The relevance of the U.S. satellite environment to the Canadian scene : report Vol. II

prepared by J.C. Strick

REPORT

THE RELEVANCE OF THE U.S. SATELLITE ENVIRONMENT TO THE CANADIAN SCENE

VOLUME II

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This Report is presented in two volumes. Volume I contained the Executive Summary, and Sections A, B, and C. This volume contains Sections D, E, and F, along with the appendix, bibliography and the glossary.

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SECTION D

IMPACT OF STATUTORY AND REGULATORY MEASURES

Rapid advances in technology and changes in the regulatory environment have had a major impact on the telecommunications industry in the U.S. in the last decade. Technology has destroyed the monopoly positions of the traditional carriers, as microwave transmission and satellites have been added to wire and cable transmission. Innovations have led to new services in voice and data communications. Regulations have been changed to permit easier entry into, and fewer restrictions on operations within the various sectors of the telecommunications industry, both domestic and international. A host of new companies have entered the industry, bringing new services and adding to existing capacity, and the established companies have expanded their facilities and services as well.

One of the sectors that has expanded rapidly through changing technology and regulations is the communications satellite sector. From three satellite systems in the 1970s (Westar, Satcom, and Comstar), the early 1980s show twelve systems, either in operation or authorized for operation. While many of the companies behind these systems are either totally or partially engaged in telecommunications (AT&T, GTE, Western Union), there is a trend for firms whose interests

are not predominantly telecommunications to become involved, including some giants in their own fields (IBM, Aetna Life, Hughes Aircraft, Prudential Insurance, Fairchild Industries).

In this Section an attempt is made to examine, within the context of the changing technology and the changes in the regulatory environment, such features as: the changing U.S. satellite communications industry structure (with a profile of the satellite carriers involved); some economic and financial features; new services that are being developed with authorization received or pending; and the relationships between satellites and cable and other broadcasters. Views of regulators and industry analysts and personnel on industry developments, regulation, etc. and their impacts are also presented.

1. Overview of Satellite Industry Structure

The U.S. domestic satellite industry has grown rapidly since the 1972 FCC Domsat decision and its growth in the recent years has accelerated with services becoming continually more varied.

The industry can be viewed as consisting of three components: (1) satellite carriers; (2) satellite services, and (3) manufacturers of hardware and suppliers of components.[1]

The 1982-83 Directory of Regulatory Agencies, Satellite Carriers, Services and Hardware & Component Suppliers, published by Cardiff Publishing Co. listed 20 U.S. registered

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[1]The suppliers of satellite communication services could also be classified under the categories satellite common carriers, resale carriers, networks co-ordinators, systems hardware vendors, and component hardware vendors.
(1) Satellite Common Carriers. These are the basic service providers that own and operate or lease their own satellite systems. They include Comsat, RCA, Western Union and SBS and several others which have received FCC approval to construct their own satellite networks.
(2) Resale Carriers. This is a rapidly emerging industry segment characterized by vendors who buy blocks of satellite time and sell them to users whose communications requirements do not require dedicated channels. Among the earliest companies were Wold Communications and Hughes RD who sold transponder time for broadcast TV use. Companies such as these have expanded their operations into the corporate area offering a variety of services including business teleconferencing.
(3) Networks Coordinators. These companies arrange for satellite time, necessary ground equipment and facilities for corporate meetings and special events.
(4) Systems Hardware Vendors. This category includes the suppliers of earth stations and the vendors who supply complete end-to-end communications networks. They include AT&T, with hardware courtesy of Western Electric, and IBM, with its space segment courtesy of SBS.
(5) Component Hardware Vendors. For those corporate users willing to establish their own private network, the hardware can be pieced together from among the suppliers of earth stations, transponder time, interconnect equipment, and other related equipment.

satellite carrier companies (an increase from 11 in 1981), about 125 U.S. companies offering satellite services, and 315 companies serving as hardware and component suppliers to the satellite communications industry.[1] New companies are continually entering each of these communications sectors.

The satellite carriers (owners/operators) are discussed in detail later in this Section. The companies and entrepreneurs comprising the other two components are too numerous to list and describe, but some of their activities can be highlighted.

The satellite industry service, hardware manufacturing and component supplier firms indicate a large variety of entrepreneurship. Firms have sprouted offering satellite system analysis; satellite systems engineering; leasing and sales of equipment; personnel placement service in the satellite communications industry; consulting for private networking; ad hoc networking; transponder re-sale; weekly newsletters and magazines covering satellite communications and development; video teleconferencing; market research reports; audio and video teleconferencing design and production studios; earth station installation and antenna erections; marketing, economic and regulatory studies; training programs for technicians; satellite shows and conferences, etc. The list goes on and on.

Manufacturers of hardware and equipment include

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[1] Satellite Communications, 1982-83 Directory of Regulatory Agencies, Satellite Carriers, Services and Hardware and Component Suppliers.

manufacturers of satellites, earth stations, antennas, receivers, converters, towers, amplifiers, electronic test equipment, etc., and a host of accessories. The primary suppliers of satellite earth stations are Rockwell International/ Collins, Scientific-Atlanta Inc., and GTE International Systems Corp. Together they are reported to command two-thirds of the market. There are between 15 to 20 other suppliers of commercial satellite receivers, and dozens of suppliers of home satellite antennas.

In the U.S. there are three companies engaged in the design and manufacture of communications satellites and satellite systems, namely, Hughes Aircraft Co., RCA Astro-Electronics, a subsidiary of RCA Corp. and Ford Aerospace and Communications Corp. Hughes claims to have approximately 70 percent of this market.

NASA, of course, has had the satellite launching business in the U.S. all to itself, using a variety of launch vehicles, and more recently adding the space shuttle to its launch facilities. NASA's role in the U.S. space program and in communications satellites is treated later in this Section.

2. Profiles of Domestic Satellite Carriers

Table D-1 provides a summary of the organization and activities of U.S. domestic satellite carriers. The following pages expand and elaborate on some of the features and services of these carriers, some of which are currently operational while others are preparing operations. These carriers provide the framework or base for commercial satellite communications in the U.S. The satellite carriers covered are:[1]

Alascom Inc.
American Satellite Co.
American Telephone & Telegraph (AT&T)
Communications Satellite General Corp. (Comsat General) and its parent Communications Satellite Corp. (Comsat)
GTE Satellite Co.
Hughes Communications Inc.
RCA American Communications Inc.
Satellite Business Systems (SBS)
Southern Pacific Satellite Co.
Space Communications Co.
United States Satellite Systems (USSS)
Western Union Telegraph Co. (WU)

Of these commercial services, Western Union, RCA Americom, Alascom, Comsat General, and SBS currently operate their own fleet of satellites. The remaining companies leased satellite capacity on the existing systems, but are in the process of launching their own satellites.

Further information on the features of the satellites (both launched and planned) of these satellite carriers is contained in Table D-2, including number of transponders, operating frequencies, lifetime, and orbital location.

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[1] Not included are some of the companies recently authorized to introduce direct broadcast satellite systems.

TABLE D-1

U.S. DOMESTIC SATELLITE CARRIERS

Satellite Carrier

1. Alascom Inc.

System: Satcom

Launch date: Alascom I (Satcom V) - 1982

Service: Long lines carrier for the state of Alaska. Provides video, voice, and data communications services within Alaska and between Alaska and the remainder of the U.S.

Owner: Pacific Power and Light. Purchased Alascom from RCA in 1979 for $200 million. Pacific Power & Light is a public utilities company engaged in electric power, telecommunications, oil and gas exploration, etc. operating in the North-west States.

