the DCA-Comsat contract contained an escape—or 'assignment'—clause, relieving the Pentagon of liability for possible damages by giving it the option of assigning the contract to other carriers if it wished or if, for instance, Comsat could not obtain FCC clearance. The DCA had kept the clause secret by refusing the carriers copies of the contract
since the clause "bespoke an open-ended opportunity to vie for the Comsat contract," as the subcommittee later reported. (75)

This the carriers promptly did, accepting the FCC's order to file proposals for rate reductions and submitting cuts of some 40 percent on transpacific services. ITT's new monthly rate per circuit would be $7,100—if the company were awarded the entire 30-circuit contract—and WUI offered $8,000 regardless of how the DCA contract was assigned, while promising to meet the ITT bid if it got the whole contract. RCA in early October filed similar reductions. (76) Although the new rates were still much higher than Comsat's $4,200 bid, the carriers had the enormous advantage of being able to promise reductions on not only the 30 circuits but on the rest of the government's commercial requirements in the Pacific—as well as those of other bulk users—while Comsat could only bargain on the basis of the 30 circuits and whatever other satellite capacity the government might be interested in leasing. Estimates varied as to how much the government would save by accepting the carriers' offers: the Pentagon and the White House calculated that application of the lowest composite rates—those proposed by WUI and ITT—would save per year between $6.1m and $6.7m in the Pacific, excluding the 30 circuits, and around $900,000 in the Atlantic, as against $2m to $2.9m in savings from Comsat; the FCC's figures were even more favourable to the carriers' offers, and by adding the savings the lower rates would provide on the 98 cable circuits the Pentagon currently leased in the Pacific and the reductions on the carriers' previous bids for the 30 satellite circuits, along with expected savings if the foreign carriers followed the Americans' examples—and the reductions private customers would consequently receive—the Commission arrived at a total figure of $11.5m per year in savings for all commercial circuit users in the Pacific. If, furthermore, the new composite rates were applied in the Atlantic region, savings would be even greater. (77)

8. THE PENTAGON GIVES IN

The carriers' offer had virtually everything going for it, as the House subcommittee concluded: savings to the government would be greater, overall rate reductions would benefit all users, foreign administrations might follow suit, "a more harmonious relationship among Government
agencies and within industry would be promoted," and Comsat would suffer no loss of revenues "since it would supply, through Intelsat, the space segment services in any case."(78)

The Pentagon was, however, not satisfied that the carriers' proposed reductions were sufficient, and in mid-September Secretary of Defence McNamara informed the FCC that the lowest carrier rates were still "unjust and unreasonable:" ITT would, for example, be charging DOD $7,100 per month for services for which it would be paying Comsat $4,250, leaving ITT with a net $85,500 monthly from the 30 circuits alone.(79) DOD also claimed its Atlantic cable rates were too high, and again warned that it might expand its own satellite system to handle administrative traffic if its objections were not heeded.(80)

Nevertheless, once the House subcommittee report was issued in October urging acceptance of the carriers' offer the handwriting was on the wall. On October 10 DOD announced it was ordering 10 satellite circuits from WUI for U.S.-Hawaii service, allegedly to enable DCA to gain experience in using commercial circuits prior to the anticipated commencement of transpacific service in April, and to hasten application of the new composite rates. By December the 10 circuits had been apportioned among the five international carriers, again supposedly for temporary experimental purposes.(81) Then on January 31, 1967 the White House director of telecommunications management asked the FCC to give Comsat temporary approval to furnish the 30 circuits to the Pentagon for a preliminary period, after which they would be re-assigned to the other carriers.(82)

Two days later Comsat was instructed to begin the DCA service, and the FCC stipulated that ITT, RCA, WUI and Hawaiian Telephone would take over as soon as practicable. In a separate order the Commission attempted to clarify its position on direct government-Comsat dealings by stating that such service would be permitted if the White House certified that it would be in the national interest. Although this proviso appeared to be a concession to Comsat, leaving open the possibility that the nearly moribund 30-circuits contract could be revived, any such intervention by the White House would at this point be difficult to justify: first, even if savings could be advanced as a 'national interest' consideration, the carriers' rate reductions had undermined the economy argument; second,
the case for urgency had been largely eliminated by the FCC's willingness to allow Comsat to provide the service immediately on a temporary basis; and third, any contention that Comsat was uniquely qualified to furnish the capacity would be clearly untenable, since the carriers were unquestionably qualified technically. (83)

So the authorised users decision, effectively extended to include state traffic, was sustained and by April 1, 1967 the international carriers were installed as middlemen in the entirety of Comsat's satellite business. (84)

9. CONCLUSIONS

The authorised users decision has been defended as "probably inevitable and almost certainly sound" (85) and condemned as "tragic." (86) Schwartz has written that in its absence the international carrier industry would probably have evolved into an AT&T-Comsat duopoly, with a corresponding decrease in the already deficient degree of competition. (87) To this it should be objected that it is far from clear that the industrial structure the decision was meant to preserve was preferable: the international carrier industry is probably best described as a monopoly disguised as a cartel, and even if Comsat's position had been sustained that company would still have remained competitive to both its owners and principal customers in its quest for private sector business—hence an unlikely co-equal to AT&T in a duopoly. (88) To counteract AT&T in any meaningful sense would require either merging Comsat with the record carriers and/or allowing Comsat to have as much state traffic as it could get, in both of which cases some substantial basis of industrial independence might, arguably, have been created.

For Kinsley the decision helped "to keep satellite economies obscure, preventing satellites from competing with the carriers' cables," (89) and the Rostow Report similarly concluded that the ruling has "insulated the record carriers from direct competition from Comsat." (90) Such was, of course, a principal reason given by the FCC for obliging Comsat to deal exclusively through the carriers since the proposed competition would have comprised little more than 'cream-skimming'—Comsat taking over the
lucrative leased-line business and leaving the record carriers—and the general public—to bear the increased costs of switched services, if that is these managed to survive. The problem with this distributive rationale is that its applicability to government traffic rests on a mystification of the origins of state revenues: since the state's operating expenses are borne ultimately by taxpayers—who moreover had already paid to develop the same technology they were now being obliged to pay the carriers not directly to use—the identification of the state with other big corporate users is unacceptable. In these terms it would have been more defensible to allow the prices on switched record services to rise to the point where they reflected disaggregated costs—or even to provide a subsidy from leased revenues—than to penalize non-using taxpayers.

One is left with the simpler protectionist justification: the carriers were forbidden by law to undertake satellite development themselves and could therefore not compete with Comsat in the supply of those services, and if they were obliged to purchase satellite capacity at the same prices as their erstwhile customers they would, through no fault of their own, be in sorry shape. As a congressman told Comsat's chairman during September 1966 hearings:

'It looks to me like [the carriers] are going to be dead ducks because they have not got the facilities and they cannot possibly compete with you on these services...So you will have a true monopoly when we get all through.' (91)

Whether it was to be Comsat that would have to bear the costs of this protection was something that the FCC—and some Comsat officials—contended was unlikely. A former Comsat vice president described the decision as "of no great economic consequence" to the company, (92) and the FCC similarly argued:

'Since...Comsat's proposed charges to the carriers and other users would be substantially the same, it should realize substantially the same revenues whether the carriers or others lease circuits from it.' (93)

This contention does not seem reasonable, however, and appears to contradict a central reason given for the ruling: the potential price sensitivity of demand for satellite services, if freed from the restrictions of composite pricing. If Comsat would not attract a greater volume of traffic by being permitted to set tariffs which reflected only satellite
costs, there was no reason to prevent it from doing so, since the record carriers would retain the cable traffic that had hitherto been sufficient for their survival. Furthermore, the argument implies that the FCC could administratively assure Comsat the same volume of traffic the company would attract if permitted to undersell its competition—which is both implausible practically and would be the very eventuality the Commission was trying to avert: what then would become of the switched services and indeed the undersea cables? The FCC, in short, could not have it both ways, could not claim to subvert and defend the same policies at the same time. Comsat could not help but lose from the decision, and its loss would be the carriers’ gain. (94)

If the authorised users decision could nevertheless be defended as a way to promote ‘competition’ and assure nondiscriminatory access, it did so at the expense of rational resource allocation. For private users, the administered preservation of companies whose operational usefulness has largely disappeared represents an illegitimate charge. For the government, an obligation to pass through two levels of private middlemen — Comsat and the carriers—in order to gain access to a technology the state had developed, and only then upon payment of fees based on inherited industry costs, was likewise illegitimate. Moreover, it is hard to see how enforcing the preservation of companies that largely depended for their survival upon state business would seriously contribute to competition within the private sector. To the degree that the decision was ‘inevitable and sound’, as Schwartz has claimed, those attributes derive from its service within a wholly unsound context, defined by the desire to safeguard an archaic industrial structure by diluting the benefits of a thoroughly modern technology.

What is clear is that the combined impact of the earth station and authorised users decisions was to rewrite the 1962 legislation so that the situation would, in its essentials, conform to the position on which the FCC and carriers had insisted throughout the legislative process. The practical significance of Comsat’s formal status as a quasi-independent corporation was all but eliminated: the company’s domestic facilities were, under the earth station decision, common property of the carrier industry; now Comsat would have to depend for its business on
traffic shunted onto its circuits by the carriers; and as the next chapter will show, the prices of satellite circuits would be determined by the need to support and amortise in an orderly and lucrative way the totality of industry investment in plant. Having failed to convince the White House and Congress that it would be best to integrate satellite communications fully and formally into the existing carrier industry, the FCC and carriers did so administratively—effectively restitching the fabric of evasions and ambiguities that had so deliberately been woven into the 'Comsat compromise'.
1. OVERVIEW

The third principal arena of U.S. satellite controversy concerned the coexistence of undersea cable technology and communications satellites. Through authorisations for new cables in the Caribbean, Atlantic and Pacific issued between 1966 and 1973, the structure of industrial control over satellite technology that was extended in the earth station ownership decisions and defended from attenuation by the state in the authorised users rulings was sustained on the level of technological dominance.

At stake in these cable authorisations was the degree to which satellites either would be free to maximise traffic and realise economies of scale, which in turn would permit lower tariffs and greater expansion of services, or conversely would be obliged to develop in a parallel fashion with submarine cables, prevented from depriving a growing cable network of a substantial share of overseas traffic and indeed compelled to reflect cable costs in the rates charged to satellite users. Hence while the cables would serve primarily the metropolitan countries, the impact of their operations would be global through lower satellite utilisation and higher tariffs worldwide.

Before recounting the history of these cable authorisations, the chapter begins with a comparison of cable and satellite capabilities, costs and reliabilities, which concludes that in most respects satellites were the superior communications technology. The determinants of continued cable construction are then discussed—including U.S. state policies favouring intermodal diversity in overseas links and possibly government uncertainty over the future of American control over Intelsat, analogous policies in Europe supporting cables on technical and political grounds, and the outstanding interests of the U.S. carrier industry in preserving the more profitable cable technology.
2. CABLES AND SATELLITES COMPARED

The so-called satellite era has also been a period of dynamic growth and technical advance in submarine cable technology. Between 1955 and 1970 some 94 voice-grade cable systems linking continents or coastal points were constructed, and global mileage of undersea cables trebled in the first decade after Early Bird's launch in 1965. Table VII provides the numbers of countries in representative years which were directly connected to international broadband transmission systems, and suggests the parallel pace of cable and satellite growth.

Table VII: Total countries linked directly to international broadband systems for selected years

<table>
<thead>
<tr>
<th>Year</th>
<th>Submarine Cables</th>
<th>Satellites</th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>13</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1970</td>
<td>49</td>
<td>34</td>
<td>23</td>
</tr>
<tr>
<td>1975</td>
<td>54</td>
<td>77</td>
<td>35</td>
</tr>
</tbody>
</table>


Inherent advantages: Cables were not without some inherent advantages over satellites, providing telephone service without time delays or echo problems, placing no demands on the frequency spectrum, causing no interference with over-the-air services, offering greater life expectancies than satellites and requiring no theoretically limited assignments in the geostationary orbital band. Satellites, on the other hand, offered: linkages whose costs were insensitive to terrestrial distances, direct interconnection—unmediated by lengthy overland lines—of all points equipped with ground stations, practically instantaneous compensation for most technical malfunctions in space through availability of in-orbit spare satellites, television relay, and the possibility of point-multipoint transmission.
Capacity and costs: Cables were steadily improving in terms of greater carrying capacities and declining costs per circuit. The first transatlantic cable, TAT-1 in 1956, provided 36 voice circuits at a capital cost of $45m in current dollars; TAT-5 in 1970, the first transoceanic cable with transistorised amplification, offered 720 voice circuits between the U.S. and Spain at a cost of $107m. Costs per circuit had thus fallen from $1.25m to $140,000 in less than 15 years. Furthermore a technique, known as Time Assignment Speech Interpolation (TASI), had been perfected whereby simultaneous conversations were interleaved through rapid sampling—such that the first four TAT cables, with a nominal combined capacity of 470 circuits, could be stepped up to 580 and TAT-5 could provide 825 voice circuits. Methods of burying cables at their most vulnerable points, near coastlines, were also refined to reduce their susceptibility to breakage by trawlers, their most common enemy. Finally, although cables were normally depreciated over a 20-year period some estimates held that the new models would last as long as a century.

Notwithstanding those advances, satellites were still given the edge over cables in most respects. Comsat's chairman spoke in 1966 of a 'cost-effectiveness ratio' of twenty-to-one in favour of satellites, based on average cable lives of 20 years and satellite lives of five years, capital costs for satellites at one-half cables', and satellites offering 10 times the cables' circuit capacities. Inasmuch as Comsat was also forecasting improvements from satellite generation to generation of four-to-one in circuit-years (capacity multiplied by satellite useful life), those estimates were probably conservative. A 1968 study by the U.S. National Academy of Engineering examined three strategies for meeting an anticipated 10 percent annual traffic growth in the North Atlantic between 1975 and 1985: 1.) all additional investment in satellites; 2.) incremental investment divided between cables and satellites, but emphasising satellites; 3.) incremental investment again divided, but emphasising cables. The Academy's findings, summarised in Table VIII (next page), were that: "[T]he optimal system would be the maintenance of existing cables with incremental investment concentrated in satellites, except
when Defense needs are overriding"—in which case the Pentagon should pay for the additional cables. A 1971 study for the White House

Table VIII: Comparison of three strategies for meeting transatlantic requirements through cable and satellite deployments

<table>
<thead>
<tr>
<th>Strategy</th>
<th>1985 traffic percentage via satellite</th>
<th>Cumulated annual costs, 1976-85, US $m</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.) All incremental investment in satellites</td>
<td>85</td>
<td>90</td>
</tr>
<tr>
<td>2.) Incremental investment mainly in satellites</td>
<td>70</td>
<td>127</td>
</tr>
<tr>
<td>3.) Incremental investment mainly in cables</td>
<td>48</td>
<td>184</td>
</tr>
</tbody>
</table>


Office of Telecommunications Policy of projected costs for 1976 similarly concluded, in spite of generally adverse assumptions made as to satellite use, that for transoceanic communications—where cables were at their best as compared with satellites—current satellite technology was still about one-third cheaper than current cables. In terms of purchase prices alone, the entire eight-satellite Intelsat IV space segment—including in-orbit and on-ground spares—which offered some 5,000 voice circuits per satellite, cost roughly as much as a single TAT-5 cable, which was capable of linking only two points directly and providing a maximum of 825 circuits.

It is therefore clear that when the FCC approved in 1966 construction of an 800-circuit cable from Florida to Puerto Rico at a projected cost of $38.5m, in 1968 a 720-circuit $107m TAT-5, and in 1972 a 3,500-circuit $145m TAT-6, it was not acting to minimise costs. Indeed in the first instance the Commission simultaneously approved a satellite earth
station in Puerto Rico, and the Rostow Report later observed: "[E]ven if the highest responsible estimate of demand for 1970 should materialize, either the cable or the earth station will turn out to have been a redundant facility." 

That the FCC was disinclined to assign importance to costs was clear when the Commission refused to discuss costs in its TAT-5 authorisation, and when the FCC chairman announced in June 1971 that circuit cost estimates would not and should not be decisive in the TAT-6 case.

Comparative reliabilities: Although AT&T claimed, during the opening phase of an FCC inquiry into long-term international planning in late 1970, that "cable circuits have proven to be much more reliable than satellite circuits," the contention is arguable and, on balance, in spite of some considerable difficulties with the Intelsat III series satellites appear to have been the more reliable technology. The IIIs, deployed between September 1968 and July 1970, unfortunately came during a critical period of cable deliberations—and with only two unqualified successes in eight attempts did the satellite case little good.

In all, the satellite system sponsored 15 launch attempts between April 1965 and December 1971; four satellites failed to achieve orbit and four others had some technical malfunction that either limited or eliminated their usefulness for communications before the end of their projected lives. The Intelsat IV series—which had been intended to inaugurate officially the global system—was more successful; deployment began in January 1971 and by May 1975 Intelsat's overall success rate for the preceding decade had risen to 12 out of 21 attempts. With the IVs, furthermore, Intelsat initiated a policy of stationing a spare high-capacity satellite—or its equivalent in earlier craft—over each of the three oceanic regions to incorporate a full measure of circuit redundancy into the system.

Intelsat also had problems on the ground, attributed by Comsat to the separation of earth and space segment ownerships in the U.S. but also due to use of small, mobile stations by NASA during the II series. In any case Comsat contended that most of the outages were brief and were caused by switching to alternate equipment for maintenance.
purposes rather than by actual malfunctions. Nevertheless between 1970 and 1971 earth station service continuity was improved to 99.99 percent and circuit losses due to ground problems were reduced 25 percent.

Notwithstanding its shortcomings, the satellite system seems to have been more reliable than the cable network in at least two respects: the duration and seriousness of technical mishaps. AT&T's 1970 contention of cable superiority was based upon figures which showed that for the 19 months ending with July 1970—hence comprising the entire lamentable III series—satellite circuit failures had averaged 11 per day as against one per month for cables. The figures ignored, however, the length of time required for repairs and circuit replacement; at their worst—where insufficient spare capacity aboard the satellite being used existed, or if no in-orbit back-up satellite was available—a replacement satellite could be launched within two or three days; cable breakages, which rarely led to anything but a total loss of circuits, took anywhere from three days to two weeks to locate and repair. Consequently, while Intelsat's reliance on cables for emergency back-up facilities was derisory, the cable network's dependence on satellite 'cable restoration' services was chronic and gave no signs of improvement with the more advanced cables: only once were cables needed to restore satellite circuits, that in 1969 when a total of 49 circuits was shifted onto the Caribbean cable; TAT-5 failed four times in 1971 alone—requiring 500 hitherto cable circuits to be shifted onto satellites for up to two weeks and when in April a second cable broke at the same time, 633 circuits were transferred to satellite. In all, although this is only a partial indication, Comsat's revenues from cable restoration service were 68 percent higher in 1971 than in 1968, in spite of the fact its tariffs were lower.

If, in short, a single technology were to be selected to assure reliable, low-cost and high-capacity overseas communications, the choice would seem clearly to be satellites. The need for choice, however, was not accepted by most of the interested parties in the cable–satellite deliberations.
3. DETERMINANTS OF CABLE CONSTRUCTION

The technical, political and economic case for continued cable building was such that Comsat was virtually the only participant in the actual deliberations to oppose further authorisations. That is not to say, however, that Comsat's were the only interests that stood to be harmed by more cables, as we shall see.

Technical factors: The U.S. government's support for cable construction derived from a national policy favouring a diversified overseas transmission capability. As the White House director of telecommunications management (DTM) told a congressional committee in 1966:

"It would be a serious mistake at this time to conclude that cables are outdated. The development of transistorized, broadband cables should be aggressively pushed in the United States as well as abroad. They are a natural complement for satellites and do not consume the frequency spectrum." (29)

The White House similarly praised the "wisdom" of the FCC's TAT-5 and Caribbean cable decisions in November 1969: "In times of crises it is vital that the United States have the means of communicating overseas which will provide the greatest overall reliability of service." (30)

The FCC was no less concerned with technical diversification, (31) and when the Commission's chairman declared in 1971 that relative satellite-cable costs would not be decisive in the approval of TAT-6, he noted the importance of maintaining reliability through intermodal diversity. (32)

The policy was recognised as encouraging higher costs—and tariffs—than would otherwise have been the case. During the Comsat Act debates the FCC chairman was asked whether a carrier could charge a dollar for services it could provide through alternate means for 20 cents. "We would not be doing our job," he replied,

"if we permitted any kind of return that was not geared to the particular facilities useful for the service. The trouble with it is that in the communications field, first of all, by national interest we are required to keep more than one service going. (33)

The National Academy of Engineering study cited above (see Table VIII) also cautioned that the cost savings a primarily satellite-based overseas plant would provide had to be balanced against "the better quality of cable service resulting from shorter time delays and the potential
benefits of mixed-mode service—for example, greater reliability and re-
tention of competitive modes..." The 1968 Rostow Report, while ac-
knowledging the costs of the policy and arguing that optimal use of the
two technologies was unlikely as long as they were separately owned,(35)
nevertheless endorsed the pending TAT-5 application in the interests of
"total availability," as Rostow later said. "Ultimately it was a defence
question."(36)

The technical concern with diversity was shared in Europe, though
not apparently for military reasons. The British Post Office sought a
50-50 split in the traffic loads to be borne by cables and satellites,
and furthermore initiated within Intelsat the notion of using two satel-
lites in the Atlantic, one 'major path' facility to handle messages among
big traffic stations and the other to link all terminals in the region.
Along with other European PTTs the British were significantly ahead of
AT&T in introducing international direct dialing, which intensifies the
need for reliability in commercial overseas linkages since callers whose
calls cannot be completed tend to continue trying, thereby placing added
loads on domestic grids. It was estimated that a loss of more than 25
percent of overseas capacity at a stroke could provoke disruption of domes-
tic telephone service, and the British sought to design their international
facilities so that no more than that would be concentrated in a single
transmission device.(37)

Political factors: For the U.S., relying primarily on the Intelsat
system for overseas linkages might have led to a situation where control
over the national capability was substantively shared with foreign PTTs
and, by extension, foreign governments. While this concern was not ex-
pressed as such in the official cable deliberations, the American govern-
ment was unquestionably aware by early 1967 that considerable European
discontent with Comsat—and U.S.—Intelsat dominance existed, and that
material political reforms might very well be necessary to ensure Intelsat's
continuance beyond the interim period. President Johnson's message
on communications policy in August noted that foreign sentiment,(38) and
by the autumn American diplomats were circulating drafts of proposals for
permanent Intelsat arrangements. Although cable ownerships were also
shared internationally, the share quotas were fixed from the outset and
were usually distributed only among the few countries where the cable heads were landed. Although American shares were high, the cables were politically non-controversial and therefore much safer than satellites.

New cables were also politically attractive to the European Intelsat members, offering a means to pressure Comsat, to resist efforts to accelerate satellite deployment and to moderate reliance on an international venture whose future was uncertain. The presence of a credible cable alternative meant the possibility that serious intransigence on Comsat’s part in acceding to European demands could provoke a pull-out from Intelsat—or a shift simply to leasing satellite circuits—without endangering overseas services. Having sufficient cable capacity available could also help sustain European efforts to defer approval and deployment of new satellites—especially the Intelsat IVs—until after the re-negotiations were concluded, when it was hoped modified procedures would result in more contracts for European firms and aerospace development would be sufficiently advanced to permit more successful competition. Finally, it seems reasonable to surmise that cables would enable the Europeans to hedge their bets on Intelsat: if the organisation fell apart because of political irreconcilabilities, important international linkages would be retained notwithstanding. European PTTs were in any case actively supporting construction of the TAT-6 cable at the same time as the permanent Intelsat arrangements were being negotiated.

Economic factors: The principal elements of the U.S. carriers’ interest in new cables were contained in this summary of the pro-cable argument provided by Comsat in November 1967:

We are aware that under the Communications Satellite Act, the satellite offers to U.S. carriers no rate base or profit potential comparable to their investment in cables. We are aware that to the European cable participants, the cable affords a larger measure of control in the limited system than they may expect in the global system. To the same parties, also, the cable offers transiting income between cable head and communicating point. We appreciate that the economics of cable manufacturing and cable laying industries are favored by keeping their facilities busy...

At issue for the American carriers was not their existing outlays in undersea cables—AT&T alone had as of 1965 some $225m worth of cable holdings—since there was no precedent for the FCC’s striking these assets from the carriers’ rate bases and no suggestion that it should, but rather the
future of a far more lucrative source of continuing investment than the satellite system. The TAT-5 cable, for instance, was initially estimated to cost $70m—not including another $20m in land connections—which would be depreciated over from 20 to 25 years, yielding a cumulative return to its owners of around $260m.\(^{44}\) Hence a single cable might easily expand AT&T's rate base more satisfactorily than the company's total investment in U.S. satellite ground facilities—the carriers' being unable to include their space segment (Comsat) shares in their rate bases.

AT&T not only operated submarine cables, however, it also built them. While Bell claimed that foreign cable companies would "move into the vacuum" to the detriment of the American capability in the field if the U.S. carriers' cable proposals were rejected,\(^{45}\) its patriotic impulse is hard to credit. It was a British subsidiary of ITT, Standard Telephone and Cables Ltd., that was fast becoming the world's leading cable outfit\(^{46}\) and Bell's real concern was very likely that its Western Electric manufacturing subsidiary would be held back by FCC restrictions while ITT continued to refine and market cables elsewhere. ITT though did not view its cable interests so exclusively, and joined with AT&T in urging the various authorisations.

Comsat's dissent: For Comsat itself, new cables would help fulfill the threat implied by the authorised users decision by legitimating diversions of potential satellite traffic onto the new facilities. The cables would provide the carriers with the incentive—and indeed the financial necessity—to deprive the satellite system of traffic. Application of composite rates—making satellite and cable tariffs uniform—would mean that satellite rate reductions need go little further than the system's carrier customers, whose charges to ultimate users would remain buoyed up by parallel investments in cables. Only if the carriers had no choice but to route traffic via satellite would this threat be allayed. Otherwise, as Comsat's chairman put it, the carriers' use of satellite circuits would be "like renting a motel room down the street when you have a spare room in your own home."\(^{47}\)

Although Comsat's prospects for rate base expansion would suffer, however, its immediate financial prospects were probably in little danger: it was unlikely that Comsat would be unable to meet its current revenue requirements no matter how heavily its costs would, because of
the traffic the new cables would absorb, fall on each utilised satellite circuit. Nevertheless Intelsat's financial prospects were at issue, and to the degree that Comsat's leadership would be tested by its ability to defeat this threat to the satellite system the company was obliged to fight, not for itself alone. Comsat told the FCC that "the economic benefits from satellite operations are dependent on the use of large capacity satellites and maximum utilization of the system." Commenting on the TAT-5 proposal in November 1967, Comsat's chairman wrote:

We oppose any compromise solution in the Atlantic which would handicap the economic capability of satellite communications and would water down the commitment of the U.S. to the lowest cost communications for developed and less developed nations alike, many of whom may never have cable service.

The awareness that lower utilisation in the North Atlantic would mean higher satellite tariffs elsewhere was not lost on Third World Intelsat members, and led to a protest of the pending transatlantic cable plans from a meeting of the Inter-American Telecommunications Commission in Mexico City in autumn 1967. New cables would mean, in effect, subsidy of the richer nations by the poorer through denial of operational economies to those who gained virtually nothing from the success of the policy the subsidy would finance.

Pre-conditions: This protest helps illuminate some of the political, technical and industrial pre-conditions upon which satellite-cable rivalry was based, without which the determinants of cable construction we have described would not have operated. Politically, the U.S. government's deliberate reliance on commercial facilities for most of its requirements made it possible for state exigencies—e.g. bi-modal plant—to shape the commercial capability, and to shift the additional costs onto private users worldwide. Technically, the rivalry would probably have been unthinkable had it not been for genuine and substantial improvements in cable technology; those gains may not have made cables the equal of satellites, but they made the two broadly comparable which would not have been the case if transistorised cables had not been developed. Industrially, carrier interest in further cables derived from the retention of rate base regulation and a multi-firm overseas communications industry, notwithstanding suggestions that both be modified to eliminate some of
the economic peculiarities that militate against rational resource allocation between the two transmission modes.\(^{(52)}\) What is, in sum, notable about all of these pre-conditions and indeed the determinants to which they gave rise is that they were pre-eminently American—or at best transatlantic—concerns, but with decidedly global consequences.

4. THE CARIBBEAN CABLE

Although the fourth transatlantic phone cable, TAT-4, was actually completed after Early Bird's launch, Comsat had assumed its existence in satellite service projections and TAT-4 was not controversial. The carriers' 1966 application to build a high-capacity cable in the Caribbean, however, surprised Comsat and became a preliminary and revealing skirmish between Comsat and the carriers—largely because applications to construct an earth station to serve the same region were filed at the same time, and some choice between or balancing of the two technologies was unavoidable. The FCC's adjudication introduced two elements that were present in each of the subsequent cable authorisations: obligations on the carriers to divide traffic between cables and satellites, and to reduce their tariffs.

In February 1966 AT&T asked for Commission approval to construct jointly with ITT its first advanced 720-circuit cable 1,250 miles from Florida to Puerto Rico and the U.S. Virgin Islands (USVI), at an estimated cost of $33m.\(^{(53)}\) The application was important due to the volume of Caribbean traffic and the relationship the proposal had to AT&T's more ambitious cable plans. Traffic from Puerto Rico and the USVI had been growing at around 33 percent yearly—as against 17.6 percent between the U.S. and the rest of the world—and by 1965 accounted for more than one-fifth of all overseas phone calls to and from the United States.\(^{(54)}\) Bell forecast a requirement of 588 new international phone circuits for the region by 1973.\(^{(55)}\)

Moreover, AT&T had plans for extensive cable systems in the Western Hemisphere and their fate might be foreshadowed by the treatment the relatively modest Puerto Rican facility received. These included continuation of a recently-completed link to the Panama Canal Zone down
the west coast of South America and perhaps across the Andes to Argentina and up the east coast to Brazil. Other cables to Venezuela and the Dominican Republic were either under construction or proposed, and AT&T was candid in its intention to make full use of its undersea network, notwithstanding the satellite system. The company's 1966 service forecasts envisaged that most traffic between the U.S., Caribbean and Central America would soon be going via cable, and noted that satellite circuits would be used to communicate with southern parts of South America until the mid-1970s, when "cable systems will be available to these locations." Bell's preferred policy favoured cables for shorter distance links, a mix of cables and satellites for intermediate distances (including transatlantic and U.S.-Hawaii routes), and satellites for some very long distance links (U.S.-Japan) and for "reaching distant countries that have very light circuit loads, such as some of the countries in Africa and Asia," although traffic to North Africa and South Africa would go by cable.

AT&T was clearly giving away little in its plans for satellite usage. Major traffic routes were either claimed as exclusively suited to cable links (as with the Caribbean) or proposed for an intermodal mix whose precise composition had yet to be negotiated. Satellites were assigned priority only where Bell had no cables—to Japan for instance—or where cables would be evidently uneconomic.

Although ITT had applied in March and again in November 1965 to build the region's satellite ground station, it was the February 1966 cable proposal that prompted a response from Comsat, and in April the Corporation asked for authorisation to put an earth station on St. Croix, USVI, requesting at the same time that the cable application be denied. Without the Caribbean region traffic, Comsat said, its per circuit revenue requirement and consequently its tariffs would increase by 35 percent; over the next five years, Caribbean traffic would enable rates to come down by one-quarter. Comsat argued that a satellite earth station, at a cost of $6m, would bring the entire eastern Caribbean into the global system and provide direct access to all points in the network. While approval of the station would "contribute greatly to the economic viability of the satellite system" and would
"serve as a demonstration to all the smaller or less well-developed countries of the world that the United States has confidence in the future of satellite communications," construction of the cable would inhibit expeditious satellite development and therefore "substantially undercut the policy of the United States."\(^{(61)}\)

AT&T charged that Comsat's anti-cable position was "grounded in large part on the untenable contention that there is some overriding national policy favoring the use of satellites over cables..." Bell minimised the importance of the promised global connections satellites would offer, noting that less than 1.5 percent of 1965 traffic to and from the region involved points other than the U.S. mainland,\(^{(62)}\) a figure which ignored Comsat's intention to provide direct service to the West Coast, which would have deprived Bell of cross-country transiting income. ITT naturally could not criticise the need for a satellite ground station as such and focussed its remarks on Comsat's bid to be its sole owner.\(^{(63)}\)

On December 7, 1966 the PCC authorised construction of both the AT&T-ITT cable and the earth station, the latter to be owned jointly by Comsat and selected carriers. Two stipulations written into the decision are especially important: 'proportionate fill' and tariff reductions. The Commission noted the expressed willingness of Bell and ITT to lease a total of 100 satellite circuits for service to the region, and announced a utilisation formula that would obligate the carriers to lease equal numbers of satellite and new cable circuits, thereby dividing traffic growth on a 50-50 basis. Also, to reflect satellite economies and the savings a greater traffic volume would produce, the carriers would be expected to enact a promised 25 percent reduction in composite rates to and from the region.\(^{(64)}\)

Application of the proportionate fill policy—first put forth in a very different form by AT&T in its January 1964 commitment intended to assure equal numbers of satellite and cable circuits in the Atlantic\(^{(65)}\)—proved inconsistent, incomplete and contentious in the Caribbean. When the cable's ownership quotas were announced in January 1967, a division of circuits among the four carriers concerned was also agreed whereby the entire capacity of the cable was in principle assigned—which would imply a corresponding commitment to use 720 satellite circuits.\(^{(66)}\) When the Puerto Rican earth station opened in
January 1969, however, the carriers claimed that meeting the fill ratio depended upon overall traffic volumes: although they were then using 123 cable circuits, they were willing to activate only 70 satellite circuits and not the 100 previously promised. The problem, as both Comsat and AT&T had forewarned, was that there simply was not enough traffic to go round; the FCC had predicted a 1969 requirement of 268 new voice circuits for the region, and even that had failed to materialise.

Comsat nevertheless insisted upon the proportion it had been promised of what traffic there was. Claims and counterclaims ensued until July 1969, when the FCC ordered AT&T to stop using 13 Florida-USVI cable circuits and activate 13 satellite circuits instead. The Commission also ruled that Comsat was entitled to the full $3m in annual revenues that a lease of 100 satellite circuits would have brought, and allowed Comsat to compensate itself through higher charges to the carriers on other services. Finally in January 1970 AT&T was ordered to pay Comsat for 18 satellite circuits that Bell was not leasing due to construction of the cable, an action intended to compensate Comsat for AT&T's effective non-compliance with the 50-50 proportionate fill formula.

5. THE FIFTH TRANSATLANTIC CABLE (TAT-5) CONTROVERSY

Comsat had consoled itself over the paucity of traffic for Early Bird with the belief that the TAT-4 cable, which went into service in mid-September 1965, would be saturated by the end of 1966 and the Atlantic satellites would then get a needed surge of new traffic. Comsat had not, however, counted on TAT-5, plans for which appear to have been prompted partly by AT&T's expectations of a slump in its cable-building business, and partly by the anticipated completion of some new Mediterranean cables which strengthened the case for a transatlantic facility directly to southern Europe to feed those new links, and aggravated Bell's concern with ITT undersea cable dominance.

Taking a lesson from Comsat, AT&T and the other international carriers tried to secure international agreement on the new transatlantic cable before asking for FCC authorisation. In September 1967 a meeting
was held in Lisbon of the four U.S. overseas carriers and the PTTs of Italy, Portugal and Spain, where a 720-circuit cable between the U.S. and southern Europe was proposed for completion in 1970. The cable would be built by ST&C and Cables de Lyon, with repeaters, transistors and amplifiers supplied by Western Electric. Spain's interest in the facility derived from a desire to end its dependence upon France as a transit point for all its U.S. traffic—satellite and cable—but both Spain and Italy indicated they would attempt to maintain parity in their uses of the two modes.

AT&T's announcement that the new line, "together with our plans to increase substantially the number of satellite circuits in service to Europe, would further insure the diversity and dependability of communications between the United States and transatlantic points," drew a favourable initial response from the Pentagon—aware of the important U.S. naval and air installations in Spain—though it left the State Department unimpressed. State asked for and got a 60-day delay before any agreement was signed—pending, it was said, release of the Rostow Report—but the carriers were evidently still hopeful of presenting the FCC with a fait accompli and scheduled a second meeting with the European PTTs for November 27 in Geneva. At that meeting, however, a request was made on behalf of the State Department, FCC and White House for another delay while the cable-satellite review continued in the U.S. The Europeans were reportedly dismayed, and a spokesman noted their "vital interest" in the timely provision of this "essential means" of communication, and the "indispensable diversification" TAT-5 would afford. The PTTs announced March 1, 1968 as the deadline after which a thorough review of the entire situation would be necessary.

Comsat had in the meantime mounted a counterattack, criticising carrier satellite usage and cable costs, and apparently accelerating plans for the Intelsat IV series. In early October a Comsat official pointed out that the carriers were using the full number of available transatlantic cable circuits—580—but only 110 satellite circuits, less than half the available total; another 1,200 satellite circuits were scheduled to be operational during 1968 when the Atlantic Intelsat
III was launched. AT&T thereupon asked for another 80 satellite circuits. Comsat also reminded the FCC that TAT-4 and TAT-5 together would provide 1,200 circuits for $150m, which would entitle the cables' owners to more than $500m in revenues over the next 20-25 years. A single Intelsat IV offered 5,000 circuits, would be depreciated over one-third the time—thus allowing for replacement by more advanced and lower-cost components—and would be part of a global space segment that would cost less than the two TAT cables. In November, as "a tactical move in its eleventh-hour fight" to block the cable, Comsat announced plans for the $91.2m Intelsat IV programme for 1970-73, although at the time the IIIIs were approved in 1966 Comsat had contended the IVs would not be operational before 1972.

The carriers contended however that the proposed TAT-5 was not just another transatlantic cable because southern Europe was currently wholly dependent on satellites for direct links to the U.S. Moreover, the issue was said to be one of "balance": without TAT-5, according to AT&T, the anticipated 19 percent annual increases in transatlantic traffic would mean that by 1970, the total proportion of traffic going by satellite would have risen from 20 to 60 percent, and to 75 percent by the end of 1972. TAT-5 would enable cables to provide 46 percent of capacity in 1970 and around half by late 1972. It is notable that AT&T's figures were premised on comparisons of satellite usage and cable capacity: parity was not based on equal degrees of utilisation—e.g. half of cable capacity and half of satellite capacity—but rather on anticipating the proportion of total traffic a fully-utilised cable system could handle. Maximum cable capacities, in short, would determine the levels of satellite traffic, however inadequately that traffic filled the satellites. Furthermore, even this curious parity formula would require activation of equal numbers of cable and satellite circuits, which according to Bell's 1966 service forecasts the company had no intention of doing.

When, however, the FCC on February 16, 1968 announced approval of the TAT-5 cable, among the conditions the Commission attached was that agreement be secured with foreign co-operators that cable and satellite facilities in the region be leased in numbers sufficient to assure that this cable and the satellite facilities provided to handle traffic between the United States
and their respective countries shall each be filled at the same proportionate rate. (85)

The carriers were also instructed to negotiate rate reductions of at least 25 percent with their foreign partners, since AT&T had promised that the new cable would offer just such savings. (86)

6. FIGHTING OVER FILL RATIOS

The FCC's proportionate fill policy, as set forth in the TAT-5 authorisation, was never effectively implemented. By the time the cable opened in April 1970, Comsat had been asking for eight months for a firm statement on intermodal mix from the FCC, claiming that carrier traffic forecasts were "sensitized to anticipate carrier applications for new cables" and that sound planning was consequently difficult. (87) Moreover, an Intelsat III was scheduled for service over the Atlantic in January 1970, and the carriers were contending that the FCC's fill ratios had not been intended to apply to the III series. ITT and RCA said that the policy referred not to satellites that had already been approved when it was promulgated, but to those which would come later—that is, not to the Intelsat IIIIs, but to the IIIIs which were never deployed and the IVs. The carriers produced an April 1968 memorandum to that effect from a meeting with the European TAT-5 participants, and then boycotted the Atlantic III altogether. (88)

Notwithstanding Comsat's complaints of lost revenues, (89) the FCC sustained the record carriers' objections in part by ruling in May 1970 that the second Atlantic III launched that month was a back-up facility and therefore exempt from fill requirements. In return the record carriers, who had hitherto not used any TAT-5 circuits either pending resolution of their complaints, agreed to lease one more satellite circuit for every two they leased on TAT-5. (90)

Despite the apparent agreement that the FCC's ratios would apply in any event to the Intelsat IVs, they were not. ITT in fact tried to get first the White House and then the FCC to postpone or prevent the first IV launch scheduled for January 1971, since the company claimed the satellite was not needed. Instead the Commission's common carrier bureau announced in May a five-to-one utilisation formula: the carriers were to activate immediately five Intelsat IV circuits in the Atlantic region for every one TAT-5 circuit they used, conditional only upon rate reductions
from Comsat. Although the decision actually accorded with AT&T's estimates of what would be necessary to comply with the FCC's 1968 TAT-5 policy, it appeared to signal a victory for Comsat. (91)

By September, however, the five-to-one formula—which had of course only been adopted to enable Comsat to make up for the carriers' earlier non-compliance—had been scrapped due to pressure from the U.S. record carriers and European PTTs. The PTTs of 17 European countries had met in November 1970 and declared themselves opposed to fixed fill ratios, although they accepted a 50-50 satellite-cable traffic split as a useful planning objective. At a transatlantic meeting in February 1971 which the PTTs had requested, agreement was reached on continuing consultation between U.S. and European carriers and the Europeans proposed a one-to-one fill ratio. Consequently, after the FCC's May 1971 five-to-one declaration the Europeans complained vigorously that they had not been consulted and that any attempt to implement the new policy would lead to "severe financial and operational effects." (92)

Although the FCC replied that it had assumed that AT&T's proposals reflected understandings already reached among the carriers and PTTs, and the FCC's policy was "not only consistent with, but in fact implemented" Bell's proposals, proportionate fill was doomed. (93) After a meeting in late September with representatives of the U.S. carriers and 14 foreign PTTs, the FCC on October 15 revised its formula to the preferred one-to-one ratio for voice traffic and dropped ratios altogether for record traffic. (94)

7. TAT-6 AND THE TRANSPACIFIC CABLE

In September 1969 AT&T informed the FCC that it would soon apply to build two new 720-circuit cables, between the U.S. and France and the mainland and Hawaii, both to be needed by 1972-73. Bell also said that it expected to ask for authorisation in 1970 to lay a further transatlantic cable of substantially higher capacity than theretofore—1,800 to 3,000 circuits. The new Atlantic links would be needed to avert a "serious imbalance" in the region by 1980, when according to AT&T 84 percent of total capacity would be furnished by satellites. (95) Bell noted concern expressed by
French, Belgian, Dutch and Scandinavian PTTs that TAT-5 would soon be filled, but the FCC—fearing a repeat of the TAT-5 episode—instructed AT&T in December to stop negotiating with the Europeans over TAT-6 while the Commission continued its new inquiry into overseas planning.\(^{(96)}\)

In September 1970 AT&T formally applied to build an $86m, 720-circuit cable to France—the capacity of which could be upgraded to 845 circuits through TASI sampling techniques. In spite of support from the Pentagon and European PTTs however AT&T appears to have fatally tipped its hand by alluding the year before to the new generation of cables with much higher capacities which it was developing.\(^{(97)}\) The new White House Office of Telecommunications Policy—created in 1969 to succeed the Director of Telecommunications Management—told the FCC in May 1971 that the "administration's position" was that existing cables and Intelsat IVs would meet regional requirements through 1977 and that new Atlantic cable deployments should await availability of the 3,500-circuit lines, whose costs would be comparable to the Intelsat IVs'.\(^{(98)}\) The FCC accordingly turned down the 845-circuit TAT-6 proposal in late June, and invited applications for a 3,500-circuit facility, attaching at the same time no conditions as to traffic-sharing with satellites aside from a reference to "reasonable parity."\(^{(99)}\)

Bell submitted its application to build the high-capacity cable in December 1971 and the FCC approved it the following March. TAT-6 was scheduled for opening in 1976 at a cost of $145m. Although no fixed sharing formula was included in the authorisation, the FCC noted that more than 8,000 circuits were currently unused on the two Intelsat IVs then over the Atlantic, and said it would expect traffic growth to be divided one-third to each of the IVs and one-third to TAT-6.\(^{(100)}\)

In spite of the Commission's rejection in June of the 845-circuit version of the TAT-6, AT&T proposed in late September 1971 to build a similar cable between San Francisco and Hawaii at a cost of $59m. The Hawaii link was intended as the first section of a transpacific cable to Japan, a route AT&T had said in 1966 it wished to use satellites to serve, and while the FCC continued deliberating on the Hawaii cable AT&T requested authorisation for the Hawaii-Japan segment in October 1972.
Comsat was relatively unconcerned about the California-Hawaii link, since it appeared likely that Intelsat's traffic between those points would be transferred to a domestic satellite before long, but the company did ask that the cable not be used to carry traffic destined for beyond Hawaii. The Hawaiian state governor, however, asked the FCC to turn down the cable since its construction would, he believed, mean higher tariffs. In June 1973 the FCC approved both segments of the transpacific cable. To meet the Hawaii governor's objections, 25 percent rate reductions were ordered from the carriers. Although the Commission asked Comsat and the carriers to draw up traffic-sharing plans, by 1975 there was little agreement and the FCC continued consideration of the matter.

3. CONCLUSIONS

The paradox in satellite-cable rivalries lay in the fact that much the same forces that had promoted satellite development were also instrumental in providing satellites with their most damaging competition. Neither the U.S. government, FCC nor—for the most part—the carriers ever wavered from a commitment to proceed with satellite formation, even while they insisted more cables be built. Both the state and the communications industry still stood to gain from satellites, although they agreed on the need to restrain the impact satellite technology might have, respectively, upon maintenance of a diversified overseas plant and upon profitability. It is indeed arguable that the FCC's compliance with most of the carriers' proposals eliminated a major obstacle to satellite development (although it would be unwise to push the argument too far): as long as industry got its cables, it would have little reason to object to new satellites; if the carriers could keep their cables fully loaded and use satellites virtually as and when they wished, they would have little reason not to tolerate expansion of satellite services.

Nevertheless, it was clear that satellites were not then or in the future to be the exclusive—or even principal—means of international communication among metropolitan countries. To satisfy the transatlantic preference for a bi-modal mix, to placate the American carriers and to furnish the Europeans with negotiating leverage vis-à-vis Comsat, satellites
would be denied the chance to realise operational economies of scale if that chance came at the expense of undersea cables and the whole complex of overland facilities that permits submarine links to serve inland areas.

The obligation to coexist with cables helped provoke a relocation of satellite services, since customary intercontinental long-haul service could no longer be viewed as the most promising area of satellite growth and expansion. By their very success, the restraint and compression that had characterised pre-emptive underdevelopment were forcing satellites toward fields where their superiority was unquestionable. The political expression of this displacement would—almost inevitably—be a revision in the terms of American and European co-dominance within Intelsat. That revision derived formally from the fact that since satellite usage determined political weight in the organisation, the division of North Atlantic traffic between satellites and cables would reduce the metropolitan countries' Intelsat traffic margins over the growing use of satellites elsewhere. Moreover, satellites could only become of greater importance to those who had no alternative means of international communications—to say nothing of techniques to permit cheap and rapid modernisation of domestic communications facilities. The cable decisions, in sum, facilitated the devolution of control over satellite technology.
1. OVERVIEW

The haste that the U.S. inspired in international satellite development seems equalled only by the delay tolerated at home in domestic satellite deployment. It was more than nine years after Early Bird that the first American domestic satellite was launched—for Western Union, the national telegraph monopoly, in July 1974. By that time, eight fourth-generation Intelsat satellites were in service internationally, a Soviet internal system had been operational since 1967, a Canadian domestic network was into its second year of service, and upwards of a dozen companies and consortia had been asking to provide U.S. domestic satellites for at least seven years. The FCC policy under which the Westar spacecraft was authorised was promulgated in June 1972, seven years after the Commission's formal inquiry had begun and two years after the White House had recommended much the same policy: opening the field to competent private entities subject to certain minimal service and antitrust requirements.

Since the history of efforts to create U.S. domestic satellite service compares in length and convolutions to the history of international satellite communications, which is the principal focus of this study, it will be necessary to confine the treatment that follows to sketching the empirical domestic record. Our theoretical interest in this history is two-fold: to consider domestic satellite formation as 1.) parallel to and independent of the international process, and as 2.) a component of a larger process encompassing both spheres.