Operations 1981	$ Million
Revenues	721
Net Income	167
Assets	3,262

Table D-1 (continued)

Satellite Carrier

2. American Satellite Co. (ASC)

System: Owns 20% of Westar system.

Planned Launch: ASC1-1985; ASC2-1986.

Services: Private line voice and data services to major cities; business video-teleconferencing.

Operations 1981	$ Million
Assets	141
Sales	44
Net Income	2

Owners: Jointly owned by Continental Telephone Co. and Fairchild Industries.

1981 Operations	Fairchild Ind. ($ million)	Continental Tel. ($ million)
Sales	1,378	1,197
Assets	902	3,544
Net Income	64	143
Business	Govt aerospace & commercial aerospace	Telecommunications

Table D-1 (continued)

Satellite Carrier

3. American Telephone & Telegraph Co. (AT&T)

System: Lease Comstar satellites from Comsat General Corp.

Planned Launches: Telstar 3 satellites - 1983, 1984, 1985.

Satellite Services: Integrated with AT&T terrestrial network to provide MTS/WATS services; domestic TV; private line; government communications.

Operations 1981

Revenues	$ million
Local Service Revenues	
Service & equipment	21,728
Message charges	2,325
Public telephones	862
Private line & others	638
Toll Service Revenues	
Message charges	22,233
WATS	4,488
Private Line	3,527
Other	3,002
Total	58,214
Assets	137,749
Net Income	6,881

Table D-1 (continued)

Satellite Carrier

4. Communications Satellite General Corp. (Comsat General)

System: Owns Comstar satellites, leased to AT&T.

Launch dates: Comstar D1-D4, 1976, 1978, 1981.

Services: Leases the communications capacity of its Comstar satellites to AT&T for U.S. domestic communications, furnishes maritime communications services through the Marisat satellites, and provides technical services world-wide.

Owner: Communications Satellite Corp. (Comsat)

Comsat carries out its responsibilities under the Communications Satellite Act. Comsat is the U.S. participant in Intelsat and Inmarsat. Has one-third ownership of Satellite Business Systems. Plans to offer DBS services through its subsidiary, Satellite Television Corp.

Operations 1981	$ million
Revenues	334
Assets	599
Net Income	40

Table D-1 (continued)

Satellite Carrier

5. GTE Satellite Co.

Planned System: G-Star 1 & 2 - 1984; G-Star 3 - 1985.

Services: Custom digital network for private companies, government, voice, data, and video distribution.

Owner: GTE Corporation. GTE is the second largest telephone company in the U.S. with widely dispersed companies serving 4 million people. Operates Comstar system with AT&T.

Operations 1981	$ Millions
Revenue	
Telephone operations	6,800
Other	4,100
Total	10,900
Assets	7,562
Net Income	722

In 1982 GTE Corp. announced its intention of purchasing all of the stock of Southern Pacific Communications Corp. by mid 1983.

Table D-1 (continued)

Satellite Carriers

6. Hughes Communications Inc.

Planned System:	Galaxy
Planned Launches:	Galaxy I - 1983 Galaxy II- 1984
Services:	Transponder capacity to large communications users -- HBO, Turner Broadcasting, Times-Mirror -- to which it has sold 16 of 18 transponders on Galaxy I.
Owner:	Hughes Aircraft Co. (which is itself owned by the non-profit Hughes Medical Institute). Manufacturer of aerospace equipment, satellites, earth stations, etc. Revenues 1981 - $2.4 billion.

Table D-1 (continued)

Satellite Carrier

7. RCA American Communications Inc. (RCA Americom)

System: Owns & operates Satcom satellites

Launch dates:
Satcom I - 1975
Satcom II - 1976
Satcom IIIR - 1981
Satcom IV & V 1982

Planned launches: Satcom VI - 1983; DBS satellites, 1985-87.

Services: Private line voice, television and data services to the cable television and broadcast industries, other businesses, and the federal government. Introducing a DBS system.
Revenue split: 40% from video services; 60% from government, both data and video.

Subsidiaries: RCA Americom Services. Provides video taping, editing and playback services.

Owner: RCA Corporation. Company and subsidiaries manufacture radios, TVs, equipment for broadcast, cable TV and communications; military and space electronic equipment; operates TV and radio stations; audio records and videotapes; renting and leasing of automobiles (Hertz).

Operations 1981	$ million
Revenues	
Product sales	4,018
Broadcasting, communications, etc.	3,987
Total	8,005
Assets	7,856
Net Income	54

Table D-1 (continued)

Satellite Carrier

8. Satellite Business Systems (SBS)

System: Owns & operates SBS satellites.

Launch dates: SBS 1 - 1980
SBS 2 - 1981
SBS 3 - 1982 (from space shuttle Columbia)

Planned launches: SBS 4 - 1984; SBS 5 - 1986.

Services: Complete voice, data, facsimile, and teleconferencing services to large corporations. Skyline service -- national network of satellites, earth stations and switching centers for interstate long-distance telephone service to residential and small business customers.

Owners: Equal ownership by IBM, Comsat General Corp. and Aetna Life.

Operations 1981	IBM	Comsat	Aetna
		($ million)	
Revenues	29,070	334	13,532
Assets	29,586	600	39,630
Net Income	3,308	40	462
Business	Information handling systems; computers & electronic equip. & services	Telecommunications services via satellite. Parent of Comsat General.	Full line insurance; diversified investments.

Table D-1 (continued)

Satellite Carrier

9. Southern Pacific Satellite Co. (SPS)

Planned System: Spacenet

Satellite Launches: Spacenet 1 & 2 - 1984; Spacenet 3 - 1985.

Service: Lease satellite transponders mainly to video users.

Owner: Southern Pacific Communications Corp.
Specialized common carrier with long distance telephone service. Operates Sprint, a microwave long distance communications service. Company plans to use 20% of Spacenet capacity.

Southern Pacific Communications Corp. is itself a subsidiary of Southern Pacific Company, a holding company conducting business through subsidiaries, providing transportation services by rail and truck, pipelines; real estate; natural resources; communications; insurance and financial services.

Operations 1981	$ million
Revenues	3,272
Assets	5,500
Net Income	168

Equity Share in SPS. Prudential Insurance Co. of America. In return forcapital financing for SPS, Prudential will receive a 20% equity share.

Note: In late 1982 GTE offered to purchase Southern Pacific Communications Co.

Table D-1 (continued)

Satellite Carrier

10. Space Communications Co.

System:	TDRSS
Planned launches:	4 TDRSS/Advanced Westar satellites.
Services:	Lease satellites to NASA. Satellites will be used exclusively by NASA as a tracking and data relay satellite system (TDRSS).
Owners:	Western Union (50%); Fairchild Industries (25%); and Continental Telephone (25%) (Fairchild and Continental own American Satellite Co.) In early 1983, Fairchild and Continental reached an agreement with WU to acquire WU's interest in Spacecom.

Table D-1 (continued)

Satellite Carrier

11. United States Satellite Systems Inc.

System:	USSS1
Planned launch:	USAT-1 and 2 satellites - 1985-86.
Planned Service:	Domestic satellite system for business users. Offer voice, data, and teleconferencing services. Customers will have the option of providing their own earth stations.
Owners:	Three individual entrepreneurs with financial backing by Manufacturers Hanover Trust (MHT has assets of $54 billion).

Table D-1 (continued)

Satellite Carrier

12. Western Union Telegraph Co. (WU)

System: Owns and operates Westar satellites.

Launch dates: Westar I & II - 1974; Westar III - 1979; Westar IV & V - 1982

Planned Launches: Westar VI - 1983; Westar 7-11 - 1984-86.

Services: Integrated into WU's terrestrial microwave system to carry telex, mailgram, voice, and data for WU. Distributes TV and radio for users including Public Broadcasting System, ABC, NBS and others. Sells transponders to commercial users.

Investment in Satellites and Related Equipment: $156 million as of December 31, 1981.

Operations 1981	$ million
Revenue:	
Teletypewriter networks	312
Private wire, satellite & related services	264
Telegram message services	71
Mailgram services	107
Money Order Services	81
Other	71
TOTAL	907
Net Income	69
Assets	1,868

(1) Alascom Inc.

Alascom Inc. is the long lines carrier for the state of Alaska. It provides video, voice and data communications services within the state of Alaska and between Alaska and the remainder of the U.S.

Alascom Inc. is a subsidiary of Pacific Power & Light Co., which purchased it from RCA Corp. in 1979 for $200 million. As an RCA subsidiary it was called RCA Alasca Communications (RCA Alascom). RCA Alascom was one of the first applicants for a U.S. domestic satellite and together with RCA Globecom, an international record (data) carrier, started the first domestic satellite service in 1973 by building earth stations and leasing transponder channels from Telesat Canada on Anik II. On order of the FCC it later shifted to Western Union's Westar system, and in 1975 to RCA's own Satcom I satellite.

In late 1982 Alascom launched its own satellite from Cape Canaveral, Alascom 1, which was Satcom V, purchased from RCA for $84.5 million. RCA Americom will operate the satellite jointly with Alascom, who will pay RCA Americom $875,000 a month to 1991 to operate the satellite.[1] Placed in geostationary orbit above the equator, it is to be used by Alascom for communications services previously provided by leased satellites. Four transponders will be leased back to RCA Americom for $1.6 million per transponder per year, to be used by RCA Americom

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[1] Moody's Public Utilities Manual, 1982. Moody's Investor Service, New York.

to expand its government and commercial communications services.

In late 1982 Alascom was awarded a $40 million contract by the General Services Administration for the installation and maintenance of a satellite voice communications system which will serve the telecommunications needs of the federal government, offering private line services between Alaska and the lower states.[1]

(2) American Satellite Co.

American Satellite Co. (ASC) provides private line services to major cities, wideband communications using dedicated earth stations located on customers' premises, and two-way business video teleconferencing service.

ASC presently has more than 100 earth stations operational or under construction and provides its services to over 250 customers across the U.S. Customers include the Wall Street Journal, Boeing Computer Services, Exxon, E. F. Hutton, Pam Am Airways, Texas Instruments, Robinson-Humphrey, and Bank of America.

ASC listed its assets in 1982 to total $141 million, and expects this to increase to over half a billion dollars by 1986.[2] It made a profit for the first time on its satellite operations in 1982, reportedly to be about $2 million on

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[1] Communications News, November 1982, p. 10.

[2] Satellite Communications, November 1982, p. 22.

revenues of $44 million. Losses in previous years ranged from $5 to $10 million.[1] Revenues in 1981 and 1980 were $25 million and $18 million respectively. Revenues of $61 million are forecast for 1983.[2]

ASC is a jointly owned subsidiary of Fairchild Industries and Continental Telephone Co. As the revenue increases show, it is a rapidly growing company. Its staff has increased from 290 in 1981 to 437 in 1982.

To keep costs down, ASC had passed up the prestige of launching its own fleet of satellites. Instead, it bought a 20 per cent interest in Westar, the Western Union system. By offering cut-rate voice and data transmission, ASC has wrested some business from AT&T. It has also pried a major customer from Satellite Business Systems (SBS) as early in November 1982, Allstate Insurance signed a five year contract worth some $70 million to ASC.[3]

ASC plans, however, to launch its own satellite system with the first satellite scheduled for launch in 1985. The company's decision to launch and operate its own fleet of satellites was based on two major considerations:[4]

(1) ASC owned satellites would ensure continuity of service, making the company independent of other satellites and transponders scattered over a number of satellites. The

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[1] The Commercial Satellite Communications Market in North America, Frost & Sullivan, N.Y., 1979, pp. 151-152.

[2] Statement by ASC President, W. Paschall, reported in Satellite Week, October 4, 1982.

[3] Fortune, November 15, 1982, p. 11.

[4] Information from ASC.

President, L. Paschall, stated that the future of the company depended on an assured space segment.[1]

(2) Owning satellites could enhance ASC's image as a sound, well established company and this image could assist in attracting potential major customers (i.e. "We're no fly-by-nite operation").

To finance this system, ASC has arranged a $350 million credit line with a syndicate of 12 banks.[2] ASC claims this credit is independent of its parents, Fairchild and Continental Tel. and is one of the largest unsecured loans ever extended to a domestic satellite carrier.

ASC recently announced a joint effort between ASC and Tandem Computers for continuous on-line transactions processing, distributed data processing, and information management systems. ASC will provide satellite capacity and earth stations, while Tandem will provide the computer hardware.[3]

ASC also recently signed an agreement in principle with Mitel Corp. of Canada under which a new U.S. specialized common carrier will be formed. The new carrier will combine ASC's satellite transmission facilities with the Mitel SX-2000 integrated communications system to provide switched long distance voice, data, video-conferencing and value added services via satellite to business users. ASC will own 75 per

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[1] Satellite Week, October 4, 1982, p. 2.

[2] Satellite Communications, November 1982, p. 22.

[3] Ibid., July 1982, p. 1.

cent and Mitel 25 per cent of the new company. ASC claims to have entered the agreement with Mitel because of Mitel's excellent switching hardware, as well as to obtain financial assistance for the new venture.

The new carrier is to begin operations in 1984 and ASC anticipates that it will bring about $250 million in revenues by the end of its fifth year. Initial service is scheduled for seven major cities with more cities added later. Users of the new private network will access it through their own PBX's and terrestrial lines to ASC earth stations. ASC claims that users will be able to save 20-30% over comparable long-distance services.[1]

The arrangements with Tandem and Mitel reflect ASC's expansion policies -- to build the company in stages, frequently joining with hardware component companies which serve as suppliers for the equipment needed.

ASC has deliberately avoided entering the satellite TV market including DBS with its satellite services because of RCA Americom's entrenchment in the area and the intentions of the relatively large number of other companies to zero in on satellite TV and DBS. ASC has reservations regarding whether the satellite TV market was sufficient to make so many entrants profitable. ASC chose instead to concentrate on data and voice services, viewing voice as likely the more profitable of the two.[2]

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[1]Reported in Satellite News, December 20, 1982.

[2]Information from ASC.

The customers on which ASC has set its sights are the large U.S. firms (Fortune's 500) which have operations and subsidiaries in various parts of the country.[1]

In an interview with Satellite Week recently, ASC President L. Paschall stated: "ASC has all the ingredients for massive expansion to make the company AT&T's leading competitor in the business communications marketplace.[2]

(3) American Telephone & Telegraph Co. (AT&T)

AT&T began leasing Comstar satellites from Comsat General Corp. in 1976 to provide domestic satellite communications services. Initially AT&T was limited by the FCC to utilize satellites only for the regular message traffic (MTS/WATS) for a three year period. No private line could be handled, including voice, data and television. These restrictions were later lifted and AT&T began to use satellites for private line service and domestic TV. Following the FCC Computer Inquiry II decisions in 1980 and 1981, AT&T was permitted to enter the deregulated enhanced service market, but only through a fully separate subsidiary.[3]

AT&T leases transponders on the Comstar satellites to GTE Satellite Corp., and the earth station facilities for the

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[1]Information from ASC.