The first perspective helps illuminate some of the distinctive features of pre-emptive underdevelopment through a consideration of the evident lack of urgency in the domestic case, which is attributable to the essentially lass-feraire—or laisser-ne-pas-faire—role assumed by the state. In part that role was determined by the absence of consensus within the private sector over domestic satellite services and organisation, which was itself fueled by the increasing sophistication of satellite
technology and the range of applications it could readily accommodate. More important to the state's tolerance of delay, however, were the facts that domestic service was not deemed essential to meet pressing requirements and that, if anything, the civil and political turbulence of the period suggested caution in introducing a technology that might lower the cost and increase the availability of general telecommunications services.

From the second, and for our purposes more important, perspective, the U.S. domestic history is evidence of a fruitful course of satellite development that was not pursued during the first phase of technological formation, thus helping sustain our characterisation of that period as one of pre-emptive underdevelopment. The mere contemporaneity of international and domestic events is not, of course, in itself sufficient to merit grouping the two processes within a single overarching description. Important empirical linkages did, however, exist: 1.) U.S. urgency concerning global satellite deployment led indirectly to omission of domestic prescriptions from the Comsat Act, thus setting the stage for the lengthy deliberations that ensued; 2.) the Americans were promoting an expansion of Intelsat's competence to include regional and in some cases domestic satellite services, which would be contradicted by a decision awarding U.S. satellite development to private entities with no Intelsat affiliation; 3.) an anti-Comsat decision might rigidify the company's stance in the Intelsat re-negotiations and endanger the compromises that might be necessary; 4.) a chief concern of Comsat's carrier rivals in the struggles recounted in previous chapters—which deprived Intelsat of traffic and opportunities to cut tariffs—was to reduce the likelihood of Comsat's extending its satellite monopoly domestically. In sum, the chief political uncertainty holding back satellite development in both spheres was the same—Comsat, and its future prerogatives.

2. DOMESTIC SATELLITE CONTROVERSIES THROUGH MARCH 1970

Consideration of domestic satellite service was provoked by an industry hitherto excluded from participation in satellite development—the broadcasters. Their proposals for a system dedicated to broadcast relay
challenged both AT&T's long-lines monopoly and Comsat's desired satellite monopoly, and raised the question of whether satellite services should be created solely on a common carrier basis to serve all telecommunications users or for narrowly specialised uses as well. These issues remained unsettled from the time the FCC opened its formal inquiry on domestic satellites in March 1966 until the Commission's first decision was announced just four years later—and well beyond.

In May 1965 the American Broadcasting Company (ABC) told the FCC it would soon request authorisation to buy and operate a satellite system to distribute network TV programming in the U.S. and abroad. ABC, which was immediately joined by the National Broadcasting Company (NBC), had drawn up a plan with the help of Hughes Aircraft for a $25m system—including space segment and two transmitting stations—that would enable it to save more than half the $12m it paid AT&T every year to relay TV nationwide. The proposal was submitted to the FCC in September and returned to the network in March 1966 because, the Commission said, it "presents basic questions of law and policy which must be resolved." A domestic satellite docket was then opened, with a December 1966 deadline on proposals.

Comsat had responded to ABC's announcement by saying that it too was exploring various domestic satellite possibilities and expected to propose an elaborate $100m system in the near future. Furthermore, Comsat contended, satellite service at home was "a matter entrusted to the Corporation under the Communications Satellite Act," and independent involvement by the networks would therefore be illegal. The company proposed a high-capacity multipurpose network of four satellites—one for each time zone—to provide 16 TV channels and more than 20,000 voice and record circuits at a total cost for space and ground segments of between $110m and $126m. Comsat's stated intention was to "combine TV with the general satellite communications market, thereby maximizing the savings to all users, including television," but in fact the TV relay market was but a subsidiary part of the massive volume of U.S. domestic telecommunications that Comsat wished to handle. As the company's board chairman said:

This market is extremely important to Comsat and its shareholders. For the foreseeable future, it is vastly greater than any expectancy for Comsat's share in the long-distance international market.

Indeed, even ignoring the fast-growing demand for non-voice (e.g. data) services, interstate phone calls were of a different order of magnitude from international, with domestic long-distance calls expected to be
around 60 times greater than international by 1980.\(^7\)

AT&T and Western Union had in March 1966 offered to support Comsat's proposal before the FCC if Comsat agreed to function domestically solely as a carriers' carrier, seeking neither to own ground facilities nor to contract directly with the TV networks.\(^8\) Comsat turned down the offer, and AT&T submitted a domestic satellite proposal of its own in December for a $340m system to supplement its existing network and carry the full range of telecommunications traffic, including broadcast relay. Bell said the cost would be some $200m less than comparable ground facilities, and repeated its offer to allow Comsat to act as owner and operator of the space segment as long as terminals, interfaces and routing decisions remained under AT&T control.\(^9\)

In addition to the proposals of Comsat, AT&T and NEC—which called for a more elaborate broadcast relay system than ABC had proposed, but which was nevertheless supported by the networks\(^10\)—by the time of the deadline for proposals the Ford Foundation, in its capacity as patron of noncommercial television, had submitted a plan for a Broadcasters' Nonprofit Satellite Service (BNSS) to furnish television relay service at lower rates than AT&T had hitherto provided, while generating surplus revenues to subsidise a noncommercial TV network. Ford, after consultations with Hughes Aircraft officials, estimated that satellites could for $20m per year provide the same interconnection services that a recent AT&T rate increase would mean was costing $65m from Bell; the networks could be charged $50m—thus saving them $15m—and the remaining $30m would go to noncommercial broadcasting, which would also receive free nationwide interconnections.\(^11\) Although the plan offered a way to strengthen the ailing noncommercial TV industry—and indeed catalysed a series of actions culminating in November 1967 in the creation of the Corporation for Public Broadcasting to oversee a new noncommercial network\(^12\)—and suggested the kind of repayment for publicly-financed space R&D that some legislators felt was overdue,\(^13\) it also effectively unified an opposition that otherwise would have had little in common: the commercial TV networks, who had no wish to subsidise a competitor; AT&T, which stood to lose both its TV carrying revenues and its participation in the domestic satellite field; and Comsat, which would be denied the exclusive rights it claimed.
The Ford Foundation plan was no more successful than the suggestion of Hughes Aircraft for a high-powered satellite network to interconnect cable television systems and broadcast directly to home TV receivers. In an effort to break the logjam of filings and counter-filings before the FCC, Comsat applied in March 1967 for interim status as owner and operator of a $58m pilot satellite system, intended to be operational by 1969 and to test the feasibility of domestic satellite use. Earth stations would be concentrated in the western part of the U.S. in order to serve the various phone systems owned by GT&E and avoid directly competing with AT&T for its own traffic.

In spite of doubts expressed by White House officials over the need for domestic satellite services, and the lukewarm support offered by some nominal supporters, the FCC was by mid-1967 rumoured to be favouring Comsat's proposal for a pilot system. In August, however, President Johnson announced formation of the Rostow Task Force to examine the full range of government communications policy, and the FCC voluntarily suspended its own deliberations during the year-and-a-half that the group conducted its studies.

The Rostow Report was finally released in May 1969—without, however, White House endorsement—and supported Comsat's plan, while recommending that carriers, broadcasters and other users be eligible to participate in ground station ownership. Again the FCC was said to be close to awarding Comsat interim responsibility, and Comsat began in June to negotiate with NASA for use of an experimental ATS spacecraft domestically.

Once again, however, White House intervention cut short an apparent pro-Comsat drift by the FCC. Reportedly after seeing a draft of the policy the Commission was ready to announce, the Office of Telecommunications Policy in late July told the FCC that "a small working group" had been formed "to assist the administration in further reviewing this area." A report was promised within 60 days, but the FCC expressed dissatisfaction with yet another delay.

By mid-August the group was reported to favour restricting Comsat's pilot status in the interest of promoting competition among not yet specified entities, and when it failed to report in October as promised AT&T touched off a new flurry of satellite interest among the TV networks.
by announcing a 44 percent increase in its television carrying charges. Bell's reaction to the subsequent revival of proposals for a satellite system dedicated to TV relay—which came notwithstanding the FCC's previous indications that it favoured multipurpose systems—was both surprising and showed almost preternatural anticipation of the direction White House and FCC policies took. AT&T said it believed the wisest policy at this time would be to permit any organisation or group interested in establishing a domestic satellite system—including the networks—to apply for a license to establish and operate such a system. We believe this approach would allow flexibility and incentive for creative private initiative, and would provide the most appropriate means for an orderly development of domestic satellites. Bell added that it was no longer certain that satellites would be economical to deploy domestically, except to avoid peak period congestion and furnish back-up capacity.

While effectively calling the networks' bluff, AT&T's new policy was also clearly in tune with White House preferences. On January 23, 1970 the working group announced: "Competition in the offering of satellite services appears to hold forth greater benefit to the economy and the public than would a single chosen instrument." The government therefore "should encourage and facilitate the development of commercial domestic satellite communications systems to the extent that private enterprise finds them economically and commercially feasible." Since there were believed to be enough orbital slots to accommodate anticipated systems, and since there were "insufficient economies of scale ... to warrant government restriction of competition," the preferred policy was 'open skies'—subject to minimal conditions—at least for the next three to five years.

Although Comsat protested that "the establishment of a commercial satellite system by a U.S. entity other than Comsat would require new legislation," and noted that the real outstanding question was "who is financially big enough to play the game?", the company's share price slid badly and its prospects dimmed. AT&T, however, recovered from its coyness of the autumn and announced it would soon file its own satellite proposal: "Close operational integration with other modes of transmission will provide the public the maximum benefit," Bell said.

On March 24, 1970 the FCC published its long-awaited First Report...
and Order on domestic satellites, in which it invited concrete and detailed proposals—much like the one from ABC that the Commission had claimed exceeded its competence five years earlier—to provide the basis for further decisions. The FCC said it was "unable to determine" whether one or more multipurpose systems, specialised systems, or the White House-supported open entry should be approved, and announced:

Thus, we will consider applications by all legally, technically and financially qualified entities as to what system or systems are to be authorized in the context of specific proposals. (39)

While hinting at possible restrictions on AT&T's domestic satellite role, the Commission explicitly rejected Comsat's claim to a domestic franchise, though stating that if Comsat chose to operate at home it would be allowed to serve customers directly. (40)

The FCC's turnabout from its reported support for Comsat's interim plan was opposed by elements of its professional staff, (41) and was in part a response to political exigencies: the Commission's chairman, a career civil servant, had retired and been replaced by the Nixon Administration with a political appointee well-known among right-wing Republican Party circles; (42) the White House had signalled, through the December 1969 of the Office of Telecommunications Policy, an interest in taking a more active role in policy-making in the field; (43) and since statutory authority over domestic satellites was not clear, the possibility of a legislative battle existed if the FCC's rulings were, as the OTP director later warned, "sufficiently out of step." (44) Nevertheless, there had been little support even among those who backed Comsat's plan for awarding the company an indefinite domestic monopoly, and the desire for an interim arrangement was based on purely temporary technical and economic expediency. (45) The White House pro-competitive position was both consistent with the Chicago School 'free market liberalism' the administration espoused, (46) and a recognition that the technological-industrial environment was such that a good many firms—not least key aerospace companies like Hughes, TRW and Lockheed and the burgeoning computer industries of 'Silicon Valley', all based in Nixon's home state of California—stood to make a lot of money from relatively unrestricted satellite development. (47) Above all, however, the government's willingness to entrust domestic satellite development to the vagaries of the private economy—without insisting on expeditious deployment or anything of the kind—
suggested a considerable degree of state indifference to the field, or at least a greater concern with procedures than with ultimate services. "It was concluded," as the press statement accompanying the January 1970 policy said,

that Government policy should encourage and facilitate the development of commercial domestic satellite communications systems to the extent that private enterprise finds them economically and operationally feasible, but that there is no reason to call for the immediate establishment of a domestic satellite system as a matter of public policy nor to promote uneconomic systems or dictate ownership arrangements. (48)

The key question remained, whatever the pro-competitive rhetoric, the restraints that would be imposed on AT&T, whose traffic would very likely be sufficient—even without cross-subsidisation—to permit it to undersell most competitors in the domestic satellite industry. For Comsat, however, the FCC's rejection of its pilot project and the Commission's relegation of the company to one among many in the satellite field, came just two weeks after the Intelsat re-negotiating conference had voted on March 9 to cut substantially Comsat's role in the permanent international arrangements. The coincidence of these two events represents, formally, a decisive break in the process of satellite formation and are landmarks in the transition from pre-emptive underdevelopment to a more intensive, politically de-monopolised development process. (49)

3. DOMESTIC SATELLITE ACTIONS, 1970-75

Although the FCC's March 1970 ruling set a deadline of March 1971 on submissions and applications, the Commission did not announce its findings until June 1972. Eleven separate proposals had meanwhile been filed, including: Western Union, for a three-satellite system to handle mainly telegraph and teletype traffic, but with enough capacity for TV relay as well; Hughes and GTE, for a two-satellite network to interconnect Hughes' cable TV systems and GTE's phone systems; MCI, the company that had broken Bell's monopoly over specialised carrier services, and Lockheed, whose two-satellite system would serve intercity data markets and possibly the TV networks; Fairchild-Hiller, for a giant 120-transponder satellite—10 times the capacity of an Intelsat IV—to carry AT&T's phone traffic; and RCA, for a satellite to link
Alaska—where RCA had recently acquired a communications network from the Pentagon—to the lower 48 states.\(^{50}\)

Two separate proposals were made by AT&T and Comsat, the first for a joint system whose space segment would be owned by Comsat and ground facilities by Bell and which would be dedicated solely to AT&T's phone traffic, and the second from Comsat alone to serve all users other than AT&T: record carriers, data industry, network and cable TV.\(^{51}\) Comsat told the FCC that those two systems would exhaust the available markets: "The market base for a truly multipurpose system should not be fragmented by authorization of multiple systems."\(^{52}\)

From the government, in spite of reports that the White House was "backing toward preference" for some restrictions out of a fear of ruinous competition,\(^{53}\) OTP reiterated its pro-competitive position and recommended the FCC approve all applications.\(^{54}\) The Justice Department, however, strongly criticized the joint Comsat-AT&T plan—since "Comsat is already subject to an unhealthy degree of control by AT&T"\(^{55}\)—and further advised that the TV relay business be denied to any system in which Bell was involved, since that market was the biggest sure source of revenues apart from telephone traffic.\(^{56}\)

Restrictions on Comsat, however, not on AT&T figured prominently in the FCC's second Report and Order which, approved by a 4-3 vote and issued on June 16, 1972, otherwise affirmed the 'open entry' position favoured by the White House.\(^{57}\) The two proposals in which Comsat was involved were judged to have considerable anti-competitive potential: while the joint plan would make it impossible for Comsat to compete with AT&T for retail customers, it would likely provide Comsat with enough money to make competition with Comsat's second system by other entities interested in serving non-Bell customers equally impossible. Comsat was therefore offered a choice: either to operate its own system as a carriers' carrier, wholesaling capacity to any authorized users including AT&T, or to serve on a wholesale and retail basis all potential customers apart from AT&T.\(^{58}\) A further blow to Comsat was the FCC's requirement that all parties seeking to furnish domestic satellite service offer to include Alaska, Hawaii and Puerto Rico in their plans, which would deprive Intelsat of some 40 percent of its revenues and take from Comsat a considerable portion of its international
voting power.\(^{(59)}\) The sole restriction on AT&T was a temporary prohibition on entering the specialised leased-line market; the delay would give competitors a headstart and provide the FCC with cost data that would help prevent AT&T from eventually cross-subsidising its own operations in the same field.\(^{(60)}\)

The Commission also raised the long-simmering issue of AT&T's 29 percent ownership of Comsat,\(^{(61)}\) which figured in the FCC's final ruling on domestic satellites in December 1972. Comsat had in September merged its hitherto independent proposal to serve non-AT&T customers with a similar plan advanced by MCI and Lockheed, thus enabling Comsat to argue that approval of its joint plan with Bell would not harm its competitiveness in the specialised services market because Comsat would only own one-third of the latter system. The FCC approved the MCI-Lockheed-Comsat proposal in December, and furthermore reversed its June ruling on the AT&T-Comsat scheme—which now would be authorised if Bell sold off its Comsat holdings. While the sale would not mitigate Comsat's dependence upon Bell in a joint venture—since AT&T would control all the traffic and ground facilities—it was felt that Comsat would participate more effectively in the MCI-Lockheed system, which was expected to compete with AT&T in specialised markets, if Comsat was formally independent.\(^{(62)}\)

In January 1973 Comsat established a wholly-owned subsidiary, Comsat General, gave it £200m and empowered it to undertake virtually all subsequent non-Intelsat business—maritime and aeronautical, as well as domestic satellite development.\(^{(63)}\) Within three years Comsat General had greater outstanding investments than its parent,\(^{(64)}\) and after a series of inter-corporate reshuffles had installed itself admirably as the prospective satellite partner of two giants of U.S. industry, AT&T and IBM. The arrangement with AT&T had derived from earlier plans—though with the additional participation of GTE, which had given up its previous intention of jointly establishing a separate system with Hughes Aircraft. Comsat General contracted with Hughes for construction of four 14,400-circuit satellites in September 1973, with deployment expected to begin in mid-1976 of two Comstar spacecraft, the entire capacities of which would be leased to AT&T. A third satellite was scheduled
for launching early in 1978 to furnish GT&E with long-distance links.\(^{(65)}\)

IBM, which had virtually been destined all along to be a major customer of Comsat's second, specialised satellite system, bought out MCI's and Lockheed's shares in the venture in July 1974. The Justice Department and Federal Trade Commission objected, however, to the proposed ownership of the system—55 percent IBM and 45 percent Comsat—since the set-up would be similar to the original AT&T-Comsat plan: IBM would be controlling facilities that were supposed to be used by its teleprocessing competitors. The FCC therefore turned down the proposal in January 1975, instructing IBM and Comsat to find a third partner. A major insurance company, Aetna Life and Casualty, was recruited and in December the three companies formed Satellite Business Systems Inc., and began planning a highly sophisticated, digital communications system, capable of extremely high-speed transmission and able to operate with 16- to 23-foot unmanned ground antennas.\(^{(66)}\) Although the FCC approved the project in 1977, further hearings were ordered after objections from the Justice Department and AT&T—whose own entry into the private leased-line satellite market was prohibited until July 1980—and initial deployment of SBS spacecraft was not expected before 1981.\(^{(67)}\)

The record carriers Western Union and RCA meanwhile were well ahead in domestic space segment deployments, providing capacity that was used or re-sold by a number of new 'satellite' entities on the ground. Western Union's Westar series began operations in 1974, and in addition to the expected telegraph and teletype traffic attracted the business of the Public Broadcasting System—which aimed to stop using AT&T interconnections by 1979—, a new Spanish International Network of eight TV stations, a 16-station Independent TV News Service and the American Satellite Corporation, a subsidiary of the aerospace firm of Fairchild-Hiller which specialised in teleprocessing. RCA began forming its Satcom network with an agreement in January 1974 to lease capacity from the Canadian domestic system; in March 1976 deployment of RCA's own satellites began, and a number of cable TV operators, religious broadcasters and a new type of 'superstation'—a nominally local TV station that used satellites to distribute programming nationwide to cable systems—were soon among its customers.\(^{(68)}\) While entertainment and other
broadcasting uses predominated in initial domestic satellite utilisation, the anticipated entry of SBS (INL-Consat), AT&T and perhaps Xerox into the specialised leased-line market was expected to produce an important shift toward business applications, as well as a dramatic increase in revenues from some $100m in 1978 to perhaps $2,000m in the mid-1980s. (69)

4. CONCLUSIONS

Considering the U.S. domestic satellite history as a process of technological formation independent of and parallel to the international, the paradox between urgency abroad and delay at home is especially curious when the capability of the technology available in 1962 is compared with that of later in the decade: Telstar, able to relay 240 phone calls or one substandard TV channel between two huge terminals for brief periods, as against Fairchild-Hiller's proposal for a geostationary satellite with 100 times Telstar's capacity, capable of assigning capacity instantly upon demand among multiple routes and with narrow-beam antennas to serve many small ground stations. (70)

Not only, however, did the evident ripeness of the technology not compel its rapid deployment, but its sophistication engendered serious obstacles, since no one conception of how to apply satellites domestically could claim to be logically and uniquely implied by the state of the art. Each feasible application—broadcast relay, cable TV interconnection, long-distance phone service, teleprocessing or multipurpose—summed the interest of different entities and industries, whose demands had to be negotiated and adjudicated.

The absence of a private consensus—like the one the international carriers manoeuvred into a kind of existence in 1961—was a principal determinant of the apparent paralysis of the most important force in satellite development, the state, for the discord made immensely more difficult the state's task of distilling, clarifying and formalising principles of institutionalisation and preferred modalities of service. Moreover, private sector indeterminacy derived also from uncertainty over the future of AT&T's industrial dominance, which the state both shared and nourished through the anti-Bell actions taken in other fields.
while domestic satellites were being discussed.

The state's hesitancy is not, however, reducible to the lack of consensus in the private sector: indeed the carriers' 1961 pseudo-consensus was in large measure a response to state insistence on satellite formation, and it was this insistence that was absent in the domestic satellite case. The simple reason was that domestic satellites did not implicate in a significant way the sorts of conditions that the state is normally responsible for securing. Apart from improving linkages with Alaska and getting Hawaiian and Puerto Rican traffic off the international satellite system, 'national security' considerations were not involved—if indeed they were involved in those instances. America's image abroad would not be enhanced substantially. Most important, the overall adequacy of the national telecommunications plant was believed generally sound irrespective of satellites, and the government was not even convinced that they would be economical domestically.

Furthermore, to the degree that state responsibilities were implicated in domestic satellite formation, caution seemed indicated. If, as some believed, satellite deployment could produce rapid declines in the general costs of communicating, new patterns and intensities of social relatedness would result—perhaps further straining a society which in the late 1960s was already facing an unpopular war abroad, civil turbulence and seasonal near-insurrections in major cities. The evidence that such concerns explicitly entered upon satellite deliberations is, admittedly, scant.\(^{(71)}\) Nevertheless, there was a common finality to the delays arising from industrial and state-industry negotiation, and the effective denial of communications facilities that might have provoked dramatic changes in the possibilities of social relatedness.

**Domestic satellites and pre-emptive underdevelopment:** Pre-emptive underdevelopment is clearly an incorrect characterisation of satellite formation within the United States. The absence of state insistence eliminated the need for the carriers to compromise by undertaking constrained satellite development as a means of securing technological control. Every effort was made—through interminable study, repeated attempts at rulemaking, and shifting industrial alliances—to decide control prior to, not by means of, deployment. The result was not an
initial period of incomplete action, but of inaction.

Conceptually, both international and domestic histories nevertheless were aspects of a single process of constraint—absolute in the U.S., relative abroad—and liberalisation. The absence of domestic satellite development is valuable evidence that the technology was underdeveloped during the first phase of overall technological formation: one might even say that the forms of satellite technology that were deployed operationally in the 1960s and early 1970s were marginalia compared with the sophistication—and traffic levels—satellites might have attained in the U.S. Satellites were not only stunted, but shunted away from where their immediate potential was greatest.

Empirically too, the domestic satellite history did not unfold independently of international events—no more than the latter were unaffected by U.S. controversies. The two areas were interpenetrated as concerned: 1.) the absence of legislative intent regarding domestic satellites in the Comsat Act's mandate of rapid international development; 2.) the presumptive interest of U.S. carriers in domestic markets while they were fighting Comsat over international satellite issues; 3.) the problematic relation of the 'single global system' to U.S. satellites; 4.) the uncertain future of U.S. dominance in Intelsat; and 5.) a fear of forcing Comsat into unacceptably rigid negotiating positions vis-à-vis its international partners.

First, the urgency that had inspired the Comsat Act ruled out attempting to deal with the apparently more remote, and certainly more difficult issues of domestic satellite service. The conditions for delay at home were engendered by the same haste with which satellite service abroad was approached. During the legislative hearings, Sen. Long at one point asked Secretary of State Rusk why satellites had not from the outset been considered for domestic applications:

Secretary RUSK. I think the principal impetus behind space communications was intercontinental, to link those more effectively that are not now linked, by TV and other means, and to deal with a rapidly expanding growth of circuits across, say, the Atlantic...

Senator LONG. No one except the so-called international carriers was even offered the opportunity to advise in this matter. (72)

In effect, both were correct: the "principal impetus" was international, and it required the exclusive participation of the international
carriers for its success. Extending consideration to domestic applications could not have expedited the process although, as a 1967 Fortune magazine article on domestic satellites observed:

Decisions might have come more easily if these issues had been seen more clearly when legislation was drawn in 1962. How they are greatly complicated by Comsat's enmeshment in Intelsat, and by the U.S. effort to forge a single dominating instrument in the international field...

Second, it is likely that much of the opposition to Comsat's attempts to expand its Intelsat-related operations in the U.S.—and at least some of Comsat's desire to do so—derived from domestic satellite ambitions. The carriers did not wish to foreclose their own options in the field, as conceding to Comsat sole ownership of ground stations and rights to serve customers directly might have helped to do. Comsat would then have been in a far better position to pursue its self-selection as domestic chosen vehicle, offering its earth stations for internal uses, proposing an economical mix of international and national spacecraft, and pointing to a record of smooth dealings with many of the same ultimate users it would be serving domestically.

Third, by November 1967 Comsat had drafted and circulated proposals for transforming Intelsat into a permanent organisation, thus commencing a re-negotiation process that lasted until July 1971. The U.S. supported a role for Intelsat as the site of responsibility for a single, integrated global system, entitled to undertake specialised, regional and domestic satellite development. A decision denying Comsat its domestic franchise in favour of private entities with no affiliations with Intelsat would therefore contradict and perhaps undermine official American international satellite policy.

Fourth, if the U.S. in effect endorsed the 'single global system' by awarding a franchise to Comsat on the strength of its Intelsat role, and if Comsat's dominance in the international body were substantially reduced, the U.S. might have entrusted control of a considerable component of its domestic communications plant to an extra-national body, which would have been both illegal and politically unthinkable.
Finally, the FCC was aware of the precarious position Comsat was holding internationally, and of the possibility that a decisive setback at home might force Comsat to the wall, determined to insist on diplomatically untenable conditions that might endanger Intelsat's continuance.\(^{77}\) "If Comsat," as The Economist observed in 1969, were allowed to run a domestic satellite service, it probably would not give a damn about retaining its much-criticised domination of Intelsat...which means little in terms of cash in the bank.\(^{78}\)

If, however, domestic conditions were such that Comsat could not be awarded its exclusive rights, the uncertainties arising from delay were preferable to the firm resolution that might come from defeat.

Hence, notwithstanding the various factors unrelated to the international which determined the pace and style of U.S. domestic satellite formation, the two processes had much in common: a focus of political uncertainty in Comsat; and a single dynamic of political and industrial compression which drove the technology's development along a course of lesser resistance—internationally toward diversification and reduced dependence on metropolitan regions, and in the U.S. toward specialised applications which would leave untouched the heartland of ATT's monopoly. Once those limits were agreed, liberalisation of control and more intensive exploitation of satellite technology could ensue.
PART FIVE

THE END OF PRE-EMPTIVE UNDERDEVELOPMENT:
The setting and conduct of international negotiations, 1969-71
Operational satellite development was by the late 1960s approaching limits set by the unstable political accommodations out of which the Intelsat system had emerged. This chapter and the three succeeding ones consider the determinants of the impending technological stalemate and the way in which their influence upon satellite formation was reduced or re-defined, permitting a more liberalised regime of satellite control to emerge, and a new intensity of technological development to be achieved in the aftermath of the 1971 adoption of permanent organisational arrangements for Intelsat.

The evidence of technical stalemate—which is examined in comparison to post-1971 developments in Chapter 19—included: 1.) qualitative limits on the range of satellite applications undertaken either within or without Intelsat, since the Europeans were opposing any expansion of Intelsat’s operational mandate and the Americans were discouraging independent communications satellite projects outside Intelsat; 2.) stagnation—relative to subsequent years—in the proliferation of Intelsat ground stations, which was related to uncertainties about the organisation’s continuance and to the value of the services it currently offered; 3.) low levels of space segment utilisation, the remedy for which required agreement on Intelsat’s right to diversify its services even if independent satellite systems might thereby be pre-empted.

Restraints on satellite development and use were engendered not by technological problems but by political discord over two principal concerns: Intelsat’s sphere of competence and its internal distribution of power. Regarding the first, either Intelsat could be transformed into a comprehensive operational and quasi-regulatory entity, with authority to undertake virtually any international, regional or domestic communications satellite applications and with priority over systems members
might wish to create independently—this, the 'single global system'—
or Intelsat could be confined mainly to providing its existing services,
primarily intercontinental telephone, and thereby leave the way clear
for others, whose facilities for other applications would neither com­
pete with Intelsat nor deprive it of traffic. Regarding Intelsat's
internal organisation, the choice was between creating an international
agency run democratically by an all-member assembly and a de-nationalised
management, or ratifying the existing "North Atlantic club"(1)—adminis­
tratively streamlined, politically skewed.

Both areas of political concern were inevitably focussed upon Com­
sat, whose comprehensive dominance within Intelsat made change impossible
without impinging on Comsat's prerogatives. Just as it had been the
European response to the power Comsat wielded during the 1963-64 nego­
tiations that had produced an insistence on a fixed duration to the
initial Intelsat arrangements, so it was the future of Comsat's domi­
nance that was the political axis of the 1969-71 re-negotiations. Com­
sat sought to widen its own opportunities in the satellite field through
promoting the 'single global system' concept(2) and opposing efforts to
eliminate—in the name of democratic procedures—certain key features of
its internal dominance of Intelsat.

As before, however, Comsat's real strength in the negotiations was
based principally upon its relationship to the hitherto technically in­
dispensable stocks of U.S. aerospace hardware and expertise, and to the
commercially vital flows of American international communications. (3)
Comsat's ability to determine the availability of those resources derived
not from any independent power the company exercised domestically—as its
collisions with the carrier industry had proven—but on its utility as an
instrument of American satellite policy which, in turn, was no stronger
than the U.S. interest in the satellite field as an arena in which to
pursue larger international political objectives. Even a superficial
comparison, however, of the strident and urgent rhetoric that accompanied
passage of the 1962 Comsat Act with President Nixon's welcoming of the
May 1971 conclusion of the Intelsat permanent arrangements—"For seventy
nations to agree on anything is a super accomplishment"(4)—is enough to
suggest that a downward revision in the political weight attached to
international satellite determinations had intervened.
Satellites had become disengaged, in the interim, from the main contextual political concerns that had engendered efforts to control and deploy satellite technology and upon which that control, once secured, was meant to exert influence—a process we shall call de-coupling. De-coupling refers not to changes within the satellite field itself, but to the progressive attenuation of linkages between that field and the more fundamental political objectives of dominant participants in it, which was premised in part upon the irrelevance—or obsolescence—of satellite technology as a political instrument and in part upon the successful attainment of the goals originally sought through participating in satellite formation.

De-coupling meant, at the same time, relaxation of the politically-related constraints on satellite development that had characterised the initial phase of pre-emptive underdevelopment, since the combination of urgency and developmental limits had been produced by rival approaches to satellite control that were born from the same concerns whose influence was now being decisively reduced. De-coupling was hence a precondition for the subsequent devolution of satellite control to a liberalised, politically polycentric regime in which demands for wider and more intensive technological exploitation could more readily be met.

In this and the two chapters that follow, the principal Intelsat controversies of the 1964–71 period—operational competence and internal power-sharing—are examined in terms of the two broad sets of contextual political relations that satellites had, in one way or another, served: relations among metropolitan industrial countries, mainly transatlantic; and relations between metropolitan and Third World countries, or North–South. The changed political conditions of each sphere are considered, and the importance of providing, procuring or controlling satellite technology as a means of sustaining or modifying dominance in each is assessed.

This chapter discusses the 'single global system' concept of a comprehensive Intelsat in light of European–American strategic policies and commercial rivalries. In Chapter 16 the same satellite controversy is examined in terms of metropolitan–Third World relations, in particular the challenge to U.S. globalism posed by European efforts to revive particularistic 'spheres of influence'. Proposals to reform and democratise
Intelsat internally are considered from the perspectives of both transatlantic and North-South relations in Chapter 17, which is followed in Chapter 18 by an account of the 1969-71 Intelsat re-negotiations when these issues were formally addressed. Finally, Chapter 19 recounts the aftermath of those negotiations and concludes this study with a consideration of findings.

The chapter continues with a consideration of the competence—'single global system'—issue in the context of transatlantic relations. As the likelihood of a strategically significant, independent European nuclear capability receded, the continuing U.S. prevention of technological transfers that were potentially valuable to European satellite-related work emerged as more firmly based upon a desire to preserve commercial advantage than upon fears that control over the Western strategic deterrent would be fragmented. This commercial component was justified by concern with Intelsat's fate and future operations, and to secure the integrity of the single comprehensive satellite system the U.S. supported efforts to suppress independent satellite development were required. To the degree, however, that these efforts included denying use of American rockets, they risked stimulating the Europeans to develop their own, which would eliminate the most potent long-term leverage the U.S. had over independent space projects, perhaps resuscitate European nuclear weapons ambitions, and absorb funds that the Americans wanted fed into the U.S. post-Apollo space programme. Furthermore, insisting on Intelsat's satellite monopoly over specialised satellite services might greatly complicate resolution of principally transatlantic issues and further delay provision of valuable and lucrative services.

The short-term defence of an Intelsat satellite monopoly thus called into play measures whose longer-term consequences not only would not serve, but might actually frustrate pursuit of more important policy objectives—endangering transatlantic cooperation in new fields, and possibly, if paradoxically, strengthening European competitiveness in existing commercial aerospace fields. A recognition that the benefits of monopolisation through Intelsat were less impressive than those drawbacks, and that permitting liberalisation of satellite control would not prevent vital technological interests from being pursued, underlay the
2. THE STRATEGIC COMPONENT

Intelsat's interim period coincided with a time of considerable European resistance, led primarily by France, to the continuance of U.S. postwar military and economic dominance. The period was bracketed by President DeGaulle's January 1963 pronouncement against British entry into the European Economic Community (EEC)—for Prof. Kissinger, a "watershed in European-American relations" (5)—and by the U.S. government's August 1971 suspension of the convertibility of the dollar, an unprecedented action provoked by the unwillingness of European central banks to honour the dollar's status as a principal reserve currency. (6) Throughout the period France pursued development of an independent nuclear arms capability; in March 1966 the French withdrew from the integrated NATO command, and later refused to sign the nuclear Non-Proliferation Treaty concluded in July 1968 by the U.S., Britain and the Soviet Union. (7)

American strategic policy consistently opposed creation of new national nuclear forces, and although the possibility remained that a transnational capability might be accepted—e.g. a federated European state—the likelihood of such political unification was remote enough to justify strong urgings that recalcitrant allies, including West Germany and Japan as well as France, sign the 1968 treaty. (8) Since warheads were assumed to be more or less easily developed, attempts to sustain the policy on a technological level were concentrated on restraining the proliferation of militarily useful delivery systems—rockets, guidance and telemetry equipment. The Americans relied on domestic 'munitions control' regulations—derived, curiously, from a 1954 Mutual Security Act—which empowered a munitions control board in the State Department to review and prevent proposed commercial transactions whose consequences might injure national security, however defined. (9) Although aggrieved U.S. manufacturers complained in the late 1960s that foreign trade in electronics and aerospace equipment was being stopped even in strictly civilian fields, a review of items on the proscribed list conducted by the State Department in 1970—after
requests by the Pentagon and NASA—retained all space-related items "because," a White House official said, "there is as yet little space technology which does not impinge on military uses."^10"

U.S. suspicions that European space programmes might be a blind for lingering military ambitions were presumably strengthened by the chronic absence of clearly defined scientific or commercial objectives within the European Launcher Development Organisation (ELDO), in which France was a principal participant. (11) During a 1966 Parliamentary review of Britain's ELDO role, for instance, aviation ministry officials acknowledged that the ultimate uses of the current ELDO rocket project remained an open question. (12) France's military aspirations may have been "demonstrably political rather than military," (13) but no less political justifications could be offered for developing a multilateral European strategic capability on grounds that it would facilitate and deepen efforts at European unification:

The Community's industrial and technological policies, equally necessary for an economic union—and more so for political union—would have to include the armaments industries and defence technologies...Thus the 'European defence and security option' would become a political consequence of unification in a federal state rather than a strategic requirement or even a military advantage for Europe. (14)

Realistically, though, the likelihood of a European capability's emerging to force a revision in American NATO control—let alone a disintegration of the alliance—was remote: the French nuclear programme was limited and dependent, wider interest in following France's lead was practically non-existent, and nuclear weapons technology was meanwhile advancing well beyond the ICBM stage. The French force de frappe through the 1960s consisted of three dozen obsolescent bombers, which required American-supplied jet tankers for long-range missions; and in spite of France's formal withdrawal from NATO, its strategic force still relied on the alliance's early warning systems. (15) The entire programme was delayed by budget cuts occasioned by conventional arms requirements, rising costs of nuclear development and the post-May 1968 reorientation toward domestic expenditures. (16) Although only a portion of the arsenal originally scheduled to be available by the early 1970s was deployed, (17) that achievement suggested the ineffectiveness of U.S. export controls where the potential recipient of the
technological transfers had both the ability and will to develop the
technology independently.

Not only did France fail to win wider European support for and par-
ticipation in nuclear arms development, (18) but even the nominally civil-
ian multilateral launcher programme had been crippled by disagreements
over how to apportion work according to national investment shares—the
juste retour principle—, by concern over rising costs and by doubts
over the programme's ultimate usefulness. The British climaxed several
years of dissatisfaction by withdrawing from ELDO in November 1970, when
the programme was centered on development of the €600m synchronous Europa
3 rocket. (19) A truly Europe-wide commitment to launcher development
came only in April 1975, when the European Space Agency (ESA) was created
under a British director-general, inheriting all 10 of ESRO's members—
while ELDO had had only five, further evidence of slack interest in
rocket development. Although the French had insisted that its own laun-
cher projects—including the Ariane synchronous rocket and a largely
idle base in Guyana—be accepted as the collective responsibility of
ESA, it was nevertheless envisaged that France would continue paying 70
percent of the base's costs over the next five years. (20) ESA took on
the Ariane rocket though and multilateral launcher development work
continued.

The strategic importance of such efforts—whether under French or
European auspices—was meanwhile being made questionable by development
of far more sophisticated weapons systems. The practicability of anti-
missile defences summoned a response first through deployment of multiple
independently-targetted warheads —several to a single missile—and sub-
sequently through development of low-altitude Cruise missiles, launched
from aircraft and equipped with guidance systems enabling them to evade
ground radar and deliver nuclear bombs for one-fiftieth the cost of an
ICBM. Soviet and American scientists were also, by the mid-1970s, work-
ing on space-borne systems employing laser or particle-beam weaponry,
which would further increase the vulnerability of traditional rockets. (21)

1. THE COMMERCIAL COMPONENT: THE SINGLE GLOBAL SYSTEM

In view of the apparent marginality of nuclear weapons development in
in Europe, the military justification for U.S. export restrictions cannot account for the vigour with which they were enforced. American policy was also broader in coverage, as a White House official indicated in 1971: "Valuable technology and know-how should not be given promiscuously, and of course we must avoid endangering our national security through inadvertent technology transfer."\(^{(22)}\)

As early as March 1965 the State Department stopped Hughes Aircraft from selling satellite technology to the British Aircraft Corporation to enable BAC to build a synchronous communications satellite for London-Sydney service. The Economist observed:

> The reason had little to do with military security. The State Department appeared to think that American industry has a valuable monopoly in commercial satellites which should be exploited for maximum profit, which means keeping the knowledge in America. (23)

The French were prevented in 1966 from buying communications technology for satellite experiments,\(^{(24)}\) and by 1967 the White House had confirmed existence of what an account called a "flat ban on the export of U.S. technology that might possibly be applied to commercial communications satellite development outside the Intelsat system."\(^{(25)}\)

Around 95 percent of foreign requests for technical information from American firms were delayed by the State Department; among the two to three percent ultimately disapproved, a spokesman noted, "a number" were "related to communications satellites, and particularly to satellites whose relationship to Intelsat has not yet been clearly defined."\(^{(26)}\)

Export restrictions were a means of defending the 'single global system' policy—first introduced to the Europeans soon after the Comsat Act was passed, formally rejected by them during the interim negotiations, but nonetheless reaffirmed by President Johnson in his August 1967 policy message to Congress: "Our country is firmly committed to the concept of a global system for commercial communications," which would avoid duplication of space and ground facilities, reduce costs and ensure efficient frequency uses,\(^{(27)}\) the President said. Therefore, "Intelsat should be the permanent organization for operating the world's global system, and ... all domestic and regional systems should be under its supervision," which would include assuring technical compatibility,\(^{(28)}\) and which would prevent what a former State Department official termed the "very wasteful..."
The cornerstone of the American position on independent systems was 'compatibility'. In principle, Intelsat could be given certain regulatory powers to ensure technical non-interference and adjudicate conflicts over frequencies and orbital slots without being entrusted with comprehensive responsibilities as to construction, operation, management and rate-making of regional and/or domestic systems. Despite arguments that the development of regional (i.e. intra-continental) networks might—as long as Intelsat controlled interconnections among them—expand the demand for Intelsat circuits "by 'collecting' domestic traffic," Comsat was opposed to such projects and had suggested as early as 1965 that regional traffic might eventually double Intelsat's revenues. The U.S. government was less certain, and as of August 1966 the White House director of telecommunications management (DTM) described separate systems as an "open" policy question: "The national interest is not clearly apparent in any of the cases that have recently been advanced." Consequently the American proposals on permanent Intelsat arrangements, submitted in October 1967 to the ICSC, said nothing about regional systems, and a speech by Comsat's international vice president in April 1963 ostensibly devoted to the subject did nothing but categorise the various networks then being proposed. Notwithstanding internal uncertainties, however, U.S. embargoes on satellite-related foreign trade effectively endorsed a wide-ranging notion of 'compatibility'—at least until Intelsat officially decided on its sphere of operations—whereby the potential competitiveness of proposed systems with Intelsat was sufficient to make them unacceptable.

4. THE EUROPEAN RESPONSE

To the Europeans, these strictures smacked of the celebrated 'American challenge', implying continuing dependence upon American discretion of European efforts to develop commercially valuable aerospace technology. Their response was four-fold: attempting to improve European competitiveness within Intelsat; developing a technical and organisational
capability to make the threat of separate development credible; pro­posing a divided ownership scheme within Intelsat that would erase the distinction between global and regional systems; and supporting limitations on Intelsat's operational competence. In all, the Europeans' goal was to enhance their prospects of participating on satisfactory terms in the commercial space field.

Improving the European position in Intelsat: It is difficult to determine the degrees to which European aerospace mobilisation in the mid- to late-60s was designed to improve the collective position vis-a-vis the U.S. in Intelsat, or was genuinely expected to produce viable independent space systems. The July 1966 decision by an interministerial conference to up-grade ELDO's current project to meet geostationary re­quirements, for instance, was justified on both counts: according to ELDO's secretary-general, it would "provide independent launcher capac­ity for European commercial payloads" by 1979; according to Bri­tish space industry officials it would enable the Europeans to negoti­ate a bigger Intelsat share and to bid successfully on the volume of Intelsat contracts their existing quotas entitled them to. American officials believed the real objective was negotiating leverage, but the immediate intent mattered less than the capability to fulfill the implied threat.

The money paid to non-U.S. companies for the first three Intelsat spacecraft generations had been derisory: Early Bird was entirely built in the U.S.; 2.3 percent of Intelsat II contract money and 4.6 percent of Intelsat III, all subcontracts for minor components, had gone abroad. As of 1967 Western European Intelsat members had contributed 28 percent of the system's capital and received less than four percent of its contracts, and were thus reluctant benefactors of American aero­space companies. The Europeans refused, however, to approve the Intel­sat IV series without assurances of more contract money, and more than 36 percent of the costs of the first four IVs was consequently spent in Europe. Nevertheless, by November 1970 ninety-two percent of Intelsat's total expenditures had gone to American firms or to NASA, while U.S. shareholding stood at just over 50 percent.

As Comsat was fond of pointing out, however, European aerospace ambitions were difficult to reconcile with their actual expenditures. As of February 1966 the U.S. was spending on space activities roughly as much
as the British on their entire defence budget (£2,000m), while Western Europe's space expenditures totalled around £60m. On a per capita basis the gap was equally remarkable: France 45½ pence, Britain 25½ pence, the U.S. £1. The ability of European firms to compete for Intelsat contracts could not fail to suffer accordingly, as this June 1966 memorandum from the UK National Industrial Space Committee suggests in its explanation of why no British firm had bid on the Intelsat III prime contract:

This arises purely and simply from the fact that due to the absence of any significant national space programme no British company has the necessary experience or expertise to submit a bid as a prime contractor within 30 days on a fixed price development contract with a guaranteed reliability for the end product. (48)

Even by 1971, when the costliest era of American space endeavours was all but past, Western Europe was spending collectively and individually less than 10 percent of U.S. totals. (49)

Independent space projects: Even if sustaining the effort to improve the collective position in Intelsat was a principal objective, European aerospace work required projects of its own to orientate R&D and, in time, to yield commercially lucrative results for application inside or outside of Intelsat. Preliminary work began in 1967 on two communications satellite projects: a European telecommunications and broadcasting network, and the Franco-German Symphonie system.

The 14-member European satellite group (GETS) asked ESRO in the spring to draw up plans for a continental satellite system. The European Space Council, which had been created in late 1966 to coordinate the work of ESRO, ELDO and GETS, appointed a committee of PTT representatives, broadcasters and aviation ministry officials to study ESRO's proposals in November 1969. The plan was formally released in July 1970, and called for creation in the 1980s of an elaborate, high-powered synchronous satellite system—each spacecraft radiating a full kilowatt of power and capable of 10-15,000 voice circuits and two TV channels. Up to one-half the total traffic carried among European PTTs—most traffic going more than 500 miles—would be accommodated, and the system would extend real-time Eurovision television service to outlying members of the European Broadcasting Union like Cyprus, Iceland and Lebanon.
In June 1967 a $40m satellite plan was announced by France and Germany, which would involve geostationary spacecraft linking the two countries to western and southern Africa, the Caribbean, Quebec and eastern South America. The project arose from two parallel programmes, SAROS in France and Olympia in Germany, and included for a four percent Belgian participation. Called 'Symphonie', the system would be used mainly for TV distribution and some telecommunications, and would require smaller and cheaper ground stations than those hitherto deployed for Intelsat, which was hoped to make adherence especially attractive to Third World countries. Indeed by March 1968 Intelsat was reported as "wooing French Africa" through overtures to the Ivory Coast, Cameroons and Malagasy Republic in hopes of keeping them from following Senegal into Symphonie.

Divided ownership of Intelsat's space segment: It was argued, mainly by the French, that regional satellite plans could easily be accommodated within the Intelsat framework if the regime of undivided space segment ownership were replaced with one where the users of specific spacecraft decided their own requirements and were empowered to meet them. Influence would therefore be based upon regional, not global, traffic volumes and contracts presumably would be distributed accordingly. Intelsat, or some successor organisation, would under the French plan ensure technical compatibility and service continuity among four constituent satellite systems, each run by a separate users' consortium.

It was said that the divided ownership scheme—which had wider European support only inasmuch as the association of PTTs (CEPT) drafted its 1967 proposals for a permanent Intelsat to include both undivided and divided ownership possibilities—followed "logically and fairly" from the notion of basing influence upon use, and that it would benefit the "large majority of Signatories" who used only one satellite. Since a geostationary satellite was "only regional and of limited coverage," it was "practically impossible" to distinguish between domestic and regional—or for that matter 'global'—spacecraft, and divided ownership would thus be more appropriate to the technology itself. Finally, the French adopted the U.S. 'single global system' rhetoric to argue that their ownership proposal would establish a principle under which comprehensive services could be offered through Intelsat: "...A system of separate ownership is the only one that might possibly become 'single global' and also extend its scope to encompass a multitude of
services, assured by a diversity of operating entities," which might even include Soviet bloc countries, whose regional—as against global—traffic shares would entitle them to participate on acceptable terms.\(^{(58)}\)

**Restricting Intelsat's competence:** Numerous arguments were advanced in favour of exploiting satellite technology on a regional, as against a global, basis: synchronous satellites had an inherently regional character, reinforced by development of highly-focussed antennas;\(^{(59)}\) similarly, narrow beams reduced the need for global coordination to avoid technical interference and made regional decisions on usage the more pressing concern;\(^{(60)}\) proposed regional systems concerned land masses roughly comparable to the U.S., and were therefore no different from American domestic plans for which Intelsat's advice—let alone approval—was not sought;\(^{(61)}\) it was technically unlikely that spacecraft dedicated mainly to intercontinental usage would either have sufficient capacity or be suitably positioned to handle regional traffic, and even if they could it would be unwise to concentrate so much capacity in a single facility;\(^{(62)}\) and specialisation in the form of regional space segments would permit use of smaller and cheaper ground stations.\(^{(63)}\) These arguments found considerable support within UN organs, principally the Working Group on Direct Broadcast Satellites and UNESCO,\(^{(64)}\) and among Intelsat's European members.\(^{(65)}\)

Commercial arguments were, as the French recognised in their divided ownership plan, even more persuasive, and a 1969 memorandum from the Eurospace aerospace and electronics consortium observed:

> European firms could not compete with U.S. industry and the only way to assure that their development effort is of value, at least in the envisaged future, is to exploit their systems in a regional context.\(^{(66)}\)

If, therefore, the qualitative breadth of Intelsat's activities could be confined, regional satellite development could ensue irrespective of higher local costs and without directly impairing the integrity of the 'single global system', as currently defined. It was necessary to define the limits of the future competence of Intelsat and, within this sphere of competence, the criteria on the basis of which regional systems may be considered as compatible with the world system.\(^{(67)}\)

Furthermore, since Intelsat's scope should be limited in principle to the space sector of systems over which international traffic that lies within the competence
of the Telecommunications Entities signatories to the Agreements is carried...

the organisation would furnish only public, fixed-point voice and record services. With other offerings by definition "outside the competence of Intelsat, risk of duplication of competition disappears and the concept of regional systems becomes possible."(63)

Confining Intelsat's operations on geographical—i.e. regional—grounds was not therefore the sole objective of this position. At issue as well was the organisation's entitlement to enter so-called specialised fields, principally aeronautical and maritime services. The American view was that Intelsat "would have authority to furnish...all services which can be provided by means of communications satellites."(69) As the Rostow Report argued:

By providing a reservoir of expertise in satellite planning, [Intelsat] should continue to be the focal point for coordinated planning for the most effective global utilization of satellites, and should likewise serve as a forum for coordinating plans for specialized satellite uses. (70)

The European position was, essentially, that Intelsat's entry into those fields was negotiable but not self-evidently justified, and that certain collaboration with other international bodies—e.g. the International Civil Aviation Organisation (ICAO) and the International Maritime Organisation (IMO)—which represented potential users and already exercised authority over the relevant services should be required. (71) The majority ICSC recommendation, approved in December 1963 and forwarded to the Intelsat re-negotiating conference, was that Intelsat be permitted to provide specialised services only if specifically authorised by a majority of its membership—who were to determine that the proposed services would be technically and economically acceptable—and if Intelsat's primary interest in furnishing fixed-point public telecommunications services would not be adversely affected. (72)

5. EFFORTS TO CREATE SPECIALISED SATELLITE SERVICES

Previous attempts to offer aeronautical and maritime services within Intelsat had been thwarted in part by the general disinclination of the European members to furnish Comsat with other fields to which to extend its dominance—but only in part. It was also true, notwithstanding the
tidiness of the comprehensive satellite system concept, that these services involved different institutional and indeed national constituencies than had hitherto been active or dominant in Intelsat: PTTs did not normally provide aviation guidance or links among ships at sea; the countries whose fixed-point telecommunications traffic bulked large were not necessarily those with big shipping fleets; \(^{(73)}\) and improved aeronautical services were of concern mainly to those airlines that faced growing congestion on North Atlantic routes. \(^{(74)}\) To a degree, therefore, Intelsat's expansion was prejudiced by the particular nature of its composition and structure of dominance—based upon PTTs and national fixed-point traffic shares. Furthermore, the technical requirements of specialised services might well be different from those of its existing operations, involving virtually miniature terminals and perhaps different zones of coverage (e.g. transoceanic air and sea routes.)

**Aviation:** Nevertheless, by proceeding through Intelsat, Comsat could hope to apply its voting power and technical leverage, and guarantee itself an important role especially in the aeronautical field, where the need for satellite services was believed by some to be great. Beginning in 1965, when Comsat's tests with Early Bird and NASA's experiments with Syncom III demonstrated the feasibility of serving aircraft via satellites, \(^{(75)}\) Comsat sought to involve itself and Intelsat in the field, where the deficiencies of the existing combination of Very High Frequency (VHF) and High Frequency (HF) radio services—such that transoceanic flights were sometimes cut off from contact for an hour or more \(^{(76)}\)—prompted the ICAO in 1963 to identify a need for satellites by 1970 \(^{(77)}\) and the U.S. Federal Aviation Agency (FAA) in 1966 to term the requirement in the North Atlantic as "immediate." \(^{(78)}\)

The FAA first asked Comsat if the company was interested in supplying aviation services in 1965 \(^{(79)}\) but Comsat was able to get only one bid from industry—which was considered too high \(^{(80)}\)—and the FAA turned instead to experimenting with a NASA ATS spacecraft. \(^{(81)}\) Comsat began developing a plan for "an initial demonstration of service," \(^{(82)}\) which government agencies rejected in 1963 as providing for insufficient capacity. The principal communications service of the U.S. airlines, Aeronautical Radio Inc. (Arinc), then offered to join with Comsat in modifying the plan to include use of higher capacity satellites, and domestic efforts continued. \(^{(83)}\)
Comsat had proposed to the ICSC in 1967 that Intelsat begin work on creating an aeronautical service using multipurpose satellites, and on Intelsat's behalf commissioned Philco-Ford to conduct an engineering study of potential systems. Intelsat however went no further, due to French and British opposition. The French were leaders in airborne transmission equipment operating in the Ultra-High Frequency (UHF) range, while the U.S. airlines—and Comsat—wanted the system to function in the lower VHF bands, which would entail replacing less equipment. Perhaps as a consequence, the French were concurrently arguing that Intelsat should keep out of mobile services altogether on grounds that these were not commercial but public—i.e. intergovernmental—services.

For their part, the British were simply not convinced of the immediate need for aeronautical satellite facilities and concluded, on advice from the ICAO, that Comsat's goal of operational service by 1971 was needlessly ambitious; since it was the advent of the supersonic Concorde that was expected to aggravate the need for improved transatlantic facilities, 1975 would be adequate. Furthermore, the British agreed with the French on the desirability of UHF operations, because the VHF range was growing too congested. Comsat nevertheless issued a formal request for proposals to manufacturers in August 1968, and in a September submission to the ICSC the American government supported Comsat's view that an immediate requirement existed.

Maritime: Little was proposed and nothing was done in regard to applying satellites to maritime communications prior to the 1969-71 Intelsat re-negotiations, in spite of expressions of interest in the field by Comsat dating from 1964. Both the need for and economic practicability of such service were doubtful: although existing facilities were even poorer than those of aircraft, ships had less outstanding need to improve them than did aeroplanes, since up-to-the-moment locations were not generally required and better general telecommunications services—radiotelephone or teletype—would be of questionable importance, and unlikely to be considered worth several thousand dollars in additional monthly operating costs per ship. Changes in the character of the shipping industry—containerised cargo ships, supertankers, seismic research vessels requiring high-speed data links with shore-based computers—later altered the situation (see Chapter 19), but it was nevertheless
estimated that a maritime system would need 35-40 percent of world shipping to be viable.\(^{(91)}\)

Hence, in the field of aviation if not maritime services—although it is notable that Intelsat’s first decision to experiment with satellites for commercial ships was in spring 1972, after the permanent arrangements had been adopted—delay was produced in part by European reluctance to authorise an expansion of Intelsat’s competence, where such expansion would offer Comsat and U.S. industry the opportunity to extend U.S. dominance into attractive fields for independent exploitation.

6. LAUNCH SERVICES

The technical basis of that dominance, however, was ultimately the U.S. geostationary launch monopoly: until that monopoly was either broken or placed at the unconditional disposal of European commercial space efforts they would remain vulnerable and dependent, irrespective of the three-fold increase in overall European space expenditures between 1964 and 1972.\(^{(92)}\)

Protecting the 'single global system' from possible rivalries, though, posed a considerable problem to the American defence of its launcher monopoly. Whereas the U.S. had previously offered launch services to the Europeans in part to discourage their channeling money into ELDO,\(^{(93)}\) to furnish the rockets the Europeans now wanted to use would assist the very satellite competition that the U.S., in Intelsat’s name, were trying to prevent. Consequently American launch services were reportedly denied to the Symphonie project.\(^{(94)}\)

This defence of Intelsat threatened not only to encourage independent launcher development, however, but to dampen prospects for further European participation in U.S. space programmes. By early 1970 NASA was attempting to draw European interest to its post-Apollo projects—the orbiting space laboratory and the reusable 'space shuttle', the latter intended for 100 or more flights into space.\(^{(95)}\) In response to congressional reluctance to approve lavish space expenditures, NASA hoped to raise more than a billion dollars from Europe—10 percent of the shuttle’s development costs. European aerospace officials in return wanted assurances that U.S. launchers would be made available for their satellite projects, before funds then assigned to ELDO were diverted to the post-Apollo programme.\(^{(96)}\) NASA and the State Department were by early 1971
prepared to concede the launcher question, but Comsat officials reportedly went to the White House in May and threatened not to sign the Intelsat permanent arrangements—then all-but concluded—if the launcher offer was not withdrawn, which it then was.

Nevertheless the U.S. position remained that launch services would be available "for projects consistent with peaceful purposes and international agreements," so the precise nature of the new Intelsat agreement would be important in determining the likelihood of further offers. A decision relegating Intelsat to a circumscribed area of competence would therefore be advantageous to U.S. as well as European space programmes, since it would free NASA to assist European commercial payloads and perhaps release the funds the space agency needed.
CHAPTER 16: THE 'SINGLE GLOBAL SYSTEM' AND NORTH-SOUTH RELATIONS

1. OVERVIEW

Issues relating to future control of satellite communications did not arise solely from transatlantic concerns, but were animated as well by contention derived from the sphere of relations between metropolitan industrial and Third World nations. At play were: 1.) the opportunities presented by regional as against globalised satellite approaches to European and American interests for lucrative and politically beneficial transactions with underdeveloped countries; and 2.) the prospects of Third World nations for obtaining on desirable terms the communications services they increasingly believed indispensable to national development strategies.

Within the conflict between globalism and regionalism at the level of Intelsat can be detected elements of a larger controversy that was dividing the 'North Atlantic community'. What became, in effect, a renunciation by the United States of its attempt to mandate a global satellite monopoly through Intelsat was a response in part to the vigour with which the Europeans were seeking particularistic links with Third World regions, in part to the risk that stalemate might endanger American and European exploitation of attractive markets, and in part to the outstanding interest of Third World countries in increasing the variety of potential sources of necessary services.

2. THE EUROPEAN CHALLENGE

Despite assurances from scholars like Kissinger that "the process of de-colonization has sharply reduced Europe's interest in extra-European affairs,"(1) and predictions from others that a unifying Europe "may sink into the provincialism of a large Switzerland,"(2) collective European policy toward the Third World was by the late 1960s directed toward fashioning new links with old empires, and even challenging the United States in areas where American commercial and political hegemony was
Formal arrangements: Indications of an unflagging European interest in commercial partnerships with Third World nations were evident even during the 1956-58 negotiations that yielded the Treaty of Rome and founded the EEC: at the insistence of France and Belgium—and over opposition from Germany, Italy and the Netherlands—an association of African francophone states was created and a free trade zone and common development fund were established to help draw the overseas colonies and territories of the Six into the EEC.\(^{(4)}\) Continuing efforts accompanied the 1963 debates over British entry, when the Dutch and Germans succeeded in having the major external tariffs of interest to the Commonwealth reduced, partly to facilitate Britain's admission and partly to assure the Community enhanced access to the Commonwealth if Britain were kept out.\(^{(5)}\) Further overtures to Africa resulted in the Yaoundé Convention, signed in July 1963 by the EEC and 13 African states formerly linked to France, Belgium and Italy,\(^{(6)}\) and in the September 1969 Arusha Convention among the EEC, Nigeria and the three states of former British East Africa.\(^{(7)}\)

Negotiations over trade preferences during the latter 1960s expanded out of Europe's traditional sphere of interest in Africa to Latin America, culminating in the July 1970 Declaration of Buenos Aires, intended to serve as the basis for closer cooperation between the 18—later 22—Latin American signatories and the EEC.\(^{(8)}\) Yaoundé was renewed in 1971 and replaced in 1975 by the Lomé Convention, which created commodity price stabilisation measures and reduced tariffs on some Third World industrial exports.\(^{(9)}\) The EEC had meanwhile unilaterally announced in July 1971 a generalised preference scheme covering 91 Third World countries,\(^{(10)}\) and a year later the eight British Caribbean dependencies of the Caribbean Free Trade Association (CARIPTA) opened negotiations on special ties with the Community.\(^{(11)}\)

Lomé created a preferential trading zone comprising at first 46, and within three years 54 countries of Africa, the Pacific and the Caribbean, which were linked to the EEC through 'reciprocal' trade preferences, commodity stabilisation schemes and an aid programme administered by the European Development Fund.\(^{(12)}\) Talks were proceeding with Egypt, Lebanon, Syria and Jordan, and formal negotiations continued with Spain, Portugal, Greece and Turkey over creation of a Mediterranean Free Trade Area, which would include North Africa as well.\(^{(13)}\) The 1972 forecast of R. Dahrendorf that there would soon be 58 countries tied by various formal commercial
preferences to the EEC had, in the space of a few years, been well overtaken.\(^{(14)}\)

**Substantive trends—concentration and diversification:** The formal arrangements both assisted and reflected growing volumes of transactions between the EEC and Third World. Even before British entry, the EEC had by 1970 replaced the U.S. as the most important trade and aid partner of underdeveloped countries, absorbing more Third World exports and originating a greater flow of private capital and official aid.\(^{(15)}\) The degree to which the dependence was mutual is another matter: due to declining prices of primary materials the importance in money terms of Third World trade actually fell during the 1960s from the 25 percent of world volume of the previous three decades to around 15 percent;\(^{(16)}\) and, as P. Jalée has noted, if 1965 is compared with 1952 the range of significant trading partners for each of the metropolitan countries had widened, but the proportion of trade conducted between each and its top three trading partners increased an average of 6.5 percent.\(^{(17)}\) Nonetheless, overall dependence may well be reducible to sectoral dependence within industrial economies, as H. Magdoff has argued,\(^{(18)}\) and there can be no question that the Third World was vital as a source of primary materials and dynamic market growth.

Although transactions involving the EEC and its members with underdeveloped countries had tended to concentrate in areas of traditional interest, the concentration was weakening. In 1970 nearly half of the Community's Third World trade was with Africa, owing partly to pre-emptive efforts related to possible British entry and partly to vigorous French policies to reassert ties with francophone Africa.\(^{(19)}\) France had also by 1972 become the biggest exporter of industrial equipment to Arab countries.\(^{(20)}\) Signs of geographical diversification were evident too, however, especially in Latin America, where the U.S. was providing around 70 percent of foreign investment, sending the region 35 percent of its imports and buying 30 percent of its exports. Between 1960 and 1969, while Latin American exports to all metropolitan countries increased 45 percent, those to the U.S. rose only 10 percent and exports to the Six increased 72 percent. Italy, Germany and France in particular emerged as strong commercial competitors to the United States and as sources of capital for manufacture and extractive activities.\(^{(21)}\) Evidence of the breakdown—or widening—of the former pattern of dependence includes the 1975 German-Brazilian deal on uranium enrichment; Germany, which had been reliant on the U.S.
for 90 percent of its uranium, would exchange enrichment facilities for Brazilian ore, despite American efforts to keep such technology out of Latin America. (22)

Japan: In addition, the Japanese commercial and political presence in the Third World was broadening and deepening. Both U.S. and EEC preference schemes typically excluded products that had sensitive implications for domestic industries—particularly manufactures, in which the export-orientated economies of East Asian centres like Taiwan, South Korea and Singapore specialised. (23) Japanese policy exploited this discrimination through liberalised trade preferences covering exports of special interest to Southeast Asia, and through a $20,000m cooperation fund which offered the very assistance to emerging heavy industries—steel, shipbuilding and petrochemicals—that Europe and America had been unwilling to extend. (24) Furthermore Japanese interest was expanding into North Africa and Latin America, and by the late 1970s the latter was the location of around 35 percent of Japan's overseas investment, (25) including steel and shipbuilding in Brazil, motor manufacture in Mexico, and other heavy industrial projects in Argentina, Colombia and Venezuela.

'Spheres of influence': While indications of regional diversification in metropolitan transactions with the Third World are of interest, they should not detract from the more compelling evidence of strong trends—opposed by the United States—toward geographically concentrated commercial arrangements. "The formation of a bloc," as one scholar wrote of the EEC, "may not have been the intent originally, but it is the inescapable conclusion to the proliferation of special agreements." (27) Whether called "blocs," "spheres of influence," (28) what Kissinger termed in 1972 the "pentagonal power structure of the international system," (29) or G. Barraclough's "regulated, regionally organized world economy," (30) rivalries among the domains were intensifying as the stakes increased; by 1970 Third World countries were absorbing 43 percent of Japanese exports, by 1978 forty percent of EEC exports, and as of the mid-1970s the non-OPEC developing countries took a bigger share of American exports than the EEC and Soviet bloc combined. (31)

The United States was growing increasingly aware of the threat special agreements posed to its own commercial prerogatives. A 1971 presidential trade commission observed that American business was operating
in a "radically" changed environment abroad from that of the immediate postwar years. The U.S. tried unsuccessfully to block the spread of EEC trade preferences in Latin America by threatening to exclude beneficiaries from its own generalised 'most favoured nation' scheme. Secretary of State Kissinger, in an April 1973 speech, sought to contrast America's "global responsibilities" as a superpower with the "regional interests" of Europe as an economic unit. H. Malmgren summarised the U.S. position effectively as follows:

The profound interest of the United States in the establishment and use of international rules and institutions on a global basis is threatened. This is not a matter of theoretical, ideological enthusiasm for certain types of principles and procedures. The United States does have global political and economic interests. The global economic interests are best protected by rules of non-discrimination which apply as widely as possible. The global political interests are best served by rules which restrain divisive economic nationalism.

3. SATELLITES AND THIRD WORLD MARKETS

Inevitably, negotiation over global versus regional formulas for satellite control was informed by this larger rivalry for political and commercial advantage in the Third World. Globalism in the satellite field was viewed in Europe as a recipe for American dominance, as this 1965 French commentary, which noted as well the direct advantages Intelsat's single global system promised the U.S. in equipment sales, observed: "Above all, this would open to the Americans the possibility of considerable political and strategic implantation" in Third World countries.

Regionalism, on the other hand, offered not just diversification of access and influence, but relatively clear paths for possible international and industrial consortia to develop and market satellite equipment and services, and to benefit from an indeterminable volume of sales of space and ground segment hardware. In March 1971 British Aircraft, for instance, revealed a £36m proposal for a synchronous satellite—which the company got experience in building due to a subcontract that had enabled it to assemble an entire Intelsat IV, the first operational communications satellite built in Europe—which was announced as suited to service in the Third World.
Furthermore, a vast potential market in conventional telecommunications equipment existed—from earth stations, relays, exchanges, switching apparatus to the telephones themselves—for which satellite-related transactions could serve as inducements and which, moreover, the basic transmission capacity satellites provided would open up. Between 1963 and 1975 world investment in new telecommunications plant averaged 19 percent growth per annum, and international trade in the field rose 13.5 percent yearly. Top contenders in the market included STC in Britain, Ericsson in Sweden and Thomson CSF in France, as well as IBM and ITT's U.S. operations. (38)

**U.S. industry and the single global system:** The attractiveness of overseas markets made U.S. manufacturers far more eager to market their wares abroad than they were grateful for the protection their government was providing through 'munitions control' restrictions on their trade. In 1967 the Aerospace Industries Association complained that member firms were being prevented from exchanging sufficient preliminary information with prospective foreign customers to enable actual negotiations to take place. The AIA urged "a thorough review of the present export procedures and definitions that are hampering effective marketing of U.S. space products and know-how in the world market." (39) American policy, in the AIA's view, was actually stimulating foreign competition, and the group criticized the assumption that lack of U.S. technical assistance will effectively prevent a foreign nation from making headway in a given technology, e.g. launch vehicles or communications satellites, only to see U.S. refusal to help as spurring that nation to develop that technology independently, and subsequently deny any financial return to the U.S. and create new competition for U.S. industry in the world market. (40)

Hughes and TRW were described in early 1969 as especially hard-hit by the restrictions, and McDonnell-Douglas was prevented from selling a Thor-Delta rocket to the French and Germans without assurances that it would not be used to orbit communications satellites. The aerospace industry's spokesmen condemned "an arrogant use of technological power to enforce Comsat's position on the rest of the world," and the "tremendously bureaucratic" practices of the State Department, which was stopping exchanges of wholly unclassified information. "We favor," according to one industry official, "a proliferation of communications satellite
The satellite market the companies wanted to enter was one they had been nurturing since Early Bird was launched. With NASA's help they had thereby brought the attention of Third World governments to the possibilities offered by satellite service. Representatives of Hughes, General Electric, TRW and consulting firms like Page Engineers had been roving far and wide, generating interest in for example domestic satellite broadcasting in Brazil and regional telecommunications via satellite for Latin America. After two years of negotiation—with the State Department—Hughes was allowed to conduct a feasibility study of direct satellite broadcasting for Mexico, and the company prepared a similar plan for Iran, which involved a $30m educational TV system. NASA had been providing operational demonstrations with its Hughes-built ATS spacecraft of experimental domestic service in Australia, and later for direct satellite broadcasting to community receivers in India. Hughes' attempts to meet requests from Brazil for experimental ATS service were, however, rejected by the State Department pending conclusion of permanent Intelsat arrangements.

### 4. THIRD WORLD SATELLITE INTEREST

In Intelsat: Judging from the number of Third World countries that joined Intelsat, the spread of ground stations and circuit usage increases, U.S. industry was largely preaching to the converted. By 1972 more than half Intelsat's members were Third World countries, and nearly half the system's ground antennas were located in them. Circuit usage as of 1970 was more than double the capital subscription of the members concerned, since virtually everywhere earth stations were made operational, total overseas communications volume rose rapidly and dramatically. This table suggests the volume increases of four Third World countries by comparing voice traffic figures from the year before earth stations began operating with figures for 1973, and giving the number of years that had elapsed between the two:

systems under appropriate regulation."
Table IX: International traffic increases for four Third World countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Pre-satellite voice traffic</th>
<th>Interval (years)</th>
<th>1973 voice traffic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>400,000</td>
<td>5</td>
<td>4.7m</td>
</tr>
<tr>
<td>Indonesia</td>
<td>6,000</td>
<td>4</td>
<td>291,000</td>
</tr>
<tr>
<td>Jordan</td>
<td>4,000</td>
<td>2</td>
<td>71,000</td>
</tr>
<tr>
<td>Senegal</td>
<td>13,000</td>
<td>1</td>
<td>30,000</td>
</tr>
</tbody>
</table>


Earth station location was seen as conferring particular commercial advantages to host nations within a region, and local editorialists wrote of the "excellent rewards" and "open doors" satellite system membership was producing. The both costly and at times humiliating colonial heritage of indirect international routing, and natural barriers that had prevented direct communication even between neighbouring countries, were surmountable thanks to satellites. Third World interest in Intelsat's operation had prompted members to pool their ownership quotas in order to send collective representatives to the interim governing committee: an Asian group of eight countries, an Arab group of 13 and a Latin American group of four each had an ICSC member.

New applications: The most prevalent and pressing Third World requirement was not, however, for international circuits but for domestic networks, which could be furnished either through nationally-owned or regionally-shared satellites, and could make available TV service for education and national development and basic improvements in telecommunications plant—arguably "one of the key elements, if not the catalyst, in the chain process of economic growth."

While the contention that priority should be assigned to modernising communications facilities had not gone unchallenged—and it has been noted, for instance, that Indonesia's plan for domestic community broadcasting via satellite called for use of Siemens colour TV sets each costing around 12 times the national per capita income—once such modernisation
is accepted as a policy objective satellites have much to commend them. Network television in Africa, for instance, was determined by the ITU to be practically impossible without satellite relays because of the continent's low population density.\(^{(59)}\) A cost study of telecommunications alternatives for Brazil, which compared satellites with coaxial cable and overland microwave relays and even added the costs of 152,000 TV sets equipped for direct satellite reception, nevertheless found that initial capital outlays plus projected five-year maintenance costs for the satellite option were less than one-quarter those of cables and some 40 percent those of microwave.\(^{(60)}\) Other estimates put the cost of providing Latin America with a TV distribution network at £600m initially plus £60m per year through conventional methods, and £20m plus £12m per year with satellites.\(^{(61)}\) Where countries required all-new facilities for the full range of telecommunications and broadcasting services, satellites were said to be economical even for relays of 50 miles or less,\(^{(62)}\) and were believed to enable nationwide TV networking to be introduced within four years, as against a past average of 10–12 years in technically advanced countries.\(^{(63)}\)

**Social cohesion:** The appeal of satellite services was not limited to their putative benefits for educational, agricultural training, birth control and health information programmes. "Many developing countries," a 1971 UN report stated, face an acute problem arising from social forces of disintegration...A single system of mass communications providing a common shared experience to the entire population can perform an important role in making credible the oneness of the territory.\(^{(64)}\) A principal objective of India's direct broadcast experiment was "contributing to national cohesion,"\(^{(65)}\) and while a UN study concluded of Indonesia, "Only a satellite system can efficiently link these islands"\(^{(66)}\) —some 3,000 in number—a particular concern was said to be "the fear of regional revolt and what in army circles is known as 'Kuomingtangism'."\(^{(67)}\) A Brazilian diplomat appraised his country's satellite plans somewhat similarly:

> A satellite will treat all parts of the country equally. That is important in a federalized country such as ours. All the politicians feel that their states are getting an equal share.\(^{(68)}\)

Even in an industrial country like Canada national unity was invoked as a justification for satellite deployment.\(^{(69)}\)
Hence, for all these various reasons by mid-1971 domestic or regional satellite projects were being formally considered by Brazil, by an Andean group of nine South American countries, by an Arab group consisting of six countries and the Arab States Broadcasting Union, and by Japan, while the Canadian system was nearing completion.\(^{70}\)

5. BROADCASTING AND INTELSAT

Since many of these ambitions concerned TV service, the relationship of broadcasting to Intelsat is important to assessing the organisation's candidacy to undertake or supervise the projects. Both technically and organisationally, intensive use of Intelsat's space segment for television service was, though feasible, not self-evidently appropriate.

**Technically:** A satellite system dedicated primarily to TV transmission—whether to modest-sized receiving stations for re-broadcast, to specially-augmented community TV sets or to unaugmented receivers—would require large amounts of satellite capacity.\(^{71}\) More capacious satellites than Intelsat had hitherto deployed would likely be required, and pricing would—in order for the service to be competitive with specially-designed systems—have to be untied from current voice-circuit equivalences. Furthermore, modifications in earth station standards would be required: the 85-foot Intelsat antenna standard, needing extensive re-broadcasting, was suited mainly to already highly-developed areas; elsewhere economic efficiency would be determined by the numbers of ground stations having access to the satellite at once, and costs would have to be reduced to encourage earth station proliferation.\(^{72}\)

Intelsat's earth station standards were excessively high from the standpoint of TV distribution requirements,\(^{73}\) and this consideration was provided for in both Soviet and Franco-German satellite plans. In 1968 the Soviets proposed an Intersputnik system, to be the international and geostationary counterpart of its domestic elliptical-orbiting network; emphasis was placed on TV distribution to dispersed users equipped with 10- to 12-foot diameter antennas.\(^{74}\) Symphonie too would stress TV relay and incorporate as standard earth stations costing one-third Intelsat's, which were characterised as "monsters" requiring "une politique anti-monstre."\(^{75}\)
A further drawback to a globalised approach to satellite broadcasting service was technical discontinuities in TV standards—a total of 12 different monochrome and three different colour transmission standards, each incompatible with the other. (76)

Organisational conflicts: The institutional separation of broadcasters from telecommunications entities, and the different functional interests it expresses, had given rise to considerable discord over satellite TV use since Intelsat was created. Both European and American broadcasters had spoken bitterly about the tariffs and terms imposed on their efforts to have access to satellites, insisting on assurances of full-time availability—if not priority—, exclusive frequency allocations and the right to own separate terminal facilities. (77) After an initial promotional period of TV relay free of charge on Early Bird, television officials found themselves confronted, as a practical matter, with a variety of national telecommunications entities demanding widely differing payments for essential links. European PTTs evidently were much less interested in encouraging TV traffic: as of 1969, ten minutes of transatlantic television transmission cost $3,290, of which $2,400 covered the European earth station–satellite connection and $890 the same service on the American side. (78) European telecommunications officials were said to view TV relay "as an amusing but slightly childish gimmick to be used on suitably portentous occasions and then forgotten." (79) Broadcasters believed that they had been 'used' for promotional purposes by Intelsat, (80) and the European Broadcasting Union asked its members to boycott the system in 1965–66 to protest high charges and low priority assigned to TV. (81) U.S. broadcasters too complained initially that satellite tariffs were "grossly excessive" and "prohibitive" and asked for uniform through-rates and a reduction of the 30-minute—later cut to ten—minimum transmission time Intelsat required payment for. (32)

Intelsat responded with substantial rate reductions, although officials were skeptical that satellite charges had much influence on the volume of TV relay traffic. (83) One study found that even if satellite service was offered for nothing the hourly costs of television transmission, from studio to local transmitter abroad, would fall by less than 15 percent because of continued charges levied by operators of ground links. (84) Others objected, however, that lower prices "might produce new kinds of programming that...have never been given an opportunity to develop. In advance of inaugurating such a price structure, it is
difficult to predict what effect it might have.\textsuperscript{(85)}

Comsat introduced price reductions of around 40 percent and cut the minimum TV transmission time to 10 minutes on the eve of the renegotiations in February 1969, and the company used the occasion to criticise domestic rules under which TV traffic was shared on a rotational basis among the U.S. carriers.\textsuperscript{(86)} Although European PTTs reduced their fees as well, broadcasters still were confronted with a variety of post-reduction charges, as Table X indicates. It is noted that Intelsat's own space segment tariffs were uniform, and thus had nothing to do with the variation of nearly 100 percent between highest and lowest TV relay rates.

\begin{table}[h]
\centering
\begin{tabular}{|l|c|c|}
\hline
Between U.S. earth & First 10 minutes, & Per minute thereafter \\
station and & colour (US $) & \\
\hline
Australia & 2,352 & 120 \\
Europe & 3,290 & 89 \\
Japan & 2,520 & 110 \\
Hawaii & 1,650 & 86 \\
Thailand & 2,900 & 155 \\
Brazil & 3,130 & 99 \\
\hline
\end{tabular}
\caption{Variations in satellite television relay charges, 1969}
\end{table}


Comsat defended Intelsat's charges as "already promotional"—the ICSC finance committee found in 1970 that TV relay was actually underpriced in terms of fully allocated costs, the usual basis of Intelsat pricing\textsuperscript{(87)}—and said that "the major burden of...increasing the use of satellite television" fell on individual national administrations.\textsuperscript{(88)} Intelsat nevertheless modified its practice, since 1968, of charging each receiving station in a multi-destination broadcast as if it were the only receiver, and charges per station were effectively halved in November 1970 at the insistence of broadcasters in Spain, Portugal and Latin America; daily live TV news exchanges among them subsequently began in 1971.\textsuperscript{(89)}

The dominant tendency during Intelsat's interim period, notwithstanding
increases like the ten-fold rise in hours of transatlantic TV relay between 1966 and 1969 (90)—was for television use to be restricted to events of wide international interest or to specially-conceived programmes like the 1966 multinational 'Our World' telecast. Coverage of the 1970 World Cup in Mexico City, for instance, comprised around half the total satellite TV transmission time for that year. (91)

So despite the gradual introduction of policies more favourable to broadcasters, the history of Intelsat's relations with national broadcast interests suggests that the organisation's standing as a logical candidate for more extensive activities in the field was not proven. Furthermore, largescale television use—whether customary relay or direct broadcasting to community or home receivers—would require admitting to Intelsat a functional constituency different from that hitherto dominant in the organisation, one which had moreover a history of strained relations with PTTs and carriers. (92)

6. THIRD WORLD APPROACHES TO RE-NEGOTIATION

The interests of Third World nations in satellite communications thus concerned above all securing access to space facilities on domestic or regional bases—the latter primarily in order to share costs of domestic uses—to pursue development objectives relating to economic growth, mass education and national unification. Intercontinental links were conceded to have been well provided by Intelsat, but were generally considered of lesser importance than potential domestic applications. Nevertheless, if Intelsat could provide space segment facilities capable of furnishing domestic services, certain economic, political and technical advantages would accrue. First, costs could be shared widely, especially if the capacity Intelsat made available was essentially surplus and was leased at promotional rates; even if priced to reflect fully allocated costs, savings could still be considerable compared with the costs of procuring satellites and launchers independently. Second, political reliance would be diffused rather than concentrated upon one or more-neighbouring regimes. (93) Third, Intelsat's technical record was good, and the organisation's technical advice could be trusted; evaluation of various proposals for associated
ground equipment would likely be of a high technical standard.

Third World countries nevertheless stood to benefit from modifications in Intelsat's existing practices, especially as concerned voting and management. As the next chapter discusses further, the virtual disenfranchisement of these members had to be ended: even if their technical confidence in Comsat and the ICSC was high, they had no reason to assume that their own interests would automatically conform with accords reached among metropolitan countries. Similarly, efforts to internationalise Intelsat's management would mean opportunities for advanced technical training and operational experience for nominated staff.

The interests of Third World countries in the questions of internationalised procurement policies and regional systems were, however, mixed. On procurement, it was argued that in the long term underdeveloped countries would benefit from Intelsat's helping create a variety of sources of equipment they might require. European attempts to insert requirements that procurement be distributed widely among potential supplying nations justified themselves accordingly:

To avoid perpetuation of a situation of monopoly to the advantage of only one country and at the expense of all the other member states of Intelsat by stimulating worldwide competition in order to achieve lower prices and better quality. (94)

This theoretical advantage was, however, more than outweighed by the unwillingness of Third World members to subsidise European aerospace development by paying part of the higher prices on equipment built for Intelsat in Europe, an unwillingness firmly expressed during deliberations over the Intelsat IV series. In June 1963, because of European insistence, the three firms competing for the prime contract were told by Comsat and the ICSC to provide for extensive international subcontracting. Hughes Aircraft's initial reward of $72m included $20m in subcontracts for companies in eight European countries, Japan and Canada, which went some way toward meeting earlier demands that every third Intelsat spacecraft be built outside the U.S. (95) Latin American and Arab ICSC members, however, demanded to know how much more "all this education and abetment of already industrialised nations" was going to cost, and Comsat readily replied that the series would cost $9m more than if Hughes performed all the work itself, and $4m more than if the
subcontracts had all been let to American firms. Although it is said that Comsat's eagerness to confirm the misgivings was self-serving and that the company produced no data to support its estimates, they may well have been accurate and were believed in any case. One Latin American ICSC member commented:

We are going to have to pay to ship the last two spacecraft to the United Kingdom for assembly, then back to the Hughes plant in California for acceptance testing, then to Cape Kennedy. And this is just the beginning. The future will tell how many failures we shall have to finance because these subcontractors do not have Hughes' long experience with...satellites. Then the same policy will be followed with Intelsat V. (98)

The protest was accompanied by demands for technical assistance funds to match the added costs attributable to internationalised procurement. As a result, the 36 percent foreign manufacture that went into the first four Intelsat IVs was cut on the next four spacecraft, yielding an overall figure for the entire series of 26 percent. As Le Monde later warned about the European negotiating position on procurement, "If they remain intransigent on this point, the European group would doubtless lose the support of the developing countries." (99) In effect, if developing diversified sources of satellite equipment was ultimately to the advantage of Third World countries—an arguable proposition, inasmuch as competition among U.S. suppliers might be just as beneficial as international competition—the goal might just as readily be achieved by leaving the satellite field open to non-Intelsat suppliers: if European governments wished, they could then subsidise the bids offered by their national industries so as to meet or better American proposals.

As to regional satellite systems, the attractions—political prestige as well as actual services—of the various proposals made by metropolitan aerospace firms and considered by Third World governments had to be weighed against the potential damage independent systems might cause Intelsat which, if not a wholly satisfactory organisation was at least a fully operational one. It was feared that a system like Symphonie, using high-capacity narrow-beam synchronous satellites, would skim off lucrative transatlantic traffic with lower tariffs and necessitate higher Intelsat charges among light-traffic countries. (100) As a RAND Corporation study had warned:
...If domestic or regional systems grow to large proportions, they would seriously disrupt traffic for the global system and a multitude of separate, competing satellite systems could emerge—each small, each high-cost on a per-circuit basis, and together denying the countries the efficiency of a large-scale shared operation. (101)

Symphonie was therefore largely opposed by Intelsat Third World members, and an early 1969 meeting of the Latin American group pronounced itself skeptical of regional satellites in general and hostile to Symphonie in particular:

We want Europe in the Intelsat system as a balance against the strong position of the United States. We are apprehensive of the Symphonie program...This is not an intra-European regional system, but another global system. It would link European countries with their former colonies. (102)

As with the procurement issue, the Third World position on the U.S. 'single global system' was thus a pragmatic one: if such a system could deliver the services they required on acceptable terms, they would procure from it; that did not however mean—as Chapter 13 will show—that they wished to be barred from looking elsewhere for those services by an abstract commitment to globalism or by a desire to appease the U.S. Generally then the Third World position dovetailed with that of the metropolitan aerospace industry, whose American component viewed liberalisation of satellite control as a means to exploit its industrial dominance, while the European component saw the same relaxation of restraints on separate development as a way to undermine that dominance. Out of the future collision between those confident irreconcilables it was possible that the Third World would be able to obtain on desirable terms the services it needed.
CHAPTER 17: THE POLITICS OF REORGANISING INTELSAT

1. THE IMPORTANCE OF ORGANISATIONAL REFORM EFFORTS

Controversy over formal modifications of Intelsat's structure and procedures was expressed stridently, if inexacty, in terms of alternative models of international collaboration—the Americans insisting on the value of a streamlined 'business-like' operation subject to a minimum of 'political' proceduralist restraints, while the Europeans denounced unilateralism, proclaimed the indispensability of democratic forms and brandished the model of a truly international 'UN-type' agency.

Although it might seem that the issues were less important than those relating to Intelsat's competence—if Intelsat were functionally confined, its internal organisation would matter little—in fact the conflict over reorganisation played three distinct roles within the overall process of negotiating a permanent Intelsat, and was closely tied to seemingly more substantive issues because: 1.) it concerned, in general, the distribution of effective power within Intelsat, 2.) might ultimately determine Intelsat's actual spheres of competence, and 3.) furnished rallying points for more substantive matters.

First, the proposed reforms would unquestionably affect the structure of control over Intelsat. How far power would actually be redistributed was an open question: whatever the Third World enthusiasm for democratising formulas, the most likely immediate beneficiaries of a reduction in American dominance were the Europeans, and the fact remained that their interest in the satellite field was primarily that of potential suppliers of equipment and services while the majority of Intelsat members were potential customers. Mutual advantage presumably was possible, but there was no self-evident identity of interest.

Second, internal procedures and changes in structure might prejudge the likelihood of Intelsat's expansion into new fields. If unequivocal prohibitions on a wider sphere of competence were not agreed, the key questions would concern the kinds of internal authorisations that would have to be obtained before such activities could ensue. If the procedures
were complicated and difficult, Intelsat might never undertake work formally within its bailiwick; an essentially restrictive motivation would be obscured by the appeal for democratisation and wider participation in decision-making.

Third and similarly, the proposed reforms had symbolic and rhetorical value to European efforts to rally support behind their positions on more material matters. During the actual negotiations, the reforms were included in omnibus packages of proposals which included procurement sharing, specialised services and the like, and attempted to legitimate those as fully consistent with greater multilateralism.

2. POSITIONS ON REORGANISATION

Entering into the negotiations on permanent Intelsat arrangements, the main positions on reorganisation were as follows.

Creation of an all-member assembly: This was formally agreed by virtually all parties, and contention centered on the assembly's powers. The American position was that the assembly would meet annually 1.) to "receive and consider a report from the Governing Body" on the previous year's activities; 2.) "to consider and approve or disapprove the recommendations of the Governing Body concerning any change of Manager or of arrangements between the organization and the Manager;" and 3.) "to discuss matters relating to the operation of the Intelsat system and make recommendations thereon to the Governing Body." Voting in the assembly would require a numerical majority which would have to include at least two-thirds of Intelsat's total investment shares.\(^1\)

In short, powers would be limited to review and advice, and decision-making procedures would be skewed to ensure dominance by heavy traffic countries: if Comsat retained even 25 percent of Intelsat's shares, another eight percent—or the agreement of Great Britain alone—would enable assembly actions to be blocked. It is notable too that the U.S. wished to give the assembly substantive powers only in regard to the managership, thereby making potential anti-Comsat initiatives within the governing body more difficult to sustain.

The unified European position declared the assembly "the supreme organ of the organisation."
it would consist of representatives of each country who had signed the Definitive Agreement. It should have adequate powers in order to lay down the policy of the organisation. In the case of undivided ownership, it would take decisions; in the case of separate ownership, it would make recommendations to the various owners' consortia. (2)

The actual divergencies between the European and U.S. positions remained, however, to be seen, since even the Europeans placed limits on the application of one-nation one-vote procedures. These would be followed on matters of general policy, regulation and internal organisation, but on questions of management and project execution votes would be weighted by investment shares. (3) A British submission in March 1968 to GETS stated that the assembly "should be more than a sounding board...but it should not have powers to interfere in detail with the development, planning and operational functions of the Governing Body, and it should only have very general powers with respect to financial matters." (4) Thus, notwithstanding the European insistence on the assembly's having ultimate supervisory authority, definite limits existed for both sides on the degree of redistribution of power that would be permitted.

The governing body: Much the same proximity can be detected in the apparently contrasting positions taken on the composition and powers of Intelsat's governing board. The U.S. favoured retaining a small, cohesive decision-making body like the ICSC. (5) Its powers would be comprehensive—including principal responsibility for the design, development, construction, operation and maintenance of the space segment—and would be limited only by those few functions assigned to the assembly. Although board membership would be expanded from its interim level by admitting any five Intelsat members regardless of their shareholdings—in the ICSC a 1.5 percent collective minimum was set—the U.S. wanted a two-thirds weighted vote to be required on all substantive issues. This provision would be coupled with a 50 percent ceiling on the voting power any one member could wield—"with a view to preventing there being inordinate voting power in any one member"—but would nonetheless have virtually guaranteed Comsat a comprehensive veto over Intelsat actions. (6)

The European alternative also assigned the governing board "powers of decision in order to direct the current affairs of the organisation"—if, that is, space segment ownership remained undivided. (Under a
separate ownership scheme, its powers would necessarily be recommenda­
tory.) It was by and large agreed that "the Governing Body of an enter­prise providing operational service should be effective and to a large extent free from detailed control."(7) On voting, though, the Europeans insisted on procedures to prevent not just unilateral actions but uni­lateral vetoes as well; hence the two-thirds weighted vote requirement urged by the U.S. was unacceptable.(8)

Identity and accountability of manager: Positions on Intelsat's management were deeply divided. The U.S. began the re-negotiation pro­cess apparently committed to Comsat's indefinite continuance as sole managerial entity. Some moderation of the 1963-64 American position was evident inasmuch as the formal basis of the Intelsat-manager relation­ship would now be made contractual and not constitutional, but the U.S. insisted "a single entity be designated to serve as manager," and that entity be Comsat "in order to provide continuity and make use of the experience accumulated."(9) Furthermore, since two-thirds weighted votes in both the governing board and the assembly would be needed to change the management contract, Comsat would very likely be able to veto any efforts to replace it as manager.

The alternative conception, promoted strongly by the Europeans, was of a "de-nationalized managerial entity"(10) to consist of "an interna­tional organism which could not be a member of either the General Assem­bly or the Board of Directors." The manager would be directly responsi­ble to the board and operate under its authority, and would be headed by a secretary-general selected by the board and confirmed by the assembly. Although the European members insisted that immediate steps be taken toward substantive internationalisation of the management, they indicated too that the precise nature of the transition from Comsat might be nego­tiable. The British account of a March 1968 GETS meeting noted:

There is widespread recognition that an international Management Organ is the objective to be aimed at, but there will be differences both as to timing and as to the intermediate steps towards the objective. (11)

Negotiation was therefore bound to focus on the advantages of different transitional schemes: if the time period were fixed but long, or sub­ject to continuing review and modification, Comsat's assent might be won to the principle of internationalisation.
BACKGROUND TO REFORM CONTROVERSIES

Notwithstanding the concessions, in general the U.S. was not only hostile to many of the reforms proposed but was irritated by the importance assigned them by their supporters. Intelsat had, in the American view, been "the largest and most functional international joint venture ever established," according to Comsat's chairman:

Improvements can be made, but fundamental restructuring will hardly commend itself to those who are interested in maintaining the pace of progress which has been enjoyed during these initial years. (12)

The State Department apparently felt the U.S. could neither give in altogether to the reformers nor simply refuse to continue with the renegotiations without endangering the previous decade of American policy in the field.

... The only way in which we can hastily conclude these agreements would be to accommodate the views of the other countries without insisting on and negotiating those safeguards which we consider essential to the U.S. interest. Obviously, such capitulation would not be tolerable. (13)

If the conference foundered, the U.S. would be held responsible:

... Cancellation or delay would be regarded by other members of the consortium as a U.S. effort to perpetuate our high degree of control under the interim arrangements. (14)

Thus, for official American policy the impulse toward organisational reforms offered few opportunities and a number of risks. Little could be gained by reaching agreement with the reformers; but much—perhaps all—could be lost if agreement were not reached. Resolution was indispensable even if the Americans could not see quite why.

Comsat: In gross terms, Comsat's own corporate objectives had hitherto basically coincided with those to which Intelsat was dedicated—expeditious and global satellite deployment—since the absence of a clear technical achievement and a self-sustaining operation would have made dubious Intelsat's continuance on any terms reasonably acceptable to Comsat, and raised the spectres of a shrunken satellite system and of its possible disintegration. (15) At a stroke, U.S. policy would have failed and Comsat's only sure commercial operation would have been lost.
In spite of that basic consistency, Comsat's role was easily "the most controversial feature of the original agreement," and the company recognised that certain elements of its Intelsat dominance—its investment quotas and the absence of an all-member assembly—were untenable. First, Comsat's shareholdings were too high: by the end of 1970, when its share of global satellite traffic was around 35 percent, Comsat owned more than 52 percent of Intelsat's total equity. Theoretically this disproportion was to Comsat's advantage, since the company's rate base was accordingly inflated and it was earning a 14 percent return on its Intelsat investment, part of which return derived from the international traffic of other countries. Prolongation of the interim arrangements and indeed higher satellite tariffs would therefore, in principle, benefit Comsat. Nevertheless from 1967 on, Comsat acknowledged the need for a reduction in its investment and voting shares, and proposed an upper voting limit of 50 percent for governing board members, irrespective of their proportion of total system usage. While bringing investment into line with use would help ensure that "the organisation will maintain its international character" by narrowing Comsat's edge, it would also release Comsat capital from the global system for investment elsewhere, either domestically or in specialised international systems.

Second, Comsat conceded that Intelsat's two-tiered interim structure—governing board (ICSC) and manager—would have to be augmented by a general assembly of all members. Many signatories were clearly little more than "spear-carriers," as one journalist put it, who paid $60,000 to join Intelsat and had no say in anything. In his August 1967 policy statement President Johnson said the U.S. supported the assembly's creation "so that all may share in the consideration of policy," and various Comsat utterances later in 1967 indicated support for "providing a forum in which all Intelsat members would have a voice," although it was also noted that by pooling their investment shares 47 of 58 current Intelsat members were formally represented on the ICSC.

This willingness can be attributed in part to fears that the Soviet Union was, as Comsat's president said in March 1967, "developing and demonstrating communications satellites of their own as a basis for a major recasting of the present organisational structure at some future
When the Soviets announced at a UN conference in the summer of 1968 their plans for an Intersputnik international system, foreign delegates reportedly were especially impressed by provisions that would give all participating states votes on the system's governing board. Soviet observers later attended the first Intelsat plenipotentiary session in February 1969 and urged equal representation of all member countries on Intelsat organs, noting that usage would, in the Intersputnik plan, determine investment shares and revenue distribution but not voting weights.

The managership: Notwithstanding those concessions, Comsat held firm on retaining its managership, which even in 1964 had been sufficiently sensitive an issue to warrant explicit mention in the interim agreements that in the ICSC's eventual recommendations as to permanent organisation, consideration should be given to "whether the interim arrangements should be continued on a permanent basis or whether a permanent international administrative and technical staff should be established."