[2]Satellite Week, October 1982.

[3]In Computer Inquiry II the FCC identified two types of telecommunications services: "basic services" -- common carrier offering of transmission capacity for the movement of information; and "enhanced services" -- all other telecommunications services.

Comstar system are provided by AT&T and GTE Satellite. In 1981 AT&T was offering transponders on the Comstar D-2 satellite for lease for about $1.6 million per transponder year, including earth station services.[1]

In December 1980 the FCC authorized AT&T to construct a satellite system (Telstar 3) with authority to launch two satellites to replace two Comstar satellites currently leased from Comsat General when those satellites reach the end of their design lifetime. AT&T's Telstar 3 system will begin in the summer of 1983 when the first Hughes-built Telstar 3 is to be launched. The second and third Telstar satellites are scheduled for launch in 1984 and 1985 respectively.[2]

Many rival companies feared AT&T's entry into the deregulated enhanced telecommunications market because of its highly dominant position, immense resources, and possible cross-subsidization between basic services (MTS/WATS) and other services. AT&T's entrance into satellite communications and the various potential services of satellites had also caused concern among competitors. AT&T's access to the capital market make it readily easy for it to raise huge amounts of capital to finance new and/or extended operations, and to finance research and technological innovations through Bell Labs. This is evident from AT&T's recently announced plans to increase the equity of its common stock by 10 per cent or roughly $1 billion. The funds are to be used for general corporate

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[1] Satellite Communications, August 1981, p. 67.

[2] Communications News, March 1982, p. 72.

business and for advances to subsidiaries and associated companies.[1]

(4) Communications Satellite General Corp.

Communications Satellite General Corp. (Comsat General) is a wholly owned subsidiary of Communications Satellite Corp. (Comsat). Comsat was incorporated in 1963 as authorized by the Communications Satellite Act of 1962. Two segments of its operations are:

(i) Jurisdictional Satellite Systems Services -- encompass the activities undertaken by the corporation to carry out its responsibilities under the Act. These activities are handled by Comsat World Systems Division, ensuring full separation of these activities from the corporation's other operations, which are conducted through wholly owned subsidiaries. Comsat is the U.S. participant in Intelsat and Inmarsat, and Comsat World Systems Division uses the satellites of Intelsat to provide services to and from the U.S., and furnishes marine communications services through the satellites of Inmarsat. It served as a "carrier's carrier" leasing satellite circuits to U.S. overseas carriers.

(ii) Non-Jurisdictional Satellite Systems Services -- include the business the corporation pursues through the Comstar and Marisat satellite systems. These activities are conducted by Comsat's subsidiary, Comsat General Corp.

Comsat General owns the Comstar satellites. It leases

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[1] Telephony, January 3, 1983, p. 42.

the communications capacity of these satellites to AT&T for domestic communications, furnishes maritime communications services through the Inmarsat satellites, and provides technical services world wide. The Comstar system has been described earlier. The Inmarsat commercial system consists of satellites over the Atlantic, Pacific, and Indian Oceans. It provides high-quality voice, data, facsimile, and teleprinter service to ships at sea.

In August, 1982, the FCC lifted the restriction confining Comsat to function as a "carrier's carrier," allowing it to serve the public directly and to compete for customers with other international common carriers.[1] To ensure that Comsat does not use its position in Intelsat to deal unfairly with its competitors, the FCC required the company to offer public services through a separate corporate subsidiary. This decision allowed Comsat to enter the end-to-end service market through a separate entity, free to offer leased channel, switched or any other service directly to end users.

In addition to Comsat General, Comsat has a one-third partnership interest in Satellite Business Systems and has created a new subsidiary Satellite Television Corp., through which it has authorization to introduce and operate a direct broadcast satellite system. The FCC, however, has restricted the amount of investment by Comsat into this subsidiary to $225 million. The FCC also ordered Comsat to terminate its relationships with AT&T and GTE because of its participation

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[1]FCC, Docket 80-170, August 1982.

in SBS. Consequently, as the Comstar satellites end their operations, AT&T and GTE will launch their own satellites (Telstar and G-Star) to replace them.

In December 1982, Comsat registered with the Securities and Exchange Commission for a public offering of one million shares of common stock. Funds from the offering would be used for various purposes including expenditures for development of the Satellite Television Corp., Comsat's DBS subsidiary. The offering was the first by Comsat since its initial stock sale in 1964.[1]

(5) General Telephone & Electronics Satellite Corp. (GTE Satellite)

GTE Satellite Corp. is a subsidiary of GTE Corp., the second largest telephone company in the U.S. GTE Satellite leases satellite transponders from AT&T on the Comstar system, and uses the satellites and large earth stations to connect GTE widely dispersed telephone companies, which serve more than 4 million customers.

GTE Satellite Corp. has received FCC approval to launch its own satellites, as the Comstar satellites near the end of their lifetime. The company has contracted for three high-capacity 14/12 GHz domestic satellites for digital voice, data, and video distribution. The launch dates are May and August 1984 using the French Ariane 3 launch vehicle.

RCA Astro-Electronics is constructing these satellites

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[1] Telephony, December 20, 1982, p. 14.

for a cost of approximately $100 million.[1] The G-Star satellite will serve all 50 states and will be capable of handling 30,000 simultaneous telephone calls.[2]

GTE has started construction in Los Angeles, Chicago and Houston on earth stations for a private line satellite communications system. The system will provide private line transmission services for large and small companies with multiple city locations. According to a preliminary tariff schedule, a monthly charge for a voice channel between Los Angeles and Houston would be $700, and a Houston to Chicago channel would cost $500. Data will be transmitted at low and high speeds. Monthly charges for lower speed transmission would range from $600 between Houston and Chicago, to $900 between Los Angeles and Houston or Chicago. For the fastest speed, the cost between Houston and Chicago would be $3,000, and between Los Angeles and Chicago or Houston, $3,500.[3]

GTE Satellite Corp. has sought FCC approval to initially begin a four-city service and has filed tariffs with the FCC.

GTE recently offered to purchase Southern Pacific's communications business for a reported $750 million, including its long-distance Sprint service. The four-year-old Sprint network has captured about 1 per cent of the $40 billion long distance market (AT&T has 96 per cent), and showed its

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[1] Communications News, March 1982, p. 72.

[2] Ibid.

[3] Telephony, September 13, 1982, pp. 18-20.

first profit in 1981. The president of GTE, T. F. Brophy, claims the acquisition will result in a more vigorous level of competition with AT&T.[1]

The FCC and anti-trust regulators must approve the deal, and one of Sprint's long distance rivals, MCI Communications, has stated that it will try to block it as anti-competitive.

In December 1982 the Department of Justice acted to block the purchase, requesting more time to access the competitive implications of the proposed acquisition.

(6) Hughes Communications Inc.

Hughes Communications Inc. is a subsidiary of Hughes Aircraft Co., a long-time builder of communications satellites.

Hughes Communications Inc. is preparing, and has FCC authorization for its own satellite system, the Galaxy system. Galaxy I is scheduled for a May 1983 launch, and Galaxy II is scheduled for September 1983. Galaxy III is planned for 1984, subject to FCC approval on the basis of a showing of need.