Throughout the interim period other ICSC members charged Comsat, at one time or another, with arrogance, high-handedness, using its technical position to prejudge decisions on system choice and deployment schedules and then using its voting weight to sustain its prejudgments. On the general question of retaining a national management entity, perhaps the watershed case involved the Intelsat III contract, where the FCC had been reluctant to authorize the series even after the ICSC had approved it, and the incompatibility of Intelsat's manager being subject to the unilateral actions of a wholly national agency was decried. As one State Department official put it:

The timing of events and the way the FCC regulatory actions appeared to our partners was that the U.S. was reviewing or second-guessing actions after they had been made with full U.S. participation. Although the FCC was subsequently enjoined to make its recommendations before and not after ICSC actions, and although Comsat sought to offset charges of conflict-of-interest by introducing an internal division of responsibilities in January 1963—whereby a separate department from that which served as U.S. Intelsat representative would handle management functions—the feeling remained that Intelsat should not be subject
to FCC oversight but that as long as Comsat remained the organisation's sole manager such national influence was unavoidable. \(^{32}\)

Research and development: An even more important reason for opposition to Comsat's managership was related to the company's apparent interest in expanding its own R&D activities—and perhaps even entering the satellite-manufacturing business. In September 1969 Comsat opened an elaborate complex of laboratories outside of Washington, D.C., which the company said were needed to carry out its Intelsat managerial role, evaluating proposals, testing equipment and the like. Other ICC members however were skeptical and noted Comsat's outstanding interest in the U.S. domestic satellite business, its need to expand its rate base, and the incentive the facilities would give Comsat to urge Intelsat to carry out more in-house—as opposed to contracted-out—R&D. Intelsat's total R&D outlays were some $4m in 1969—almost entirely in-house, i.e. Comsat, work—and by 1970 Comsat was proposing that Intelsat earmark a fixed percentage of its operating revenues to R&D, leaving it up to the manager to decide on what proportions would be contracted out and conducted by Comsat. Some considered the laboratories, from the point of view of legitimately Intelsat-related work, "disproportionately large, disproportionately well-equipped and overly expensive"—in fact a facility not to test but to build satellites.\(^{33}\) If that was true, and if Comsat remained as Intelsat's manager, the company might shortly find itself in the enviable position of evaluating satellite proposals of its own concurrently with its competitors!—from which much of Comsat's expertise would very likely have originated. Furthermore, the company's advantage could only be enhanced by Intelsat's interim practice of acquiring titles to inventions and discoveries that emerged under Intelsat contracts, thus preventing suppliers from offering the same technology to other procuring entities.\(^{34}\) Neither the American aerospace industry nor those Intelsat members hopeful of themselves supplying space segment equipment for the global system could be indifferent to these possibilities, and the leverage in the technical field to be permitted Comsat—or some other managerial entity—was an important consideration in deciding the identity of the manager and the structure of accountability to which it would be subject.

Nevertheless, Comsat was implacably opposed to an international
managerial organ, and that opposition became—along with an unwillingness to assign substantive powers to the Intelsat assembly—the core of the company's position on reforms. In favour of retaining Comsat as manager was its technical record and know-how: "It would be foolish," as one European delegate put it, "to toss aside the known ability and experience of Comsat." When the ICSG voted in December 1968 on its recommendations on permanent organisation, however, the result was 17-1 against Comsat's indefinite continuance.

4. CONTENDING MODELS OF COLLABORATION

Underlying the various specific positions on Intelsat's structure and procedures were the rhetorical and substantive attractions of different models of international collaboration—commercial enterprise and international agency. American pronouncements were steeped in the certainty that a single worldwide system efficiently managed and not subject to the vagaries of votes by an international debating society will permit far more orderly and rapid development than would occur if responsibilities were diffused and basic decisions depended upon international conferences.

An international agency was "likely to be formalistic rather than operational, cautious when the state of the art may warrant action and enthusiastic where caution may be required," orientated not to efficient project definition and resource utilisation but to the practice necessity of continually assembling a political consensus and carefully guiding it toward goals that would be obvious to a "business-like enterprise."

To others, however, Intelsat was "an inadequate organisation, one which does not meet the needs of the majority of its members," and indeed did not even solicit their participation in its running as a properly international agency offering a valuable public service ought to do. The effective disenfranchisement of most Intelsat members was not just unfair in principle; it also seriously misrepresented the manner in which real reliance on the organisation for essential services was actually distributed. Paradoxically, the heavy traffic countries that dominated Intelsat were, thanks to cables, less generally dependent upon Intelsat than were light traffic members with no alternative facilities. Furthermore, by restricting Intelsat's properties to the space segment—necessary though this was to avoid entanglement
in domestic facilities—a considerable part of the total investment made by members in satellite communications was excluded. While by mid-1971 around £300m worth of hardware and services had gone into the space segment, around £200m was invested in earth stations, the property of countries whose ground segment outlays added nothing to their entitlement to influence Intelsat actions while contributing substantially to their stakes in those actions.

It seemed also that the opportunities confronting Intelsat concerning expansion of services and earth station proliferation were greatest in hitherto disenfranchised or under-represented regions and, furthermore, that some of these future activities were far more controversial than those Intelsat had thus far undertaken. "It becomes apparent," said A. Chayes, former legal adviser to the State Department, "that many of the most important decisions to be made about communications satellites over the next decade will be highly political, more so as satellites become powerful enough to beam directly to home receivers without the interposition of a national ground station. This growing political element must find reflections in the allocation of voting power. And the distribution of votes in proportion to use simply does not do that."(42)

5. INTELSAT’S ’POLITICISATION’

Superficially, as one Comsat official has written, "the climate for negotiation of the Intelsat definitive arrangements was gradually ’politicalized’," whereas during the interim negotiations, "political considerations, while present, did not significantly affect the outcome."(43) While it was certainly true that the 1969-71 negotiations, involving 70 and not 17 nations, were considerably more contentious and conflicted than the 1963-64 sessions, that fact does not necessarily justify qualifying the later set as more political. In our view, important changes in the character and location of the operative political concerns had intervened—and for hitherto dominant participants in Intelsat, a lower order of political objectives were at stake in the negotiations which began in 1969.

The issues that emerged during Intelsat’s interim period had been submerged in 1964 by an inexorable and unilateral determination of the United States to see a powerfully symbolic and operationally valuable
technology deployed with all the urgency the U.S. could inspire. The satisfaction of that objective during the interim period had de-activated it as the principal determinant of collective policy and action. The success of the endeavour had fulfilled and outrun the limited policy goal for which it initially had been undertaken. In the absence of that objective flowed a number of theretofore secondary goals, some of which had been shunted aside by the push to meet it—like international procurement—and others of which had essentially emerged in the course of its satisfaction—like regional systems, which pre-required synchronous satellites, and the constituent assembly. Consequently the locus of political concern had shifted from the sphere of superpower rivalry and the fundamental terms of transatlantic cooperation, to where the main unresolved issues involved subjects on which no consensus yet existed because none had been required. The agenda of issues had been widened, space with the growth of Intelsat's membership and with the search for new satellite applications that had remained unexploited because they were unrelated to the major formative political concerns; contestation could only follow suit. The principal political movement was, however, devolutionary, away from the profound 'politicisation' of the 1963-64 negotiations and toward a broader, but less sensitive, array of concerns.
CHAPTER 13: NEGOTIATING INTELSAT'S PERMANENT ARRANGEMENTS, 1969-71

The plenipotentiary conference to create definitive arrangements for Intelsat opened in Washington, D.C. on February 24, 1969. "The mood," said one magazine, "may well be closer to that of a stockholders' get-together than of a diplomatic conference."\(^{(1)}\) In fact it took 27 months, with three full conferences—attended by representatives of from 67 to 78 countries—and six sessions of various preparatory bodies before final agreement was reached on May 21, 1971.

1. PREPARATIONS

Formal preparations began early in 1967, when the 18-member European Telecommunications Satellite Conference (CETS) opened discussions and the 13-nation Arab group at Intelsat began talks directed at forming a common front with Latin American members.\(^{(2)}\) In the U.S. a five-member interagency panel began work at that time on drafting the American proposals, which in October were the first to be released. The U.S. plan represented an uneasy accommodation between Comsat and the State Department—since the Pentagon had early been told that any special compliance with military requirements would be politically impossible to negotiate \(^{(3)}\)—and reports of divisions within the U.S. delegation surfaced intermittently throughout the conference.\(^{(4)}\) Comsat grew increasingly concerned by the possibility that negotiations might break down unless it modified certain of its positions, and conceded certain organizational reforms upon which the State Department and Europeans had been insisting.\(^{(5)}\)

The State Department was said to have been impressed, as the 1969 conference opened, by the presence of 29 non-member countries, including seven of the eight signatories of the 1968 Intersputnik agreements.\(^{(6)}\) Partly in response to their presence, delegates devoted considerable attention to modifications that would make adherence to Intelsat as universal as possible, and the possibility of merging the proposed Intersputnik system with Intelsat's was informally discussed. The Soviet role
was described as "probably the biggest uncertainty" of the conference's first stage and strengthened the case against Comsat's maintaining a "distribution of forces of one commander-in-chief and 64 privates," as one editorial characterised Comsat. The brief history of Franco-Soviet satellite cooperation suggested that whatever intervention the Soviets would choose to make would likely be to reinforce known French positions. The combined determination of the two countries to see Intelsat replaced or decisively restructured would have to be taken seriously by the U.S., and the sooner indications were given that grievances could be redressed within the Intelsat rubric, the less potent the threat would be.

2. Chronology of the Conference

First conference: The first plenipotentiary conference, from February 21 to March 21, 1969, created four 'committees of the whole' to deal respectively with structure and functions (including the scope of Intelsat services), legal and procedural matters, financial arrangements, and other operational questions (among them procurement and technical matters.) The four weeks allotted were insufficient for the full conference to hear the committees' reports, and when the conference recessed a preparatory committee was formed to write draft articles based on the various reports.

Preparatory committee: The preparatory committee (Prepcom) was the site where the main alternative packages of proposals were assembled and informally discussed. Three sessions were held between June and December 1969—in all, around eight weeks of meetings—with some 40 members and nine non-members attending. During this period the U.S. delegation chairman resigned as a result of the change in government; also, in September an international conference on satellite communications was held in France, sponsored by the Carnegie Endowment for International Peace and the Twentieth Century Fund. Its report was released in December and widely read by Intelsat delegates, and recommended Intelsat's transformation into an integrated and comprehensive satellite organisation, empowered to bid on any regional or specialised projects and to advise on technical and economic compatibility. The report also urged
that Intelsat become its own manager after a transitional phase, that weighted voting be restricted to a narrow range of issues, and that procurement should be directed toward encouraging international diversity of supply sources, even at the risk of higher initial costs.\(^{(11)}\)

The U.S. and its supporters released their proposals in a package prepared by the Australian and Chilean delegation, and known as PC45, during the second Prepcom session in September. PC45 was opposed by a second document, PC54, representing the views of the Western Europeans and their supporters and released in November at the third Prepcom session. These drafts became the poles between which negotiation continued. Sixteen Third World countries were among the 22 reportedly associated with the U.S.-backed PC45 proposals, while the PC54 document attracted support from five Third World countries—along with the notable 'defections' from the American camp of Japan and Canada.\(^{(12)}\)

**Resumed conference:** The resumed plenipotentiary, the second of three full conference sessions, ran from February 16 to March 20, 1970 and was attended by 67 of Intelsat's then-75 members, 18 observers and representatives of the UN and ITU. The session opened with release of an inconclusive draft document that had emerged from informal talks held shortly before the conference re-convened among PC45 and PC54 supporters. Although little progress was made toward compromise on that basis, midway through the session—on March 6—a more comprehensive attempt, known as Document 93, was introduced by the Australian and Japanese delegations and quickly acclaimed as the likely basis for final agreement. Only three weeks remained to the session, however, and at the close an intersessional working group (IWG) was created to prepare a single set of recommended texts on the basis of Document 93. Unlike the Prepcom, the IWG was given full negotiating powers and while the fully conference was scheduled to re-convene on September 8, the IWG was empowered to postpone the third session if necessary.

**IWG:** The IWG held 10 weeks of meetings in three sessions between mid-May and mid-December 1970, and was attended by 47 member countries. Despite an invitation from Guatemala to hold sessions there,\(^{(13)}\) and some grumbling on Capitol Hill over the half-million dollars the conference was costing,\(^{(14)}\) meetings continued in Washington—in part because the U.S. delegation reassured Congress "that a relocation of the site of the
conference to another country could have seriously adverse effects on
the U.S. negotiating posture.\(^{(15)}\) The IWG's work load obliged it to
reschedule the third session of the full conference from September to
April 1971, and draft articles were forwarded to it for consideration.

The final conference: Attention at the final plenipotentiary con­
ference focussed on the IWG texts, and particularly on language left
bracketed due to lack of agreement. Held from April 14 to May 21, 1971,
the conference was attended by 78 of Intelsat's then-79 members, 12 ob­
servers and representatives of the UN and ITU.

Despite predictions at the end of the IWG sessions that the "foun­
dation for final agreements" existed and the work was 75 percent com­
pleted,\(^{(16)}\) the conference was soon running behind schedule and some
participants ventured that another full session would be necessary.\(^{(17)}\)
A European effort, led by the French delegation, attempted to rally sup­
port for major changes in texts provisionally agreed, in order to give
further power to the intergovernmental assembly and to reintroduce pro­
curement distribution formulas. The American position hardened consid­
erably at this point, and in early May the U.S. delegation released a
set of 11 proposals described as non-negotiable and indispensable to
American approval of the final agreements. These included: eliminating
procurement formulas to ensure "minimum necessary flexibility" in con­
tracting procedures; widening Intelsat's scope of services "to insure
that the definition of public telecommunications includes those services
traditionally considered to be public in nature"—a reference to British
efforts to have all mobile services classified as "specialised" and there­
fore to require more elaborate internal authorisations than "public" ser­
vices; a sufficiently high capital ceiling to enable the governing board
to procure the next satellite generation without approval by the consti­
tuent assembly; and a recasting of amendments procedures, which the U.S.
wanted to require a two-thirds weighted vote in the assembly—thus as­
suring Comsat a veto—and the Europeans insisted should require an 85
percent unweighted vote.\(^{(18)}\)

American acceptance of the European-backed amendments procedure
turned out to be the key to final agreement. On May 19, at a 25-nation
negotiating caucus, the U.S. delegation agreed to the 85 percent unweigh­
ted vote requirement in exchange for acceptance of its other 10 demands.\(^{(19)}\)
After another five days of closed-door meetings, final agreement was announced on May 21 by the conference chairman and head of the U.S. delegation, Abbott Washburn: "There were times when I never thought I would be standing here saying that we had reached agreement," he said. "Nobody is completely happy with the result, but all believe it is viable." The vote on the permanent arrangements was 73 for, none against, with four abstentions—France, Mexico, Monaco and Malagasy. Criticisms of the final form were made by Sweden, the UAR, Syria and Algeria, but all indicated they would sign the document nonetheless. The agreements were opened for signature on August 20, 1971 and entered into force on February 12, 1973.

The process by which the various issues addressed by the conference were resolved is now recounted.

3. THE SCOPE OF INTELSAT SERVICES

Precisely which services Intelsat would be empowered to provide, and subject to what internal approvals, was one of the most intractable questions the conference addressed; final agreement came only toward the end of the 1971 plenipotentiary session.

Domestic service was, however, much easier to agree on than were regional and specialised applications, in part because the 1968 ICSC action on the Canadian domestic system had set a generally acceptable precedent. While the 1967 U.S. submission to the ICSC's preparation of its recommendations had stated that "as a general rule the basic Intelsat system will also be able to provide efficiently and well domestic communications services," the Americans acknowledged that there could be no question of binding Intelsat signatories from establishing strictly domestic services, and insisted instead that a balance was required between sovereign national rights and legitimate international concerns—e.g. orbital slots, frequency assignments.

Under the U.S. plan, Intelsat members could choose either to lease circuits for domestic purposes from Intelsat spacecraft, to operate a separate satellite or satellites for domestic service, or to operate a separate space segment jointly with neighbouring countries for their respective domestic requirements. In regard to financing, members could ask Intelsat to pay for the necessary space facilities (in which case
the satellites would likely be used for international traffic as well), they could pay Intelsat to provide and operate the satellite, or they could finance and furnish the spacecraft independently, subject only to minimal technical coordination with Intelsat. In sum, Intelsat's role as managerial, operational or regulatory entity would be determined on a case-by-case basis, with pivotal responsibility assigned the country or countries most directly concerned.

In its May 1968 ruling on the proposed Canadian system, the ICSC had found no legal obstacles to the plan as long as technical coordination ensured that domestic frequency use did not interfere with Intelsat service. Formal endorsement of the implied policy by the United States—which had already agreed to launch the Hughes-built Canadian satellites, very likely to help Canada keep Quebec out of the Symphonie system—came shortly after the first conference was recessed in a letter from the U.S. delegation chairman to a senator. Separate domestic systems would be acceptable with "no qualifications except for technical coordination with Intelsat."

In view of the general American insistence on the widest possible interpretation of Intelsat's competence, this position on domestic satellites suggested that the subject would be relatively non-controversial. During the first conference, however, there was some disagreement over whether the power to decide on the compatibility of a separate domestic should be vested in Intelsat's governing body or its intergovernmental assembly. The controversy went no further than the European-supported PC54 draft, issued at the third Prepcom meeting in November 1969, which stipulated that members interested in creating their own domestic systems should consult with the governing board in advance; the board would then advise on the proposal's technical compatibility with the Intelsat system. The various financing provisions set forth in the 1967 American draft were accepted, and the resulting formulation was written into Article XIV of the permanent agreements.

Regional systems were a far more contentious subject. While the U.S. pre-conference submissions did not object to separate systems that would provide different services—e.g. direct broadcasting—and be confined to a definite geographic region, the position was silent as to the permissibility of satellite systems that would be distinct geographically but not functionally from Intelsat's. The implication, however, was
that the Americans did not recognise a legitimate need for other international systems that would duplicate Intelsat's services, a position supported by other pre-conference IGSC contributions: Australia and Canada urged that members refrain from any activities that would compete with and divert traffic from Intelsat; the Asia/Pacific group wanted all but domestic systems prohibited. The Western Europeans, however, argued that no restrictions should be placed on the rights of members to pursue independent satellite projects regardless of their geographic or functional scopes, and the French reiterated support for dividing space segment ownership which, they said, would make the regional-global distinction academic.\(^{(30)}\) The ICSC's recommendations to the conference indicated majority support for allowing no independent systems that would compete with Intelsat, while permitting specialised regional networks if established in consultation with the governing board.\(^{(31)}\)

Little progress was made at the first conference, where much of the discussion on the subject was devoted to the acceptability of the "single global system" wording which the U.S. wanted inserted in the agreements' preamble. The term was supported by Nigeria, Malaysia and the Philippines—reportedly reflecting Third World fears that regional systems would drive up Intelsat tariffs—and by New Zealand, Italy and Israel.\(^{(32)}\) India proposed "integrated worldwide system" as an alternative, and was backed by most of the European delegations, Canada, Australia, Indonesia and the Polish observers. The controversy was defused when the U.S. announced that "single" modified "global" and not "system," a clarification that for some reason made the phrase universally acceptable.\(^{(33)}\)

The more substantive dispute over liberalising rules governing creation of regional systems was led by Japan, in favour, and the United States, opposed, during the first conference and from there to the Prepcom, where debate centred on: first, whether Intelsat's determinations would be binding on members or simply advisory; and second, whether in making those determinations Intelsat would be entitled to consider any economic harm regional systems might cause as sufficient reason to rule against them, or whether some stipulated degree of economic harm would have to be demonstrated. On the first question, both PC45 and PC54 drafts agreed that members should be obligated to "ensure," in consultation
with the Intelsat governing board, that proposed systems were technically and economically compatible. The PC54 position, however, was that "substantial" economic harm would have to be threatened before members could be enjoined to abandon the project; the U.S.-backed PC45 draft omitted the modifier, thus making any economic harm unacceptable. (34)

The matter remained unsettled during the 1970 conference, and the Australian-Japanese compromise Document 93 left the word "substantial" bracketed—reserved for later decision. At the first IWC session though a wording change put forth by the New Zealand delegation broke the deadlock: "significant" would be inserted instead of "substantial" to qualify the economic harm a proposed regional system would have to threaten before Intelsat's governing body could rule it incompatible; the board would then advise the intergovernmental assembly, where the decision could be ratified or reversed. (35) American acceptance of this formula was confirmed by a February 1971 announcement by the State Department that launch services would be offered to independent regional satellite projects upon a finding by Intelsat's intergovernmental assembly that they were acceptable. (36)

Specialised services remained controversial up to the closing days of the 1971 conference. The ICSC's recommendations indicated significant—arguably, substantial—differences of opinion, while suggesting that agreement did exist on the need to prevent Intelsat's entry into specialised fields from impairing its ability to continue providing customary public telecommunications services. A majority ICSC recommendation—which under the approved nomenclature meant support of from 10 to 13 of the board's 18 members—favoured specialised services to be offered if the governing body found they would not adversely affect Intelsat's principal mission. "Substantial" support—six to nine members—was however expressed for requiring formal amendment of the permanent arrangements before such services could be provided. (37)

At the first conference, the American position that Intelsat be empowered to furnish any service that communications satellites could provide received backing from Canada, Kuwait, Iran, Israel, Nigeria and the Philippines. (38) Arrayed against this view were not only the Europeans, but a number of Third World countries who feared that specialised applications would impose costs on them without offering compensatory
benefits. The consensus in Committee I was that any specialised services should be "acceptable from the technical and economic points of view, and that the Organisation's ability to provide the Space Segment for public telecommunications services [should] not be adversely affected."(39) Left unresolved were such key questions as which specific services would be defined as specialised, how such services would be financed, and which Intelsat organs would make the critical decisions as to technical and economic acceptability.

During the Prepcom sessions, the U.S.-backed PC45 position was to allow Intelsat's governing board—subject to review by the intergovernmental assembly—to decide upon Intelsat's entry into specialised fields, conditional upon a finding that public services would not be impaired. The PC54 draft, however, proposed a series of procedures likely to make such expansion difficult: first, while the governing board would rule on technical and economic acceptability, it was the intergovernmental assembly that would decide whether Intelsat would provide the services; second, contracts would have to be concluded with specific users before services could be furnished; third, consultation with specialised UN agencies with jurisdiction in pertinent fields would be required.(40)

Compromise drafts circulated at the beginning of the 1970 conference retained the PC54 position, but the conference itself did little but refer the matter to the IWG. It was by that time clear that some agreement existed on Intelsat's theoretical entitlement to enter specialised fields, either through new uses of the existing space segment or through specially dedicated new spacecraft. To accommodate Third World fears that additional costs would be incurred and borne in part by them, the IWG recommended that if a separate space segment were created by Intelsat for specialised services, specific users should finance the satellites and related facilities—unless a decision to the contrary was taken by the second constituent assembly composed of PTTs and other formal signatories of the agreements, called the Meeting of Signatories. Nothing was stipulated concerning specialised uses of Intelsat's existing space segment. A definitional dispute also arose within the IWG: earlier drafts had defined specialised services to include radio navigation, scientific research and direct satellite broadcasting; at the third IWG session, however, the British proposed that any mobile services apart from those already furnished by Intelsat under the interim
arrangements would be classified as specialised. The IWC's report to
the conference incorporated this expanded category of specialised fields,
although U.S. acceptance was unlikely. (41)

The British position was nevertheless sustained by three preliminary
votes of the final plenipotentiary, prompting the American delegation to
declare its rejection essential to final U.S. approval of the accords. (42)
The U.S. was willing to exclude from the definition of 'public' telecom­
munications "flight control of aircraft or of aviation or maritime navi­
gation" not hitherto provided by Intelsat—since at least maritime tele­
communications would have remained open to Intelsat without the elaborate
authorisations entry into specialised fields was likely to require. (43)
It was not, however, until the day before final agreement was reached
that a settlement was reached, which substantially accorded with the U.S.
position: mobile services not previously furnished by Intelsat would be
considered as specialised when they would be provided

through mobile stations operating directly to a satellite which
is designed, in whole or in part, to provide services relating
to the safety or flight control of aircraft or maritime radio
navigation. (44)

At the planning stage, the intergovernmental assembly would have to ap­
prove any proposals made by the governing board for specialised services
requiring dedicated facilities. In the case of specialised uses of the
'public' space segment, the board was obligated to ensure that fully
allocated costs were recovered from the actual users and not borne by
other Intelsat members. (45)

In all, the various questions raised by Intelsat's future expansion
into domestic, regional or specialised services were answered only equi­
vocally by the guidelines contained in the permanent arrangements. The
United States, to be sure, was unable to secure for Intelsat the exclu­
sive rights to comprehensive satellite services that certain of its pre­
conference declarations had asserted—but the Europeans were equally un­
successful in clearly prohibiting Intelsat from undertaking such expan­
sion. On balance, however, the restrictive impulse carried the day: on
regional systems, Intelsat would have to determine that proposals constitu­
ted material threats to its viability before the plans could be disap­
proved; on specialised systems, as one Comsat official complained:

... [As a realistic matter, there is such a miasma of cumbersome,
if not impossible, bureaucratic restrictions and approvals required
that it does not appear very likely that Intelsat will engage in
such activities in the future on a significant scale. (46)
In fact, Intelsat's expansion would depend on case-by-case determinations, subject to an agreed priority assigned to conventional public telecommunications services: long-haul voice and record traffic, and television relay. Whether Comsat's prophecy would come true remained to be seen.

4. POWERS, COMPOSITION AND PROCEDURES OF THE GOVERNING BOARD

There was general agreement, both within the ICSC and at the 1969 conference, on the need for a small executive organ composed largely of heavy-traffic countries and responsible for directing Intelsat's business on a routine basis. It was also agreed that while the board's membership should be limited, provision should nevertheless be made for representation of smaller countries. Proposals on how best to expand board membership differed somewhat: the U.S. suggested a minimum investment share be set, and that any five countries be entitled to collective representation regardless of their combined shares; the British favoured a minimum combined shareholding without further provisions; a plan proposed by Canada, Germany and India would have had the board composed of the 18 Intelsat members with the biggest investments, plus four seats reserved for regional representatives chosen by countries not otherwise represented. Discussion of voting procedures at the first conference indicated a widespread desire to prevent weighted votes from sustaining or preventing actions contrary to the wishes of a numerical majority on the board. Under the Canadian et al. scheme a certain percentage of votes would be assigned on a regional basis, but Britain and the United States objected that an imposition of actions upon Intelsat's biggest shareholders would be unacceptable. (47)

The principal dispute concerning the governing board, however, both at the first conference and during the Prepcom sessions, involved its powers vis-à-vis the intergovernmental assembly—particularly, the degree to which the board would be subject to scrutiny and authoritative review by all Intelsat members. The PC54 draft sought to enhance the assembly's powers by designating it the primary Intelsat organ and assigning the board definite and inclusive powers; the PC45 plan gave the board any residual powers not otherwise listed. As concerned composition, PC54
provided for countries not otherwise represented to select board mem-
bers on a regional basis, while PC45 proposed that those countries with
insufficient investment quotas be allowed to pool their shares, as had
been done with the ICSC. More important, PC45 asserted that investment
quotas should be based on the total amounts of traffic—international
and domestic—routed by members through the Intelsat space segment, but
that a 45 percent maximum be set on the votes any one board member could
cast regardless of his investment share—a feature that might have been
a major concession by the U.S. since if Intelsat satellites were used
for domestic traffic the American traffic share might have been as much
as 80 percent of the total.\(^{(43)}\) The U.S. claimed that including domes-
tic traffic in national shares would help encourage use of Intelsat's
space segment for such purposes,\(^{(49)}\) but PC45 proposed additional safe-
guards to prevent Comsat dominance of board actions: the agreement of
at least one other board member would be needed to block a vote, and
three others would be needed to carry a decision. The PC54 proposals,
however, were that only international traffic should be used to compute
investment—and hence voting quotas.\(^{(50)}\)

Compromise efforts during the second conference, culminating in the
Australian-Japanese Document 93, resolved some of these conflicts. The
list of board powers was prefaced by the "including but not limited to"
phrase favoured by the U.S.-backed PC45, implying that unstated residu-
al powers accrued to the governing body. Another troublesome matter,
concerning the powers of the board vis-a-vis the assembly over appoint-
ing or removing Intelsat's secretary-general (see below, pp. 351-4), was
also settled: Document 93 asserted that a right of appeal to the assem-
bly would mean long and time-consuming disputes—"If the Board of Gover-
nors is to be in command of the work, it must have full power over the
staff—including the Director General."\(^{(51)}\) Agreement also was reached
on precisely which space segment usage would be counted in determining
investment and voting shares. All traffic routed via jointly-financed
spacecraft would, as PC45 proposed, count toward investment quotas; but
only international traffic would determine voting weights, as the PC54
supporters bad urged, although certain classes of domestic traffic would
also be counted: where the traffic was between points separated by the
high seas (e.g. U.S.-Hawaii), by another country (East-West Pakistan) or
by natural obstacles that made conventional facilities more or less useless (the interior of Australia, e.g.). The PC54 provision for regional representation on the board was also included in the compromise, and a 40 percent ceiling on the voting weight of any one member was proposed; substantive questions would require a two-thirds weighted vote, but at least four members must vote in favour regardless of their combined voting weights, and all but three members' votes would be enough to carry an issue no matter how small the numerical majority's combined weights.

With minor changes, the Document 93 compromise was retained by the IWG and forwarded to the final 1971 plenipotentiary. There the main recommendations on voting and board composition were approved: a 40 percent voting ceiling along with the other safeguards to prevent unilateral domination, consideration of certain kinds of domestic usage in computing investment and voting shares, and provision for collective representation on the basis of combined quotas and for a maximum of five regional representatives. Until the first session of the Meeting of Signatories—the constituent assembly composed of PTTs and other nominated national entities—the board would be composed of the top 12 traffic-generating countries and any others whose combined quotas equalled that of the twelfth largest. The French delegation led a last-ditch unsuccessful attempt to weaken the board's authority by assigning final say over hiring or firing Intelsat's secretary-general to the intergovernmental assembly, but the principal lines of the Australian-Japanese compromise were retained in the final version.

5. THE ALL-MEMBER ASSEMBLIES

Despite the broad agreement that Intelsat's structure would have to be expanded from its interim two-tiered arrangement to include a formal assembly of all members, both the nature and powers of such an assembly were contentious matters. The American proposal was for an intergovernmental assembly empowered to review Intelsat's activities periodically and recommend long-term policy directions. A preliminary problem with this approach was its failure to distinguish between the roles appropriate to national governments and to the operating entities that would be the
actual signatories of the agreements.\(^{(57)}\) Most of the other conference participants felt it necessary to provide for separate governmental representation in order to permit national interests to be safeguarded; the operating entities should be involved as participants in, and perhaps supervisors of, Intelsat's operational affairs. Hence, during the first conference a proposal for a four-tiered structure was made by Australia, Belgium and Chile, the two new tiers to be an intergovernmental Assembly of Parties and a Meeting of Signatories composed of operating entities. A more radical Swedish proposal to establish two separate institutions—the one commercial and operational and the other intergovernmental and political—drew little support.\(^{(58)}\)

The U.S. conceded the need for two assemblies, and there proved to be little dispute over the powers and responsibilities of the Meeting of Signatories, which would enable PTTs to review Intelsat policy in their capacities as investors and co-participants in commercial and operational matters; the importance of making the Meeting a review body was in any case lessened by widening membership of the Board of Governors. Controversy over whether the intergovernmental Assembly should supervise the Board continued, however.\(^{(59)}\)

The PC54 proposals were to empower the Assembly to define Intelsat's overall policies, review the implementation of the agreements, and consider and decide upon any changes in the organisation's functional competence—especially concerning specialised services. The Assembly would also appoint or remove the director- or secretary-general. Under the PC45 provisions, the Assembly's powers were restricted to amending the agreements, requesting information from the governing board, issuing opinions and recommendations, and deciding whether members had withdrawn from Intelsat owing to violation of the agreements.\(^{(60)}\)

At the 1970 conference agreement was finalised on the need for two assemblies, and the intergovernmental Assembly of Parties was designated in principle Intelsat's primary organ; it would meet within the first year after the permanent arrangements entered into force, and thereafter upon request by one-third of Intelsat's membership.\(^{(61)}\) The Australian-Japanese document said little, however, as to the Assembly's actual powers, but resolution of some of the outstanding issues concerning Intelsat's management (see below, pp. 351-4) defused the question somewhat by the time the Intersessional Working Group began deliberations. The U.S. believed the Assembly's powers to be the most important remaining
issue, and the formulation finally approved by the IWG was closer to the U.S. PC45 than to the PC54 position: during the September-October IWG session Canada and Mexico proposed empowering the Assembly to "give consideration to those aspects of Intelsat which are primarily of interest to the Parties as sovereign states," and the IWG accepted that formulation. (62)

During the 1971 conference, however, the matter was revived when 18 nations—led by France, Sweden and Switzerland—proposed changes in the IWG language to give the Assembly "the power to establish guidelines concerning the general policy and long-term objectives of Intelsat..." (63) Thirty-one members supported the change by the time the issue reached the full plenary, but a spokesman then announced that the U.S. delegation would refuse to sign the agreements if the change were approved, and it subsequently failed. The IWG formulation, however, was also unable to win the necessary two-thirds majority for adoption, and further negotiation produced a wording change empowering the Assembly to give "due and proper consideration" to actions taken by the Board and the Meeting of Signatories. In that form the relevant article was finally adopted on May 19. (64)

Thus two all-member assemblies were created. The intergovernmental Assembly of Parties retained its formal status as Intelsat's principal organ while losing most of the substantive powers its major supporters had wanted for it. A Meeting of Signatories, composed of operating entities, was empowered to make recommendations to the Board on operational and managerial matters, future programmes and the like, and could set the minimum investment shares to be required for Board membership. (65) Its real role in future Intelsat deliberations was nevertheless qualified by the very reforms that had widened opportunities for direct participation on the Board.

6. MANAGEMENT

It quickly became evident that Comsat's managership would, in its existing form, be impossible for the U.S. to retain. Early in the deliberations held in committee during the 1969 conference agreement was reached that Intelsat's manager either would be internationalised, or
would be subject to thoroughgoing international control. In both
cases a directorate or secretariat would be established as an execu­
tive organ within Intelsat. Considerable disagreement remained over
the degree to which the new organ would take over technical and opera­
tional matters, whether Comsat would be retained for those purposes
under contract, to whom Comsat would be responsible as a contractor,
and what kind of transition toward internationalisation should be man­
dated to ensure operational continuity.

The U.S.—supported by a number of South American and African
countries and, initially, by Japan—at first insisted that "interna­
tionalisation of the organization does not, in theory or in fact, re­
quire internationalizing the manager,"(66) but Comsat's position was
soon moderated under the combined pressure of the State Department and
other Intelsat members.(67) American objections to the various tran­
sitional schemes focussed on the notion of having the new executive
organ interposed between Comsat and the governing board, while mana­
gerial functions were gradually transferred to the new international
staff. Proposals at the first conference nevertheless stressed full
internationalisation as the ultimate objective: a plan submitted by
five European members, Canada and India urged a five-year deadline for
completing the transition, but an alternative put forth by Australia,
Chile, Nigeria and Venezuela—countries otherwise allied with Comsat—
stated that although the objective was desirable, its attainment should
depend upon continuing consultation between Comsat and the governing
board to guarantee continuity.(68)

The managership was the most controversial question addressed by
the Prepcom, in spite of substantial modifications in the U.S. posi­
tion. PC45 signalled a retreat from insistence that Comsat remain as
sole managerial entity: an international secretariat would be created
under a secretary-general appointed by and responsible to the board,
and would immediately take on administrative and financial responsi­
bilities. The board would meanwhile commission a wide-ranging inde­
dependent study of managerial options, especially in regard to the optimal
division of in-house (secretariat) and contracted (Comsat) func­
tions. Comsat would remain technical and operational manager under
contract to the board, and might stay on indefinitely if the management study so recommended.\(^{(69)}\)

The European-backed PC54 proposals, however, called for swift and complete internationalisation; a director-general would oversee a wholly in-house international staff that would replace Comsat entirely within five years. The directorate would immediately take over general administrative and financial responsibilities, and any activities related to procurement and specialised services, leaving Comsat for the time being with the remaining operational and technical functions. Significantly, though, PC54 left open the possibility that certain specified responsibilities might continue to be delegated by contract even after the five-year transition, but the management study the board was to commission would not examine the overall wisdom of internationalisation or determine the ultimate direction of the transition.\(^{(70)}\)

During the 1970 conference, the Australian-Japanese compromise largely settled the basic principles governing changes in Intelsat's management, and effectively dashed any lingering hopes of securing Comsat's tenure.\(^{(71)}\) "To keep the Conference from foundering," one American official wrote, the U.S. delegation "acquiesced in the Japanese-Australian compromise package, although this meant a significant sacrifice by the United States with regard to the future management of the system."\(^{(72)}\) The entirety of Intelsat's management—and not just the non-technical functions the U.S. was ready to surrender—would be internationalised under a director-general after a six-year transition. The American contention "that the concept of a director-general interpositioned between the manager and the governing body was unacceptable"\(^{(73)}\) was however endorsed, in that Comsat's interim contract for managerial services would be directly with the board.

Immediately after the agreements entered into force the board would appoint a transitional secretary-general, who would be kept informed of Comsat's activities and would observe major contract negotiations. The management study recommended by both PC45 and PC54 drafts would meanwhile be commissioned, but regardless of the study's findings the board would appoint by the end of 1976 a permanent director-general to succeed the secretary-general and serve as Intelsat's chief executive officer. The key to U.S. acceptance was said to be a provision calling
for the amount of work eventually to be performed under contract to be
maximised, although this provision still had to be clarified.\textsuperscript{(74)} The
U.S. still professed to be "skeptical and somewhat agnostic" as con-
cerned internationalised management,\textsuperscript{(75)} and declared that Intelsat's
ultimate arrangements should not be decided until the management study
had been finished.\textsuperscript{(76)}

Settlements reached within the IUG effectively ended debate over
management. The American delegation proposed language to ensure that
the director-general contracted out, to the maximum extent possible,
necessary services; but European delegates objected that the director-
general would therefore become little more than a figurehead while Com-
sat would remain the real technical and operational power.\textsuperscript{(77)} The IUG
solution was to stress the commitment to full internationalisation, while
inserting language which made organisational efficiency and operational
continuity the principal criteria of the management study, and which
stipulated that contracting should be maximised to the extent practicable.\textsuperscript{(78)}

7. PROCUREMENT AND TECHNICAL MATTERS

A three-sided division emerged over procurement policy at the 1969 con-
ference. 1.) The European position, contained in a Swedish submission,
was that when bids on equipment contracts—both prime contracts and major
subcontracts—were comparable as to quality, price and delivery condi-
tions, the awards should be distributed internationally so as to approxi-
mate national investment quotas.\textsuperscript{(79)} 2.) Third World delegates, mainly
those who had been involved in joint meetings of Latin American and Arab
members, proposed an 'equal treatment clause', whereby any cost increases
due to international contract distribution would be matched by technical
assistance grants.\textsuperscript{(80)} It was claimed that around 45 of Intelsat's then-
68 member countries were unlikely to compete for contracts, and "correc-
tive steps" were therefore appropriate.\textsuperscript{(81)} 3.) The American view was
that Intelsat should procure with a view solely to getting best price,
quality and terms, and it was this position that attracted—for the
moment—majority support within the-conference committee responsible for
drafting procurement policy.\textsuperscript{(82)}

While the PC45 draft issued during the Prepcom sessions omitted any
reference to international contract distribution, the PC54 document kept
the issue alive by stressing that application of any formula would first
depend on the comparability of competing bids; only when more than one
bid offered the 'best' combination of quality, price and terms should
contracts be awarded "so as to ensure the widest possible international
participation in procurement with a view to furthering by competition the
long-term interests of Intelsat."(83)

The procurement debate was overshadowed during the 1970 conference
by the management issue, and was therefore referred to the IWG where it
remained as "the major hurdle" facing the group at its final session in
December 1970.(84) Although the IWG had previously approved a procurement
article with a softer distributional clause, in December West Germany led
Belgium, Canada, France, India, Japan, Switzerland and Britain in insis­
ting the PC54 language be adopted. No agreement was reached and the mat­
ter went to the final conference.(85)

There the British delegation, among others, argued that the distri­
butional formula would add nothing to space segment costs, since it
would come into play only when bids were otherwise comparable.(86) The
Europeans' argument was at first successful, and the plenary approved
the addition of the clause on May 6. Then however the dispute was again
revived by Chile, Peru, Venezuela and Colombia, and the U.S. listed dele­
tion of distributional requirements as one of its non-negotiable demands.
After conciliation efforts, the original IWG language was re-adopted:
"If there is more than one bid offering such a combination"—offering,
that is, the "best combination of quality, price and the most favourable
delivery time"—"the contract shall be awarded so as to stimulate, in
the interest of Intelsat, world-wide competition."(87) Thus rejected
was the wording urged by the PC54 group—in the event of comparable bids
"the widest possible international participation in procurement" should
be sought.(88)

A further set of issues related to procurement concerned the rela­
tive merits of titles and licences attached to equipment development
under contract to Intelsat. During the interim period Intelsat—and
Comsat—had insisted on acquiring full titles to the results of work
carried out for the system, and thereafter making them available to In­
telsat members strictly for facilities to be used with the global space
segment. Clearly, retaining the titles was more expensive—since contractors insisted on compensation—but it helped safeguard the 'single global system' by preventing the same technologies from being used in other satellite systems. Pressure had been mounting since at least 1969 with one under which Intelsat would purchase, at lower cost, limited licences on equipment; ultimate rights to market the hardware of expertise would remain with the contractor, from whom they would be available for other satellite projects. By the time the IWG began its sessions the U.S. had given in on its preference for titles. Some dispute remained as to the precise conditions under which the governing board would be permitted to deviate from a licencing policy, and agreement was finally reached toward the end of the final conference, when a specified and limited range of instances was accepted as suitable for board discretion. Consequently, Intelsat members would henceforth have considerable rights to use technology developed for Intelsat in their own satellite systems.

8. CONCLUSIONS

The permanent Intelsat arrangements provided for a large, if not cumbersome, organisational structure consisting formally of four, and effectively of five, organs: a governing board meeting at least four times a year; an intergovernmental Assembly of Parties gathering once every two years; an annual Meeting of Signatories composed of operating entities; an executive organ headed initially by a secretary-general and, after the six-year transition, by a director-general; and a 'management services contractor', designated as Comsat for the transitional period and responsible to the board—but if retained beyond the six years, to be accountable to the director-general. The transitional formulas, one Comsat official complained, "called for one of the most awesomely complicated transitional and organizational structures in the tortuous annals of international cooperation." More prosaically, an Intelsat governor has observed that the new arrangements "have not made Intelsat more efficient, just more expensive," and an FCC commissioner—who had served as U.S. delegation chairman during the renegotiations—has commented that the all-member assemblies whose creation required so much effort had little to do aside from "talking about how
well everything is going."(93)

The changes in Intelsat dictated by its permanent arrangements were not, however, meant to improve or even to modify its operational performance. They were intended 1.) to symbolise convincingly the multinational character that members wished the organisation to have, and 2.) to provide the means through which a fuller range of national and regional political interests that had mobilised to participate in satellite activities could, potentially, influence the organisation's actions. The principal focus of both symbolic and substantive enfranchisement efforts was Comsat's interim dominance over Intelsat, and the main thrust of reform was toward moderating that dominance so as to produce a structure that would respond better to the policy objectives that members might procure or create satellite services to fulfil.

On the face of it, the re-negotiations' success appears greater formally than substantively—when viewed, that is, in terms of impact upon Comsat's role. While, as O. Riegel has observed, the conference outcome "represented what was substantially a general retreat by the United States from its major positions," it was also true that "in terms of practical power, in spite of the concessions the United States would appear to have lost little if anything."(94) The new constituent assemblies seemed little threat to the interim regime where "control ...rests solidly with the advanced nations," and in particular Comsat.

Although a voting maximum was enacted in the Board of Governors, the ceiling was higher than Comsat's current—or likely future—traffic volume and therefore "would not appear to hurt the United States too much in the long run."(95) Similarly, the material impact of the complex transitional management arrangements was diminished by Comsat's mandate to continue as principal managerial entity for another seven or eight years, thus giving the company a total of 13 or 14 years in the job.(96) Comsat would still be manager when the next big round of contracts—for Intelsat V—came onto the agenda, and the precedents set by its tenure would make it unlikely that the eventual transfer of responsibility to an international directorate would produce significant alterations in operational practices.(97)

Nevertheless, there were at least two real consequences of the 1969-71 negotiations, in terms of accountability and confinement. First,
even though Comsat remained—for a time—technically and operationally indispensable, it would be subject to a radically different structure of accountability. The company’s ties to Intelsat were henceforth contractual and negotiable; review procedures would be more extensive and opportunities for scrutiny far more widely distributed among members. Comsat would still be, faute de mieux, in a managerial role rather closer to what it had previously played than some would have liked—but its tenure depended not on its continued self-selection, but on a convincing demonstration that its service to Intelsat was not likely to be bettered by some other entity.

Second, the re-negotiations established clear priorities governing expansion of Intelsat’s sphere of activities, and left the way open for separate satellite systems. Specialised applications, for instance, would be evaluated first and foremost as to their likely impact on what henceforth was agreed to be Intelsat’s principal mission—international public telecommunications. The likelihood that Intelsat attempt to stop its members from creating new systems for broadcasting or telecommunications was slim indeed. The organisation had, in sum, chosen its major path of future development; the path was narrower than the proponents of the ‘single global system’ had wished, but it was no longer claimed to be the only path.
Finally, space will be annihilated and thought will travel as fast as the speed of electricity and the ingenuity of man has made possible. Science thus will serve mankind if political organization can keep pace.

— Francis Colt de Wolf, 1946

This final chapter consists of two main parts, the first a survey of satellite developments from the conclusion of permanent arrangements for Intelsat through the mid-1970s, the second offering theoretical conclusions related to the characterisation of satellite formation proposed in Chapter Two but in light of the historical account that the study has presented. It is necessary to demonstrate empirically the technical and organisational transformation of the satellite field that was inaugurated by the 1971 Intelsat agreements in order to justify the search for determinants of that transformation, which should be located in the changed political objectives which participation in satellite formation promised to fulfil.

1. INTELSAT: STALEMATE BROKEN

Notwithstanding the internally negotiable, and hence uneasy, features of the lengthy transition to internationalisation provided for by the permanent arrangements, satellite development within Intelsat showed almost immediate signs of resurgence and expansion of services.

Earth station proliferation: While 63 antennas were built in 39 countries for Intelsat during the seven-year interim period from 1965 through 1971, a further 84 antennas were added to the system in the four years following the 1971 re-negotiations. The average annual addition of ground station antennas thus rose from nine through 1971 to 22 through 1975, and the number of countries with their own Intelsat ground facilities increased from a total of 39 at the end of 1971 to 72 by the end of 1975.

Space segment utilisation: Although when considered relative to
to capacity, utilisation of Intelsat's space segment declined sharply from a 1965-71 average of 39.2 percent to 27.5 percent from 1972 to mid-1975,\(^{(3)}\) it is notable that the system's on-line capacity more than doubled when global deployment of the Intelsat IV series was completed in 1972—and circuit leases would therefore have had to double immediately simply to maintain the previous level of utilisation. When the post-1971 absolute rise in full-time circuit leases is considered, however, substantial improvement is evident: from 2,917 circuits leased worldwide in December 1971, to 6,689 in mid-1975.\(^{(4)}\)

**Diversification of usage:** Circuit lease figures had become, furthermore, poor indications of total system utilisation since Intelsat began in April 1972 to offer long-term leases of bulk capacity (half- and full-transponders) at rates substantially below those which would be justified by voice circuit equivalences.\(^{(5)}\) In terms of overall usage, by 1976 eleven countries were leasing a total of 87 transponders—more than two-thirds the capacity of an Intelsat IV—for domestic telecommunications and bilateral television exchanges: in effect, as much capacity was being devoted to these applications as to intercontinental relay. Among the customers were: Spain and Mexico for TV exchanges; Algeria, which had established a 14-station domestic telecommunications network; Brazil for domestic uses; Malaysia for live telecasts between the Malay Peninsula and Eastern Malaysia; Norway, to interconnect North Sea oil operations, and Chile, Nigeria, Zaire and the Philippines. Negotiations were also underway with the Arab Telecommunications Union over use of Intelsat spacecraft for Mideast regional service.\(^{(6)}\)

This diversification was aided by more tolerant policies toward smaller, non-standard earth stations, which comprised nearly 29 percent of the antennas added to the system between 1972 and the end of 1975.\(^{(7)}\) Smaller earth stations were authorised in January 1976 for Chad, Sierra Leone, Thailand and Upper Volta.\(^{(8)}\) Partly as a consequence, TV relay traffic more than doubled in volume between the end of 1971 and 1974 and, interestingly, a broadcast-like pattern of usage began to emerge—whereby total earth station transmission times were outpaced by the increase in hours of reception, as multi-destination telecasts became more frequent. France inaugurated a daily TV transmission to 11 francophone countries, and by 1974 total transmission time was half that of reception.\(^{(9)}\)
Comsat and the Intelsat IV-As: Comsat became Intelsat's 'management services contractor' under a contract running from August 1974 to February 1979, which set a $500,000 yearly fee and, as amended in 1976 to allow for the director-general's assumption of responsibilities, provided Intelsat's executive organ with substantial and continuing powers of review over Comsat's Intelsat-related activities. Comsat had, however, used its remaining tenure under the interim arrangements to promote successfully what some Intelsat members viewed as an accelerated follow-on satellite series to the Intelsat IVs. The IV-As, offering around double the capacity of the IVs, were first opposed by the U.S. international record carriers and later by European ICSC members, on grounds that the satellites—six in all, at a total cost of $279m—would be deployed between 1975 and 1977, while the advanced Intelsat Vs would be available by 1979. Nevertheless, Comsat prevailed, and the first IV-A was launched in July 1975, the same month the request for proposals to manufacturers for the Vs was published. Of the first Atlantic IV-A's 20 transponders, one was reserved for demand-assignment (SPADE) service and another for two simultaneous TV channels.

2. SEPARATE SYSTEMS

International regulatory changes: Preparation had already been underway within the International Telecommunications Union (ITU) for modifications of regulatory practices to accommodate a possible multiplicity of satellite systems—and competing claims on orbital slots and frequencies. A World Administrative Radio Conference (WARC), the first such conference to deal with space communications since the 1963 EARC, was held in Geneva in June-July 1971. Its results included an eight-fold increase in the frequencies formally eligible for satellite use—an expansion that effectively would be even greater, owing to advanced frequency re-use techniques—and new procedures to ensure coordination between terrestrial and space users, and among existing and prospective space users. Of special importance were provisions entitling ITU members who had no satellites to object to proposed systems on the basis of possible interference with future plans. Previously, a satellite system would be registered virtually automatically
— and thereby approved—as long as its specifications were not challenged on grounds of interference with current uses, but the new provisions gave standing to prospective satellite operators and therefore placed some obligation on satellite-operating countries to consult with others to ensure more equitable long-term opportunities in the field.

Launcher services: After the Intelsat arrangements were concluded, the United States in September 1971 offered full launch services for the proposed European satellite system which, it was decided, threatened measurable but not substantial economic harm to Intelsat. The Europeans, however, viewed the concession as but a temporary advantage, and the French pushed ahead with development of their Ariane rocket, designed eventually to put two synchronous satellites in orbit at once. Forecasting a growing demand for launch services—30 to 40 communications satellites envisaged during the 1980s for India, Brazil, Scandinavia and various Arab countries, among others—France secured support for multilateral rocket development in 1975 from the new European Space Agency. Although the American space shuttle offered, in principle, cost savings over the Ariane, the Europeans remained wary of the still mal-defined terms under which the shuttle's services would be available to them, and were therefore reportedly heartened by the Soviet Union's April 1975 announcement that it would provide launch services to international satellite projects. Meanwhile the ESA budgeted some $600m for Spacelab—the space station the U.S. shuttle would eventually place in orbit, a facility believed to be of great potential value to certain industrial processes—an allocation which was twice NASA's own budget for the laboratory.

Regional and domestic systems: The modifications in Intelsat's own rules on transponder leases and earth station standards dampened but did not eliminate interest in separate telecommunications and broadcasting satellite systems. Three systems, on which work had already begun, were deployed or expanded in the immediate post-1971 period: the Soviets, after a first successful test launch of a geostationary satellite in April 1974, announced plans in March 1975 to expand their domestic Molniya network through addition of synchronous satellites designed to serve small-diameter community TV antennas; Telesat-Canada began operations in December 1973; and the first U.S. domestic satellite was launched five months later.
The first experimental Symphonie satellite was launched by NASA in December 1974; a follow-on spacecraft was scheduled for launch in August 1975, and was to begin providing TV and radio distribution services, initially relying on extensive terrestrial links but later to be used with small-diameter ground antennas. A comprehensive feasibility study by a UNESCO/ITU joint mission for a regional Latin American educational TV satellite system was requested by eight countries in 1970 and was expected to be published in late 1975, and requests to manufacturers for bids on a Brazilian domestic system were to be issued by the end of that year. In early 1974 a group of Arab ministers of information reaffirmed confidence in the findings of a 1970 UNESCO/ITU study which had recommended an Arab Communications Satellite System; the current plans of the Arab States Broadcasting Union and the Arab Telecommunications Union envisaged a regional system of two 12-transponder satellites providing 5-7,000 voice circuits and 2-5 television channels. Japan had immediate plans to launch two Japanese-built geostationary satellites with U.S. rockets in 1977, to be followed in 1978 by an experimental communications satellite put in orbit by a Japanese rocket. Indonesia's domestic system, which would use a Hughes-built satellite similar to that of the Canadian and U.S. Westar spacecraft, was scheduled to begin educational TV service in August 1976. Pending creation of an ASEAN system in the early 1980s—which would jointly serve Indonesia, Malaysia, Thailand, Singapore and the Philippines—the Philippines and Malaysia announced interest in leasing capacity from Indonesia spacecraft. Planning continued on West African and Australian systems, while in Europe a geostationary Orbital Test Satellite (OTS) was scheduled for mid-1977 launch; OTS was a precursor to the European Communications Satellite, which would offer operational service to CEPT and EBU members and possibly direct broadcasting to augmented home TV sets, beginning in 1980.

**Maritime services:** Intelsat's governing board authorised Comsat to conduct satellite experiments with Cunard Lines in spring 1972, and in spite of objections from British and French ICSC members sent a report to the International Maritime Consultative Organisation (IMCO) showing the feasibility of using the next generation of Intelsat spacecraft for maritime communications. Meanwhile, however, parallel efforts
independent of Intelsat in the U.S. and Europe appeared likely to culminate in creation of a new international satellite organisation dedicated to maritime communications.

In November 1972 the U.S. Navy awarded a contract to TRW for a naval satellite system, Fleetsatcom, which was expected to begin operations around the end of the decade. The Navy announced interest in having an interim system and in March 1973 Comsat General, the only entity to have submitted a bid, received a $28m contract from the Navy to provide two years of maritime service. Comsat General contracted with Hughes in May to purchase a $40m three-satellite Maritime Satellite (Marisat) space segment, which would be operational in the Atlantic and Pacific by 1977 and, moreover, would provide enough capacity in excess of Naval requirements to permit Comsat to solicit commercial customers. Under an FCC order in April Comsat was obliged to sell minority shares—totaling just under 15 percent—to the U.S. international record carriers. An overall outlay of $32m was envisaged to cover the satellites, two elaborate ground installations, and 200 sophisticated shipboard terminals—with four-foot antennas and automatic mechanisms to ensure that they remained locked on to the satellites—which would furnish voice, record and high-speed data services.

In 1974 ESRO—and later the European Space Agency—announced plans to modify the OTS spacecraft for maritime usage, and began work on a MAROTS project to put a European satellite over the Indian Ocean by 1977. ESRO was to manage the project—in which Britain sought a 56 percent interest and for which two UK firms, Hawker-Siddeley and Marconi Space Systems, were competing for the prime contract—and Germany, Italy, the Netherlands, Spain, Sweden and Norway were participating. The initial focus of MAROTS on Indian Ocean shipping lanes clearly complemented the Marisat plans for Atlantic and Pacific coverage and the possible benefits of a merger—suggested by the IMCO as early as 1972—led to the convening in April–May 1975 of an intergovernmental conference to consider establishment of an International Maritime Satellite System (Inmarsat) in London. In addition to the U.S. and MAROTS project members, the conference attracted participation from the Soviet Union, East Germany, Poland, Australia, Canada, Denmark, Finland, Greece, Japan and Liberia.

Although Comsat General's Marisat system began operational service of 14 ships in May 1976, the company remained interested in formalising
international arrangements to permit service to be sustained after its contract with the U.S. Navy—extended owing to delays in construction of TRW's Fleetsatcom—expired in 1980. (26)

Aviation services: Work on aeronautical satellites also continued in a parallel fashion in Europe and the United States. Comsat's work, in cooperation with the aviation communications carrier Arinc., to design a VHF system suited to the U.S. airlines was discontinued during the Intelsat conference, largely because of the downturn in business experienced by the principal American airlines, Pan Am and TWA. (27) The White House Office of Telecommunications Policy (OTP) had meanwhile been formulating government policy in the field, and in January 1971 called for pre-operational deployment in the Pacific by 1973 and the Atlantic by 1975. The OTP policy represented a two-fold setback for Comsat: first because the Federal Aviation Agency was named to manage the project, and second because the White House endorsed the UHF system favoured by ESRO and NASA but hitherto opposed by Comsat and the U.S. airlines. The policy also, however, restated a commitment to leasing capacity from an eventual system—rather than owning and operating it—but the status of Comsat's $100m two-satellite proposal was nevertheless unclear. (28)

Under International Civil Aeronautics Organisation (ICAO) agreements, responsibility for aviation communications was divided internationally: the U.S. in charge of the Pacific, and Canada and Britain primarily responsible for the Atlantic. (29) A shift to intergovernmental negotiations, notwithstanding the American policy of leasing circuits to the state, was apparent when discussions among the FAA, ESRO and the Canadian government over a joint satellite project opened later in 1971. At a meeting of an ad hoc intergovernmental group in Madrid in August, it was decided to form an Aerosat Council composed of representatives of each participating government in order to draft formal arrangements. (30)

Despite having by 1972 made four different aeronautical satellite proposals, Comsat was on the brink of being left out of the field altogether: the Aerosat draft agreement—formally a memorandum of understanding between the FAA and ESRO—called for joint governmental ownership, in contradiction to the 1971 U.S. policy favouring leases. Under pressure from Comsat and the American airlines, "a division of views" developed within the government—reportedly with the State and Transportation departments supporting the Aerosat plan, while the OTP and Dr. Kissinger,
then a presidential adviser, opposing it—and President Nixon rejected the compact in February 1972 on grounds that it conflicted with a commitment to procure services from privately-owned sources.

Further negotiations produced another memorandum in 1974 among ESRO and the U.S. and Canadian governments providing for joint experiments on transatlantic aviation satellite services. Aerosat remained formally intergovernmental, but after competitive bids were evaluated Comsat General was selected over RCA by the Aerosat Council to serve as American representative. The system's ownership was divided 47 percent each to Comsat General and ESRO and six percent to Canada. Comsat General was to lease capacity to the FAA—which also would pay the $36m launch costs—and the two-satellite system, estimated to cost $72m, was scheduled for 1979 deployment. The Aerosat Council, headquartered in Paris, issued a formal request for bids in March 1976.

Direct satellite broadcasting: The most controversial potential application of satellite technology—broadcasting directly from satellites to TV or radio receivers—remained unlikely to be deployed operationally on a large scale as of the mid-1970s. Intelsat had made no effort to undertake direct broadcasting development, and the application had without objection been included among the 'specialised services' requiring elaborate authorizations under terms of the 1971 agreements. By the time UNESCO approved in October 1972 a "Declaration of guiding principles on the use of satellite broadcasting," the matter had been on its agenda for 10 years. As of the mid-1970s the only notable attempts to broadcast from satellites had been a NASA experimental project, using an ATS spacecraft first within the United States to transmit educational TV to schools and clinics in three regions and then to broadcast to community receivers in 5,000 villages—nearly half receiving signals direct from the satellite—located in six different regions of India. The one-year Satellite Instructional Television Experiment (SITE) was agreed bilaterally between NASA and the Indian Atomic Energy Commission.

The reasons for inaction in the direct broadcasting field are numerous, and easily sufficient to warrant a study comparable in length to this one. Worthy of brief mention are: 1.) the historical legacy of international broadcast, as against telecommunications, regulation; 2.) the larger controversy of 'national cultural sovereignty'
versus the 'free flow of information'; and 3.) the virtual absence of policy on the part of the most advanced technical power in the field, the United States.

Whereas international telecommunications regulation was initially inspired by previous postal agreements, early attempts to regulate international broadcasting actually applied principles derived from national control over airspace—and in effect attempted to supply juridically the protections that were eliminated technically by the ability of foreign transmitters to reach domestic audiences directly.\(^{(38)}\) Efforts were made as early as 1959 to prohibit broadcasting from space—ostensibly for the same reasons that extra-national 'pirate' broadcasting was declared illegal—and the French tried unsuccessfully to have satellite broadcasting banned at the 1963 EARC.\(^{(39)}\)

Direct broadcasting became an "exemplar of the challenge to national sovereignty"\(^{(40)}\) during the debate revived in the latter 1960s within various international forums—notably UNESCO and the UN Committee on the Peaceful Uses of Outer Space (CPUOS)—over the continued wisdom and acceptability of the 'free flow' of international information to which UNESCO was nominally dedicated, a doctrine which was held to have legitimated a one-way flow of media traffic from the metropolitan to the Third worlds and thereby jeopardised the political and cultural sovereignty of underdeveloped countries.\(^{(41)}\) In 1966 the UN General Assembly began efforts to have the CPUOS address formally the issues raised by satellite broadcasting, and in 1968—as a result of Canadian and Swedish initiatives—a Working Group on Direct Broadcast Satellites was created. Subsequent debate there and within UNESCO led to the 1972 UNESCO declaration of principles, which supported a requirement for prior consent by prospective receiving countries and cautioned on the need to avoid 'spillover' of broadcasts onto unwilling third countries.\(^{(42)}\)

While the U.S.—along with Japan and a dwindling number of other countries—was upholding the 'free flow' position internationally, there was "an appalling lack of Government policy" in the satellite broadcasting field, as a 1969 congressional report concluded.\(^{(43)}\) A State Department official had testified that government policy was one of leaving options open,\(^{(44)}\) and the U.S. later tried to postpone the final vote on the UNESCO declaration and ended up abstaining.\(^{(45)}\) American policy
was caught between a mild official interest in using broadcast satellites internationally—mild because there was little indication that anyone else was likely to deploy such large and powerful spacecraft—and fierce resistance domestically by broadcasters to further development of a technology that threatened to subvert the entire structure of the broadcast industry by making local transmitters obsolete.\(^{(46)}\)

While there were recommendations of greater U.S. work in the field "in order to maintain our present leadership,"\(^{(47)}\) and suggestions that Intelsat create and maintain the space segment of a worldwide space broadcasting system,\(^{(48)}\) little effort was made to pursue either course and the probability of anything but limited, bilateral arrangements was slight.

That relegation of broadcast satellite development to domestic or regional projects was, arguably, consistent with the general transformation of the satellite field, which we shall now consider.

3. CONCLUSIONS: PRE-EMPTIVE UNDERDEVELOPMENT SUCCEEDED

The satellite field has since 1971-72 begun to display a technically multifocal and politically polycentric character; various unexploited or underdeveloped technological applications have been undertaken by a loosely coordinated regime of international, regional and domestic projects, whose combined efforts promise substantially greater development of the technology than had been achieved during the initial period of pre-emptive underdevelopment. Our concluding task is to sketch the connections between the two phases in order to support the proposition that the period of monopolistic control and developmental constraint made possible—and indeed engendered—the subsequent period of liberalisation of control and, potentially, maximisation of technical development.

The model introduced in Chapter Two of pre-emptive underdevelopment described a technological formation in which control of a technology was sought and secured through rapid and limited development. A floor on development existed, consisting of the minimum necessary to discourage rival deployments and thereby to prevent loss or dissipation of control; but a developmental ceiling also existed, defined by the harm more intensive technical exploitation or wider deployment would cause to the
outstanding interests of dominant participants.

As a sustained technological formation, pre-emptive underdevelopment required two sets of conditions, one primarily external and the other internal. First, the stakes of the process had to be considered politically and industrially important, as was clearly the case during the first decade of satellite formation from 1961 to 1971: the U.S. government's two-fold requirement for improved operational services and an impressive 'propaganda of the deed', the American carrier industry's concern with the potential impact of satellite services upon future prospects, and the fears of European countries that lucrative opportunities in commercial space fields would be foreclosed to the long-term detriment of high-technology industries, together suggested that satellite formation was a novel arena of substantial importance to the pursuit of the particular and otherwise unrelated interests of major participants.

Second, internally the mode of formation had to be structured so as to confine the opportunities for substantive influence to those participants whose functional collaboration was essential to the undertaking: further enfranchisement would threaten both the process' pre-emptive urgency, by obliging more extensive negotiation and consensus-formation, and its developmental limitations, by expanding the range of demands that could be made upon the technology. The character of satellite formation that was negotiated during the 1961-71 period—both defensive in orientation, owing to the protectionist strategies of the U.S. carrier industry and of European participants, and positive in its commitment to some degree of rapid technological development, owing to the U.S. government and later to Comsat—was no more stable than the political hold of those participants over the process was firm, since negotiation would not otherwise have to be confined to the terms suggested by their interests.

The most apparent transformation during this first phase was internal to the mode of formation, which expanded in nominal composition and gradually devolved politically toward a different locus of determination. From a preliminary structure wholly internal to the U.S. government—first the military and then civilian space programmes—the mode was expanded in 1961-62 to include a small number of private
companies that were tied to the state through regulatory controls. As international collaboration was secured in Europe, both military and civilian components of state influence over the enterprise declined: the military's satellite interest was progressively re-directed toward projects separate from the commercial effort; civilian governmental oversight was reduced as an immediate result of the carrier industry's opposition to the state's serving as patron of their satellite-owning competitor, and of European objections to national regulation of a supposedly international undertaking. The increase in the formal participation of Third World countries expanded further the composition of the mode of formation, and created intense pressure to widen accordingly the opportunities for substantive influence—a result of the very success of the technical project in achieving its goal of global deployment.

While internal changes in the mode of formation were making its concentrated structure of control untenable, external changes were making monopolisation of the commercial satellite field both unnecessary and indeed undesirable from the standpoint of the hitherto dominant interests in the field. The American 'single global system' policy lingered well after it had ceased to serve any interest but Comsat's: the strategic value of the technology transfers that the policy was invoked to prevent had been diminished by the absence of a significant European challenge to U.S. NATO hegemony; and the threat separate satellite systems were believed to pose to Intelsat was lessened by Intelsat's own installation as a viable—if functionally limited—enterprise. While the Europeans had all along opposed and resented the single comprehensive system approach, they were joined in viewing the eventuality as undesirable by U.S. manufacturers, the American carriers (who wanted their own satellites) and, to a degree, by Third World countries who were solicitous of Intelsat's future but had no wish to see the availability of satellite technology restricted by continuing transatlantic stalemates. Furthermore, among the industrial countries, mutually beneficial development of specialised satellite applications might be endangered if attempts were made to adapt Intelsat's structure and procedures to accommodate projects that would better be pursued in forums specifically suited to the particular fields.
In short, the overall functionality of rapid and constrained technological formation had been eliminated: what needed to be seized, had been; what needed to be protected, had been. Moreover, in the process the stakes of further satellite development had become literally globalised. Once the technology had, largely through Intelsat, been proved useful and economical, it became subject to a novel array of demands that were broader and more pressing than those of the narrow spectrum of metropolitan industrial and political interests that had compromised pre-emptive underdevelopment into existence. These emergent interests challenged the agreed definition of satellite technology as a supplementary means of intercontinental relay and supported more intensive development and wider availability of satellite services—and for the industrial countries it would have been both commercial and political folly to resist these demands, or to permit outstanding intra-metropolitan controversies to stand in the way. Monopolisation had created conditions best exploited by liberalisation.

The initial floor of minimally necessary satellite development had been durably constructed, since there could be no question of another global satellite system now emerging to compete with Intelsat. This floor had, however, become the foundation on top of which a new minimum level of requirements was being assembled. For metropolitan countries, attempting to meet those requirements promised considerable gains, while failure to recognise them threatened little but loss of markets and influence. For potential customers, services that were increasingly deemed essential were at stake.

As for the ceiling on satellite development that had been built from the defensive responses of initially dominant participants, effective protections now seemed to exist for all to whom greater satellite development had posed a threat. Limits unquestionably still existed but, with the exception of direct satellite broadcasting, they were primarily technical and economic—e.g. national spending priorities, spectrum and orbital space—and political only to the extent that such determinations inevitably express underlying relationships of dominance and subordination, nationally and internationally. There was no longer an authoritative political consensus fashioned around the desirability, of the acceptability, of restraining satellite development. Pre-emptive underdevelopment had been succeeded by the product of its own success.
NOTES

CHAPTER ONE: INTRODUCTION AND OVERVIEW


10. Ibid., August 21, 1962.


NOTES: CHAPTER ONE, CONTINUED


19. Interview with Intelsat official who wished not to be identified, April 12, 1976, Washington, D.C.


22. Ibid., pp. 26-27.

23. Interview with John A. Johnson, president of Comsat General Corp. and former vice president/international of Communications Satellite Corp., March 24, 1976, Washington, D.C.


29. "One of the great advantages offered by satellites is the practicality of international television transmission," according to ITT Vice President Henri Busignies in: House Committee on Science and Astronautics,
NOTES, CHAPTER ONE, CONTINUED

30. A. Frutkin, op. cit., p. 373.


35. L. Lessing, op. cit.


37. Ibid., p. 12.


42. A. Chayes in McWhinney (ed.), op. cit., p. 47.

43. Ibid.

44. W. Hinchman in McWhinney (ed.), op. cit.

45. Interview with Intelsat official (see note 19 supra.)

NOTES: CHAPTER ONE, CONTINUED

47. UNESCO, op. cit., p. 14


52. Senate Committee on Foreign Relations, Hearings, Communications Satellite Act of 1962. 87th Congress, 2nd Session, on HR 11040. August 3, 6, 7, 8 and 9, 1962. p. 190. (hereinafter: Senate Foreign Relations Hearings.)


55. As of 1969, when nearly 70 countries belonged to Intelsat, membership in the Intersputnik system consisted of: the Soviet Union, Mongolia, Hungary, Poland, Czechoslovakia, Bulgaria, Rumania and Cuba. (Telecomm. Repts., February 17, 1979.)

56. See survey in Intermedia, August 1975.


NOTES: CHAPTER ONE, CONTINUED


62. Kinsley, op. cit. (see note 34 supra.)

63. Ibid., p. 238.


CHAPTER TWO: THE FRAMEWORK


3. R. Williams has used "operational" in the same sense that we have used "instrumental." (op. cit., p. 20).

5. For account of problems deriving from operation of filters on feedback, which impede reception of intelligence about previous outputs, see K. Deutsch, *The Nerves of Government* (N.Y.: Free Press, 1962.)


9. Examples of the efficiency of such systems, supplied in Dvornik, *op. cit.*, include: Persian voice relays of the 3rd Century B.C. could transmit orders in one day over distances requiring a 30-day journey (p. 44); beacons linking Xerxes' imperial capital to his dominions in the 1st Century A.D. kept the emperor informed on a daily basis of "all that was happening in Asia," according to a contemporary account (p. 32); the Mongol fire signal network could, it was said, cover the distance of a three-month march in 24 hours (p. 294); Mongol horse relays could cover 200-250 miles in a day (p. 290-1); in the 9th Century A.D. the North African Arab dynasty could receive messages from the tip of Spain in Alexandria in a single night (p. 219).


17. Clark, *op. cit.*, p. 113, 153; W. A. Williams, *The Tragedy of American Diplomacy*. N.Y.: Delta, 1962. p. 22. The first transpacific cable was built by the British in 1902, although preparations for a U.S. facility dated to 1865, when a line across Alaska and Siberia was
discussed, and the Navy was authorised to map the Pacific floor in 1873 as a preliminary to cable-laying. E. Barnouw (A Tower in Babel: A History of Broadcasting in the United States, Vol. 1, to 1933. N.Y.: Oxford University Press, 1966. p. 15) records that the embarrassment of the U.S. Navy's having to transmit victory of its decisive victory in the Battle of Manila over British telegraph cables—by ship to Hong Kong, and thence over cable through the Indian Ocean, Red and Mediterranean seas, and the Atlantic—was an immediate stimulus to American cable plans, but the growing appreciation of the political and commercial importance of China seems a more compelling explanation (see W. A. Williams, op. cit., passim.)

18. The spread of credit and money has been attributed in part to new communications technologies. Paper had been known in the West since the early 8th Century, but largescale paper production began in Europe only with the commercial revolution of the later Middle Ages. With printing, furthermore: "The accessibility of information favoured the growth of new centres of finance," as H. Innis has written (Empire and Communications, rev. by M. Q. Innis. Toronto: University of Toronto Press, 1972. p. 128, 146.)

19. An optical relay between London and Portsmouth, built by the Royal Navy during the Napoleonic Wars, was later retained for commercial users (Smythe, op. cit. 1957.) American stockbrokers in the early 1800s constructed a hillside semaphore system between N.Y. and Philadelphia and could send stock quotations the 100-mile distance in 30 minutes. (Bagdikian, op. cit., p. 4.)

20. Julius Reuter started his wire service in 1851 to relay closing market prices between Paris and London via the new Dover-Calais cable. Earlier, Reuter had used carrier pigeons to close a gap in the Paris-Berlin overland cable. (N.Y. Times, March 10, 1976.)

21. In the U.S., for example, United Fruit, Standard Oil and Firestone Tire & Rubber were either pioneers in development of or were early to adopt wireless technology. (See Barnouw, op. cit. 1966, p. 20, 29; also Herring and Gross, op. cit., p. 88, 297.)

22. Herring and Gross, op. cit., p. 109-110, noted that of the two major U.S. international cable operators, nearly all the traffic handled by one and 81 percent of the other's consisted of commercial and news messages:

The volume of business and earnings of American cable companies, as well as their facilities, have increased commensurately with the growth of foreign trade of the United States and social and diplomatic intercourse with foreign nations.

(Ibid., p. 41)

Between 1902 and 1927 the total length of undersea cables owned or leased by U.S. companies increased six-fold (Ibid.); similarly, direct foreign investment abroad rose from $2.6m in 1915 to $609m in 1929 (W. A. Williams, op. cit., p. 46, 145.) A 1944 Fortune magazine editorial noted the commercial indispensability of communications facilities: "Upon their efficiency depends whether
in the United States will grow in the future, as Great Britain has
in the past, as a center of world thought and trade." (Quoted in
H. Schiller, "Economics and electronics forging an American cen­
tury." Paper delivered to the Conference on Engineering in Inter­
national Development, Center for Research and Education, Colorado
State University, Estes Park, Colo. August 27-September 1, 1968.)
A NASA official stated in 1966: "It is not difficult to understand
this tremendous burst in the requirements for global communications,
for trade patterns have assumed global proportions." (L. Jaffe,
p. 6.)

23. The works of H. Innis (see note 18 supra; also, The Bias of Com­
munication. Toronto: University of Toronto Press, 1951.) lay con­
siderable emphasis on the perishability—and transportability—of
certain communications media (e.g. papyrus, paper, radio) as fa­
vouring 'hierarchical' administration over large territorial units:
such media are 'space-biased', according to Innis, in that geographi­
cal reach is enhanced; but because the media are not durable, com­
municating skills must be delegated to peripheral points in order to
ensure continuity over time—and the resulting form of administra­
tion cannot therefore be highly 'centralised'. Innis' otherwise
exhaustive study of pre-electrical media ignores the apparently
space-biased signalling methods we have mentioned, and therefore does
not consider the notion we have advanced that delegation of authori­
ty, and the possibilities of independent coordination among peripher­
al points (which distribution of communicating skills—for recopying
e.g.—attributed to space-biased media would permit), could both be
pre-empted by 1.) continuous contact over time between centre and
margins, and 2.) technical and/or procedural prohibitions on inter­
marginal communication.

24. House Committee on Government Operations, Government Use of Satel­
lite Communications, House Report no. 2318. Submitted October 19,
(hereinafter: House Rept. on Govt. Satellite Use 1966.)

25. Dvornik, op. cit., passim.


28. See Dvornik, op. cit., p. 98-100. Dvornik quotes (p. 83) this passage
from Julius Caesar's writings in which much the same principle is
recommended for managing rumours:
Those states which are supposed to conduct their public admin­
istration to greater advantage have it prescribed by law that
anyone who has learned anything of public concern from his
neighbors by rumor or report must bring the information to a
magistrate and not impart it to anyone else...Magistrates con­
ceal what they choose and make known what they think proper
for the public.
NOTES: CHAPTER TWO, CONTINUED


30. Galtung writes (Ibid., p. 91):
How could—for example—a small foggy island in the North Sea rule over one-quarter of the world? By isolating Periphery parts from one another, by having them geographically at suf­ficient distance from each other to impede any real alliance formation, by having separate deals with them so as to tie them to the Centre in particularistic ways, by reducing multilateralism to a minimum by having all kinds of graded membership, and by having the Mother Country assume the role of window to the world.

31. Cable-relayed traffic from Rangoon to Djakarta passed via Tokyo, from Dakar to Lagos via Paris and London, from Tahiti to American Samoa through California. (Lyndon Johnson, "President's message on communications policy," August 14, 1967, reprinted in Rostow Report, p. 4. Hereinafter: 1967 Presidential Policy Statement.) An excellent instance of indirect routing was provided by an Intelsat traffic ana­lyst in an interview (Henry Chasia, Washington, April 12, 1976): a telephone call between two villages 20 miles apart, one in western Tanzania and the other in eastern Zaire, was routed through Dar es Salaam, Nairobi, London, Brussels, and Kinshasa, and cost 20 percent more than a call to London. On the other hand, British imperial policy had set a penny-per-word rate on news from anywhere in the Empire to London (Galtung, op. cit.), and internally the Reuter press service empowers the editor in charge of British news to route stories directly onto the international wires, without first passing through the world news editor for approval—as news from anywhere else must do. (Tour by the author through Reuter's headquarters, London, April 1977.)


33. W. A. Williams, op. cit., p. 22.

34. W. S. Rogers, op. cit.; Herring and Gross, op. cit., p. 37.

35. W. A. Williams, op. cit., p. 231; Clark, op. cit., p. 153.

36. By 1930 the British imperial and international network comprised 168,000 miles of long-distance cables out of a world total—for all undersea cable lengths—of around 350,000; the British network was nearly twice the size of the American. (P. J. Brown, op. cit., p. 4.) Even as of 1966, some American officials maintained that Britain controlled the world's biggest international communications complex. (in H. Schiller, op. cit. 1968, note 22 supra.)

37. "Governments were forced to act quickly and in common, to interna­tionalize the practice, since the Marconi company, backed by the
governments of Great Britain and Italy, was aiming for a monopoly.”

38. Loevinger, op. cit., p. 830.


40. The Roman roads relied upon horses provided by inhabitants of regions through which the roads passed, and the Mongol postal system obliged localities to supply horses, boats when necessary, food and whatever else messengers required. (Dvornik, op. cit., pp. 97, 291.) The analogy with a modern government's contracting with private companies may seem far-fetched, but in each case the collaboration of non-state agencies is deemed operationally necessary—or highly convenient—and the possibility of widened influence upon the resulting communications system is thereby created.


43. The 1927 creation of Cable & Wireless Ltd. by the British Parliament is a good case in point. Legislation followed upon recommendations made by an Imperial Conference—requested by the Canadian and Australian governments—which had been called to consider the serious reductions in cable revenues owing to the recent introduction of short-wave radio service among Britain, Canada, Australia, South Africa and India. C&W was a merger of formerly state-owned operations into a private entity; HM Government would appoint its chairman and one other director, and the company was required to consult with the Imperial Communications Advisory Committee on policy matters and to obey the orders of Commonwealth governments on military ones. (see: F. J. Brown, op. cit., p. 101-3; also T. O. Elias, "The contribution of telecommunications and direct satellite broadcasting to technical assistance and nation-building," in McWhinney (ed.), op. cit., p. 122.)

44. Statements of this position have included this from NASA's administrator in October 1960:

"Traditionally, communications services in this country have been provided by privately-financed carriers competing with each other to serve the public interest under Federal controls and regulation. There seems to be no reason to change that policy with the advent of communications satellites." (Gouldner, op. cit., p. 111.)

In April 1962, the vice president of General Telephone & Electronics,
America's second biggest domestic phone carrier, declared:

Private enterprise has given the United States a communications system second to none. There is no reason to believe that a government monopoly, which will pay no taxes and not have a profit incentive, can do a better job than private enterprise. (T. Brophy in Telecomm. Repts., April 30, 1962.)


46. Examples include: Morse's invention of the telegraphy, inspired by a government inquiry into building an optical telegraph relay to link Washington and New Orleans after the War of 1812; state coordination and direction of radio R&D during the First World War, which resulted in new devices and patents; early private efforts to build Latin American and transpacific cables, actively solicited and encouraged by the government; transpacific phone cables "accelerated by the strong urging" of the state. See: Smythe, op. cit. 1957, p. 50; Galloway, op. cit., p. 9; Barnouw, op. cit. 1966, p. 52; Military operations subcommittee, House Committee on Government Operations, Satellite Communications —1964. Part I, March 17, 18, 19, 24, 25, 26; April 7, 8, 9, 14, 15, 16; May 21, 27 and 28, 1964. Washington: GPO, 1964. p. 297. (hereinafter: 1964 Satellite Hearings Part I.)

47. Examples include: Electrical telegraphy was refined and operationalised by the Post Office between 1843 and 1847. In the cable field, President Grant promulgated a ban on foreign cable landings in 1869 where prospective foreign licensees held monopoly concessions abroad that would deny American companies—of which there were none as yet—reciprocal rights. The 1927 Radio Act authorised the Navy to handle commercial traffic where private facilities were unavailable. Earlier, so-called amateur radio users were barred from the preferable frequency ranges. Internationally, the government has acted throughout this century to secure frequency assignments for private usage before the ITU's International Frequency Registration Board. See: Clark, op. cit., pp. 111-12; Herring and Gross, op. cit., pp. 91-2, 231-2, 288; Smythe, op. cit., p. 87.

48. First federal legislation, in 1866, authorising state aid to telegraph companies reserved the government's right to buy the resulting systems and, by the 1920s, nearly 100 bills had been introduced to nationalise the communications industry. The 1927 Radio and 1934 Communications acts provided for state licensing of transmitters and also restricted foreign shareholdings in U.S. licensees. State conditions have included determining the routes of overseas linkages: the first U.S. transpacific cable was routed, at government insistence, bypassing the German-owned Marshall Islands despite the technical optimality of landing there; in 1935 the government prevailed upon AT&T to establish radio service direct to Paris, instead of via London as AT&T preferred. State policy on competition among U.S. carriers in furnishing overseas links has varied according

49. Of particular importance have been antitrust-related interventions. (For general background, see: S. E. Berki (ed.), Antitrust Policy: Economics and Law. Boston: D.C. Heath, 1966.) AT&T was forced to divest itself of the telegraph monopoly Western Union acquired in 1910. RCA-NBC was forced to sell one of its two radio networks in 1941, which subsequently became ABC. A 1956 Justice Department settlement, while permitting AT&T to keep its manufacturing subsidiary Western Electric, prevented AT&T from entering non-common carrier services—especially cable television—for some 15 years. Efforts byITT to buy the ABC network were stopped by the Justice Department in 1968 (although they had been approved by the FCC.) See: Barnow, op. cit. 1966, pp. 47-8; Gouldner, op. cit., pp. 78-81; R. Bunce, Television in the Corporate Interest. N.Y.: Praeger, 1976. pp. 91-3.


51. As of 1966, the U.S. government was the world's biggest user of international commercial circuits, using around 15 percent of the total capacity of all international common carrier systems. (Telecomm. Repts., February 28, 1966.)

52. R. Williams (op. cit., p. 14) has warned of the need to transcend the debate between "technological determinism" and "symptomatic technology:"

Each view can...be seen to depend on the isolation of technology. It is either a self-acting force which creates new ways of life, or it is a self-acting force which provides materials for new ways of life.

The solution, according to Williams, is to restore intention to the process of technical discovery and invention, and to demonstrate that social purposes play a direct role in organisation and orientation of R&D.

53. Fire beacons, for instance, were first used by the Assyrians in the 11th Century B.C. and were subsequently re-adopted by the Persians, Greeks and Romans. The Greeks added a water clock which permitted an impressive variety of pre-arranged signals to be relayed, and the Romans used pairs of beacons at each terminal, introducing a binary code through which words could be spelled out. (Dvornik, op. cit., pp. 15-19, 32, 42-3.)
"All the essential features of signalling by Hertzian waves were really outlined in scientific laboratories long before any idea of utilising them for commerce had occupied prominent attention." (The Electrician, October 14, 1898. Quoted by Briggs, op. cit., p. 32.)


Examples include continuing use of optical signalling—e.g. stroboscopic warning lights, naval semaphores—the value of the posts despite a century of telephony, and the revival of private couriers—ironically as adjuncts of advanced communications industries like broadcasting and data processing.

Herring and Gross, op. cit., p. 80. In the 1920s the cable industry developed and rapidly deployed cables incorporating a new high-permeability loading material (permalloy) and multiplex features, whereby several conducting cores were wrapped within a single cable strand. The net result was four to five times the capacity of pre-permalloy, non-multiplex cables, at costs from 15 to 20 percent higher. (See: F. J. Brown, op. cit., pp. 81, 86; President's Communications Policy Board, Report, Telecommunications: A Program for Progress. Washington: GPO, March 1951. p. 131.)


Equifinality is, for Stinchcombe, "the causal centrality of consequences." (See Stinchcombe, op. cit., p. 80.)

A. G. Bell's patent filing was followed a few hours later by another telephone patent filed by one Elisha Gray, whose patent was later purchased by Western Union; the whole dispute was later settled, in Bell's favour, by the U.S. Supreme Court. (See Gouldner, op. cit., p. 38.)


In the evolution of electrical communication, it might easily have happened that wireless might have preceded wire communication. In that case, the use of land wires to guide the etheric waves of wireless transmission would...have been hailed as a great step forward—minimizing the electrical power required, and conducing to that secrecy and reliability under all atmospheric conditions which wireless has not yet completely given. The invention of the submarine cable would have been regarded as still more noteworthy. (F. J. Brown, op. cit., pp. 6-7.)

R. Williams, op. cit., p. 19:

...The key question, about technological response to a need, is less a question about the need itself than about its place in an
existing social formation. A need which corresponds with the priorities of the real decision-making groups will, obviously, more quickly attract the investment of resources and the official permission, approval or encouragement on which a working technology, as distinct from available technical devices, depends.

64. Houlton, *op. cit.*, Abstract.


68. By 1912, around four-fifths of the world's radiotelegraph stations were aboard ships, and most of the rest were land-based facilities for communicating with ships. (Smythe, *op. cit.* 1957, p. 37.)


70. The plan was rejected in 1906 and 1909, finally approved in 1911 when the possibility of war seemed growing, but re-examined after a scandal broke involving Marconi officials. The plan was re-approved in 1913, but little work had been done when war began. Reluctance has been attributed to Marconi's poor relations with the Post Office, perhaps due to cable holdings. (Wedlake, *op. cit.*, pp. 80-2; Briggs, *op. cit.*, p. 34.)

71. AT&T had bought the valve patents of Lee DeForest, an early radio inventor; United Fruit acquired J. C. Pickard's company and his patents on crystal detection equipment; GE and Westinghouse owned vacuum tube patents from their work on light bulbs. Litigation arose among these companies and Marconi's. (Barnouw, *op. cit.*, pp. 47-8.)


73. Those bills died in committee, despite support from the Postmaster General and the Navy. (See Smythe, *op. cit.* 1957, p. 37; Barnouw, *op. cit.* 1966, p. 52.)
NOTES: CHAPTER TWO, CONTINUED

74. Clark, op. cit., p. 242; President's Communications Policy Board, op. cit. 1951, p. 131.

75. Wilson acted under presidential powers assigned by the 1912 Radio Act to take control of communications facilities "in time of war or public peril." (Public Law 264 sec. 2, 62nd Congress, cited in Barnouw, op. cit., p. 41.)

76. Under wartime powers the disputes were put on ice. Contractors were to make the equipment needed. Claims under patent rights later could be filed with the government and adjudicated. A letter from Franklin D. Roosevelt, as assistant secretary of the Navy, guaranteed each contractor 'against claims of any and all kinds' in the carrying out of government contracts, and each was told to use 'any patented inventions necessarily required'.


77. Ibid.

78. Ibid., p. 52.

79. Along with its own pre-war stations, the Navy had as of 1918 all the American Marconi transmitters, a high-powered station seized from Telefunken, a French transmitter and two others built during the war for direct communication with France. (Herring and Gross, op. cit., p. 30.) Smythe has written (op. cit., p. 50) that new patents deriving from state-supervised or -conducted R&D during the war would have guaranteed the government postwar industrial dominance even if confiscated properties were restored.

80. Orders are said to have come directly from President Wilson, then at Versailles and exasperated by Lloyd George's conduct at the Peace Conference. (Clark, op. cit., p. 243.)


82. Legislation authorising state ownership of the communications industry—including the telephone system, which had been nationalised late in the war—was then pending in Congress. (Herring and Gross, op. cit., p. 81.)

83. Barnouw, op. cit. 1966, p. 59; Herring and Gross, op. cit., p. 82. By 1921, GE, Westinghouse, AT&T and United Fruit had traded patents for stock and owned 65.1 percent of RCA.

84. Ibid.


86. RCA's actions were "carrying the principles of the Monroe Doctrine into the field of communications in the Western Hemisphere." (Clark, op. cit., p. 197; see also Herring and Gross, op. cit., pp. 82-3.)
87. Four operational areas were agreed. RCA got the U.S. and its overseas territories, along with certain rights to Canada and the Caribbean; Marconi got the British Empire. In those two parts of the world either company could use the other's patents. In a 'no man's land' including most of Europe, Russia, Japan and Argentina, neither could use patents controlled by the other. The rest of the world was deemed neutral, and the patents of both could be used freely by both. (Smythe, op. cit. 1959, pp. 50-1.)

88. By 1934 RCA maintained 57 direct circuits to 47 countries. (Herring and Gross, op. cit., p. 85.) According to Smythe, the boom in equipment sales domestically owed much to the government's turning a blind eye to RCA's use of state-held patents (op. cit. 1959, p. 51.) He quotes 1929 congressional testimony by one of the Navy officers who had helped persuade GE to form RCA:

We gave them (RCA) advice, and we urged them on. And I might say that we thought we were doing a great thing, to help set up a great American company to compete with the British monopoly in communications. (Ibid., p. 52.)

89. When transatlantic radiotelegraphy was first introduced in 1903, its rates were one-third less than cables. (F. J. Brown, op. cit., p. 96.)

90. Ibid., p. 97.


92. When Marconi began radio service between England and Canada in 1926, for example, and the next year between England, Australia, South Africa and India, the cable carriers lost half their business. This was a principal reason for the 1927 conference that led to creation of Cable & Wireless Ltd. (Wedlake, op. cit., p. 144; F. J. Brown, op. cit., p. 101.) See note 43 supra.

93. RCA had five domestic collection and distribution centres as of the early 1930s. (President's Communications Policy Board, op. cit. 1951, p. 34.)


95. Ibid., p. 203. The authors conclude:

It is inconceivable in a competitive system that a telegraph company having cable lines of its own would handle the foreign communications of its competitor with the same care and expedition as it handles its own...This...prevents the Radio Corporation from competing with the cables in certain high-speed services to and from points outside New York City.


97. By the end of the First World War, 90 percent of European-North American traffic passed through London. (Herring and Gross, op. cit., pp. 26-7.)
NOTES: CHAPTER TWO, CONTINUED

98. State concern with the future viability of cables in the face of radio competition was a major reason for recurrent proposals in the U.S. for a British-style merger of competing overseas transmission modes. Such a merger was considered by Congress in 1929, 1934, 1935, 1942 and 1945. (See Herring and Gross, op. cit., pp. 202-210, 385; A. Ende, op. cit. 1969, p. 413; Testimony of Dallas Smythe in Sen. Antitrust Hearings 1962 Part I, p. 205.) The 1951 presidential commission, notwithstanding its anti-merger recommendation, stated the cable-protection argument as follows:

The cable companies have been burdened with a heavy investment in plant. Intense competition with each other and from radio has held down profits. Development of radio in the international field has added circuits faster than traffic has grown...Fundamental to this problem is the possibility offered by radio of providing, with relatively small capital outlay, circuit capacity exceeding the normal requirements of international communications. (President’s Communication Policy Board, op. cit., p. 123.)

With the advent of telephonic cables in the mid-1950s, the question of intermodal diversity became less critical in consideration of merger than was the survival of the so-called record carriers—who handled all traffic other than voice—at a time when the only U.S. voice carrier (AT&T) in the overseas field had deployed a sufficiently high-capacity cable to handle easily the relatively small capacity requirements of the record carriers. Merger was therefore considered solely in regard to the record carriers, in order to increase their strength vis-a-vis AT&T, and was supported by the FCC in 1959 and by a special interdepartmental committee in 1966. (Smythe testimony in Sen. Antitrust Hearings 1962 Part I, p. 205; Telecomm. Repts., June 20, 1966.) The notion of merging all transmission modes under a single ownership—comprising voice and record carriers—was again revived by the Rostow Report (Ch. I, p. 20; Ch. II, p. 8.)

99. Houlton (op. cit., p. 50) defines a template as "the ordering of the components or sub-systems" of a communications system, in other words, a definite form in which a technical potential is deployed.

CHAPTER THREE: THE EMERGENCE OF U.S. GOVERNMENT COMMUNICATIONS SATELLITE POLICY, 1957-61


2. As of 1972 around 86 percent of the 815 U.S. satellites launched since 1958 had been military, and 84 percent of those in service were military. The military proportion of the Soviet total, 630 spacecraft, was not known but was suspected to be higher. (R.
NOTES: CHAPTER THREE, CONTINUED


5. Ibid., Ch. 3. Early and sustained Soviet interest in rockets, on the other hand, was a response to the U.S. lead in manned bombers and A-bombs.


7. Larger outlays were prevented, in part, by President Eisenhower's own disinclination to invest in possibly needless arms. (V. Van Dyke, Pride and Power: The Rationale of the Space Program. Urbana: University of Illinois Press, 1964. p. 11 and passim.)


10. There was some objection to allowing the project access to classified military information. (Goldsen, op. cit., p. 7.)


13. Ibid. and Van Dyke, op. cit., pp. 120-1.

14. Quoted in Aliano, op. cit., p. 59. Sherman Adams, a White House aide, later wrote: "Nobody in Washington had really given much consideration to the possible importance of an invasion of space as psychological propaganda or even as scientific achievement." (Ibid. p. 47.)

15. Quoted in Van Dyke, op. cit., p. 140.


Never before has a nation widely believed to be second-rate in education and technology so drastically demonstrated in a single conspicuous stroke that it had forged a revolutionary and potent new instrument unmatched anywhere on the face of the globe.


22. G. Allen, testimony before House space committee, in N.Y. Times, January 23, 1960. The subcommittee led by Sen. Lyndon Johnson investigating the nation's "preparedness" had similarly concluded:


24. The House space committee's chairman, Rep. Overton Brooks, took up this post after 22 years on the House Armed Services Committee, a fact which suggests the interpenetration of the two realms.


28. The NASC consisted of the secretaries of Defence and State, the administrator of NASA, and the chairman of the Atomic Energy Commission.

29. "Declaration of policy and purpose," National Aeronautics and Space Act, reprinted in Galloway, op. cit., p. 13. Some reluctance on the part of the military to share findings with NASA can be inferred from an "Air Force policy letter to commanders" of February 1, 1961, in which the various benefits the military space programme had received from the civilian were recounted. (see House Mil. Sat. Hearings 1961, pp. 96-7.)


Mr. RANDALL. Now, we hear all this talk about throwing all this money away with NASA for peaceful uses of space. That is just not so. There is a lot of this that is fed right back into the military. Isn't that true?

Mr. GARBARINI. Yes, sir.

(1964 Satellite Hearings Part I, p. 367.)

31. See note 29 supra.

(in Schiller, op. cit. 1965) who, as the State Department's legal advisor, offered the mainstream explanation: "When we talk about peaceful uses of space, we mean the use of outer space for non-aggressive purposes."

33. Sec. 102(b), in Galloway, op. cit., p. 13.

34. See claims cited Aliano, op. cit., p. 54; Van Dyke, op. cit., p. 16; and Shelton, op. cit. 1968, pp. 54-5.

35. See: Ad Hoc Committee on Space, Report to the President-Elect, reprinted in House Mil. Sat. Hearings 1961, p. 19. (hereinafter: Wiessner Report); also Sen. Space Committee Rep't. 1962, p. 76. During 1961 legislative debates, it was not anticipated that sufficiently powerful rockets for geostationary payloads would be available before 1964, which according to Fortune magazine was "another penalty of the decision in the early 1950s to build rockets just powerful enough to carry warheads, while unimaginatively disregarding the needs and potentials of space exploration." (Lessing, op. cit.) Typically, commercial payloads have been launched by combinations of military first-stage and civilian upper-stage rockets—e.g. Thor-Delta, Atlas-Centaur, Titan-Agena. (see Comsat Ann. Repts. 1968, pp. 33-5; 1972, p. 37.)