Galaxy I will be devoted to cable TV, but rather than leasing transponders, Hughes has been selling Galaxy I transponders. Hughes expects to cut deeply into the CATV satellite business, up to now the preserve of RCA's Satcoms. Sixteen of the transponders on Galaxy I have been sold, primarily to cable TV companies. Buyers were as follows: HBO (6); Westinghouse (4); Turner (2); Times-Mirror (2); Viacom (2).[2]

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[1] Fortune, Nov. 1, 1982, p. 13.

[2] Satellite Communications, December 1981, p. 44.

Galaxy II and III will be devoted to voice and data communications. Hughes has signed an agreement in principle to sell 24 transponders to MCI to be used in its telecommunications network.[1]

At the time of filing with the FCC for the Galaxy launches, Hughes estimated costs for the three satellites to total about $112 million, with an additional $60 million for the launching of Galaxy I and II.[2]

Hughes Aircraft Co. claims to have 70 per cent of the communications satellite construction market. Hughes was recently awarded a $700 million contract to develop and build five satellites for Intelsat. About 22 per cent of the award will be subcontracted to foreign contractors, including Spar Aerospace of Canada, and Comdev of Canada. Intelsat also has options for 11 additional spacecraft that could eventually raise the total value of the contract to $1.6 billion. The first Intelsat VI satellite, the largest commercial satellite ever built, with a 33,000 two-way telephone circuit capacity, will be delivered in late 1985 for launch early in 1986.[3]

Another of Hughes Aircraft Co. subsidiaries engaged in satellite communications is Hughes Communications Services Inc. (HCSI), which provides military communications services. HCSI operates the Leasat Communications satellite system with related ground service facilities and communication satellite service to the U.S. Navy and other agencies in the Department of Defence. Scheduled for launch in 1982, the first of four Leasat satellites was delayed until 1984, when two satellites

[1] Telecommunications Reports, February 7, 1983.

[2] Satellite Communications, December 1981, p. 44.

[3] Telephony, April 12, 1982, p. 11.

will be launched and another two in 1985. The total value of the contract is reported to be $335 million, including earth stations and control facilities.[1]

(7) RCA American Communications Inc.

RCA Americom is a wholly owned subsidiary of RCA Corp. RCA Corp., through its subsidiaries RCA Globecom and RCA Alascom, began providing satellite services in December 1973, when it leased channels on Telsat Canada Anik II satellite and then launched its own, Satcom I and II in 1975 and 1976. In 1975 the FCC required RCA to establish a new subsidiary if it wished to carry on in the satellite communications business (to avoid the potential of cross-subsidization between companies), and as a result RCA Americom was created.

RCA Americom provides satellite private line voice, television, and data services. Most of RCA's satellite system is being used for cable TV distribution.

Satcom IIIR, a replacement for the original Satcom III which was lost in 1979 during launch, was launched in 1981, followed by Satcom IV and V in 1982. Satcom V was sold to Alascom Inc. Satcom IIIR relieved traffic from Satcom I which was the primary cable TV satellite. In March 1983, RCA plans to launch Satcom IR, to replace Satcom I. Satcom IV will become operational on April 1, 1983 and RCA Americom has received permission from the FCC to make certain transponders available for lease at a fixed price of $13 million each for

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[1] Satellite Communications, March 1982, p. 69.

the period April 1983 to December 1989, which was the average bid at its attempted 1981 auction. RCA submitted that the rate of $13 million was supported by the cost of providing service.[1]

The new satellites launched by RCA Americom are the first solid-state satellites to be launched, using solid-state power amplifiers instead of the traditional travelling wave tube amplifiers.[2]

In November 1981, RCA Americom attempted a new approach for leasing transponders on Satcom IV. RCA used an auction, in which 53 bidders participated, and lease rights to seven of the 24 transponders yielded $90.1 million. Prices ranged from $10.7 million to $14.4 million. However, the FCC invalidated the auction results, ruling that the RCA auction was discriminatory because the transponders had been bid on separately, resulting in different amounts for the winning bids.

RCA Americom continues to expand and in late 1982 acquired for $30 million, Cylix, a privately held corporation in Memphis, Tenn., which provides "value-added" data communications services through the use of high-speed computers and a domestic satellite network.

Another of RCA Corp's subsidiaries engaged in satellite communications services is RCA Global Communications Inc. RCA Globcom is a common carrier principally engaged in business of furnishing overseas voice/record communications. It operates a system of satellites, submarine cable, and radio circuits for this service which includes telegrams, telex, leased (private

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[1] Communications News, April 1982, p. 1.

[2] Ibid., March 1982, p. 72.

line) teleprinter circuits, and data and program transmission. RCA's Globcom's subsidiary, RCA Globecom Systems, Inc. is engaged in installation of communications switching systems and also provides resale communications services.[1]

(8) Satellite Business Systems (SBS)

SBS, created in 1976, is a joint partnership of Comsat General, International Business Machines (IBM), and Aetna Life and Casualty Co. It has three satellites in orbit, SBS 1,[2] launched in 1980, SBS 2 in 1981 and SBS 3, launched from the space shuttle Columbia in late 1982. (SBS paid $8 million to NASA for the launch.) SBS plans a fourth satellite for June 1984. It has been a rapid growth company, with a staff increasing from about 250 in its early years to over 1,800 personnel today.

SBS offers integrated voice, data, electronic mail and video services in the high frequency 14/12 GHz band. The signals are all digital. It includes among its customers IBM, Aetna, General Motors and Westinghouse. Use of the high frequencies avoids interference with land microwave systems and permits use of small earth stations directly at customers premises (roof top or parking lot). SBS also offers Business Message Service (BMS), a type of long distance telephone service for

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[1] Moody's Industrial Manual, 1982, Moody's Investors Service, New York.

[2] SBSI cost $20 million to build and $23 million to launch. Moody's Industrial Manual, 1982, Moody's Investors Service, New York.

large business customers, similar in nature to the WATS service provided by AT&T. BMS will utilize a network of dispersed earth stations and SBS satellites for intercity voice transmission, interconnected with local exchange telephone lines.[1]

SBS has recently introduced its Skyline service, an interstate long distance telephone service for residential and small business customers. This service is designed to supplement BMS.

SBS is planning for the so-called Office of the Future, providing word-processing, text-editing, teleconferencing, etc. through its communications network to both business and government.[2] SBS has chosen to concentrate on developing its voice and data business rather than television, believing that the former is largely an untapped market and is the market of the future.[3]

SBS applied for international common carrier status, for which it received FCC approval in late 1982. The FCC gave SBS permission to provide high-speed private line, digital transmission service between the U.S. and the U.K. The agreement was arranged between SBS and British Telecom International and the two companies will begin the new service in January 1983. SBS is discussing similar arrangements with other European telecommunications organizations and with Telesat

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[1]W. D. English, Vice-Pres. SBS, "SBS and the North American Telecommunications Environment," Paper presented at the Online Conference on Satellite Communications. Online Publications Ltd., Middlesex, England, 1980, pp. 25-39.

[2]Ibid., p. 39.

[3]Information from SBS.

Canada. SBS contends that it was to a degree forced into the international market with its own facilities. It feared that if it had to refer its customers to another carrier (i.e. AT&T) for international service, AT&T might attempt to attract that customer to its own domestic services.[1] Another reason for involvement in international operations, of course, is that it is a highly profitable operation. (The FCC stressed the high rates and profitability of international communications in its decision to permit U.S. domestic carriers into the international arena.)

(9) Southern Pacific Satellite Co. (SPS)

Southern Pacific Satellite Co. is a subsidiary of Southern Pacific Communications Corp. (SPCC), which is itself a subsidiary of Southern Pacific Co., a holding company engaged in transportation, communications, real estate and financial services.