37. For example, the August 1960 launch of Echo I, a 100-foot diameter metallic balloon and the first passive communications satellite. (J. R. Pierce, The Beginnings of Satellite Communications. San Francisco: San Francisco Press Inc., 1968. p. 21.)

38. Echo I could reflect one millionth of a millionth of a millionth (10^-12) of the 10 kilowatts of energy beamed at it from the ground. (Ibid.) It would have taken a surface the size of two football stadiums to relay a television signal, and passive satellites tend to wrinkle in time and lose reflective properties. (Lessing, op. cit.) Passive satellites did, however, retain their advocates. (see S. H. Reiger, A Study of Passive Communications Satellites, Report prepared for NASA. Santa Monica: RAND Corporation, 1963.)

39. Project West Ford, undertaken by ARPA in 1961 and carried out in May 1963, was the last big passive project, an audacious and controversial scheme to launch millions of tiny metal needles into low orbit to form an artificial troposphere. Radio astronomers feared that they would hear no more from deep space, but little harm—or good—came of it. (see 1964 Satellite Hearings Part 1, pp. 242-56, for discussion.)

NOTES: CHAPTER THREE, CONTINUED


43. Testimony of Elmer Engstrom, senior executive vice president of RCA, in House Space Committee Hearings 1961, p. 69. Geostationary—or synchronous—satellites are stationary relative to a fixed point on the earth's surface, since they are positioned over the equator at an altitude (23,400 miles) where their orbital velocity equals the earth's rotational speed. Random-orbiting satellites are placed at lower altitudes, and travel faster than the earth rotates.

44. As is discussed in Chapter Five, the military believed geostationary spacecraft to be vulnerable to destruction or jamming, required polar coverage which satellites placed over the equator are not especially suited to, and felt that the on-board propulsion equipment synchronous satellites required made them susceptible to being shifted around by adversaries on the ground. When NASA took over synchronous satellite development in autumn 1962, it was given use of the earth stations built by the Army for Project Advent. (Senate Committee on Aeronautical and Space Sciences, Communications Satellite Legislation Hearings, February 27 and 28, March 1, 5, 6, 7, 1962, on S. 2650 (Bill to Amend the National Aeronautics and Space Act of 1958) and S. 2914 (Bill to Provide for the Establishment, Ownership, Operation and Regulation of a Commercial Communications Satellite System, and for Other Purposes.) 87th Congress, 2nd Session. Washington: GPO, 1962. p. 274. Hereinafter: Sen. Space Committee Hearings 1962.)

45. Hughes Aircraft, which built NASA's Syncom series, was selected by Comsat to build Early Bird. The latter was described by a Hughes official as "very similar to the early Syncoms." (Testimony of Dr. Allen Puckett, in 1964 Satellite Hearings Part I, p. 376.)


47. All 1960 presidential campaign quotes from Van Dyke, op. cit., p. 23.

48. Weisner Report, p. 17. (See note 35 supra.)

49. "Prestige," as one academic wrote in 1963, "will be a major—if not the dominating objective motivating nations to participate in, and indeed to try to excel in, space activities." (K. Knorr, "The international implications of outer space activities," in Goldsen (ed.) op. cit., p. 130.) See also: A. L. Horelick, "The Soviet Union and the political uses of outer space," and G. A. Almond, op. cit., both in Goldsen (ed.), op. cit. Frequently cited were Khruschev's remarks to Kennedy during their 1961 meeting in Vienna (in Ibid. p. 43): You cannot drive people to Communism by war. It is necessary for people to realize the need to replace capitalist society...
NOTES: CHAPTER THREE. CONTINUED

by a Communist society... We want to provide an example, and I think our example is not a bad one. Whose rocket was it that first went to the moon? The Communist. Who first photographed the hidden side of the moon? Communists.


52. Adduced by a congressman in July 1961 was this passage from a speech in June by M. V. Keldysh, president of the Soviet Academy of Sciences: "A priority of the highest importance is assigned to artificial earth satellites as a means for the solution of a number of economic problems," among them weather forecasting, solar energy utilisation and radio transmission. (House Committee on Interstate and Foreign Commerce, Communications Satellites Part I, Hearings on Establishment, Ownership, Operation and Regulation of a Commercial Communications Satellite System, July 25-28, 1961. 87th Congress, 1st Session. Washington: GPO, 1961. p. 306. Hereinafter: House Commerce Hearings 1961, Part I.) The Soviets had no "economic problems" with their overseas links, since they had little requirement for them, and it seems certain (in retrospect, that is,) that domestic communications were the real concern.


54. In April 1974 Cosmos no. 637, an experimental synchronous satellite, was successfully launched. In March 1975 plans were announced for a Stationar-T satellite network, which would incorporate geostationary spacecraft in an improved domestic communications system. (See Intermedia, August 1975, p. 6.) The orbital configuration theretofore preferred by the Soviets was sub-synchronous and highly elliptical—i.e. satellites were at high altitudes over the Soviet Union, thereby maximising the time they were useful to terminals there, and at lower altitudes on the other side of the earth.


56. Figure is as of 1963, in D. Smythe, "On thinking about the effects of communications satellites." Paper for the American Institute of Aeronautics and Astronautics. Washington: June 30, 1964.


59. Ibid., p. 144.

60. Goldsen, op. cit., p. 8. Similarly, in the Sen. Space Committee Rept. 1962, p. 25:

The success of the United States in being the first to accom-
plish this objective will encourage other nations to seek technical and other help from the United States rather than turn to the Soviet Union for leadership.

61. It was estimated that a single geostationary satellite over the Atlantic could serve 90 percent of the world's telephones. (Dr. Alien Puckett testimony, in Sen. Space Committee Hearings 1962, p. 225.)


63. Quoted in Schlesinger, op. cit., p. 275.

64. Aliano, op. cit., p. 247.

65. Ibid., p. 248. Schlesinger, Kennedy's in-house historian, wrote that "the Khruschev speech, though sufficiently tough, confined its belligerence in the main to the underdeveloped world; and here, as Kennedy understood, the Russians were confronted by opportunities they could not easily resist." (op. cit., p. 276.) That interpretation was not, however, the only possible reading, as E. Crankshaw has pointed out by suggesting that the speech was probably directed more to China than to the U.S.—a response to China's increasingly strident enthusiasm for Third World liberation movements, and a claim for Soviet political and ideological (though not necessarily military) leadership. (See: E. Crankshaw, Khruschev: A Career. N.Y.: Avon Books, 1966. p. 284.)


68. Ibid., p. 144.


70. Weisner is said to have been among the first to urge, in 1949-50, a revision of U.S. thinking to encompass 'limited' wars. (Schlesinger, op. cit., p. 279.)


73. As of December 1960, uncoordinated communications satellite projects were being conducted by the Army, Navy, Air Force and NASA. The Air Force subsequently was given exclusive responsibility for Pentagon space R&D, a decision unpopular with the other services and the Joint Chiefs of Staff. (See House Mil. Sat. Hearings, 1961, p. 2.)
NOTES, CHAPTER THREE CONTINUED


75. Tropospheric scatter—or 'tropo'—relies upon the low-lying troposphere to disperse signals over wide areas, which has the advantage of avoiding the ionosphere used by high-frequency radio but subject to static, fading and interference. The wastage of radiated power is enormous: perhaps one-trillionth of transmitted strength is detected. The technique is useful, however, in communicating among widely-dispersed terminals, although its carrying capacity is much inferior to line-of-sight microwave. (From research provided by Joseph A. Connor, based upon interviews with U.S. military personnel stationed in Mediterranean installations, autumn 1974.)


77. Ibid.

78. Testimony of Dean Rusk, secretary of state, in Senate Foreign Relations Hearings, p. 190.


81. See note 75 supra. This system was replaced in 1966 by a more sophisticated network of tropo and microwave, capable too of linking up with satellites to assure diplomatic and military communications in Europe and the Mediterranean.


83. In Telecomm. Repts., October 12, 1964. According to testimony given in March 1964: "There was a serious problem in the adequacy of State Department communications to carry the load in a kind of crisis like that." (A. Chayes testimony, 1964 Satellite Hearings Part I, p. 352.)

84. "The objective of the NCS is to provide necessary communications for the Federal Government under all conditions ranging from normal
NOTES: CHAPTER THREE, CONTINUED

situations to national emergencies and international crises, including nuclear attack." (Testimony of F. W. Morris, former associate DTM, Satellite Broadcasting Hearings 1962, p. 190.) See Schiller, op. cit. 1969, p. 49, for view that NCS "consolidated and deepened the already deep penetration of military influence in the communications system of the United States."

87. See below, chapters seven and eleven.
95. Testimony of H. W. Paige, general manager, GE's missile and space vehicle department, in Ibid., p. 171.
96. See note 91 supra.
97. Industry representatives favoured this idea, since it was altogether to their advantage. See: Testimony of Henri Busignies, vice president and general technical director, ITT, in Sen. Space Committee Hearings 1962, p. 291; Testimony of Elmer Engstrom, senior executive vice president, RCA, in House Space Committee Hearings 1961, p. 6.
98. In effect, this was done with the Intelsat II satellite series, requested by and developed for NASA.
100. See note 91 supra.
101. Senate Foreign Relations Hearings, p. 292. For confirmation that the formulaic 'unique and vital needs' referred to military requirements, see: Satellite Communications—1964 Part II. Hearings before the military operations subcommittee of the House Committee on Government
NOTES: CHAPTER THREE, CONTINUED


103. Ibid., p. 10.


108. Ibid., p. 9.

110. Sen. John Pastore, in Sen. Comms. Subcommittee Hearings 1961, p. 3. The problem for the U.S. was that while it needed space frequencies, it could not afford to lose the great number of frequency assignment it currently held in the high-frequency bands—and as American officials had learned at a September 1961 meeting in Geneva of an ITU Panel of Experts, representatives of developing countries believed the immediate value of satellites would be to release the HF assignments for their use. Military communications "would be crippled" if the HF bands were lost; hence the U.S. had to show "that we recognize their communication needs and are directing the development of satellite communications toward bringing them satellite service which will be as inexpensive as and much superior to HF radio service, and within ________ not too many years." Letter from S. G. Lutz, chief scientist, Hughes Aircraft, to Sen. Kefauver, April 2, 1962. Reprinted in Sen. Antitrust Hearings 1962, Part II, pp. 437-8.
NOTES: CHAPTER THREE, CONTINUED


112. AT&T had at the time operating agreements with more than 160 countries, RCA with 69 and ITT with 40. (Lessing, *op. cit.*)


120. NASA was "to direct its activities in this field toward the advancement of space technology and its application to civil communications." (*Ibid.*)

121. "Special problems which may arise in connection with the regulation of a commercially operable system are being explored by both agencies, and may result in legislative recommendations at a later date." (*Ibid.*)


123. Quoted in *Sen. Space Committee Rept. 1962*, p. 44. Webb had previously testified:

   Our purpose here is to pass on to private industry not only the responsibility and the operational framework within which they can work, but also every opportunity to invest their own money and resources and handle it as a private operation.


127. As Abram Chayes put it in an interview, "We got clobbered." (March 8, 1976, Cambridge, Massachusetts.)


129. Kildow (*op. cit.*, p. 11) incorrectly states that State Department officials continued their opposition through August 1962 and, "in hearings before the Senate Committee on Foreign Relations, expressed strong opposition to the decision to make Comsat a private profit corporation." As the State Department's representative at those hearings, Secretary Rusk in fact reassured legislators that the new corporation would be "an effective instrument for U.S. partici-
NOTES, CHAPTER THREE, CONTINUED

...pation in a global communications satellite system." (Sen. Foreign Relations Hearings, p. 172.) On the strength of his more creditable research, J. Galloway (op. cit., pp. 47-9) writes that as of autumn 1961—when legislative drafting sessions were being held—Undersecretary of State George Ball put forth the Department's position as favouring widely-based, but nonetheless private ownership.

130. According to John A. Johnson, then legal counsel for NASA, the government ownership option had "no support...anywhere inside the Executive Branch of government...The Democratic Administration itself, in the persons of John Kennedy and Lyndon Johnson, had absolutely no interest whatsoever in the government's getting into the telecommunications business." (Interview, March 24, 1976, Washington.)


132. A June 1962 survey of 6,000 business executives found 52 percent opining that the White House was "strongly anti-business," 36 percent "moderately anti-business," and nine percent either "neutral" or "pro-business." For this, and other Kennedy administration irritants to the 'business community', see Ibid.

133. Ibid., pp. 565-6.

134. Sen. Space Committee Rept. 1962, p. 75.

135. Lessing, op. cit.

CHAPTER FOUR: THE DEVELOPMENT OF U.S. INDUSTRIAL POLICY ON SATELLITE COMMUNICATIONS, 1959-61


5. "Le Telephone," Le Monde Dossiers et Documents No. 26, December 1975. Annual U.S. international telecommunications revenues have been some five percent of domestic earnings. (Rostow Report, Ch. II, p. 6.)


8. See note 3 supra., loc. cit.

9. Ibid.

10. Ibid.

11. Testimony of James Dingman, vice president and chief engineer, AT&T, House Space Committee Hearings 1961, p. 306. It was subsequently found that peak demand during 1963 in the North Atlantic exceeded capacity. (See: Prospectus, Communications Satellite Corporation
NOTES: CHAPTER FOUR, CONTINUED


12. "PCC-NASA memo of understanding," p. 199. (See Chapter Three, note 119 supra, for full reference.)


23. Jaffe, op. cit., p. 152. According to Jaffe, a top NASA official, the best available earth station components as of the late 1950s would have been inadequate by a factor of 10 for commercial satellite communications.


27. "A lot of famous words have been eaten on that," observed Louis Pollack, vice president/technical of Comsat Laboratories (Interview, March 31, 1976, Clarksburg, Md.)

28. Secretary of the Air Force H. Talbott visited H. Hughes, and the company's founder thereafter "donated" Hughes Aircraft to a new Howard Hughes Medical Institute, "a tax-exempt foundation whose activities are a well-kept secret and which is viewed by many observers as a patent tax dodge." At least Mr. Hughes was no longer in charge of his aircraft company. (The Washington Post, April 11, 1976.) Hughes Aircraft became little more than a privately-owned government R&D and manufacturing resource: by 1972 it was unofficially the nation's eleventh biggest defence contractor, and 90 percent of its total production was under military contracts. (Business Week, February 12, 1972.)
30. Ibid.
33. See note 31, supra., p. 228.
35. Gravity gradient stabilisation is discussed in Ibid., pp. 164-9. As of 1964 it had been proved useful only with spacecraft at altitudes up to 600 miles. (Ibid., pp. 170-1). Spin stabilisation was developed at Hughes "through the pertinacity of three young scientists who conducted much of their technical discussion in the lavatory, the one place where they were safe from their superiors." (The Economist, March 27, 1965.)
37. It was later alleged that AT&T had sympathisers within DOD working to encourage scrapping Advent. Brockway McMillan, who became Air Force assistant secretary for R&D after having worked for Bell Laboratories since 1946, was said to have been active in satellite decisions after joining the government in 1961 and opposed to synchronous satellite development. AT&T, said Sen. Estes Kefauver—who later led the fight against the Comsat Act—was "honeycombing the government." (see Gouldner, op. cit., p. 131.)
38. Ibid., p. 109.
40. For Goulden (op. cit., p. 112), Bell's Telstar effort was "to make (its) space domination a fait accompli by the time the question of ownership came up for discussion."
42. Ibid., p. 331.
44. ...When AT&T says it is going to spend money, what it is saying, in effect, is that 'we will collect from our users to cover this cost', and it is not taking money out of an accumulated capital stock such as a more limited private company would when it increases its costs. Testimony of Lee Loevinger, assistant attorney general and head of Justice Department antitrust division, Ibid., p. 141.
45. B. G. Segal, op. cit., p. 681.
"General agreement on the ultimate desirability of a synchronous satellite system" noted also in Sen. Space Committee Rept. 1962, p. 3.


50. In studies conducted by the Stanford Research Institute, delays of up to one second were found not to interfere with normal conversation, and two-second delays were detected by only a small percentage of speakers. (General Telephone & Electronics Corp., "Comments in the matter of an inquiry into the allocation of frequency bands for space communications." FCC Docket No. 13522, March 21, 1961. Reprinted in House Space Committee Hearings 1961, p. 86.)

51. Ibid., p. 80.


57. Edward Welsh, executive secretary of the NASC: "We believe we can get the...lower orbiting system more quickly than we can get the Advent system." (in House Space Committee Hearings 1961, p. 766.)


62. In 1960 the Collins Radio Co. was authorised by the FCC to bounce signals off Echo I, and Westinghouse was assigned frequencies to conduct experiments with earth station components. In January 1961 ITT received an experimental licence to bounce signals off the moon and man-made objects in space. (See: Craven testimony, in House Space Committee Hearings 1961, p. 536.)

63. Ibid.


65. A similar point was raised by John A. Johnson (Interview, March 24, 1976, Washington) in regard to the FCC's later insistence that it was empowered to act administratively—without legislation—to organise the carriers for satellite activity:
That would necessarily be the FCC's approach. After all the FCC is not in the direct executive branch, is not in a position usually to be a forceful spokesman or exponent of new legislation. So their feeling was that this thing could somehow be managed under the regulatory umbrella.


67. Listed in Ibid., p. 538.

68. See: GT&E, "Comments in the matter of an inquiry into the administrative and regulatory problems relating to the authorisation of commercially operable space communications systems," FCC Docket No. 14024, May 1, 1961; AT&T, "Comments...", FCC Docket No. 14024, May 1 and May 15, 1961; RCA, "Comments...", FCC Docket No. 14024, May 1, 1961; all reprinted in House Space Committee Hearings 1961, passim. RCA, interestingly, conceded that government ownership and private operation might be an acceptable arrangement (Ibid. pp. 50-2), and the company's vice president even described such a set-up as compatible with "a genuinely free and competitive system" which, in the context of the Comsat Act debates, was high praise indeed. (Ibid., p. 67.)


70. H. W. Paige, GE, in Ibid., p. 142.

71. General Electric, "Comments...", FCC Docket 14024 (undated), in Ibid., p. 156.

72. See note 70 supra., p. 141.

73. Official of GE's ComSat Inc., quoted in Lessing, op. cit.

74. Goulden, op. cit., p. 113.

75. By July, however, Lockheed had modified its position to support ownership strictly by actual operators. (See: Testimony of L. Eugene Root, group vice president, missiles and electronics, Lockheed Aircraft, in House Space Committee Hearings 1961, p. 430.)

76. See: GT&E, "Comments...", FCC Docket 14024, in Ibid., p. 102; also T. F. Brophy testimony, Ibid., p. 109.

77. M. R. Irwin, The Telecommunications Industry: Integration vs. Competition. N.Y.: Praeger, 1971. p. 26. Most of these firms are very small, and although they might wish to buy satellite stock for portfolio purposes, could hardly aspire to voting control. As of 1968, for instance, of 78 phone companies engaged in interstate traffic, a total of $16,800m in revenues was reported—$16,000m to Bell System companies. (Maddox, op. cit., p. 232.) Still, a company like GT&E—with around 60 percent of the non-Bell market—was interested in influence and very likely wished to supply earth stations for the system.

78. AT&T, "Comments...", FCC Docket 14024, May 15, 1961. (See note 68 supra.) Goulden writes that more than 10,000 firms, many quite small, had supplied important aerospace equipment. Echo I, for instance, was built by a diminutive Minnesota company founded in 1955 with $100,000 in capital. (op. cit., p. 119.)

NOTES: CHAPTER FOUR, CONTINUED


81. The international carrier industry consisted of several other firms in addition to the Big Four. Only Hawaiian Telephone, a GT&E subsidiary whose 'international' traffic was mainly to and from the mainland U.S., took part in subsequent discussions. Others were Press Wireless Inc., the newspaper-owned press service, the United States-Liberia Radio Co.—essentially an internal operation of Firestone Tire & Rubber, with less than $16,000 worth of equipment—and the South Puerto Rico Sugar Co. As to the last, when its legal counsel in Washington was asked if the company wished to testify before a Senate committee, he replied: "My client is in the sugar business." (Gouldner, Op. Cit., p. 116.)


84. An FCA official testified in May: "Some of us in industry are a little uncertain how much we should discuss these problems among industry groups because of the antitrust situation." Industry representatives had also complained of the need for a joint government-industry study group. (In House Space Committee Hearings 1961, pp. 61, 64.)

85. Quoted in Sen. Space Committee Rept. 1962, p. 47.


88. Ibid., p. 572.


90. Ibid., p. 154.

91. Ibid., p. 150.

92. Ibid., p. 155.


95. Ibid., p. 293.

96. Ibid., p. 321.

97. Ibid., p. 313-14.

98. Ibid., pp. 293-5.


100. Ibid., p. 555.

101. "We feel at this point...that our present statutory responsibility is sufficient," said FCC Chairman Minow in late July. (House Commerce Hearings 1961, Part I, p. 86.) See also note 65, supra.

NOTES: CHAPTER FOUR, CONTINUED


104. Ibid., p. 161.


106. Ibid.


109. Webb reassured legislators in August: "We are proceeding now with all the things necessary to put good tools into the hands of whatever entity is chosen by the FCC and brought into being by the industry itself under FCC regulation." (House Space Committee Hearings 1961, p. 484.) What is remarkable about the passage is its blithe endorsement of the FCC's position on satellite ownership.


114. Ibid., p. 28.


116. FCC Commissioner Craven described Webb's prediction as "just dreaming." (In Ibid., p. 554.)


118. Even in February 1962, with two bills pending in Congress, RCA's president indicated the company could not yet say whether it would invest in the satellite system. (Sen. Space Committee Hearings 1962, p. 118.)

119. Assistant Attorney General Katzenbach warned that if a 15 percent maximum were placed on individual holdings, shares might not be fully subscribed. (Sen. Antitrust Hearings 1962, Part I, p. 65.)

120. Conversely, GT&E had argued that if the carriers supplied enough capital, there would be no reason to include other investors. (House Space Committee Hearings 1961, p. 102.)


122. Ibid., November 13, 1961. Previously, Long observed: "There may be a way of giving it directly to AT&T, but short of that, it seems to me you could not have made a better recommendation to achieve the same result." (Senate Monopoly Hearings 1961, p. 633.)


124. Ibid.
NOTES: CHAPTER FOUR, CONTINUED


126. According to J. Galloway (op. cit., pp. 47-9), Welsh and Katzenbach both initially supported government ownership, the latter because the Justice Department believed that no safeguards could prevent a privately-owned system from being controlled by AT&T. The State Department, where some factions had favoured state ownership, presented a unified view supporting widely-based private ownership. None of the government-ownership positions survived the group's early sessions.

127. For comments on Robert Kerr, see: Gouldner, op. cit., p. 124; H. Schwartz, "Governmentally appointed directors in a private corporation—the Communications Satellite Act of 1962," Harvard Law Review Vol. LXIX No. 2, December 1965. p. 352; Kinsley, op. cit., p. 4; Van Dyke, op. cit., p. 24. John A. Johnson (Interview, March 24, 1976, Washington) observed that Kerr got jurisdiction of the subject matter by introducing the bill for the first time and having it referred to his committee. From then on he was in control of the legislative process. He was a very controlling type of individual anyway, and of course he and Lyndon Johnson understood each other perfectly well...While these things were often referred to President Kennedy, in my opinion it was pretty largely the Senate Kerr—Lyndon Johnson axis that was running the show.


129. Ibid.


CHAPTER FIVE: PASSAGE OF THE 1962 COMMUNICATIONS SATELLITE ACT

1. Telecomm. Repts., July 23, 1962; also J. Galloway, op. cit., p. 71; J. K. Galbraith, then U.S. ambassador to India, recorded in his journal that autumn: "The Kennedy Administration at this distance seems to have lost momentum. The record in Congress is very bad—the most remarkable success was with the satellite telecommunications bill where the opposition came from the liberals. (Ambassador's Journal: A Personal Account of the Kennedy Years. London: Hamish Hamilton, 1969. p. 404.)


6. Quoted in Sen. Space Committee Rept. 1962, p. 58. The issue is likely to re-emerge over the reusable space shuttle, since Fortune
magazine has already reported that "Boeing, for one, thinks that it could run the Shuttle profitably as a commercial enterprise." (S. Bylinsky, "Industry's new frontier in space," Fortune, January 29, 1979.)


16. AT&T Vice President Dingman, in Ibid., March 19, 1962.

17. The White House version was written mainly by Katzenbach, Welsh and NASA counsel John Johnson, along with various FCC representatives. (Katzenbach testimony, in Sen. Space Committee Hearings 1962, p. 404.) Kerr's bill was also, according to J. Johnson (interview, March 24, 1976, Washington), "the result of work and conclusions that a number of us had arrived at in the Executive Branch." It was drafted by NASA officials.


22. Ibid., p. 208.

23. See testimony of J. Dingman and H. Busignies, Ibid., passim.

24. Ibid., p. 293, where Busignies says: "There is nothing about the program to attract the larger or institutional investor."

25. ITT, whose representative offered the company's help in saving small investors from such heartbreak, had had its properties in Cuba nationalised by Castro—who offered $400,000 in compensation on what ITT valued at $10m—and was under a similar threat in Brazil. Ibid., pp. 300-1.


29. The satellite corporation might therefore be able to continue operating even if its revenues did not cover its costs. (See: H. Averch and L. L. Johnson, "Behavior of the firm under regulatory constraint," American Economic Review Vol. LII No. 5, December 1962. p. 1068.)

30. Kennedy had at first wanted a $1,000 share price, since "there may be quite a long period of time before there is any return on this investment," and smaller investors should therefore be discouraged. He later told Welsh to invite the Kerr Committee to cut the price. (Telecomm. Repts., March 25, 1962.) Even at $100, it was higher than all but 63 of the 1,000 issues on the N.Y. Stock Exchange as of March 28, 1962. (Sen. Antitrust Hearings 1962, Part I, p. 85.)

31. Argument advanced by Minow in Sen. Antitrust Hearings 1962, Part II, p. 294; also by President Kennedy in "Letter of transmittal," note 9 supra. Kinsley has described the proposition as the "thin end of the wedge" for the carriers, which was discarded when it had outlived its usefulness (op. cit., p. 6.) This seems correct, but does not explain why—since it unquestionably remained to the carriers' advantage—they apparently tolerated losing the rate base provision.


34. Minow, Webb and Welsh all agreed that the favour implied for carrier earth station ownership should be deleted from the bill. Over objections from AT&T, ITT and Hawaiian Telephone (GT&E), the Justice Department's opinion that eliminating the provision was "indispensable" to Administration approval was sustained. Said Katzenbach: There is a real danger that ground stations, if separately owned by the carriers, may because of their high cost represent an obstacle to technical growth so as prematurely to freeze the type of system.


40. Senate Committee on Foreign Relations, "Negotiations with foreign
NOTES: CHAPTER FIVE, CONTINUED

43. Kefauver had an excellent reputation among liberal elements of the Democratic Party owing to his investigations of organised crime and his chairmanship of the Senate Judiciary Committee's antitrust sub­committee. In 1956 he defeated John Kennedy for the vice presidential nomination, and went on to lose the election alongside Adlai Stevenson. Among Kefauver's allies were Russell Long, son of the controversial populist governor of Alabama, Huey Long (who had been assassinated in office), Albert Gore, Ralph Yarborough, Haurine Neuberger (the Senate's only woman), Wayne Morse and Ernest Gruening. Morse and Gruening later won notoriety by becoming the only two senators to vote against the 1964 Gulf of Tonkin resolution, the congressional carte blanche for U.S. military escalation in Vietnam.
44. Kerr permitted little antitrust-related testimony during the Senate space committee's hearings; the chairman of the House commerce committee announced that the group would consider no bills to authorize government ownership; even fellow liberals like Rep. Emmanuel Celler told Kefauver: "You and I are on a team, and the President calls the signals." (Telecomm. Repts., April 9, 1962.) The Republicans were even less sympathetic, and the Senate minority leader—Everett Dirksen—opposed allowing Kefauver's subcommittee to hold any hearings at all. (See: Letters from Dirksen to Kefauver, reprinted, in Sen. Antitrust Hearings 1962, Part I, pp. 13–20.) The trade press complained that Kefauver's subcommittee had the biggest staff in the Congress, and no legislative jurisdiction over satellites. (Telecomm. Repts., April 16, 1962.)
49. Kefauver testimony, note 46 supra, p. 73. Sen. Long spoke of $25 billion spent by the government on space, "but the first time it is possible to show a profit, our Government is determined to sell it for nothing to a monopoly." (Quoted in D. Smythe, op. cit., September 1968.) The view that ownership arrangements need not be settled was shared by Leon Lipson, Yale law professor and RAND Corporation analyst: "It is not urgent, or even advisable, that the organization of our satellite communications program be decided upon now." ("Organizing for telecommunications by satellite," Paper, November 14, 1961, reprinted in Sen. Antitrust Hearings 1962, Part II, p. 479.
50. Kefauver testimony, note 46 supra., p. 349.
52. See: Ibid., pp. 157–8. Sen. Gore observed:
There were two bills introduced in Congress, the Kennedy bill and the Kerr bill, both authored by distinguished friends of
NOTES: CHAPTER FIVE, CONTINUED

mine, and I must say, as I look at the progeny, it looks a little more like my friend Senator Kerr than it does like President Kennedy.
(Quoted in Kinsley, op. cit., p. 5.)

55. Sen. Morse, in Ibid., p. 83.
61. Either the Federal Trade Commission or the Justice Department were said to be better qualified to regulate procurement. (Loevinger, in Sen. Antitrust Hearings, 1962, Part I, p. 162.)
64. Senate Monopoly Hearings 1961, p. 94. AT&T vice president Dingman testified that cables would never be made obsolete "before their time," and since foreign PTTs—with their own cable interests—would likely be participating in the satellite system, "this non-existent problem of obsolescence would therefore not be overcome by excluding the United States carriers from participation in the satellite system." (Telecomm. Repts., April 16, 1962.)
67. They objected to "the very limited role in space communications which this legislation carves out for the corporation to play"—since other systems might well be created, and earth station ownership was left open. The public was being asked to invest in "a pig-in-the-poke." (Telecomm. Repts., April 30, 1962.)
68. Ibid., April 9, 1962.
69. Ibid., April 16, 1962.
70. Ibid. Welsh warned that "prolonged uncertainty as to the rules of the game and the opportunities for investment" could delay progress.
NOTES: CHAPTER FIVE, Continued

Sen. Comms. Subcommittee Hearings 1963.) Telstar was enormously popular but not conspicuously successful. (See Jaffe, op. cit., pp. 107, 112.)


74. As Schattschneider has written: "It is the weak who want to socialize conflict, that is, to involve more and more people in the conflict until the balance of forces is changed." (The Semi-Sovereign People, N.Y.: Holt, Rinehart & Winston, 1960. p. 40.) The opposition believed that legislators accepted, rather than supported the bill; Sen. Gore challenged an advocate of it to debate him on television, but the TV network was unable to find anyone willing to do so. (Gouldner, op. cit., p. 137.)

75. Sen. Foreign Relations Hearings, p. 35.

76. Ibid., p. 61.

77. Ibid., p. 172.

78. Ibid., p. 173-4.

79. Ibid., p. 292.

80. Filibuster had become a favoured tactic of Southern legislators trying to block civil rights measures. The Comsat Act cloture was later credited with enabling the 1964 civil rights act to be passed, since liberals no longer felt duty-bound to honour the principle of unlimited debate. (Kinsley, op. cit., p. 13)


82. H. Schwartz, op. cit., p. 350. The author writes that inserting government appointees onto private boards was a popular practice among states and municipalities that were seeking to promote canal and railway construction during the 19th Century. Nationally, precedents include the Second Bank of the United States—created by Alexander Hamilton in 1816—, the Union Pacific Railroad in 1862 and 1864, and the Federal Reserve Board in 1913. (Also, RCA.

Schwartz further notes that the carriers resisted proposals to permit the President to appoint a single non-voting, personal representative to attend meetings on his behalf—preferring the three-member approach. "The reason for this choice is simple: the three government-appointed directors will provide much less protection for the public interest" than would a single, perhaps expert appointee. (Ibid., p. 355.) See also V. C. Rosenblum, "Regulation in orbit: administrative aspects of the Communications Satellite Act of 1962," Northwestern University Law Review, Vol. LVIII No. 2, May-June 1963.

83. Robert Kennedy wrote the President in a letter dated October 25, 1962: "The act makes no distinction, except in method of selection, between the directors appointed by the President and the elected directors. Therefore...it seems plain that the former will also hold private office." (Reprinted in Senate Commerce Committee, Hearing, Communications Satellite Incorporators, March 11, 1963. 88th Congress 1st
NOTES: CHAPTER FIVE, CONTINUED


84. Rosenblum, op. cit., p. 221.

85. Kildow has attempted to argue that although a "commercial philosophy" was implicit in the Act, "it was not explicit...that this philosophy had to be carried over to the international structure for the telecommunications system...Comsat officials were able to choose the path that was most obvious and familiar to them..." (op. cit., pp. 8-9.) In our view Comsat had no such element of choice, and was obliged to its shareholders to negotiate the most favourable terms it could internationally—even if it had not been wholly supported in doing so by the U.S. government, as it was (see Chapter Seven below.)

86. For Kinsley, however, the particular potential for abuse contained in Comsat's semi-consortium ownership was of great importance. The Act itself was anti-competitive, and "without competition the incentive for innovation disappears." (op. cit., pp. 244 and 234.)

87. H. Valladao, "South American contributions to the solution of the juridical problems of telecommunications and direct satellite broadcasting," in E. McWhinney (ed.), op. cit., p. 147. Similarly, an American diplomat wrote in 1922:

At bottom...there is a clearly marked difference between a conception of international communications services conducted for profit and of such services conducted on a public service basis. A postal service handling letters generally throughout the world for two or five cents each is conceived on a radically different basis than one which fixes its charges by distance and by what the traffic will bear and avoids unprofitable activities.

(Walter S. Rogers, op. cit., p. 145.)

88. See Chapter One, note 41, supra., p. 8.

89. Levin, op. cit., p. 357.


91. Communications Satellite Act, Sec. 201(a)(3).

92. Ibid., Sec. 214.

93. Telecomm. Rents., December 2, 1963. In August 1961 an FCC official reassured the Senate communications subcommittee that a section of the 1934 Communications Act empowered the President to take over all communications in an emergency. Sen. Strom Thurmond then asked:

"Aren't we in an emergency practically all the time now with the Communists, knowing their aims and goals to dominate the world...?"

The Commissioner replied: "Yes, sir; we are in an emergency now, declared in 1950 or 1951, which is still in existence, and there are certain activities taking place under that Executive Order." (Sen. Comm. Subcommittee Hearings 1961, p. 91.) Also in August 1961, the White House Director of Telecommunications Management agreed with the chairman of the House space committee that the U.S. should have the right "to use the system in time of need for our defense and our U.S. security." (House Space Committee Hearings 1961, p. 623.)
NOTES: CHAPTER FIVE, CONTINUED

97. J. Dingman, AT&T, testimony in Ibid., p. 306.
98. Sen. Antitrust Hearings 1962, Part II, pp. 388-9. Sarnoff's views, as a technologist of sorts and a Grand Old Man of U.S. broadcasting, were not necessarily in line with the interests of RCA's carrier subsidiary.

CHAPTER SIX: BACKGROUND TO THE CREATION OF THE INTERIM INTELSAT

2. F. Bataillier, "Les accords relatifs à l'exploitation commerciale des satellites de télécommunications," Annuaire Français de Droit International 1965, pp. 149, 153:
   ...(A)ucune organisation internationale n'est intervenue pour aménager cette préemption de l'exploitation de l'espace...Résurgence des 'traités inégaux', ces accords consacrent en effet, d'une part un coopération internationale dominée par une société privée nationale, d'autre part l'exploitation commerciale d'un service d'intérêt public.
3. Phrase is from G. L. Weil, op. cit., p. 29.
4. "Progress report: interim arrangements for a global commercial communications satellite system." Submitted to the UN Secretary General in accordance with Article 102 of the UN Charter, October 27, 1964, by the United States in association with signatories to the Interim Agreements. Re-issued by the Committee on Peaceful Uses of Outer Space, A/AC.105/22. (Hereinafter: 1964 Report to UN.)
NOTES: CHAPTER SIX, CONTINUED


7. Sec. 305(a), emphasis added. Elsewhere, though, the Act implies that the global system will be an entity other than Comsat: "United States participation in the global system shall be in the form of a private corporation..." Sec. 102(c).


14. While it was generally conceded that foreign earth stations would be owned by the respective countries (see, e.g., Sen. Space Committee Hearings 1962, p. 67; House Space Committee Hearings 1961, p. 16.), the possibility of centralised earth station ownership was also raised: it was noted, as a possible model, that ITT subsidiaries in Argentina, Brasil, Bolivia, Chile, Puerto Rico and (pre-Castro) Cuba played the same authoritative role in the countries' overseas communications as did the European PTTs for their countries. (See: Sen. Space Committee Rept. 1962, p. 106.)


17. Bernard Strassburg, Interview, March 27, 1976, Washington, D.C.


20. Farley, in Sen. Antitrust Hearings 1962, Part I, pp. 94-5. Chayes has said that although the State Department's view was "more internationalized" than the cable model, it was otherwise poorly articulated in the pre-Act period. (See note 15 supra.)

21. It has also been noted that bilateral agreements might violate the 'most favoured nation' clauses of existing U.S. treaties, since some countries might be 'favoured' with earth stations while others—in the interest of the system's efficiency—might not. (See: S. D. Estep, "Some international aspects of communications satellite systems," Northwestern University Law Review Vol. LVIII No. 2, May-June 1963, p. 262.)


23. Colino, op. cit. 1967, p. 34.

24. Ibid.

NOTES: CHAPTER SIX, CONTINUED


27. Sen. Space Committee Rept. 1962, p. 103.


31. Ibid., p. 98.


41. 1966 Parliamentary Rept. on ELDO, p. 148.


CHAPTER SEVEN: INTERNATIONAL SATELLITE NEGOTIATIONS THROUGH 1963


2. Summary Record of meetings, quoted in Kildow, op. cit., p. 59.

3. As Trooboff (op. cit., pp. 57-9) has observed, the single system might be taken to mean a.) unitary ownership of all international and domestic systems, b.) unitary ownership only in the case of a non-synchronous system, when only one space segment might be economical, c.) a single system strictly for international uses, and d.) simply assuring technical compatibility or connectibility for separately-owned systems.

4. See note 1, supra.


6. President Kennedy, "Report to the Congress...", p. 60.


10. Ibid., pp. 17-19.


16. State Department report, in Ibid. The Department's line can further be inferred from a 1971 commentary on the value of the U.S. space programme:

We wish to use our space capability to encourage others to identify their interests with ours, and to demonstrate that in this area of advanced science and technology we are attentive to the needs and interests of others.


18. As note 11 supra., p. 5.

19. The conference opened with an exchange of greetings, carried by Telstar-relayed TV, between the UN and ITU secretaries general. Delegates were invited throughout to talk via Syncom to the UN delegates' lounge in New York and to NASA headquarters in Washington. At the end of the

20. Ibid.
24. The chairman of the House commerce committee reported:
   "I believe we may be justified in speculating that the Soviets' willingness to work for a compromise at the Conference is due to their intention to offer keen competition to the United States and the free world in the communications satellite field." (in U.S. EARC Rept.)
25. Ibid.
27. Quoted in U.S. EARC Rept.
29. Ibid., p. 179.
33. This was the American view at least. According to Chayes (note 30 supra):
   "The British problem settled itself out because Britain was trying to be a good European...This was at the time of the EEC veto and the British were trying to prove that they were good guys. Again, the Foreign Office overrode the operating people and brought the British into the 'united front'."
37. Ibid.
39. Rydbeck and Ploman, op. cit., p. 27.
NOTES: CHAPTER SEVEN, CONTINUED

41. Batailler, op. cit., p. 156.
42. Ibid., p. 161.
44. E. Ploman, Interview, October 31, 1975, London.
45. Ibid.
47. N.Y. Times, November 21, 1963.
49. Ibid.
50. Ibid.
53. Broadcasting Magazine, January 13, 1964. The precise threat to which Rep. Oren Harris was referring is not clear.
56. Setting a five-year useful life would keep the geostationary option open, while encouraging Hughes to upgrade its specifications. See: The Economist, March 27, 1965; Broadcasting, December 30, 1963.
64. Although the relationship between U.S. success at the EARC and the subsequent hardening of the American negotiating position is speculative, the need for international assent to U.S. frequency requests had been cited since 1961 as one of the practical reasons why we believe it is important to take what the President has called the global approach to the design of the system, since if we are to get wide acceptance of its usefulness and, in turn, of support for proposals to
allocate adequate channels, we must be able to persuade other countries that they have an interest in doing this.

(Philip Farley testimony, House Commerce Hearings 1961, Part I, p. 186.)

66. Ibid.
69. Ibid., p. 60, also pp. 57-8.
79. Ibid., p. 9.
80. See, e.g.: Fred Alexander, director of telecommunications, Office of Civil and Defense Mobilization, in House Space Committee Hearings 1961, p. 624; also testimony of representatives of RCA (p. 65),ITT (p. 179) and AT&T (p. 393), Ibid.
84. 1964 NASA Hearings, pp. 452-5. DCA Director Starbird later said: We want a satellite that cannot be tampered with. A true synchronous satellite at synchronous orbit and stationary would have to have control mechanisms in it to do this. And we don't want that control mechanism.

87. Dr. Eugene Fubini, assistant secretary of defence, Ibid., p. 21.
88. W. Pritchard, Ibid., p. 192.
NOTES: CHAPTER SEVEN, CONTINUED

89. Dr. Pubini, Ibid., p. 21.
90. A. Chayes, Ibid., p. 265.
91. Ibid., p. 347. (Second appearance, April 15.)
93. W. Gilbert Carter, State Department, Ibid., p. 671.
94. Charyk, Ibid., p. 748.
95. See Carter, Ibid., p. 671 and passim.

The Pentagon initially estimated that it had lost from 10-12 months by pursuing the negotiations, a figure later raised to 12-18 months. (1964 Satellite Hearings Part I, pp. 20, 33-4.) The House military operations subcommittee released its post mortem in October, in which the DOD's "timidity and uncertainty" were noted; discussions with Comsat were "ill-advised, poorly timed and badly coordinated... (DOD) made a serious mistake to invest so much time and endeavor to negotiate an agreement." (Telecomm. Repts., October 12, 1964.)

Just after the subcommittee completed its hearings in August, President Johnson ordered the Air Force to "proceed immediately" with its own interim system, and the Pentagon returned to its Philco-STL contract for a random-orbiting system. (Telecomm. Repts., February 1, 1965 and February 7, 1966.)


CHAPTER EIGHT: THE 1964 INTERNATIONAL NEGOTIATIONS CONCLUDED AND ANALYSED

1. N.Y. Times, January 26, 1964; B. G. Segal, op. cit., p. 695.
NOTES: CHAPTER EIGHT, CONTINUED


8. W. G. Carter, 1964 Satellite Hearings Part II, p. 684: Part of our job here...has been to persuade the key future partners...that the time has come for a commercial system of communications satellites...I am thinking obviously in terms of cables versus satellites.

9. In a June speech in Philadelphia, a British GPO official observed that Commonwealth cables then linked Britain directly to Canada and Australia and would soon extend to Hong Kong (telephone cables, i.e.) "Whether we should go beyond that I don't know. We've now covered the remunerative areas, and more cables may not be practical. Comsat may well be a better way of doing the job." (Telecomm. Repts., June 8, 1964.)


13. The U.S. position was that voting weights were normal when special contributions to a collective competence were required; weighted votes were used in the International Monetary Fund, International Bank for Reconstruction and Development, UN Conference on Trade and Development, International Coffee Agreement and, arguably, in the UN Security Council. (See: E. McWhinney, "The antinomy of policy and function in the institutionalisation of international telecommunications and broadcasting," Columbia Journal of Transnational Law Vol. XIII No. 1, 1974. pp. 10-11; also Delbert Smith, op. cit., pp. 154-5.)

The precedent for weighed voting in the communications field had, little to do with special competence: since 1868, and until the Second World War, 'colonial voting' had permitted imperial powers to cast votes that reflected their territorial possessions. (See Smythe, op. cit. 1957, p. 66.)


17. Sen. Space Committee Rept., 1965, p. 120.


20. See note 18 supra. Although the dual agreements approach has been described as a departure from traditional arrangements in the field (in Colino, op. cit. 1967, pp. 36-7.), a similar duality exists in the international aviation field (see: "Direct satellite broadcasting
and the Third World," Discussion, Columbia Journal of Transnational Law Vol. XIII No. 1, 1974. p. 10.), and some of the earliest international arrangements in the telecommunications field—the 1857 codification of previous Austro-German agreements—had taken a dual form. Nevertheless, American refusal to participate in international conferences through much of the 19th Century was attributed to the government's unwillingness to send official state representatives, and the refusal of other participants to negotiate with private U.S. companies. (See Smythe, op. cit. 1957, p. 18 and passim.)

25. Ibid.
27. Quoted in Segal, op. cit., p. 690.
34. Chayes, Interview, March 8, 1976.
37. G. Stashevsky, quoted in Maddox, op. cit., p. 91.
38. Ibid.
42. Comsat's necessary margin would fall if the vote were delayed by 60 days or more. (See note 40 supra., p. 663; Telecomm. Repts., July 27, 1964; Segal, op. cit. p. 698.)
43. Although Batailler later wrote that it was primarily the Europeans' interest in having their own military systems that kept them from accepting the U.S. position (op. cit., p. 151.), this seems unlikely inasmuch as the Americans were consistently in favour of that degree
of freedom—and the Pentagon had plans of its own.


45. Ownership shares of the other original signatories were: UK 8.4 percent, France 6.1, West Germany 6.1, Canada 3.75, Australia 2.75, Italy 2.20, Japan 2.0, Switzerland 2.0, Belgium 1.1, Spain 1.1, Netherlands 1.0, Sweden 0.7, Denmark 0.4, Norway 0.4, Portugal 0.4, Ireland 0.35, Austria 0.20, Vatican City 0.05. (Table in Wiring the World: The Explosion in Communications. U.S. News and World Report Books. Washington, 1971. p. 37.)


47. Schiller, op. cit. 1965.


51. Trooboff, op. cit., p. 49.


53. Ibid., p. 28.

54. Ibid., p. 51.


57. Schiller, op. cit. 1969, p. 146.

58. Chayes, op. cit. 1971, p. 44.


60. Ibid., p. 87.


63. Further information on technical elaboration under NASA auspices of direct benefit to Comsat can be found in: Puckett testimony, in Sen. Antitrust Hearings 1962, Part II, pp. 418-21; Sen. Comms. Subcommittee Hearings 1963, p. 74. That information on NASA's research priorities can then be compared with Comsat's current technical concerns (in House Comsat Rept. 1961, pp. 3-4.) NASA later claimed to have got out of communications satellite R&D after the August 1964 launch of Syncom III (see: Frutkin submission, in
Sen. Space Symposium 1971, p. 42). Syncom was followed by the ATS series, which retained Hughes as NASA's prime contractor. In 1964 a Hughes official testified, however, that much of the specific research associated with the ATS spacecraft would be of greater benefit to Comsat than, say, to the military. Included were advanced work on focussed on-board antennas, stabilisation and demand-assigned multiple-access techniques. (Puckett testimony, 1964 Satellite Hearings Part I, p. 376.) Many of these features were incorporated in the Intelsat IV satellite series, which Hughes built under contract to Comsat.

63. Art. I(a)(i), "Agreement establishing interim arrangements for a global commercial communications satellite system." (hereinafter: "Interim Agreement.")


68. Batailler, op. cit., p. 173:

Les exigences inhérentes à tout service d'intérêt public ne s'accommoderont pas longtemps d'une orientation aussi fondamentalement inégalitaire. En effet, le cadre existe pour assurer une victoire du principe majoritaire, seul conforme au droit international.
CHAPTER NINE: BACKGROUND TO U.S. SATELLITE CONTROVERSIES


3. As of the end of 1965 Comsat listed total assets of $213m, of which $190m was held in cash or temporary cash investments. A year later the Corporation still had $172m of its assets in such forms—which provided a return of nearly $9.6m for the year, as against $6.4m in total operating revenues from Early Bird's first 18 months of service. With Comsat's share of Intelsat's capital requirements averaging overall around half the originally forecast $200m, the company's income from cash investments—mainly 5½ percent time deposits—exceeded its net operating income until 1970. (See: H. T. Simmons, "Comsat Corporation--A brighter future?", Interavia, June 1966; Wall Street Journal, March 9, 1967 [hereinafter: Wall St. Jrnl.]; Telecomm. Repts., February 6, 1967; Comsat Ann. Rept. 1972, pp. 104-5.)

4. See Kinsley, op. cit., ch. 9 passim. Kinsley's insufficient attention to these essentially anti-AT&T decisions is a major flaw in his argument that the state's regulatory capability was fundamentally compromised, compliant to Bell's wishes and unable to formulate and promulgate an overriding definition of the 'public interest'.