SPCC is a specialized common carrier, the second largest (after MCI). Its principal product, Sprint, is a long distance communications service accessed through regular local telephone lines. SPCC has been leasing satellite capacity to provide its services, but has received FCC authorization to launch its own family of satellites known as Spacenet.

The Spacenet system will consist of three satellites. Spacenet I and II are scheduled for launch in February 1984 and August 1984 respectively. Built by RCA Astro-Electronics,

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[1]Information from SBS.

each satellite will have 24 transponders. Spacenet I will be dedicated mainly to cable TV. A consortium to ensure that Spacenet I will be a cable TV satellite has been formed by Satellite Syndicated Systems and other transponders lessors. The plan, called Earthnet I, will involve placing up to 1,000 earth stations, serving 70 per cent of all cable homes, to receive programming from the satellite.[1]

Spacenet II will be used for voice, video and data services. About 20 per cent of the Spacenet system will be used for Southern Pacific Corp's telecommunications requirements.[2]

The first three Spacenet satellites will cost $100 million to construct. The launch vehicle will be the Ariane. SPCC estimates the entire project to cost about $330 million. According to reports, SPCC has been seeking partners to help finance the system. General Electric, American Express, and Cox Broadcasting have frequently been mentioned.[3] A recent report is that financial assistance has been secured from Prudential Insurance Co. of America. Prudential has agreed in principle to provide $135 million over a 3-year period to Southern Pacific Satellite Co. under an arrangement which would give Prudential a 20 per cent equity interest.[4]

In December 1982 SPS was given authorization by the FCC

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[1] Communications News, March 1982, p. 73.

[2] Moody's Transportation Manual, 1982. Moody's Investors Service, New York, p. 228.

[3] Satellite Communications, May 1982, p. 62.

[4] Telephony, October 4, 1982, pp. 90-91.

to offer transponders on its Spacenet II satellite on a non-common carrier basis. SPC plans to offer on a non-common carrier basis only 10 transponders on the Spacenet II and III. Transponders on Spacenet I and those remaining on II and III will be used to provide common carrier services.[1]

As discussed earlier (see profile on GTE Satellite Corp), GTE Satellite Corp. has offered to purchase Southern Pacific Corp's communications Operations. The deal appears to signal a decision by Southern Pacific to concentrate on its railroad business.

(10) Space Communications Co. (Spacecom)

Spacecom was established as a Western Union Telegraph Co. subsidiary in 1976 to establish a communications satellite system to be used in part to provide service to NASA. A portion of the system could also be used for commercial service. In 1980, Western Union sold 50 per cent of Spacecom to American Satellite Co., the subsidiary of Fairchild Industries and Continental Telephone. In early 1983, Fairchild and Continental purchased the remaining WU share.

The original plan called for four satellites -- two to be used exclusively by NASA as a Tracking and Data Relay Satellite System (TDRSS), one for both TDRSS and commercial service, and one exclusively for commercial service. The system was to be known as the TDRSS/Advanced Westar System. The basic construction and launch costs were to be financed by borrowings

[1] Communications News, January 1983, p. 9.

from the Federal Financing Bank with operation and maintenance costs (estimated at between $8-10 million annually) borne by Spacecom.[1]

In late 1982, however, an agreement was revealed that scrapped the plans for commercial use of the system.[2] Under the new arrangements NASA will have full control of the TDRSS for its own needs and that of the government, eliminating conflicts with commercial users.

(11) United States Satellite Systems Inc. (USSSI)

USSSI is a private company with financial backing from Manufacturers Hanover Trust. It is one of the newest applicants to enter the communications satellite field, filing an application with the FCC in November 1981 to build and operate a domestic satellite system for business users offering voice, data and color video conferencing services. Plans call for two orbiting 14/11 GHz satellites, with operations to begin in 1985.

Customers will have the option of providing their own earth stations. USSSI will provide only the space segment for businesses that set up their own networks. The system is designed to allow small and medium-sized businesses to set up

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[1] Moody's Public Utility Manual, 1982, Moody's Investors Service, New York, pp. 3792-3798.

[2] Spacecom was reportedly paid $216 million by NASA for relinquishing commercial use by WU and ASC. Satellite News, December 20, 1983.

low cost networks. It will cut space segment costs by allowing users to lease portions of transponders.

In late 1982 USSSI announced that it was initiating a project to examine the feasibility of showing satellite-delivered high-definition TV productions on giant screens in "video center" theaters.[1] USSSI stated that this was an effort to develop "innovative uses of transponders to a broad base of users."[2]

In January 1983 USSSI reached an agreement in principle with Wang Laboratories, which calls for Wang to acquire both a minority ownership position in and satellite transponder capabilities from USSSI.[3] Wang's major customers will be able to own or participate in their own national communications networks of Wang-based systems, complete with voice, data, video and text transmission capabilities. The satellites USAT-1 and USAT-2 will offer KU-band high frequency capabilities and are scheduled for launch in 1986.

(12) Western Union Telegraph Co. (WU)

Western Union launched its first two Westar satellites in 1974, followed by Westar III in 1979, and Westar IV and V in 1982. Westar VI is scheduled for December 1983. The first three satellites each have 12 transponders, the others have 24.

The Westar satellite system has been integrated with

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[1] Satellite News, December 20, 1982.

[2] Ibid.

[3] Telephony, January 10, 1983, p. 84.

WU's terrestrial communications system to carry telex, mailgram, voice and data for WU. The system also serves private users and television broadcasters, including ABC, NBS and Public Broadcasting. Transponders are sold to commercial users who require significant amounts of capacity.

WU received FCC authorization to sell 9 transponders on Westar V. Tentative reports indicate that the buyers were as follows: American Medical Buildings (1), Westinghouse (1), Citicorp (2), Dow Jones (2), CBS (1), Digital Communications Corp. (1), and Tele-Communications Inc. (1).[1]

WU has sold 20 percent interest in the Westar satellites to American Satellite Co. In addition, it has sold 50 per cent interest in the Advanced Westar system (operated by Spacecom) to Fairchild Industries and Continental Telephone.

Users, such as Cylix, apply Westar transponder capacity for private and leased voice/data offerings. American Satellite Co. provides a full range of private line services, wideband data and government services via the Westar system.

Westar satellites operate in the 4/6 GHz bands where there is a large demand for audio and video distribution services. The advanced Westars operate in both the 4/6 GHz and 12/14 GHz frequency bands, the latter being particularly suited for high speed data and large capacity voice applications. It also permits the operators the flexibility to locate small customer premise earth stations within large metropolitan areas.

In the summer of 1982, the FCC authorized Western Union

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[1] Satellite News, October 18, 1982.

to re-enter the international record communications marketplace and to provide direct service between the U.S. and six other countries.

(13) Other Satellite Carriers

Argo Communications, a new resale carrier based in New York has agreed to lease 6 Anik D transponders from Telesat Canada for services within the U.S. Argo plans to offer private line services for video, voice, and data applications It also plans in 1983 to offer fully-switched nationwide digital network.[1]

Ford Aerospace Satellite Service Corp. (FASSC), a newly organized subsidiary of Ford Aerospace and Communications Corp., is planning to operate a domestic communications system beginning in 1987. FASSC has sought FCC authorization for two satellites with a high transmission capacity. The high capacity is estimated by Ford to bring cost savings of up to 40 per cent. Financing is expected from advanced lease or sale of transponders. The Ford-built satellites are reported to permit connectivity between C and Ku-band transponders -- allowing communications to be up-linked and down-linked at different frequencies.[2]

If the FCC approves Ford's application, then Ford Aerospace & Communications Corp. will join rival satellite manufacturers Hughes & RCA in operating satellites as well as

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[1]Satellite Week, February 29, 1982 and Canadian Communication Reports, February 28, 1982.