5. Carrier holdings fell from 50 percent of total Comsat stock, held by 161 companies, to 0.3 percent owned by 57 carriers between 1964 and 1974. (Comsat Ann Repts., 1967, p. 44; 1974, p. 57.) ITT led the way in divestitures, with three major sales in 1967 and 1968 which netted a total of around $40m from a four-year investment of some $19m. ITT's divestitures seem to have been motivated partly by a desire to bring its holdings into line with those of other major carriers, partly by dissatisfaction with Comsat's positions on the earth station ownership and authorised users cases, and partly by ITT's own liquidity requirements—since the company was currently pursuing an aggressive acquisition programme, which included an attempt to buy the ABC television network. (See: N.Y. Times, December 6, 1968; Telecomm. Repts., May 8, 1967; Business Week, June 8, 1968; Wall St. Jrnl., December 6, 1968; Testimony of James McCormack, in House Interstate and Foreign Commerce Committee, Hearings, Comsat Board of Directors, 91st Cong. 1st Session. 18 February 1969. Washington: GPO 1969, p. 12. [hereinafter: House Comsat Hearings 1969.]}
NOTES: CHAPTER NINE, CONTINUED

A. Sampson, *The Sovereign State of ITT*. NY: Stein and Day Publishers, 1973. pp. 90-3; Telecomm. Repts., June 25, 1977.) RCA sold its entire 250,000 shares in December 1970, explaining—not very plausibly—that the money was no longer needed by Comsat. (Telecomm. Repts., December 21, 1970.) GT&E's subsidiary Hawaiian Telephone sold out in May 1971, leaving AT&T the sole carrier left on Comsat's board. (Aviation Week, May 17, 1971.) Bell was finally obliged to sell in June 1973 under terms of a January 1972 FCC decision, which made divestiture of Comsat shares a condition for AT&T's entry into the domestic satellite field. (See below, Chapter 14.)

6. That position is taken by Maddox, op. cit., p. 99, and is implied by Kinsley, op. cit., Ch. 3. As will be clear in Chapter 12, Comsat never actually requested authority to provide service to bulk private users, although the Authorised Users decision did—in passing—deny Comsat such permission.

7. See Chapter Five, note 34, supra.

7a. In effect, carrier holdings were of three kinds: the initially 150 or so small holdings—ranging from a few hundred shares to the 10,000 held by the Rochester Telephone Co.—which seem simply to have been considered good portfolio investments; RCA's and WU's holdings, which though large were insufficient to warrant seats on Comsat's board, and inadequate to assure the two companies of reliable information as to Comsat's intentions (see, e.g., House Rept. on Govt. Satellite Use 1966, p. 9;) and the holdings of AT&T, ITT and GT&E—with respectively three, two and one seats on Comsat's board. It is the latter which are of greatest interest here.


8a. See, e.g., Kinsley, op. cit., p. 205. This was also the position taken by the Senate opponents of the Comsat Act.

10. Such, for example, was reportedly the case when Comsat's board voted on whether to ask for FCC authorisation to own and operate the domestic earth stations; the carrier representatives walked out of the meeting. (J. McDonald, "The Comsat compromise starts a revolution," Fortune, October 1965.) On the other hand, it has also been alleged that Comsat was initially quite interested in the Ford Foundation's domestic satellite proposals, but that opposition within Comsat's board from carrier representatives quickly dampened the company's enthusiasm. (H. Schwartz, op. cit., p. 477.)


12. ITT's outlook was very likely conditioned by its hopes of acquiring ABC which, if combined with a domestic earth station role, would have given ITT in-roads to the domestic market. GT&E was discussing various schemes with Hughes Aircraft to use satellites to interconnect both GT&E's phone systems and Hughes' cable TV properties. RCA's divestiture coincided with its purchase of the military's Alaska communications system, which enabled RCA to begin furnishing domestic telecommunications service via a Canadian satellite. AT&T stayed on Comsat's board apparently in hopes of using Comsat as an essentially in-house supplier of satellite services; allowing Comsat's expertise and reputation to shield an arguably illegal arrangement from criticism. For further discussion, see Chapter 14.


14. A kind of disaggregation could presumably be achieved by applying existing usage ratios. In some cases, however, the ratios may simply reflect current pricing and have little objective value (e.g. day vs. night phone service.)

15. The advantages of composite pricing were explained in 1966 by the chief of the FCC common carrier bureau:

This practice has promoted the improvement and expansion of service by encouraging the carriers to modernize their plant promptly with reasonable assurance that their investments in existing plant will not be unduly affected.

(B. Strassburg, quoted in Schwartz, op. cit., p. 471.)

16. Regulation by rate base was described in a 1936 study as a "long standing issue" at the time of the 1934 Communications Act, which created the FCC to handle functions previously exercised by the Federal Radio Commission and the Interstate Commerce Commission. (See:
Herring and Gross, op. cit., pp. 415-16.) A U.S. Transportation Department official has written:

There is no general theory of public utility regulation. What often passes for theory is a reconstruction of historical events woven into a pattern of generalization to meet contemporary issues.

(R. Gabel, "The early competitive era in telephone communication, 1893-1920," Law and Contemporary Problems Vol. XXXIV No. 2, Spring 1969, p. 340.) Gabel argues, as has Gabriel Kolko in his study of the advent of federal regulation (Railroads and Regulation, 1877-1916, Princeton: Princeton University Press, 1964), that regulation was essentially the programme of industrial conservatism, permitting barriers to entry to be erected and slowing the pace of innovation in the telephone industry. The potential for abuse is acute, furthermore, when a regulated carrier is owned in common with an equipment supplier—as with AT&T and Western Electric, respectively the dominant forces in the carrier and communications manufacturing industries. Western supplies 95 percent of the Bell System's equipment, and Bell accounts for more than 80 percent of Western's business—most of the rest consisting of military contracts. (Goulden, op. cit., pp. 11, 79.) In all, Western's output comprises 85 percent of the communications equipment market, with half the remainder supplied by subsidiaries of GT&E, the second biggest domestic carrier. (Irwin, op. cit., p. 31.) The prices and profits of Western had never been subject to a definitive FCC inquiry as of 1960 (Sen. Antitrust Hearings 1962, Part I, p. 195) and, Irwin observes, "the integrated supplier has fallen between the stools of antitrust and regulation" (op. cit., p. 31).

The problem, from the perspective of rate base regulation, is that the prices a carrier pays to a wholly-owned supplier may essentially be adjusted to sustain whatever pricing strategy the carrier wants to pursue: if the carrier faces no competition, higher equipment prices translate into higher tariffs on communications services—as well as higher profits for the supplying subsidiary; but if the carrier has competitors, lower equipment prices can justify lower—perhaps predatory—tariffs to undersell the competition. Moreover, if a supplier dominates the manufacturing market, determining what a fair market price is may be practically impossible. (See: A. E. Kahn, The Economics of Regulation, Vol. II. London: John Wiley & Sons 1971, p. 291; Goulden, op. cit., pp. 84-6; Sen. Antitrust Hearings 1962 Part I, p. 171, and Part II, p. 325.)

17. As of the early 1960s, the FCC common carrier bureau regulated $390m worth of plant and $120m in annual operating revenues with a staff of 68—a workforce that had fallen from 80 in 1952 despite a doubling
of industry's costs and revenues over the period. (Sen. Antitrust Hearings 1962 Part I, p. 213.) A 1948 study concluded that in the telephone field, "The Commission just skims the surface," and found the existing staff "clearly is inadequate." (quoted in Ibid., pp. 213-14.) Similarly, in 1962 the report by an independent management consultancy concluded that the common carrier bureau's responsibility was "of an order of magnitude and significance which exceeds the Bureau's resources." (Quoted in Ibid., Part II, p. 657.)


20. Since international service accounted for only one or two percent of industry's total costs and revenues, "We felt we could spend our time more profitably on other matters," the FCC chairman explained in 1962. (Sen. Antitrust Hearings 1962, Part II, p. 331.)

21. See: L. L. Johnson, "Communications satellites and telephone rates: problems of government regulation." Memo RM-2845-NASA, October 1961. Reprinted in Ibid. A statement of FCC policy first made in June 1938 was introduced into the Comsat congressional debates by a commissioner in order to explain the advantages of informal discussion:

Many of the problems of interstate telephone regulation are continuing in nature, calling for frank, informal discussion between company and Commission representatives. The atmosphere of the conference table seems ordinarily much more conducive to the development of positive results in such matters than does the adversary air which tends to surround most formal proceedings.

(Quoted in Ibid., p. 291.) Although the FCC chairman stated in 1962 that the Commission "has in general been successful in obtaining rate reductions that appeared warranted without conducting protracted and costly hearings," (Ibid. Part I, p. 212) Bell had been permitted a $65m increase in long-distance phone rates in 1953 without a hearing (Ibid., p. 215), and the chairman of the House judiciary committee concluded in 1950 that the tariffs on overseas services "are fixed by the company itself." (Ibid.) Moreover, as former FCC chief economist Dallas Smythe pointed out, the willingness of a carrier to waive its right to due process before the Commission would practically depend upon its not ending up with a level of earnings below that which it considers reasonable and, "in all probability...higher than what the commission and court would determine as the result of a contested formal rate proceeding." (Ibid.)
NOTES: CHAPTER NINE, CONTINUED

22. Averch and Johnson, op. cit.

23. Ibid., pp. 1052, 1058.

24. Kahn, op. cit., p. 222, notes this problem with regard to day and night phone service.


26. FCC common carrier bureau chief Strassburg has said:

Certainly the carriers would have had a greater incentive to deploy satellites, or at least as much incentive to deploy satellites as they do cables, if they had an ownership interest in them, if their so-called rate base inducements to investment and use were the same--whereas there isn't the same incentive today.

(Interview, March 27, 1976, Washington.)

27. Kinsley, op. cit., p. 33. As H. Schwartz has written: "...[E]ven if the carriers own earth stations and have some satellite rate base, they will still be biased toward their own [cable] facilities, representing a much larger investment." As of 1963 world cable investment was estimated at $600m, and was forecast to rise to $1,000m by 1970. (Schwartz, op. cit., pp. 451, 453.)


29. Ibid., September 12, 1966.

30. The ruling was nevertheless a blow to Comsat, since it disallowed a considerable part of the company's alleged rate base; the FCC also imputed a 45 percent debt component to reduce the book cost of Comsat's expensive all-equity capital structure--a legacy of the 1964 stock issuance. Comsat claimed the decision would, if applied to its 1975 earnings, have reduced them by 60 percent. (Satellite Pathways, January-February 1976; see also: "Comsat: out of the crib, into the cold," Business Week, May 29, 1971.)


The remaining 17 percent was the long lines, which satellites did threaten.

34. *Communications News*, August 1967. To prepare for battle AT&T went to the financial market twice in 1967 and raised a total of $500m. The second time Bell was obliged to offer the highest interest rate it had offered since 1919. (Telecomm. Repts., August 7, 1967.)

35. Bagdikian, op. cit., p. 243; *Wiring the World: The Explosion in Communications*. U.S. News and World Report Books, Washington 1971, p. 43. By 1968 the total was 3.511 homes, which suggests that the rate of increase was increasing.

36. Seven of nine points in the final consent agreement were later revealed to have been authored by AT&T's lawyers. (Goulden, op. cit., pp. 78-81.)


41. Bell's plant was at that time almost entirely analogic, encoding intelligence in a continuous fashion rather than in the discrete, yes-no pulses that digital computers require: computer connections therefore required translation and waste. The phone network, furthermore, offered a single bandwidth of 200-3,000 Hz, corresponding in digital terms to around 2,000 bits per second (bps); higher computer capacity needs had to be assembled from that unit. Some data services (environmental sensors, e.g.) have much more modest requirements than 2,000 bps, while others need much higher speeds than the phone system can economically provide. The network was also poorly equipped to match the connection speeds potential customers required, and the error rates some computer applications needed. (See: Hall, op. cit., p. 17; Maddox, op. cit., p. 238.)

42. Between 1946 and 1948 broadcasters had asked for approval to create their own intercity microwave connections. Although a number of lines were permitted, in 1948 the FCC made it clear they would not be allowed to interconnect with Bell's network, and were to be considered...
Chapter Nine, continued

Temporary expedients until Bell finished its own wide-band network of microwave and coaxial cable. Also in 1948 the Commission upheld Bell's refusal to interconnect the domestic telegraph monopoly's microwave network. (Irwin, op. cit., pp. 69-70.)

43. L. Johnson, op. cit. 1969, pp. 3-4.

44. Ibid. Telpak offered bandwidths equivalent to from 12 to 240 voice circuits.

45. While conventional switched phone service was found to be earning Bell more than 10 percent, teletype was returning 2.9 percent, private line telegraph 0.4 percent and Telpak 0.3 percent. The latter three were each a service subject to competition. (See Irwin, op. cit., Ch. 5.)


47. Demaree, op. cit.; Maddox, op. cit., p. 237.

48. See: Chapter Two, note 98 supra. for references.


50. The FCC supported a merger of the record carriers, but the Eisenhower Administration's Justice Department was opposed. As of 1959 the seven overseas record companies had a combined rate base of less than $82m, while the long lines division of AT&T alone was credited with $1,750m. (Ibid.; A. Ende, op. cit. 1969, p. 413.)


52. Ibid.

53. See Rostow Report, Ch. 2, p. 8 and passim.


Chapter 10: The Technical Development of the Satellite System


3. Having more than one antenna at a ground station served one of three purposes: providing connection to a satellite located in a different region (e.g. several Euro-
pean station thereby have access to Indian, as well as Atlantic Ocean spacecraft); furnishing back-up flexibility, if the second antenna is aimed at an in-orbit spare; or, after 1973, when a second 'major path' satellite was put over the Atlantic to handle heavy traffic volumes among big users, second antennas permitted more economic use of satellite capacity in the region. (Comsat Ann. Rept. 1972, p. 42; W. L. Geddes, Interview, January 20, 1978, London.)


6. For AT&T's views see: Wash. Post, May 29, 1965; also 1964 Satellite Hearings Part I, p. 279. Tests found that the number of users who objected when a delay equivalent to one satellite hop was introduced was only slightly higher than the 10 percent who complained when no delay was introduced. (J. Martin, op. cit., p. 223.) For discussion of delay and echo see: House Space Committee Hearings 1961, p. 128.


10. The first two Intelsat satellite generations were equipped with antennas that radiated their energies over a 20 deg. by 360 deg. sector, while the earth lies in a 17 deg. by 17 deg. sector. (Hinchman, op. cit. 1971, p. 32.)


The gains in capacity—1,200 circuits versus 240 of previous generations—were not wholly attributable to antenna designs: with the antennas, which were twice as efficient as hitherto, went greater on-board power supplies and a three-fold increase in bandwidth.


20. W. Geddes, in an interview with the author (January 20, 1978, London), contended that Intelsat had been fortunate to keep up with traffic growth. Geddes, a former UK representative on Intelsat's governing board and then Intelsat's director of operations, noted that the failure of the first Intelsat III launch in September 1968 left the system without capacity to relay TV coverage of the Tokyo Olympics, and obliged Intelsat to use a NASA satellite.

21. Passell and Ross found that as of May 1970--even before the high-capacity Intelsat IVs were deployed--the Atlantic satellites were operating at 55 percent of capacity, and they write of "the high level of excess capacity" in
NOTES: CHAPTER 10, CONTINUED

the system. (P. Passell and L. Ross, Communications Satellite Tariffs for Television, IB1 Monograph 3, London: International Broadcasting Institute, 1972, p. 23.) Even M. Snow, a former Comsat employee, acknowledges "some evidence of chronic excess capacity" during Intelsat's first decade. (Snow, op. cit., p. 133.)

22. Satellite technology concentrates a good deal of capacity in a small number of potentially vulnerable components, which means in-orbit spare capacity is advisable. Excess capacity also enables occasional services--TV relay, cable restoration, etc.--to be offered at virtually no additional capital outlay.

23. Snow, op. cit., p. 18 Table 2.1. Snow's figures are probably more accurate than our own, since he had access to monthly records of space segment operations. It is, however, gratifying that the two sets of figures, and the conclusions drawn, are so close.

24. Ibid., p. 134.

25. Comsat Ann. Rept. 1975, p. 9. There were, however, some serious cable mishaps, like the April 1971 breakage of two cables at the same time, which required 633 satellite circuits for restoration.

26. See Kinsley, op. cit., Ch. 4 passim.

27. Mainland-Alaska traffic went onto an RCA satellite system by FCC order in December 1973, and Hawaii traffic was in 1974 transferred to a leased Intelsat transponder, resulting in a corresponding decline in circuit lease totals. (Comsat Ann. Rept. 1974, p. 7, 1975, p. 9.)


29. The pricing sequence is as follows: Intelsat sets a half-circuit charge for national telecommunications entities, in this case Comsat. Comsat's tariff to the carriers includes that Intelsat charge, an earth station factor (in which the carriers ultimately share thanks to their part ownerships of the U.S. earth stations) and an overhead factor. The carriers then charge their customers on the basis of their payments to Comsat, a domestic service factor covering use of interstate and local links, an international overland factor covering connections to and from the national grid and transmission points for overseas traffic, and an overhead factor for the international carriers. (Passell & Ross, op. cit., p. 11.)

Intelsat's space segment charges are thus submerged. As
NOTES: CHAPTER 13, CONTINUED

of August 1971, Intelsat charged Comsat $1,250 per month for a voice half-circuit; Comsat got $2,850 from the carriers for the half-circuit, and the carriers collected $4,025 from ultimate users. (Edelson et. al., op. cit., p. 7; Comsat Ann. Rept. 1975, p. 9.)

30. For discussion of price inelasticity of demand see Passell & Ross, op. cit., p. 16, and Snow, op. cit., p. 135. Note, however, that we are here talking about the inelasticity of overall demand for international circuits, and arguing that the general increases or decreases in composite—cable and satellite—charges would have little impact on aggregate demand. If cable and satellite prices were set independently of one another, however, the specific demand for satellite circuits would unquestionably be price sensitive.

31. Interview with Intelsat official who wished not to be identified, April 12, 1970, Washington.

32. NASA was instrumental in the construction of Australia's first station capable of commercial service, which opened in October 1966 to serve the Apollo system. (T. A. Houseley, "Application of satellites to the communications scene," in Papers, 1965 UN space conference, p. 158.) DOG was especially interested in the rapid creation of satellite facilities in Southeast Asia to support the U.S. war effort there: in 1966 the State Department helped Comsat negotiate down-links to the region, and in 1970 Thailand became the first country in the area with antennas beamed to both Pacific and Indian Ocean satellites. (Telecomm. Repts., September 6, 1966.)

In regard to the aid apparatus, although legislation was enacted to authorise official assistance to countries interested in building ground stations, the role of the official Agency for International Development seems to have concerned itself mainly with assisting domestic telecommunications modernisation—with the exception of Indonesia, where AID provided investment guarantees to ITT, which built the country's first station. (A. Notvedt, telecommunications engineer, AID, interview, April 1, 1976, Washington; Telecomm. Repts., March 18, 1968.) The commercial Export-Import Bank played a much more extensive role in helping finance purchase of American goods and services for foreign ground stations. Among countries receiving such assistance were: Lebanon, Iran, Chile, Thailand, Venezuela, Colombia, Pakistan and Cameroon. The list is partial, because Bank officials do not disclose all its operations. (C. Cass, chief engineer, Export-Import Bank, interview, April 1, 1976, Washington.) Sources are: Telecomm. Repts., March 18 and July 22, 1968; March 3 and 17, November 10, 1969; April 6, June 6 and November 13, 1970; and T. O. Elias, "The contribution of


34. Stephen Smoke, Interview, April 7, 1976, Washington.

35. H. T. Simmons, op. cit.


41. Frutkin, op. cit., in Gerbner et. al. (eds.), op. cit., p. 372.

42. S. Smoke, Interview, April 7, 1976, Washington.


44. Among the countries to which Comsat gave technical assistance were Chile, Taiwan, Colombia, Kuwait, the Philippines, Thailand, Venezuela and Peru. The stations in Chile, the Philippines and Thailand were subsequently built by GT&E, and ITT built those of Colombia and Peru. (Comsat Ann. Rept. 1967, p. 15; Elias, op. cit., p. 131; Telecomm. Repts., April 10 and November 13, 1967, November 10, 1969, and April 6, 1970.)

Other earth station contracts abroad awarded to U.S. carriers or affiliated companies included: ITT, for Indonesia, Greece, Zaire and part-interest in a second Spanish station; GT&E and AT&T jointly for a Nigerian station; RCA-Canada for an Indian station; WUI participation in stations in Spain and Italy. (Frutkin, op. cit., p. 372; Telecomm. Repts., March 18, 1968, April 7, April 14 and May 19, 1969, May 11, 1970 and November 2, 1970.)

45. Elias, op. cit., p. 134. It is true that as of 1975 only six former French colonies had Intelsat earth stations--although in addition France herself had caused stations to be built in three other départements.

46. See below, Chapter 19.
NOTES: CHAPTER 10, CONTINUED

47. In May 1961, for instance, AT&T announced that the U.S. would be needing 12,000 circuits worldwide by 1980. (J. Dingman in House Space Committee Hearings 1961, p. 306.) That autumn the Ad Hoc Carriers Committee raised the estimate to 14,000 circuits, forecasting that 4,050 would be needed by 1970 and 8,000 by 1975. (See Report, reprinted in Sen. Antitrust Hearings 1962, Part II, p. 15.) When, however, in August 1966 Bell submitted projections of its satellite circuit requirements, its total 1980 forecast was 3,225—and only 640 would be needed by 1970, with 1,525 by 1975. (Telecomm. Repts., August 19, 1966.) Hence, either AT&T was proposing to use around four times more cable than satellite circuits—a policy it never publicly acknowledged—or the overall forecast of traffic requirements had fallen, with virtually no public announcement.

48. There is a "direct relationship" between satellite radiating power and the size and complexity of earth stations. (UNESCO, A Guide to Satellite Communication. Reports and Papers on Mass Communication, No. 66. Paris: 1972, p. 9.) Intelsat selected an 85-foot diameter antenna size as its ground station standard, and deployed satellites with low power outputs—even the IIs had, for example, 127 watts of radiated strength, the equivalent of a couple of lightbulbs. (H. Goldhamer, "The social effects of communications technology," in Schramm and Roberts, eds., op. cit., p. 913.)

49. Power levels of up to 50 kilowatts were said to be available. (L. Lessing, op. cit.) The Atlas-Agena rocket in use in 1964 was capable of a 900-lb. payload, and was due to be replaced in 1966 by the Titan III, which could put 5,000 pounds into orbit at only 20 percent greater cost. (1964 Satellite Hearings, Part I, pp. 467-8.)

50. Italy's first station at Fucino, for instance, which was one of four served by Early Bird, was of substandard size. As of 1966 Intelsat charged $20,000 per year for a voice-equivalent half-circuit derived by a standard antenna; the 72-foot antenna then used by Japan paid $30,000 for the same capacity unit, and NASA—with 42-foot mobile ground units—was charged $130,000. (House Rept. on Govt. Satellite Use 1966, p. 59.) Technically, communicating capacity—for a given power level—varies with the square of the antenna's diameter, other things being equal. (L. Pollack, Interview, March 31, 1976, Clarksburg, Md.)

51. 1964 Report to UN.

52. J. McDonald, op. cit.
NOTES: CHAPTER 10, CONTINUED


54. McDonald, op. cit.; Telecomm. Repts., November 7, 1966. In May 1966 the State Department hosted an 11-day conference, attended by 100 senior telecommunications staff from 43 countries, to acquaint officials with "the current capabilities of earth station technology." (Sen. Commerce Rept. 1966, p. 56.)


56. TRW had impressive credentials in the aerospace field—having built some of the Army's Explorer series and, more recently, orbiting laboratories—but it had not hitherto been active in the communications satellite field. Comsat was said to have been attempting to diversify potential supply sources by contracting with a manufacturer other than Hughes. (Iessing, op. cit.)


60. Quoted in Trooboff, op. cit., p. 28.

61. Ibid., pp. 28-9.

62. Johnsen, as note 57 supra.


65. Maddox, op. cit., p. 95.


NOTES: CHAPTER 10, CONTINUED


72. See discussion, Chapter 13, below.

73. The trade-off derives from the relationship between power and bandwidth. For a given power output level, the smaller the bandwidth per circuit the greater the number of usable circuits; less efficient--smaller--ground antennas require larger bandwidth-per-circuit, and hence enable fewer circuits to be derived per satellite. (L. Pollack, Interview, March 31, 1976, Clarksburg, Md.)

74. Earth stations are in fact rated by an index of gain--which approximates to sensitivity--divided by temperature. In principle, the lower the temperature of the receiving equipment, the less the random 'noise' and the greater the antenna's sensitivity. Antennas can therefore be made more efficient if they are cooled, but maintaining low temperatures tends to be more expensive than increasing the antennas' diameters. The 85-foot standard antenna corresponds to a gain:temperature (G/T) ratio of 40.7 dB/K although, as stated, the same G/T could be achieved with smaller diameters--albeit at higher costs. (Ibid.)

75. Ibid.


78. Penalty factors of 2.5 and 10 were adopted in 1971 to cover two sizes of substandard antennas. (Snow, op. cit., p. 74.)

79. See discussion of Comsat's interest in expediting development, Chapter 15, below.

80. Geddes (Interview, January 20, 1978, London) noted that from a technical point of view the precise features required for heavy-traffic international routes and domestic long-haul were not very different.

81. For procurement details, see Chapter 15, below.

82. See Chapter 15, below.

83. For discussion of bulk lease pricing, see Snow, op. cit., pp. 65-68.

84. Quoted, Ibid., p. 67.

CHAPTER 11: U.S. EARTH STATIONS--CARTEL REAFFIRMED

1. Simmons, op. cit.


4. Ibid.


7. Telecomm. Repts., September 6, 1966. As of September 1966, the estimated rate bases of each of the international carriers were: RCA Globcom $84m; ITT Worldcom $40m; WU $20m; AT&T (international services) $240m; Comsat $13m. The forecast of a 25 percent reduction in Comsat's rate base and revenues under a 50-50 ownership sharing arrangement with the carriers came from the White House DTM, J. O'Connell.


10a. Ibid.

11. Ibid.


15. First Earth Station Decision, pp. 36-7.

16. Ibid., p. 38.

17. Ibid., p. 38.
18. The two dissenters criticised their colleagues for "enunciating a basic policy in the guise of, and under the stress of, the need for an interim policy." (Dissent of Commissioners R. Hyde and R. E. Lee, in Sen. Commerce Rept. 1966, p. 44.) The argument for carrier participation, they said, was all the greater now because of the need for expedition. The commissioners supported a 51 percent ownership share for Comsat, and warned of the rate base disincentive to the carriers that exclusive Comsat ownership would engender. (Ibid., pp. 45-6.)

19. First Earth Station Decision, p. 42.
22. First Earth Station Decision, pp. 34, 39.
27. Ibid., September 14, 1965.
28. Ibid., October 18, 1965.
30. Ibid. ITT forecast a requirement of 450 voice circuits between Puerto Rico and the U.S. by 1973, up from the 176 circuits available in 1965.
33. Ibid., May 16, 1966.
34. Ibid., January 17, 1966.
37. Ibid., pp. 50-1.
NOTES, CHAPTER 11, CONTINUED

38. Schwartz, op. cit., p. 444.
40. Ibid.
47. Ibid., p. 6.
51. See note 43 supra.
53. AT&T wanted 44 percent of the shares, with 50 percent going to Comsat and six percent divided among ITT, WUI and RCA. The record carriers wanted 10 percent each, 38 percent to Comsat and 32 percent to AT&T. (See note 50 supra.)
55. The California application was submitted in late October. (Ibid., October 31, 1966.)
56. AT&T and ITT now both said they favoured approval of both the cable and the earth station. ITT remained opposed to the 50-50 ownership split as applied to the Caribbean ground station, but Comsat attempted to eliminate one source of ITT conflict by shifting in late November the site of its station from St. Croix to Puerto Rico, citing possible interference with military communications at the former. (Ibid., October 31, November 14 and 21, 1966.)
NOTES: CHAPTER 11, CONTINUED

57. Quoted in Schwartz, op. cit., p. 454.

58. See discussion of earth station ownership and the Comsat Act, above Chapter Five. Schwartz (op. cit., p. 456) quotes the Senate report that accompanied amalgamation of the Kerr and White House bills into the 'compromise' version:

... (T) does not seem appropriate to legislatively limit the Commission in the exercise of its licensing functions... The intention of this change in language is to make clear that there is no legislative prejudgment as to who shall establish a ground terminal station.


60. Quoted, Telecomm. Repts., December 12, 1966.


62. Schwartz has, in our view, correctly noted the relationship between the earth station controversy and cable protection:

...(T)he carriers' sharp responses to a possible Comsat monopoly of earth stations must have been based not so much on the small rate base increments represented by the earth stations but on something much more fundamental -- the threat that satellites present to their existing and planned rate base consisting of cable and radio facilities.


64. Rosel Hyde quoted, in Broadcasting Magazine, April 15, 1966.

65. Ibid.

66. In the Guam case, the Pentagon announced that a satellite ground station would be needed to meet Vietnam-related requirements by November 1, 1969. While RCA tried to use its long-standing involvement in the region to argue for sole ownership, the Guam legislature passed a resolution supporting Comsat since RCA "has over the years taken very little interest in the Guam community..." In July the FCC awarded Comsat half the shares, RCA 34 percent, and ITT and IBM eight percent each -- while dividing the managership between Comsat and RCA. (Telecomm. Repts., July 30, 1969.)

In the Alaska case, Comsat was awarded interim ownership, which was then assigned to RCA in December 1973 when that company acquired the hitherto military communications system that had linked Alaska to the rest of the U.S. (Ibid., December 8, 1969; Comsat Ann. Rept. 1974, pp.
36-7.) For further controversy between ITT and Comsat over the Caribbean, see Telecomm. Repts., December 8, 1969. A second earth station in the region was never built.


68. As of 1975, when Comsat was on the verge of selling its shares in the Puerto Rican and Hawaiian ground stations as a pre-condition for entering the domestic satellite market, the ownership quotas for U.S. stations were: Etam, West Virginia: Jamesburg, California: Brewster Flat, Washington: Comsat 50 percent, AT&T 28.5, RCA 10.5, ITT 7, WUI 4; Paumalu, Hawaii: Comsat 50, Hawaiian Telephone 30, RCA 11, ITT 6, WUI 3; Cayey, Puerto Rico: Comsat 50, All-America Cable & Radio (ITT) 30, ITT 11.5, WUI 4.5, RCA 4; Pulantat, Guam: Comsat 50, RCA 34, ITT 8, WUI 8. (Source: Comsat Ann. Rept. 1975, p. 32.)


CHAPTER 12: '30-CIRCUITS' AND AUTHORIZED USERS CASES


7. Ibid., June 28, 1965. ITT and WUI had warned that classing TV traffic as 'voice' would enable Bell to refuse--for unspecified reasons--TV interconnection service; they further noted that the record carriers would appreciate the business. (Ibid., May 31, 1965.)

8. The FCC's change of heart was announced July 15. Although the TV networks preferred dealing with Comsat directly, they also claimed that Comsat's rates to them were too high, coming to nearly 83 percent of those the carriers proposed jointly to offer. (See:
9. Ibid., November 8, 1965. Among the supporters of a wider definition of 'authorised' usage were: the three TV networks, American Trucking Association, National Association of Manufacturers, The Washington Post Company, the finance house of Merrill Lynch, Penner, Pierce and Smith, American Newspaper Publishers Association and IBM.

IBM, whose traffic requirements are suggested by the growth of its own private domestic line network from 28,000 circuit-miles in 1961 to 380,000 as of mid-1965, contended that the Act never intended the carriers to be the sole authorised users.


11. Ibid.


15. Authorised Users Decision, p. 22.

16. In 1964, when the FCC approved construction of the fourth transatlantic cable (WAT-4), it ordered Bell to provide for ownership participation by the record carriers in order to allow them to expand their rate bases. The Commission also assigned the record carriers exclusive rights to offer alternative voice-record service, whereby undifferentiated capacity is leased and the customer uses his own equipment to derive specific channels as needed, be they phone, tele-type or data. AT&T had initially been assigned this market—which consists mainly of the federal government—but after it was found that most of the traffic was record the FCC turned it over to the record carriers. (See: Schwartz, op. cit., p. 463; Kestow Report, Ch. II, pp. 17-18.)


20. As of 1965 there was a total of 24.2m telemessages to, from or via the U.S. and 7.9m phone calls, through switched channels. (Authorised Users Decision, p. 27.)
21. Comparative totals of communications satellite R&D are as follows (in U.S. $m):

<table>
<thead>
<tr>
<th>Fiscal years</th>
<th>1964</th>
<th>1965</th>
<th>1966</th>
<th>1967</th>
</tr>
</thead>
<tbody>
<tr>
<td>NASA</td>
<td>25.9</td>
<td>30.7</td>
<td>32.8</td>
<td>26.4</td>
</tr>
<tr>
<td>DOD</td>
<td>80.2</td>
<td>25.7</td>
<td>53.9</td>
<td>62.3</td>
</tr>
<tr>
<td>Comsat</td>
<td>7.5</td>
<td>15.1</td>
<td>30.0</td>
<td>30.0</td>
</tr>
</tbody>
</table>

(Source: Sen. Space Committee Hearings 1966, p. 99.)

22. Figures from Ibid., pp. 5, 20, 22-3; also from House Rept. on Govt. Satellite Use 1966, p. 18.

23. Sen. Space Committee Hearings 1966, p. 8; House Rept. on Govt. Satellite Use 1966, p. 69. In April 1965 the two NASA spacecraft were turned over to DOD. During the first week of August the II was used for 90 hours and the III for 120 hours of operational military communications. In all, their availability was said to have saved the Pentagon between one-half and one million dollars a year.

24. Telecomm. Repts., June 20, 1966. Ground stations in California, New Jersey, Germany and the Philippines were complemented by two Navy shipboard terminals, and the Air Force expected two mobile terminals to be operational in Vietnam by late summer.


31. Ibid., p. 16.


33. J. Charyk, in Sen. Space Committee Hearings 1966, p. 41. Charyk also said that worldwide service would be possible by the end of 1966, two years ahead of schedule. Another Comsat official noted that the Intelsat II series would enable completion of global coverage by 1968, "even before we put up the first satellite actually designed for the global system." (In Simmons, op. cit.) As it happened, the first IIs were not successfully launched until early 1967 and global service was inaugurated in mid-1969, when an Intelsat III was transferred to the Indian Ocean region.
NOTES: CHAPTER 13, CONTINUED

34. Charyk, in *Sen. Space Committee Hearings 1966*, p. 45; also Maddox, *op. cit.*, p. 70.
43. Trooboff, *op. cit.*
46. *Sen. Commerce Rept. 1966*, pp. 62-3. Interestingly, the fact that the service was needed to support the U.S. war effort did not influence Intelsat's willingness to furnish the circuits. In fact, Intelsat gained two new members—Thailand and the Philippines—as a result of Comsat's arrangements on the Pentagon's behalf to arrange 'down-links'. (See letter dated August 9, 1966, from J. McCormack to J. O'Connell, reprinted in *Sen. Commerce Rept. 1966*, pp. 64-5.
50. Galloway, *op. cit.*, p. 116. The view that the Apollo contract represented assistance to Comsat was also expressed in the House subcommittee report:

The Government is supporting Comsat as a business entity in the most direct way possible—by ordering sufficient services to enable Comsat to establish the first semblance of a global system apart from the initial and largely experimental Early Bird. (*House Rept. on Govt. Satellite Use 1966*, p. 57.)
NOTES: CHAPTER 13, CONTINUED

51. Ibid., p. 17.
55. Ibid.
56. Ibid., p. 31.
57. Ibid., p. 29.
59. House Rept. on Govt. Satellite Use 1966, p. 27, 29. ITT acknowledged that it knew before the January 21 board meeting, though "only indirectly from Comsat." RCA and WUI were especially unhappy, and proposed in April that a liaison committee be formed so they too could be kept abreast of Comsat's intentions. (Telecomms. Repts., April 11, 1966.)
64. Authorised Users Decision, p. 27.
65. Ibid., pp. 27-8.
68. Ibid., p. 29; Telecomm. Repts., July 5 and 26, 1966.
68a. Only RCA submitted a new bid, offering $3,690 per circuit per month, premised on its getting sole ownership of the Hawaii earth station; otherwise the price would be $4,868, a rate proposed after DOD said it could not accept conditions on the bid. At the end of June RCA then made a final offer of $4,000, described as a nonprofit price--and the Pentagon replied that it was unlikely that the FCC would approve nonprofit service. RCA was outraged, claimed that Comsat's bid was premised on part-ownership of the Hawaii station, and with ITT complained that Comsat had cut its bid after the carriers' proposals had been submitted. RCA and ITT
jointly protested to the government's comptroller--after ITT had filed, and withdrawn, a court suit--on July 15, and the comptroller's equivocal decision was issued the day the contract was awarded: the Pentagon, he ruled, was free to contract with whomever it wished; Comsat, however, needed FCC approval before contracting with anyone. Furthermore, although it was conceded that Comsat four-month headstart had given it an unfair advantage over its competitors, that was not deemed sufficient to invalidate the contract award. (See: House Rept. on Govt. Satellite Use 1966, pp. 41-2, 46; also Note 58, supra.)

69. Ibid., p. 32.


70. Ibid., September 19, 1966, in which the record carriers' response was termed a "concerted attack."

71. Ibid., August 1, 1966.

72. The warning was contained in a letter, with "for official use only" markings, dated June 28, 1966 from O'Connell to the FCC chairman, and dutifully leaked to the press. (Quoted in Ibid., July 5, 1966.)


77. House Rept. on Govt. Satellite Use 1966, pp. 52-3. In April 1968 the FCC chairman announced that application of the composite rates had brought down leased line charges by between 25 and 40 percent, and reduced some switched telephone rates by one-quarter. Savings to users were estimated at some $20m per year. ("How Comsat customers saved $20 million", Broadcasting Magazine, April 15, 1968. (Title is inaccurate.)


79. Ibid., p. 50. The Pentagon's estimates turned out substantially correct. In December 1970 the staff of Mike Gravel, senator from Alaska, released figures suggesting "cascading profit-taking:" DOD was paying the carriers $8.25m per year for satellite circuits for which the carriers were paying Comsat $4.88m. (Telephony, Decem-12, 1970.)


82. Ibid., February 6, 1967.

83. Ibid., February 6 and March 6, 1967; also K. Johnsen, "France backs UN Intelsat control," Aviation Week, February 12, 1967.

84. Some problems arose because certain foreign entities, which had to provide the 'down-links' for the satellite circuits, refused to work with one or another U.S. carrier. In May Japan announced it would not work with WUI, and Thailand announced it would only work with RCA. The Pentagon informed the FCC that the sense of its order appeared to have been nullified, but the Commission replied that the specific allocation of circuits was not its responsibility, and it only wished to declare all four record carriers eligible. When the dust settled, and after the State Department had interceded with the Thai government, RCA was assigned the 10 Hawaii- Thailand circuits, ITT and Hawaiian divided the 10 to Japan, WUI got six of the circuits to the Philippines and ITT and Hawaiian Telephone split the remaining four. The Philippines entity then complained in October that it wanted to work only with Comsat, so Comsat was permitted to stay on there as manager. (See: Telecomm. Repts., May 15, June 19, September 5 and October 6, 1967.)


86. Stephen Smoike, Interview, April 1, 1976, Washington.


88. Irwin, op. cit., p. 103. For Galloway, Comsat's dependence on the carriers was a reason to support the decision, since a contrary ruling would "produce a conflict rather than friendly competition," and would harm Comsat by depriving it of the carriers' goodwill. (op. cit., p. 140.)

89. Kinsley, op. cit., p. 47.

90. Rostow Rept., Ch. II p. 18.


92. John A. Johnson, Interview, March 24, 1976, Washington: After all, Comsat itself had no ambitions to become another AT&T and start running telephone systems inside the United States.

93. Authorised Users Decision, p. 29.

94. One proviso should be noted. If satellites were used by the record carriers for the bulk of their services,
it could then be argued that Comsat had lost very little as a result of the decision, since the company was getting most of the leased-line traffic anyway. That outcome too, however, would be indefensible: to the degree that record carrier services and satellite operations were becoming identical, the practical value of the carriers' continued role would be nullified.


5. Bagdikian, op. cit., p. 247. Bagdikian gives a TAT-5 cost of $80m, which was only a partial estimate. (See, e.g., K. Johnsen, "Comsat reveals...", Aviation Week, November 6, 1967.) In any event, when figured in terms of capital outlay per circuit-mile, cables showed improvements fully comparable to satellite declining costs: from $305 for TAT-1 to $30 for TAT-5, expected to decline to $8 in the next cable generation. (Laddox, op. cit., p. 74.


NOTES: CHAPTER 13, CONTINUED


11. Cited in Kinsley, op. cit., p. 102. The study adduced assumed 100 percent in-orbit redundancy—i.e. one designated spare circuit in place for each circuit nominally ready to use—, a 24 percent return on satellite investment as against 14 percent for cables, a seven-year useful satellite life, and no technological improvements during the period under consideration.

12. Cost estimates were $107m for TAT-5 and $104m for the Intelsat IV global space segment. (See Aviation Week, November 6, 1967.)


14. "We do not feel it necessary to make definitive findings on the relative merits of TAT-5 and present...satellites." (Quoted, A. E. Kahn, op. cit., p. 77.)


17. Three IIIIs failed to achieve their proper orbits, and three others suffered some equipment malfunction that made them either useless or not fully usable for communications before the projected end of their working lives. (Comsat Ann. Rept. 1974, pp. 32-3.

18. See: "Le téléphone," Le Monde: Dossiers et Documents No. 26, December 1975; Comsat Ann. Rept. 1975, pp. 26-7. There was, however, some circuit loss discovered in each of the four IVs operational as of early 1973. One was re-deployed as a spare over the Atlantic, and a replacement craft was launched to replace it in that region in August. (Comsat Ann. Rept. 1974, p. 29.)


20. For the 12 months ending December 31, 1968, for instance, when four satellites were in service worldwide, their reliability was calculated at 100 percent, while ground stations operating with each had records of 99.76, 99.91, 99.59 and 99.86. Three of the satellites were Intelsat IIIs. (Comsat Ann. Rept. 1968, p. 18.)
22. Ibid., pp. 14-5.
31. B. Strassburg, Interview, March 27, 1976, Washington. Asked whether the diversity issue was primarily a governmental or military concern, Strassburg replied: "We would have been equally unwilling" to approve an all-satellite capability.
35. The Report's prognosis seems to have derived from a concern that the carrier industry would develop into a classic duopoly, a view which does not give full credit to the degree of dependence satellites would continue to have upon AT&T and the other cable-owning carriers:

Rather than the life and death choices that the market makes in truly competitive situations, the pattern would likely be one of parallel development of separate technologies, to some degree independent of economic justification. (Rostow Rept., Ch. II p. 2.)
NOTES: CHAPTER 13, CONTINUED


40. "European interests are reluctant to approve any follow-on (satellite) system until after renegotiation... This would provide a delay during which Europe could advance its own communications satellite programs." (K. Johnsen, "Comsat reveals advanced satellite plans," Aviation Week, November 6, 1967.

41. "Cables, satellites battle for key communications roles, Aviation Week, March 9, 1970.


43. J. McDonald, op. cit.


45. Aviation Week, November 6, 1967.

46. By the latter 1960s ST&C had cornered 60 percent of the 'free world' market for undersea cables, and was even—presumably by subcontract—reportedly getting 40 percent of the cable business involving countries that insisted only national firms could provide the cables landing on their shores, a volume estimated at around $250m annually. (Gwen Nuttall, "British cable coup saves Columbus Day," Sunday Times (London), October 16, 1977.)


52. As the Rostow Report (Ch. II, p. 13) concluded:

We are... persuaded that the central problems of the industry cannot be adequately dealt with in the absence of a fundamental restructuring of the industry... On balance, cable-satellite rivalry under prevailing conditions does not promise sufficient social benefits to outweigh the dangers of uneconomic investment decisions.
NOTES: CHAPTER 13, CONTINUED

53. Telecomm. Repts., February 21, 1966. ITT's claim to serve the region derives from the company's control of inland and inter-island phone systems in the Caribbean, which dates to ITT's founding. (See Anthony Sampson, op. cit., Ch. 2.) By the mid-1960s ITT owned --in addition to its international carrier subsidiary ITT Worldcom--these local Caribbean carriers: Cuban American Telephone & Telegraph, Virgin Islands Telephone, ITT Cable & Radio Puerto Rico, ITT Communications Virgin Islands, and Puerto Rican Telephone Co. (Telecomm. Repts., July 17, 1967.)


55. Kinsley, op. cit., p. 75.

56. Comsat Prospectus, p. 27.

57. The cable to Venezuela was completed in August 1966, and was expected to permit a four-fold rise in phone traffic with the U.S. by 1970. (Telecomm. Repts., August 1, 1966.) A cable from St. Thomas, USVI to the Dominican Republic was approved in July 1967, and had been promoted by AT&T in part as a response to the fact that high-frequency radio services had been disrupted during the April 1965 "civil disturbances" in Santo Domingo, which had led to the dispatch of Marines. (See Ibid., January 16, 1967.)

58. AT&T's service projections are outlined in Ibid., September 10, 1966.


61. Ibid.

62. Ibid.

63. Ibid.


65. See Chapter Seven, supra. The difference is important, since equal availability of satellite and cable circuits might mean the carriers were entitled to build anywhere from four to six cables to 'balance' a single Intelsat IV. If, however, equal utilisation of new cable and satellite circuits was intended, Comsat's prospects were still not bright: in that case, the entire capacity of a cable could be exhausted (say 720 circuits) when less than one-fifth of a single Intelsat IV was being used.

66. Caribbean ownership quotas were: AT&T 58.8 percent; two ITT subsidiaries, jointly, 35.5; RCA 2.2 and WUI
3.5 percent. Cable circuits were assigned: 200 to AT&T, 447 jointly to ITT and AT&T, 32 to ITT, 16 to RCA and 25 to WUI. (Telecomm. Repts., January 9, 1967.)

67. Ibid., January 20 and March 24, 1969. ITT and RCA were using one satellite circuit between them, and 20 cable circuits.

68. Ibid.

69. Ibid., July 7, 1969.

70. Ibid., January 2, 1970.


72. Western Electric was to be completing work on the Caribbean cable in April 1968, leaving 400 workers to be redeployed. ("Atlantic cable shaping amid 'Nays'," Electronic News, October 30, 1967.)

73. ITT's ST&C was very much involved on the European side of these projects. In November 1966 ST&C got an $11.9m contract from the British Post Office to build the first long-distance transistorised cable 1,000 miles from Cornwall to Lisbon; the link was to be finished by early 1969 as the first phase of a Britain-South Africa phone cable. In April 1967 ST&C and another ITT subsidiary, American Cable & Radio, were awarded the $61.6m contract for the 6,000-mile Portugal-South Africa segment. Finally, in August 1967 ST&C received $16.8m in assorted contracts for cable systems in Europe and the Mediterranean, including Spain-Italy, Italy-Sardinia, Sicily-Libya, and the first Baltic phone cable, Germany-Sweden. (Telecomm. Repts., November 21, 1966; May 1 and August 28, 1967; February 24, 1969.)

74. Ibid., September 11, 1967.


76. Ibid. Spain currently had four satellite and four cable circuits to the U.S., all via France. With the expected opening in 1968 of the Madrid earth station, Spain planned to activate 32 satellite circuits to the U.S. while using 40 cable circuits, thus producing a rough parity. The Italians were using 16 cable and 15 satellite circuits, and expected to need a total of 50 transatlantic circuits; they intended to take another 10 satellite circuits and nine from the new cable, again yielding a rough bi-modal equality.
NOTES: CHAPTER 13, CONTINUED

77. Telecomm. Repts., September 11 and 18, 1969; Electronic News, October 30, 1967. The State Department's concern was said to have been related to the cable's possible impact on the Intelsat renegotiations.


79. Ibid., October 9, 1967.

80. Ibid.

81. Aviation Week, November 6, 1967; Telecomm. Repts., November 6 and 11, 1967. TAT-5 alone would cost $70.4m for the U.S.-Spain link and another $35m for lines to Italy, Portugal and Britain. AT&T would provide $34.8m of the total financing.

82. Aviation Week, November 6, 1967.


84. AT&T had said in August 1966 that its total satellite circuit requirements in the Atlantic region as of 1970 --including not only the transatlantic route to Europe, but to West Africa, the Near East and between the U.S. and Caribbean points--was 310 circuits. On the TAT-5 alone, however, AT&T later took 511 circuits, while ITT, RCA and WUI jointly took another 165. (Ibid., August 19, 1966 and November 23, 1970.)

85. Quoted in Kinsley, op. cit., p. 90.


As a commentary on the regulatory capacity of the FCC, the point is obvious. We do not know what the rates should be. Perhaps they should be reduced by 50 percent or 75 percent. In any event, even the 25 percent lowering of rates is a Pyrrhic victory, since in the end consumers will have to pay at least $80 million in unwarranted costs.

(Quoted in Kinsley, op. cit., p. 84.)

87. Comsat also wanted future estimates of carrier circuit requirements to distinguish clearly between cable and satellite traffic. (Telecomm. Repts., September 8, 1969.)
88. Ibid., January 5, 1970.

89. Ibid., February 2, 1970.

90. Ibid., May 11, 1970.

91. Comsat found that 5.8-to-1 was the actual ratio, but the FCC figured 5.25-to-1, and rounded downwards to five. ("Comsat: out of the crib, into the cold," Business Week; May 29, 1971; Telecomm. Repts., May 10, 1971.)

92. Telecomm. Repts., November 30, 1970. The collective position of the European PTTs was set forth in a message relayed to the FCC by WUI from Italcable, the Italian overseas cable entity. (See Ibid., June 7, 1971.)

93. Ibid., June 14, 1971. The FCC's esteem for AT&T's estimates was not unusual, but Bell's motivations in perhaps deliberately misinforming the FCC as to the carrier industry's preferences remain mysterious. AT&T did emerge looking fair-minded, and the fill ratios were scrapped, as—presumably—was in Bell's best interest all along.

94. Ibid., October 18, 1971.

95. Ibid., September 2, 1969. Hitherto, as we have pointed out, the operative notion of balance was between cable capacity and satellite usage: cables were to be wholly filled, and satellites would (perhaps) get the same absolute traffic load. Now, however, satellite capacity was proposed as relevant, since if the numbers of circuits offered through each mode were compared, numerous cables would be needed to 'balance' a single high-capacity satellite.


97. In early January 1971, Secretary of Defence Laird told the FCC that TAT-6 would assure the "best mix" for the region. DOD analysis supported AT&T's contention that more cables would be "sorely needed within the next two to three years" and, if anything, "justifications ...have been understated." (Quoted, Telecomm. Repts., January 4, 1971.)

98. Ibid., May 24, 1971.

99. Ibid., June 28, 1971. A French PTT official objected to the cable rejection in a letter to the FCC chairman in July, which predicted that at least six years would consequently be needed before a new TAT cable would be operational. (Ibid., July 12, 1971.)
CHAPTER 14: KEEPING SATELLITES OUT OF THE UNITED STATES

1. Telecomm. Repts., May 17, 1965. Total payments by the three networks to AT&T were then around $50m per year. NBC President David Sarnoff said that a three-satellite system serving the U.S. and Canada would cost about as much as a single VHF local TV station serving a major American market. (Lawrence Lessing, op. cit.) ABC figured on a one-satellite space segment, offering four to five TV channels, at a cost of $20m, transmitting stations in N.Y. and Los Angeles at $2.5m each, and 200 receive-only terminals for affiliated local stations, which would bear the $40,000 per terminal costs themselves. (Telecomm. Repts., September 27, 1965; "Step-up in worldwide networking," Broadcasting Magazine, August 25, 1969.)


4. In Comsat’s plan, the earth segment would consist of 10 multi-use stations, 12 lower capacity terminals and another 100 for reception-only of TV programmes. (Broadcasting Magazine, August 25, 1969; Lessing, op. cit.)


6. Ibid., p. 125.

7. Leland Johnson, "Technological advance and market structure in domestic telecommunications." RAND Corp., mimeo, 1969. Forecasts were of six billion interstate telephone calls as against 96m international.

8. Simmons, op. cit.; Kinsley, op. cit., p. 147.

10. NEC's plan involved six satellites and 18 TV channels, costing $37.5m initially for the space segment. For another $6.6m, each network would have fixed transmitters in N.Y., Los Angeles and Washington, plus a mobile unit. Affiliated TV and radio stations would furnish their own receive-only equipment, at $55,000 for TV and $11,000 for radio. (Broadcasting Magazine, August 25, 1969.)


12. Only 116 of the total 632 TV channels reserved for educational broadcasting were then being used. (Sen. Commerce Rept. 1966, p. 109.) For the origins of the Corporation for Public Broadcasting and of the Public Broadcasting System the CPB oversaw, see: John Macy Jr., To Irrigate a Wasteland: The Struggle to Shape a Public Television System in the United States. London: University of California Press, 1964, pp. 18, 19, 22-3 and passim.) By July 1967 congressional supporters of noncommercial broadcasting were afraid that any continued linkages with the domestic satellite controversies would endanger passage of the CPB bill. (Telecommunications Repts., July 17, 1967.)


There should be a national decision that the savings in broadcasting costs which the American people have earned from their investment in space should be dedicated mainly to the strengthening of noncommercial television. (Sen. Commerce Rept. 1966, p. 79.)

14. Hughes had the support of two other manufacturers, RCA and TRW, and all three were likely aware than an AT&T-dominated system might mean preferential procurement from Western Electric. The direct broadcast proposals envisioned high-powered satellites (up to 10 kilowatts, as against 500-600 watts for the Intelsat IVs) which would broadcast to home TV sets augmented, at a cost of around $100 each, with four-foot antennas, amplifiers and converters. It was estimated that due to chronic underutilisation of UHF broadcasting bands, up to 30 channels could be given over to direct satellite broadcasting without interference or re-assignment; the Hughes satellites would provide 12 channels nationally.

The explosive implications for the structure of U.S. broadcasting—doing away with the networks' need for local transmitting affiliates, and with any obligation to share national advertising revenues with them—made congressional approval for NASA R&D in the field difficult to obtain. NASA had had initially favourable
results from preliminary experiments in 1965--the work was conducted by RCA and GE--but the agency's requests for additional funding were rejected in spring 1967. Direct broadcasting was not attempted in the U.S. until 1974, when a NASA ATS satellite beamed educational programming to deprived areas of Alaska, Appalachia and the Rocky Mountains. (See: Lessing, op. cit.; also, for background on direct satellite broadcasting, see: D. B. Spencer and K. G. Freeman, "Television broadcasting from satellites," Wireless World, two-part series. Vol. LXXIX No. 1458, December 1973, pp. 607-610; Vol. LXXX No. 1461, March 1974, pp. 39-44.)

Hughes' interest in interconnecting cable TV systems via satellite was doubtless related to its 17 percent stake in TelePrompTer Inc., the biggest U.S. cable TV outfit. Hughes later submitted a joint scheme with GT&E in 1971 to use satellites to interconnect cable systems and GT&E's phone systems. (Telecomm. Repts., January 4, 1971.)

15. "Comsat keeps sending them up," Business Week, October 14, 1967; also Kinsley, op. cit., p. 146.

16. The White House opposed specialised satellite systems, and appeared unconvinced that even a multipurpose system would be economical. (See statement by DTM in Telecomm. Repts., May 1, 1967.) In July the DTM noted the expected improvements in terrestrial transmission devices--millimeter wave guides, with 100,000 voice channels, and lasers capable of furnishing millions--a description that prompted Senate committee members to ask whether the satellite was already obsolete. (Ibid., July 24, 1967.) Later it was noted that satellites would, at best, only replace the long-lines component of long distance phone service, which accounted for 20 percent of total system costs. (Ibid., November 6, 1971.)

17. A Ford Foundation submission to the FCC in April 1967: Not all the parties to this proceeding are equally interested in the rapid adaptation of the communications satellite to domestic uses. Except for those of us who seek a broadcast satellite service, Comsat is almost alone in its desire to move forward with a domestic satellite system as quickly as possible, but even Comsat must be sensitive to the interests of the carriers...(who) are naturally inclined to relegate the satellite to a supplementary role. (Schwartz, op. cit., p. 484.)

19. Although not formally obliged to await the group's report, the FCC did so, and its chairman later acknowledged that the Commission did "defer reaching any policy decisions" while the studies were conducted. (Telecomm. Repts., March 10, 1969.) The Rostow Report was finished in December 1968, but the outgoing Johnson Administration had other concerns, and the report was only released in May 1969 under pressure from a congressional committee, which had called Rostow to testify. (Eugene Rostow, Interview, March 3, 1976, New Haven, Conn.).

20. Rostow Rept., Ch. I p. 14. The Report stipulated that if the overseas carriers were merged, the new entity would be barred from a domestic role except as "trustee or steward" of a pilot satellite programme. (Ibid., Chap. II p. 44.)

21. "Indications are that the FCC will provide for a three-year experimental pilot or interim program, with the Communications Satellite Corporation operating the space segment and with ownership of ground stations by various entities." (Telecomm. Repts., June 30, 1969.)

22. Ibid., June 16 and July 14, 1969.

23. This contention appears in Kinsley, op. cit., p. 151, and seems creditable.


25. "It is vital," the FCC chairman wrote to the White House, "to proceed without further undue delays..." (Quoted in Ibid., August 4, 1969.)


29. Quoted, Ibid., October 20, 1969.


32. The memorandum asserted that the pertinent section of the orbital band could accommodate 15-20 satellites, while no more than 10-12 were anticipated. As Chayes has observed, there was at least a trace of arrogance in this assertion, since it took no note of foreign intentions and did not adduce evidence to support its orbital capacity estimates. (See: Chayes, op. cit. 1971, pp. 48-9.) Although the orbital band is vast and frequency re-use techniques reduce the likelihood of interference, a premium may nevertheless exist on certain locations; for instance, a satellite connecting London and Tokyo may not deviate by more than one degree from its designated spot if one city is not to be lost. (See: Walter R. Hinchman, "Issues in spectrum resource allocation," in 20th Century Task Force on International Satellite Communication, The Future of Satellite Communications, Second report. NY: 1970; Electric Design, October 25, 1967.) Hence, a unilateral determination to claim as many spots as necessary—not even to further a national policy, but indeed to compensate for the absence of one—was not likely to win international acclaim.


34. Conditions included: proof that interested entities had enough money; proof that there would be no cross-subsidisation of or from other operations; and assurances that non-owners would have non-discriminatory access. (See Note 31, supra.)

35. Quoted, Telecomm. Repts., January 26, 1970. Virtually nobody accepted that argument, as Comsat had learned when it tried the line out at the time of the ABC proposal in April 1965, and again in February 1966. (See: Sen. Commerce Rept. 1966, pp. 128-9.) The Comsat Act in fact states:

It is not the intent of Congress by this Act to preclude the use of the communications satellite system for domestic communications services, where consistent with the provisions of this Act nor to preclude the creation of additional communications satellite systems. (Sec. 102d.)

Comsat tried to tie the 'additional systems' mentioned to the familiar 'unique and vital purposes'—hence, applicable only to government satellites. Sen. Pastore, however, informed Comsat's chairman in August 1966: "While you are not precluded, it doesn't preclude anyone else." (Telecomm. Rept., August 22, 1966.)
NOTES: CHAPTER 14, CONTINUED

36. Telecomm. Repts., February 9, 1970. Comsat had been anticipating with satisfaction the prospect of spending some of its $108m in surplus cash, and had even looked wistfully toward a debt issue within two years. (Ibid., December 15, 1969.)


40. The FCC asked for opinions on whether AT&T should be eligible for authorisation without conditions, allowed to furnish only telephone service, obliged to lease transmission capacity from another satellite-owning entity, or simply watched carefully—as the White House had recommended—for signs of cross-subsidisation. As for Comsat, the FCC's sole concession was that "the 'authorised user' policy...will not be applied to domestic service," and Comsat would therefore be eligible to own earth stations and transact business directly with ultimate customers. (Ibid.)


42. The FCC's outgoing chairman, Rosel Hyde, had been with the Commission since its founding in 1936. His successor was Dean Burch, who had been campaign manager for Sen. Barry Goldwater's 1964 presidential campaign.


45. Rostow, whose group had backed the interim Comsat plan, has recalled: "We were very concerned not to give Comsat a vested interest in running a monopoly domestically." (Interview, March 3, 1976, New Haven, Conn.) Although FCC staff were investigating a possible Comsat-AT&T joint arrangement—with the possibility of later entry by specialised carrier systems—staff believed that whichever temporary restrictions on new entrants should not be sufficient to sustain a Comsat monopoly. (Fred Cohen, Interview, March 23, 1976, Washington.)

NOTES: CHAPTER 14, CONTINUED

47. The changed technical environment was mentioned by Fred Cohen, Interview, March 23, 1976, Washington.

48. See Note 31, supra.

49. For parallel events at the Intelsat renegotiation, see below, Chapter 18.


55. The Justice Department also said that no carrier should be allowed to include satellite facilities in its rate base unless they were cheaper than comparable terrestrial plant. ("Justice urges wide-open policy on satellites," Broadcasting Magazine, May 24, 1971; Telecomm. Repts., June 1, 1971.)


57. As the chief of the FCC common carrier bureau recalled:

It was the FCC's judgment that the potentials of satellite technology for public benefit could best be realized on the domestic scene by relying on traditional entrepreneurial ingenuity and incentive in a competitive environment where economic and market forces could have maximum benefit. (B. Strassburg, "Communications satellites: contrasting policy approaches." Remarks before the Goddard Memorial Symposium, Shoreham Hotel, Washington, March 12, 1976.)


59. Kinsley, loc. cit.
NOTES: CHAPTER 14, CONTINUED

60. Ibid., p. 181.

61. Comsat Ann. Rept. 1972, p. 20. As early as 1969 other Comsat shareholders were complaining of "direct conflict" between their interests and those of the carriers. Comsat's chairman then acknowledged that "in hindsight" the Comsat Act might have been written differently. (Telecomm. Repts., May 19, 1969.) The Rostow Rept. (Ch. I p. 20) similarly favoured eliminating the carriers' holdings. Critics of Comsat, like Alaska Sen. Mike Gravel—whose constituency stood to benefit directly from satellite services—blamed Comsat with impeding the pace of domestic satellite development because of its "inherent weaknesses" engendered by its then 30.8 percent carrier ownership. The Justice Department's antitrust chief conceded that the arrangement was "contrary to the normal antitrust provisions against anticompetitive stock acquisitions and director interlocks." (Telecomm. Repts., January 11, 1971.)


69. As of early 1979, domestic earth terminals were being built five-to-one for entertainment, but manufacturers forecast a four-to-one ratio in favour of business applications by the mid-1980s. (Newsweek, January 22, 1979.)

70. Aviation Week, April 26, 1971.

71. There were two ways in which concern over social unrest influenced satellite discussions. 1.) The push for noncommercial television, which was for a time linked to the satellite issues, owed much to a wish to provide compensatory programming for disaffected, primarily
urban black groups, who were insufficiently attractive to advertisers to warrant targeting by commercial broadcasters. Rostow remarked in an interview (March 3, 1976): "Of course we were very much interested in the educational side of it... the use of communications technologies in the ghettos and so on, we were at a time of maximum racial conflict in the United States." At the same time, however, noncommercial broadcasting might furnish an outlet for politically dissident drop-outs from the dominant broadcast organizations—such as Fred Friendly, who quit CBS when the network refused to pre-empt day-time reruns in order to televise Senate hearings on Vietnam.

2.) The government was interested in improving internal police and intelligence capabilities, and with upgrading data bank interconnections to that end. While this did not imply restraining, for instance, introduction of a technology that might provide the public with long-distance telephone service at hitherto local rates, it did mean that priority would go to better 'specialised' transmission facilities, as the MCI decision suggested. (See: Henry Smith, "Goebbels in space: government use of telecommunications," Cineaste Vol. V No. 4, 1973.)

72. Senate Foreign Relations Hearings, p. 194.

73. Lessing, op. cit.

74. In May 1969 the DTM suggested that Comsat and Intelsat should not be barred from a domestic U.S. role: "Such participation may in the future prove most efficient and economical in satisfying domestic needs." (Telecomm. Repts., May 26, 1969.)

75. "Intelsat members should adhere to Intelsat supervision in any use of domestic or regional satellites." (1967 Presidential Policy Statement, p. 5.) The FCC later defended its March 1970 retreat from supporting a pilot system for Comsat by saying 'open entry' domestically was "fully consistent with our obligation to a single global system." "Close coordination" was promised before any actual authorisations were issued. (Telecomm. Repts., March 30, 1970.)

77. B. Strassburg (Interview, March 27, 1976) indicated an awareness that Comsat's position might harden as domestic avenues were foreclosed: "I think we tried to look downstream at what the implications were of a diminishing role for Comsat..." Fred Cohen (Interview, March 23, 1976) recalled similarly that the FCC was "very strong on wanting Comsat to have control over Intelsat, and any lessening of (Comsat's) position in the domestic satellite market could be interpreted as a lessening of (its international) position."
NOTES: CHAPTER 14, CONTINUED

76. The 1934 Communications Act limits the percentage of shares that can be held by non-nationals in holders of transmission licenses. The Rostow Report (Ch. V) acknowledged that procuring the space segment from Intelsat would result in "severe economic distortions and raise legal and policy problems." Comsat accordingly tried to separate its domestic plans from its Intelsat role: "Intelsat would not be involved directly in any U.S. domestic satellite system," said Wilbur Pritchard, director of Comsat Laboratories. (Sat. Broadcasting Hearings 1969, p. 31.)

78. Quoted in O. W. Riegel, op. cit. 1971, p. 30. Maddox likewise concluded in her study that Comsat "would not have to bully Intelsat" if its domestic position were firmer (Maddox, op. cit., p. 99), and more obliquely, a Business Week article (May 29, 1971), commenting on an important May 1971 anti-Comsat vote in the Intelsat renegotiations, stated:

If Comsat does not build a profit-protected domestic satellite system, last week's agreement downgrading its role in Intelsat may take on added significance.

CHAPTER 15: TRANSATLANTIC RELATIONS AND THE 'SINGLE' SYSTEM

Term used by Intelsat official who wished to remain anonymous. (Interview, April 12, 1976, Washington.)

2. Nevertheless, an Intelsat whose sphere of competence was restricted might offer advantages to Comsat, since the company would be able to enter and compete independently in new satellite fields, without compromising a principal commitment to Intelsat. A Fortune article in 1965 commented:

...The biggest single block to expansion of Comsat's services is the limitation to a single global commercial system, which the U.S. built into the consortium agreement...If the limitation to a single global system is frozen as U.S. national policy, Comsat's services will be severely confined, and it will be denied the opportunity to exploit many of the capabilities of the satellite. (J. McDonald, op. cit.)

The fact that this observation was made in 1965 is important, since Comsat's domestic prerogatives had not yet been whittled down. By the time of the renegotiations, it was clear that Comsat's surest access to new satellite fields was via an expanded Intelsat—where Comsat's entitlement to participate would be unquestionable, and its voting strength would enable it to secure satisfactory terms for that participation.
NOTES: CHAPTER 15, CONTINUED

3. This overstates the point somewhat. Comsat's negotiating position also owed something to the fact that the company had performed well as manager and 'major domo' of the Intelsat system; irrespective, therefore, of its ties to U.S. resources Comsat remained a valuable entity in and of itself. This, however, only made Comsat convenient--not essential--to Intelsat. The benefits of retaining Comsat for those reasons could equally be obtained by providing for a transition, during which necessary experience and skills could be developed by a new managerial entity--which is, in fact, what happened.

4. Quoted in Telecomm. Repts., May 24, 1971. President Johnson's August 1967 policy statement, which set forth U.S. support for the single global system and acknowledged the need to reduce Comsat's dominance in Intelsat, was really the last clear expression of White House interest in Comsat and Intelsat. Johnson had followed through on his own interest in the field by appointing Leonard Marks--formerly a lawyer for Mrs. Johnson's broadcasting interests, a director of the U.S. Information Agency and an original Comsat incorporator--to head the U.S. delegation to the 1969 Intelsat conference. Nixon, however, appointed a former political rival, Gov. William Scranton, to succeed Marks. Scranton knew practically nothing about the field, as he later acknowledged in his introduction to what he called a "layman's primer":

Upon accepting President Nixon's invitation to take over responsibility for the negotiations, I sought in vain for a simple, single source reference offering a quick overall introduction to this challenging field. (W. D. Hickman, Talking Moons: The Story of Communications Satellites. N.Y.: World Publishing Company, 1970. p. 10.)

Congressional review of the renegotiations was also limited, and what attention the conference received focussed upon--and quite probably was provoked by--Comsat. The House commerce committee did question the FCC chairman in November 1970 on recent conference sessions. "There have been rumours," said the committee's chairman, "that the American interests might be traded off for political reasons." After having been reassured by the FCC chairman that every effort would be made to ensure "the protection of developments in which we have made such a tremendous contribution," the committee's chairman replied: "I am happy to hear that because there have been some rumors that perhaps the Comsat managership might be traded off," thus making clear the object of his concern. (House Appropriations Hearings 1971, p.16.) Earlier, legislators had opined that they "just don't want the United States to be sold short," and they "hope this won't develop into a foreign aid program," but the volume and tone of review was far removed from the passion that informed the 1962 debates.
NOTES: CHAPTER 15, CONTINUED

12. The rocket at issue—the ELDO-PAS, intended for synchronous payloads—might, they said, be useful for two scientific astronomical satellites being planned by ESR0, and possibly for an experimental European communications satellite system. (1966 Parliamentary Rept. on ELDO, p. 148.)
16. Ibid., pp. 148, 302-3, 467. Even before May 1968,
the armed forces minister had predicted in March that no submarine-based missiles would be operational before 1973 and no ICBMs before the 1980s.

17. Of five missile submarines originally planned for 1972, two were operational by that time, equipped with IRBMs of doubtful effectiveness. Only nine of the 18 IRBMs scheduled for 1971 deployment were operational then. (Ibid., p. 303; IISS, The Military Balance 1978-79, p. 22 and passim.)

18. Defence Minister Michel Debré expressed his regrets in a December 1972 speech. (Pickles, op. cit., pp. 303-4.)


28. Ibid., p. 6.


30. See: Gordon Weil, op. cit., p. 3.


32. Forecast in Telecomm. Repts., January 25, 1965. Comsat's opposition to non-Intelsat systems is discussed in Electronic Design, October 25, 1967. In a March 1967 speech, Comsat's president stated that any independent systems "should be carried out in proper relationship to, and with the recognition of the international goal and the international plan" for a single
global system. (Telecomm. Repts., March 6, 1967.)


35. John A. Johnson, "Regional systems and Intelsat." Remarks at the panel session on international implications of regional systems at the Second Communications Satellite Systems Conference of the American Institute of Aeronautics and Astronautics, April 8-10, 1968. San Francisco: AIAA.

36. See discussion below, Chapter 18.


38. Opinions were those of the National Industrial Space Committee. (1966 Parliamentary Rept. on ELDO, pp. 124-5.) The aviation ministry endorsed the view that British investment quotas could be enhanced by a better industrial capability. (Ibid., p. 149.) The Post Office was skeptical that the money in commercial payloads would amount to much, but conceded that launcher development might have "sufficient broad technological interest and value to the countries concerned, or sufficient political value to the countries concerned." (Ibid., p. 67.)


40. A December 1967 report of a CETS advisory committee: Europe should attempt to achieve independent capabilities of its own in such areas as application and scientific satellites, placing it in a position to share early in the benefits of space exploration, to become eventually a desirable, respected and essential partner of other space powers in order to share the full benefits of space flight activities in the decades ahead. (J.-P. Causse, CETS, "Report of the advisory committee on programmes," December
NOTES: CHAPTER 15, CONTINUED


42. R. O'Lone, "U.S. dominance seen hindering Intelsat," Aviation Week, August 28, 1967. Britain, for instance, with an 8.4 percent Intelsat stake, received less than one-sixtieth of the Intelsat III contract money: a $500,000 contract to Hawker-Siddeley out of a $32m initial budget for the series. (1966 Parliamentary Rept. on ELDO, pp. 64-7.)


45. As a Comsat vice president said in April 1968:

Adherence to the single global system principle does not in any way inhibit individual countries or groups of countries from developing their technical capability through their own space programs, just as the United States has done. (John Johnson, op. cit. 1968.)

46. 1966 Parliamentary Rept. on ELDO, pp. 94, 122.

47. Ibid., p. 25.

48. Quoted, Ibid., p. 113.

49. A. Frutkin, in House Space Committee International Review 1971, p. 75. The figure was $300m. A $400m budget was announced in 1975 for the new European Space Agency. (Le Monde, April 17, 1975.)


A similar European satellite system had earlier been proposed by Eurospace, a consortium of aerospace firms, in March 1966. The formation of a new satellite consortium regrouping seven major European companies from Britain, Belgium, France, Germany and Italy—and called
"the most significant which has yet been formed out­side the United States"—was announced in November 1970. (Telecomm. Repts., November 9, 1970.)


53. Telephone Engineer and Management, November 1, 1967.


In 1967 the French ICSC representative suggested po­sitioning the fourth Intelsat III over the far eastern Atlantic to carry traffic between Europe and points other than the U.S., thereby opening the way for ma­jority European ownership of the spacecraft. (Fink, op. cit.)


The British appear to have been unconvinced, possibly because their big Intelsat shareholding would be dissipated under a regionalised formula. See: European Conference on Satellite Communications, Committee on Organization, London, March 7-8, 1968. "Definitive Arrangements." Paper by the United Kingdom, SCL/CO. 30/6E, March 6, 1968. (Hereinafter: 1968 UK Position Paper.)

56. French Ownership Plan. France argued that undivided ownership was equivalent to being obliged to buy shares in a building in order to be entitled to rent an apart­ment in it. (R. Sueur, op. cit., in Papers, 1968 UN Space Conference, p. 168.)

57. French Ownership Plan.

58. Ibid.


60. See: W. R. Hinchman, op. cit., in McChinney (ed.), op. cit., pp. 39-40, which includes discussion of fre­quency re-use techniques.
61. Fink, op. cit.


64. At their May 1970 session, members of the UN Working Group on Direct Broadcast Satellites were reportedly "firmly of the opinion that the greatest prospects for practical cooperation are at the regional level." (A. Chayes, J. Pawcett, M. Ito, A.-C. Kiss, *Satellite Broadcasting.* London: Oxford University Press, 1973, p. 8.) A 1972 UNESCO report (see note 62 supra, p. 15) similarly observed:

> In the present situation, the development of satellite communications tends towards not a single global concept but towards a plurality of systems intended for different purposes, on different geographical levels, with different communication patterns and different categories of users.

65. CEPT argued in 1968 that "the existence of this world organisation should not prevent the establishment of independent regional or domestic organisations." (CETS Position Paper 1968. See note 55 supra, for full reference.)


67. Ibid.

68. Ibid.


70. Rostow Report, Chapter III p. 15.

71. 1968 UK Position Paper.


73. The 1975 discussions, for instance, envisaged a 50 percent share in the proposed system to be divided among Norway, Britain, Greece, Denmark and the Netherlands. The Soviet Union, with the world's sixth biggest shipping fleet, would also get a large share, but the American holding—since much U.S. shipping is registered under flags of convenience—was not immediately determined. (S. A. Levy, op. cit., p. 679.)

74. See below.
NOTES: CHAPTER 15, CONTINUED


76. VHF radio was reliable, but useful only for ranges of 300 miles or less. Otherwise HF—which was prone to static, interference and fading—had to be used. (See: Wiring the World, p. 94; Comsat Ann. Rept. 1966, p. 15.)


78. FAA opinion quoted in House Rept. on Govt. Satellite Use 1966, p. 66.

79. The airlines were so eager for satellite services that they persuaded the FAA in January 1966 to drop plans for improving conventional equipment. One aviation communications carrier had filed to be an authorised user of Comsat circuits. (Kinsley, op. cit., p. 201.)


89. Ibid. Ships used, and still use for the most part, HF radio capable of transmitting Morse code at 10-20 words per minute and subject to delays of from eight to ten hours.

90. The Marisat system eventually charged $1,300 per month for lease of a shipboard terminal and another $800 monthly for minimum usage. (Ibid.)

91. Interview with Intelsat official who wished to remain anonymous, April 12, 1976, Washington.
NOTES: CHAPTER 15, CONTINUED

92. European space spending rose from $90m to $290m during that period. (Levy, op. cit., p. 665.)

93. In 1964, for instance, Jupiter rockets—useless for synchronous payloads, but sufficiently powerful for scientific and experimental purposes—were offered to the Europeans. (Kildow, op. cit., pp. 76-7.)

94. The denial is mentioned in Weil, op. cit., p. 17.


97. Contention is found in Kildow, op. cit., pp. 76-7.


CHAPTER 16: 'SINGLE GLOBAL SYSTEM' AND NORTH-SOUTH RELATIONS


5. Ibid., p. 212.

NOTES: CHAPTER 16, CONTINUED


11. Evans, op. cit., p. 58.


13. Ibid.


15. As of 1970, Third World exports to the U.S. totalled $10,400m, to the Six $16,100m and to the Ten $22,300m. (U. Kitzinger, "Problems of a European political economy," in Warnecke (ed.), op. cit., p. 36.) Taken together, capital and official aid flows from EEC members rose from $2,141m in 1957--around 28 percent of the OECD total--to $5,621m in 1969, or nearly 39 percent of the OECD total. (N. B. Brown, "The EEC and neo-colonialism in Africa," in Brown, op. cit., Table VI.) In terms of official aid alone, the Ten in 1969 provided $6,300m, against an American $4,600m. (Warnecke, "Introduction," in Warnecke (ed.), op. cit., pp. xiii-xiv.)


19. H. Malмагрен, "Europe, the United States and the World Economy," in Warnecke (ed.), op. cit., p. 135; Evans, op. cit., p. 21. France's interest in its former colonies was such that French official aid to francophone Africa was 33 percent the value of imports from those countries--as against two percent overall for countries of the Third World.


23. Malmgren, op. cit., p. 136. As of 1972 the average effective EEC tariff on all manufactured imports was 11.1 percent; those pertaining to typical Third World manufactures averaged 16.9 percent. (Evans, op. cit., p. 82; The Guardian, January 7, 1978.)

24. Barracough, op. cit.


26. Ibid., pp. 77-78; Barracough, op. cit.; Evans, op. cit., p. 56. Japan went from providing 0.8 percent of Latin America's imports in 1950 to 6.1 percent in 1969, and from buying 1.3 percent of the region's exports in 1950 to 6.4 percent in 1969. The volume of Latin American exports to Japan rose 350 percent between 1960 and 1969.

27. Malmgren, op. cit., p. 133.


30. Barracough, op. cit.

31. Ibid.


33. Barracough, op. cit.

34. L. Ruhl, op. cit., p. 226.


36. "Et surtout cela ouvrait aux Américains la possibilité d'une implantation politique et stratégique non négligeable dans ces pays..." (Batailler, op. cit., p. 149.)


NOTES: CHAPTER 16, CONTINUED

40. Ibid., p. 110.


43. Lessing, op. cit.

44. Maddox, op. cit., p. 140.

45. Frutkin, op. cit., in Gerbner et. al. (eds.), op. cit., p. 376; "Space communications...", Aviation Week, August 23, 1971. NASA subsequently tried to do its part for the national effort, recommending American firms to India after the year-long SITE experiment in case India wished to procure satellites itself. (Sat. Broadcasting Hearings 1969, p. 23.)


49. In Argentina, voice and telegraph traffic with the U.S. doubled in the first year of earth station operation; the same occurred in Brazil, where volume again rose an equivalent amount the second year; Kenya inaugurated its earth station by leasing 24 full-time circuits, and India's total international traffic more than doubled within three months after its station at Arvi opened in April 1971. (Ibid.)


51. For other examples of praise from Latin American newspapers, see Colino, op. cit. 1968-9, p. 33.

52. A 1960 UNESCO study found that news transmission tariffs varied as much as 600 percent within Africa. (D.W. Smythe, "On thinking about the effects of communications satellites," Paper for the American Institute of Aeronautics and Astronautics. Washington, June 30, 1964. p. 7.) A memorable remark was that of the then-president of the Central African (then-) Republic, whose telegramme to an Organisation for African Unity conference in Kampala had passed through London and Paris: "Africans cannot even keep their own secrets," he said. (Quoted in Colino, op. cit. 1968-69, p. 9.) Communication
between east and west Africa remains a problem even with satellites, since various countries (e.g., Zaire and Kenya) have their earth stations aimed at satellites in different regions, thus requiring two 'hops' for interconnection. (Interview with Intelsat official who wished to remain anonymous, April 12, 1970, Washington.)

53. Conventional communications between Argentina and Chile had been impossible due to the Andes. (UNESCO, op. cit. 1972, p. 16.)

54. Maddox, op. cit., p. 91.

55. Even for a country like Australia—a big user of international circuits with substantial deficiencies in its domestic network—overseas traffic comprises less than 0.1 percent of domestic phone and less than 10 percent of domestic telegraph volume. (T. A. Houseley, "Application of satellites to the telecommunications scene." Papers, 1968 UN Space Conference, p. 162.) A 1962 Senate report noted the inconsistency between the push for international satellite deployment and the nature of Third World needs:

The immediate need in most of the newly developing countries is not for the high-capacity large-bandwidth communication channels which the satellites will provide, but rather for simple, inexpensive, easily-operated high frequency broadcasting and local and international fixed services. Satellites would provide the fixed service requirements only if low capacity, inexpensive ground facilities are available. (Sen. Space Committee Rept. 1962, p. 113.)


60. Figures were $600m for cable, $340m for overland microwave and $135m for satellites. (UNESCO, op. cit. 1972, p. 20.)
61. Haviland, op. cit., in Papers, 1968 UN Space Conference, pp. 112-13; see also: Rostow Report, Ch. IV p. 10.


64. Report was from the UN Advisory Committee on the Application of Science and Technology to Development, quoted in UNESCO, op. cit. 1972, p. 23.


66. UNESCO, op. cit. 1972, p. 16. With some 60,000 villages on a 3,000-island archipelago, it took two months for the central Indonesian government to learn of an April 1973 typhoon that had killed 1,500 people and destroyed 2,000 homes 1,300 miles from the capital. (The Guardian, May 12, 1976.)


68. In Maddox, op. cit., p. 129.


70. See: Chayes et al., op. cit. 1973, p. 9; "Space communications...," Aviation Week, August 23, 1971.

71. See: Chayes et al., op. cit. 1973, pp. 2-4, for classifications of satellite broadcast services.


74. Ibid., pp. 10-11.

75. R. Sueur, op. cit., in Papers, 1968 UN Space Conference, p. 168. Distribution of educational TV was listed among Symphonie's project goals (Ibid., p. 156), and officials claimed, for instance, that Africa could be well-served by satellite facilities "if their design is adapted to African needs and not to those of a complex and costly global network." (Ibid., p. 166.) ("...a condition d'en adapter la conception aux besoins africains et non a ceux d'un reseau mondial complexe et couteux. )

76. See: Haviland, op. cit., in Ibid., pp. 109-11; UNESCO,
NOTES: CHAPTER 16, CONTINUED


78. Mickelson, op. cit.

79. The Economist, March 27, 1965.


81. See: Ibid., p. 29; J. V. Shute, op. cit., passim; Telecomm. Repts., April 19, 1965. Continued EBU dissatisfaction was reported in this U.S. newspaper account of a November 1967 meeting of the EBU's news study group:

The consensus, never formally voiced in a motion or resolution, appeared to be that the potential of live global TV was being thwarted by old-fashioned utilities less interested in international information for the masses than in the black ink that attends income from specific telephone calls and the like. (N.Y. Times, November 5, 1967.)


87. In Snow, op. cit., p. 54.


89. Snow, op. cit., pp. 54-5; Frutkin, op. cit., in Gerbner et. al. (eds.), op. cit., p. 374.


92. The UN Working Group on Direct Broadcast satellites observed in 1969:
NOTES: CHAPTER 16, CONTINUED

...It is regrettable that, in spite of the wide experience they have gathered and the considerable contribution they are able to offer, broadcasters and broadcasting organisations are not yet sufficiently closely associated with the planning and operation of institutional and intergovernmental arrangements for satellite broadcasting. (UNESCO, op. cit. 1970, p. 37.)

93. The Rostow Report (Ch. IV p. 17) made this point:
   While each participating country would necessarily face the prospect of not being in complete control of its telecommunications facilities, it would at least have the assurance that the responsibility for the space segment would be shared by many members with no serious risk that the organisation would become dominated by one or a few potentially unfriendly neighboring countries.

94. European spokesman, quoted in Aviation Week, October 12, 1970.


96. Aviation Week, October 12, 1970.


98. Aviation Week, January 27, 1969 (see note 95 supra.)


CHAPTER 17: THE POLITICS OF REORGANISING INTELSAT

1. 1967 U.S. Intelsat Proposals
NOTES: CHAPTER 17, CONTINUED

3. Ibid.
5. See: Rostow Report, Ch. III p. 17.
12. J. McCormack quoted in Telecomm. Repts., May 29, 1967. The view was not solely Comsat's, as this passage from a May 1969 speech by Leonard Marks suggests:

   Let me stress that the Conference was not called for the purpose of considering a new or fundamentally different form of Intelsat, but rather to consider changes in the existing organization to improve its operation. ("Intelsat--a blueprint for modern communications." Address before the satellite telecommunications subdivision, Industrial Electronics Division, Electronic Industries Association. Los Angeles, May 12, 1969.)

13. House Appropriations Hearings 1971, p. 702. The State Department's "Justification of estimates" also said:

   Our 75 partners now urge concentration on organizational structure. We cannot ignore their wishes since, if any communications system is to work effectively, all those who participate must agree on its operation and structure. (Ibid., p. 701.)

15. Comsat's chairman said in May 1966: "Our greatest ambition is to have in being before 1969 a system in which many nations are tied in as users, so that the reasons for dropping out can be greatly reduced." (Telecomm. Repts., June 6, 1966; see also: Lessing, op. cit.) For speculation that a "shrunken global system" might result from European members' turning to leasing satellite circuits and building cables, see: Wall St. Jnl., October 12, 1967. For mention of disintegration threat see: Riegel, op. cit., p. 30.

16. Hickman, op. cit., p. 73.
17. Comsat had furnished $159.9m of Intelsat's total $303.1m in cumulative capital and operating costs, and had received in return $89.9m out of $130m in operating revenues earned by the global system. Comsat's equity holdings were $100.8m out of a total Intelsat equity of $191.5m. (Sen. Space Symposium 1971, p. 201; Telecomm. Repts., October 9, 1967.)

18. Benefits to Comsat of prolonging the interim arrangements are noted in Maddox, op. cit., p. 106. The possibility that the U.S. could simply not have called the renegotiating conference was raised by Leonard Marks, Interview, March 18, 1976, Washington.


21. John A. Johnson, Interview, March 24, 1976, Washington. Johnson insisted, notwithstanding the benefits to Comsat mentioned above, that there was "no point" in having money tied up in other countries' international communications, and that Comsat had initiated proposals to reduce its voting and investment quotas partly for reasons of its own. The contention remains curious, since Comsat already had a considerable capital surplus, and was furthermore troubled by an all-equity financial structure which was more expensive to maintain than would be the debt issues the company hoped to be able to make.


25. Ibid.


27. An American professor told a Senate committee in May 1969:

When the Soviet delegation announced their intention of creating Intersputnik, there was a murmur that went around the room, which was rather interesting... I would simply say that the Soviet Government did hit upon one point that was very well received, and that is... they repeatedly expressed the idea that each country would have one vote in its management council. They were obviously looking at what they thought was a weakness in the Intelsat arrangements, and of course, in this thought they reflect the feeling of many of the participating countries. (John Hanessian Jr., in Sat. Broadcasting Hearings 1969, p. 195.)
NOTES: CHAPTER 17, CONTINUED


29. Maddox, op. cit. 1972, pp. 93-6 and passim.; Kinsley, op. cit., Ch. 5; both provide good examples. The final Intelsat IV contracts were not distributed to the ICSC until the day a vote was required. Comsat is said to have skewed bid specifications to have favoured American manufacturers, to have insisted on a rate of return that kept satellite rates unnecessarily high, to have insisted on permanent chairmanship of the ICSC and its three subcommittees, and to have overall the worst reputation abroad of all the U.S. international carriers--thereby encouraging the Europeans to continue building cables.

30. Comsat seems to have used similar techniques later to force the FCC's hand on potentially troublesome authorisations. (See comments of Asher Ende in Kinsley, op. cit., pp. 117-18.)


34. See below, Chapter 18.

35. Telecomm. Repts., March 3, 1969. Leonard Marks, the first U.S. delegation chairman and first chairman of the renegotiating conference, was more certain: "There is no other organization in existence that could possibly take over this complex managerial task." (N.Y. Times, February 24, 1969.)


37. Mickelson, op. cit.


42. In Richard O'Lone, op. cit., Aviation Week, August 28, 1967.
CHAPTER 18: NEGOTIATING THE PERMANENT ARRANGEMENTS 1969-71

   The claim seems credible, and strengthens the proposition that Intelsat's future was not of great high-level concern in the U.S. Nevertheless, formal preparations within the American government were chaired by a State Department official and included representatives of the Pentagon, FCC, NASA and the White House.
6. Observers from the Soviet Union, Mongolia, Hungary, Poland, Czechoslovakia, Bulgaria and Rumania were present. Cuba, the eighth signatory, was not represented. (Telecomm. Repts., February 17, 1969.)
9. Soviet Molniya satellites had been used for experimental links between Moscow and Paris. (See: Telecomm. Repts., November 1, 1965, May 29, 1967.) Soviet comments on Intelsat were also similar in tone to those of French spokesmen and commentators. "The right to participate in the management of the space communications system is denied to those who are not willing to subsidize and perpetuate a monopoly in the sphere," said a Soviet official during a 1964 space symposium in Warsaw. (Ibid., September 14, 1964.) See also: Aviation Week, August 28, 1967.
12. PC45 supporters included: Australia, Brazil, China (Taiwan), Guatemala, Indonesia, Italy, Korea, Malaysia, New Zealand, Nicaragua, Panama, Philippines, Spain, Thailand, U.S., Iran, Pakistan, Turkey, Greece and Singapore.
PC54 supporters included: Algeria, Austria, Belgium, Canada, Denmark, France, West Germany, India, Italy, Japan, Luxembourg, Mexico, Norway, Sweden, Switzerland, United Arab Republic, UK and Peru.

Italy's listing in both 'camps' is deliberate, since the Italian position was subtle. (Telecomm. Repts., November 24, 1969, February 23, 1970; Le Monde, February 17 and 18, 1970; Colino, op. cit. 1973, p. 113.)


15. 1969 Appropriations Hearings, p. 15.


18. The U.S. delegation's statement said:

In the course of more than two years of negotiation, the United States has accepted numerous compromise proposals and has substantially altered its position to satisfy the stated concerns of other delegations... There are, however, certain provisions which are essential to the successful operation of a global commercial communications satellite system. The U.S. does not see how, in the proper discharge of its responsibilities and obligations, it can adhere to an agreement which fails to embody such provisions. (Telecomm. Repts., May 10, 1971, also see April 26, 1971.)


NOTES: CHAPTER 18, CONTINUED

26. This is partly speculative, but the possibility of Quebec's linkage to the Franco-German system is said to have been a factor contributing to the Canadian government's urgency in setting up a domestic system. (C. K. Dalfen, "The Telesat Canada domestic communications satellite system," Stanford Journal of International Studies Vol. V, June 1970, p. 93.) In the wake of DeGaulle's "vive Quebec libre" speech, and barely a month after the announcement of the Symphonie project, a Canadian government task force was created in July 1967; the group's work culminated in establishment of the Telesat Canada Corporation in June 1969. (Ibid., p. 89.) French 'cultural assistance' to Quebec continued, and included subsidies to French-language newspapers and the seconding of journalists from France to Quebec in lieu of military service. (Sunday Times (London) Magazine, March 27, 1977.)


31. Ibid., p. 92.


35. Ibid., pp. 93-4.


40. Ibid., pp. 100-1.

41. Ibid., pp. 93, 103, 105-6, 132.

42. Aviation Week, May 17, 1971.

NOTES: CHAPTER 18, CONTINUED


46. R. Colino, quoted in Kildow, op. cit., p. 79.


50. Colino, op. cit. 1973, pp. 41-44.

51. Quoted in Ibid., p. 40.


54. Ibid.

55. Article IX(i),(ii),(iii), Permanent Arrangements. It was anticipated that the 12 countries, in descending order by investment quotas, would be: U.S. 33.28 percent, UK 10.86, Australia 4.32, Japan 4.11, Canada 3.12, France 2.98, Italy 2.49, Germany 2.38, Pakistan 2.37, Spain 1.85, Israel 1.62, the Philippines 1.56. (House Space Committee International Review 1971, p. 21; also Telecomm. Repts., May 24, 1971.)


57. Ibid., March 10, 1969.


60. Ibid., p. 51; Telecomm. Repts., December 8, 1970.


64. Colino, op. cit. 1973, p. 53: Article VIII(6), Permanent Arrangements.
NOTES: CHAPTER 18, CONTINUED


69. Ibid., pp. 48-9; Ablard, op. cit.

70. Ibid.

71. Ibid., p. 46.

72. Ablard, op. cit.

73. U.S. official quoted in Riegel, op. cit., p. 27.


77. Ibid.


82. Ibid.


84. Aviation Week, October 12, 1970.

85. Ibid.

86. Riegel, op. cit., p. 29.

87. Article XIII(a),(b), Permanent Arrangements.


NOTES: CHAPTER 18, CONTINUED

91. Riegel, op. cit., p. 27.
95. Frutkin, op. cit., in Gerbner et. al. (eds.), op. cit., p. 371.
97. Ibid.

CHAPTER 19: AFTERMATH AND CONCLUSIONS

3. See above, Chapter 10, Table II.
4. Ibid.
5. See Snow, op. cit., pp. 65-68, for discussion of this policy and its underlying pricing philosophy.
10. For example, the director-general was empowered to require Comsat to procure services from other sources--or to reduce its fees for those services--if lower cost competitive alternatives were available. (See: Management Services Contract between the International Telecommunications Satellite Organisation and the Communications Satellite Corporation, August 1, 1974 as amended effective December 31, 1976. Washington: Intelsat, p. 15.)
NOTES: CHAPTER 18, CONTINUED


18. Information on regional and domestic systems from Intermedia, August 1975.


25. Ibid.; According to Comsat General President J. Johnson, the U.S. sought only a 15 percent stake in Inmarsat, and was "practically begged" by the other participants to increase its investment quota to 17 percent. (Interview, March 24, 1976, Washington.) Comsat's view apparently had changed by 1979. In August Comsat objected to a decision by the Inmarsat governing council, based in London, awarding the
company a 22.5 percent share; Comsat insisted it was entitled to 30 percent. Twenty-six nations were initial investors in Inmarsat, among them the Soviet Union (15.7 percent), UK (11.1), Norway (8.8) and Japan (7.8). Other countries with shares greater than two percent included: Italy, Greece, the Netherlands, Canada, Spain, Kuwait and Sweden. (Aviation Week, August 20, 1979.)

26. Comsat Ann. Rept. to Shareholders 1975, pp. 2, 10. By 1979, the principal contenders for the contract to provide Inmarsat's space segment were: Intelsat, whose Intelsat Vs—scheduled for launch from mid-1981 to mid-1982—were to include maritime communications packages; MARECS, the ESA operational communications satellites, scheduled for launch in October 1980 and mid-1981, with plans for a third satellite thereafter; and Marisat, already with three satellites in operation launched in March and June 1976 and January 1977, which was hoping to orbit further satellites when those spacecraft—which would soon outlive their projected five-year lives, and which was currently serving 230 ships. (Aviation Week, August 20, 1979.)


NOTES: CHAPTER 19, CONTINUED


41. For general discussion, see: K. Nordenstreng and T. Varis, Television Traffic--A One-Way Street? A survey and analysis of the international flow of television programme material. UNESCO, Department of Mass Communications, Reports and papers on mass communications No. 70. Paris, 1974; Schiller, op. cit. 1969; Nordenstreng and Schiller (eds.), op. cit.


43. Sat. Broadcasting Hearings 1969, p. 4r.

44. Samuel de Palma, in Ibid., p. 117.

45. Gronberg and Nordenstreng, op. cit.

46. For analysis of U.S. broadcasting industry, see: R. Bunce, Television in the Corporate Interest. N.Y.: Praeger, 1976, especially Ch. 2. Domestic opposition to NASA outlays on development of direct broadcasting technology is described in Lessing, op. cit. In 1965 NASA let two small contracts to RCA and GE for experimental direct radio broadcasting from space, and after favourable results asked the House space committee in
late 1966 for another $2.6m for more study. The request was turned down, reportedly after opposition from local broadcasters was expressed.

In preparation for the 1971 WARC the FCC proposed that the U.S. ask for frequencies to be specifically dedicated to direct broadcasting. The provision was opposed by the National Association of Broadcasters, RCA, GE and the CBS affiliates' association. (Telecomm. Repts., January 27, 1969.) Although exclusive frequencies were later requested, they were said to be intended for U.S. domestic telecommunications satellites, not for broadcasting. (Ibid., January 4, 1971.) The WARC did, however, set aside wider exclusive satellite frequencies to permit further experimentation in the direct broadcast field.

47. Sat. Broadcasting Hearings 1969, p. 3r.

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