[2]Satellite News, December 20, 1982.

manufacturing them. Ford recently lost a bid to Hughes for the contract to build Intelsat VI. There is speculation that Ford wishes to use its own satellite communications system as a form of advertisement of Ford's satellites to strengthen its prospects as a future supplier of satellites for domestic systems to the world market.[1]

Oak Satellite Corp. plans to launch its own 14/12 GHz satellite in 1986 to provide subscription TV service with six channels. This is to be followed by 12 channels of programming via 4 DBS spacecraft Oak plans to launch beginning in 1988. Oak's DBS system will have 12 channels nationwide and fully developed by 1994.[2]

Rainbow Satellite Inc. applied to the FCC in 1982 requesting authority to build three Ku-band satellites. Rainbow is jointly owned by Rainbow Communications Inc. and Trexar Corp., a public company. The satellites are proposed to be launched in late 1985 and early 1986. Cost of the program is estimated at $217 million.[3] Service will be on a non-common carrier basis, with transponders sold to users. The application filed with the FCC included letters from various banks expressing interest in providing funds.

Satellite carriers which have been granted authorization to establish direct satellite broadcast systems include some of the carriers profiled in the previous pages and are: RCA

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[1] Satellite News, December 20, 1982.

[2] Ibid., August 9, 1982.

[3] Satellite Week, May 3, 1982, p. 2.

Americom, Western Union and Comsat's subsidiary Satellite Television Corp. The other carriers authorized to offer DBS services are: CBS Inc., Direct Broadcast Satellite Co., Graphic Scanning Corp., U.S. Satellite Broadcasting Co., and Video Satellite Systems Inc.

3. Some Features of Satellite Carriers and Services

The profile of satellite carriers illustrated some of the alignments of carrier companies and the degree of vertical integration that exists in the satellite carrier sector. Many of the satellite carriers are subsidiaries of larger telecommunications enterprises. Those which are not such subsidiaries are aligned with some major firms in the U.S. involved in electronics or finance.

Major companies with subsidiaries in satellite communications include AT&T, GTE, Hughes Aircraft, Western Union, RCA, and Comsat. Satellite communications companies which are jointly owned by some giant firms in their respective industries include SBS (owned by IBM, Comsat and Aetna); ASC (owned by Fairchild Industries and Continental Tel.)

These alignments provided the carriers with significant potential sources of capital to initially fund satellite construction, launch, and operate satellite systems. The substantial financial resources and assets of these companies supporting the development of satellite systems allegedly enabled them to obtain risk capital more readily than a newly established entity seeking to establish such a system. In such cases as AT&T and Western Union, where satellite communications are part of general operations, the general revenues and capital can be applied to satellite operations. These companies have little difficulty in obtaining equity capital as evidenced by AT&T's recently announced plans to increase the equity of its common stock by 10 per cent or $1 billion. In the case of some of the other satellite carriers, the issue of financing

is somewhat ambiguous.

It is difficult to determine the degree to which the satellite carrier companies have access to the resources of their parent/owner company. Satellite carriers are not required to submit financial statements to the FCC, and companies such as RCA Americom, Western Union, AT&T, GTE Satellite, etc. provide integrated annual financial statements which incorporate their satellite operations with the rest of their activities.

Carriers such as SBS and ASC claim that there is a misconception in the minds of the public and others that they have unlimited access to the resources of their parent companies and that operating losses are not of primary concern in the early years of their development because they are covered by the substantial revenues or profits of their owners. SBS contends that such is not the case. Its three joint owners -- IBM, Comsat and Aetna each contribute $200 million to start SBS but have been reluctant to provide any additional funds to finance new areas of SBS business.

SBS is expected to establish its own lines of credit without recourse to its three owners and is expected to be financially viable (i.e. make a profit). SBS officials, however, do not necessarily object to this public misconception and concede that it likely helps SBS to attract customers. Customers are likely to be confident that SBS is a sound, viable company and that its parents would not likely stand idly by if the company should experience serious financial problems.

ASC officials have made a similar point -- that its parents Fairchild Industries and Continental Tel. do not provide it with a bottomless well of capital funds. Indeed, ASC points to the 8-1/2 year $350 million line of credit recently established with a consortium of twelve banks led by Bank of America which is intended to finance ASC's domestic satellite system and general business for the next several years. The line of credit is reported to be without recourse to ASC's partners -- Fairchild Industries and Continental Tel.[1]

The profile reveals an apparent attractiveness to own and operate satellites. Several of the carriers (American Satellite, Southern Pacific, etc.) began satellite services by leasing satellite capacity from other carriers. Leasing was a common practice of these carriers in the 1970's. However, in the last two years, a number of these carriers applied and received FCC authorization to launch their own satellites and operate their own systems (Alascom I, Spacenet, Galaxy, G Star, Telstar, SBS), and who in turn will lease transponders to others. The new entrants into the satellite carrier field include companies which intend to use satellites for their own end-to-end services and incorporate them with their terrestrial facilities, as well as firms which will serve predominantly as a "carrier's carrier" (Hughes).

As seen in the profiles and further illustrated in Table D-2, there has been a recent rush to file Ku-band (14/12 GHz)

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[1] Satellite Week, October 11, 1982. Also statements by ASC officials.

satellite applications at the FCC. The list includes SBS, GTE, SPCC, ASC, USSSI, and RCA. The main advantages of the Ku-band are freedom from terrestrial interference and the ability to deliver quality signals to a relatively small earth station (2-3 meters).

Table D-3 summarizes the total number of C-band, Ku-band, and hybrid satellites approved, together with applications, to the year 1987 (as of September 1982).

The profiles of services illustrate a considerable similarity of service offered by the carriers (private line data, voice, and video; TV signal transmission; video-conferencing). As an increasing number of firms enter the industry and satellite capacity increases, competition for the more lucrative service areas (CATV) is bound to heat up considerably. Even now, late entrants such as Hughes Communications Inc., have set their sights on the CATV market which has been the prime domain of RCA's Satcom system. Table D-4, supplementing Table D-3, provides along with a picture of the satellites currently in operation and those planned, a summary of the principle use of each of the satellites, given the information available.

TABLE D-2

U.S. Domestic Satellites

Name	Operator	Launch Date(s)	No. of Transponders per Satellite	Up Link (GHz)	Down Link (GHz)	Lifetime (years)	Orbit Location (Slot) (Longitude)
Alascom 1	Alascom Inc.	82	24	5,925-6,425	3.7-4.2	10	143W
American Satellite Co. 1 to 3	American Sat. Co.	84+	12 & 6	5,925-6,425 14-14.5	3.7-4.2 11.7-12.2	7.5	
Comstar D1-D4	Comsat General for AT&T/GT&E	76, 76, 78, 81	24	5,925-6,425	3.7-4.2	7	95, 95, 87 & 127.25W
Galaxy I-III	Hughes	82+	24	5,925-6,425	3.7-4.2	9	135.7W +?
G-Star 1 & 2	GTE Satellite	84+	16	14-14.5	11.7-12.2	10	103 & 106W
Satcom I-II	RCA Americom	76, 76	24	5,925-	3.7-4.2	8	135 & 119W
Satcom IIIR & IV	RCA Americom	81, 82	24	6,425	3.7-4.2	8	131 & 83W
Satcom IR, 11R & "Sixth"	RCA Americom	82-85	24	5.925-6.425	3.7-4.2	10	139, 66W +
SBS 1 to 4	Satellite Business Systems	80, 81 +	10	14-14.5	11.7-12.2	7	100, 97 & 94W
Spacenet 1-3	SP Communications Co.	83 +	12 & 6	5,925-6.425	3.7-4.2	7.5	119, 70W
			6	14-14.5	11.7-12.2		
Telstar 3-A to 3-D	AT&T	83 +	24	5.925-6.425	3.7-4.2	10	87.95 + 1 more

Table 1 - continued

Name	Operator	Launch Date(s)	No. of Transponders per Satellite	Up Link (GHz)	Down Link (GHz)	Lifetime (years)	Orbit Location (Longitude)
Westar I-III	Western Union Telegraph	74, 75 & 79	12	5.925-6.425	3.7-4.2	7	99, 123.5 & 91W
Westar IV-VI	Western Union Telegraph	82 +	24	5.925-6.425	3.7-4.2	10	99, 123W
Advanced Westar	Space Comm. Co.	83 +	12	5.925-6.426	3.7-4.2	10	91W space @ 79W
			6	14-14.5	11.7-12.2	10	
USAT-1 & 2	U.S. Satellite Systems, Inc.	85 +	10	14-14.5	11.7-12.3		

Source: Satellite Communications, March, 1982

TABLE D-3

U.S. Domestic Satellites - 1987
(Approved plus Applications)*

Operator	C-band	Ku-Band	Hybrid	Total
RCA Americom	6	3		9
Western Union	6	3		9
AT&T	4			4
SBS		5		5
GTE Satellite		4		4
Hughes	3			3
Southern Pacific			3	3
American Satellite			3	3
Spacecom (Advanced Westar)			2	2
ABC		3		3
Rainbow		3		3
Cablesat General	3			3
Totals	22	21	8	51

*Including ground spares.

Source: Satellite Week, September 20, 1982

TABLE D-4

Uses of U.S. Domestic Satellites

Company / Satellite	Launch	Principle Use & Status
Alascom		
Alascom I	11/82	Message (voice, data)
American Satellite Co.		
ASC 1*	10/85	Digital networks, leased transponders
ASC 2*	3/86	
ASC 3* (Hybrid C/Km satellites)		
AT&T		
Telstar 301	7/83	(Replacing Comstars D-1 & D-2)
Telstar 302	8/84	(Replacing Comstar D-3) Message
Telstar 303*	5/85	
Comstar D-4		
AT&T is replacing Comstar capacity leased from Comsat General		
GTE Satellite Corp.		
G-Star 1	5/84	Message, video
G-Star 2	8/84	
G-Star 3*	1985	
G-Star 4*		
G-Stars replace Comstar capacity leased from AT&T		
Hughes		
Galaxy 1	6/83	18 transponders sold to cable networks
Galaxy 2	9/83	Plans not announced
Galaxy 3*		
Hughes informs FCC of "backlog" of 146 requests for video and non-video transponder service.		

Table D-4 (continued)

Company / Satellite	Launch	Principle Use & Status
Oak Satellite Corp.		
?	1986	Subscription TV
(Ku satellites)		
RCA Americom		
Satcom 1	12/75	Pre-emptible
Satcom 2	3/76	Alaska, commercial, govt.
Satcom 3R	11/81	Cable TV, serving approx. 6,000 cable heads
Satcom 4	1/82	Cable TV, serving fewer than 1,000 cable heads
Satcom 5	10/82	Alascom service on 20 transponders
Satcom 1R*	3/83	Commercial & govt.
Satcom 2R*	8/83	Pre-emptible video
Satcom 6*	1/85	
Satcom Ku-1*	5/85	
Satcom Ku-2*	10/85	
Satcom Ku-3*	5/87	
Satcom Ku- spare to be built by January 1988.		
Rainbow Satellite		
Rainbow 1*	late-85	Video. Transponders to be sold
Rainbow 2*	early-86	Transponders to be sold
Rainbow 3*		Ground spare.
Rainbow intends to launch 16-transponder Ku-band spacecraft.		
SBS		
SBS 1	11/80	Lightly loaded, message, data.
SBS 2	9/81	Lightly loaded, message, data
SBS 3	11/82	
SBS 4*	mid-84	
SBS 5*	early-86	
Southern Pacific Satellite Co.		
Spacenet 1	2/84	Mainly cable
Spacenet 2	8/84	Cable & general purpose
Spacenet 3*	2/85	Ground spare
Spacenet 4*		Future ground spare
Spacenet satellites are C/Ku-band hybrids.		

Table D-4 (continued)

Company / Satellite	Launch	Principle Use & Status
Space Communications Co.		
TDRS/AW		Dedicated Advanced Westar
TDRS/AW		
United States Satellite System Inc.		
USSSI 1*	Fall-85	Message
USSSI 2*	Fall-85	
USSSI 3*		
Western Union		
Westar 1	1974	Co-located with Westar 2. Lightly loaded.
Westar 2	1974	Lightly loaded.
Westar 3	8/79	TV & message.
Westar 4	2/82	TV & message.
Westar 5	6/82	Cable TV.
Westar 6*	9/83	
Westar 7*	1984	
Westar 8*	1985	
Westar 9* (Ku)	1985	
Westar 10*(Ku)	1985	
Westar 11*(Ku)	1986	

*Application pending at FCC

Source: Satellite Week, Satellite News, various other miscellaneous sources.

As indicated in the section on profiles of the satellite carriers and Table D-4, communications satellites are applied to provide a variety of services in a variety of markets. An indicator of the relative significance of the markets is the amount spent on earth stations in these markets. Table D-5 shows the value of earth stations in the U.S. by market segment for 1981. The largest component is the common carrier followed by the broadcasters (cable and network TV and radio stations).

Video is a primary application of RCA Americom's Satcom system, particularly the satellites Satcom 3-R and Satcom 4. Transponders on these satellites have been leased to a number of programmers, some on a 24 hour basis, others on a partial basis. This is also true of Western Union's Westar 4. Table D-6 shows the video-service applications of transponders on Satcom 3-R and 4 and Westar 4.

TABLE D-5

U.S. Earth Stations

Value in $ Millions (1981 Dollars)

MARKET SEGMENT	1981
Cable TV	$ 8.6
TV Networks	2.3
Radio Stations	6.0
Newswires	9.9
Large Business	1.5
Government	1.5
Marine	1.8
Common Carriers	35.0
Hotel/Motel	4.5
Religious Groups	3.1
Computer Networks	1.5
Other	4.5
Total	$80.2

Source: Communications News, March 1982.

TABLE D-6

Video Services on Satcom 3-R, 4 and Westar 4

Satcom 3-R

Transponder (Owner)	Service/Major Owner	Subscribers in millions	Hours
1. Warner Amex	Nickelodeon/Warner Amex	3.2	8 a.m.-9 p.m.
Ad-supported programming for children & teenagers.			
1.	ARTS/Hearst-ABC Video	6.2	9-12 p.m.
Ad-supported fine arts programming.			
2. PTL	PTL/non-profit	5.0	24 hrs.
Christian entertainment & news, basic service.			
3. United Video	WGN-TV Chicago/Tribune	7.6	24 hrs.
Independent Chicago station acting as passive superstation.			
4. Times-Mirror	Spotlight/TM, Cox, Storer, TCT, Cablevision	N.A.	24 hrs.
Pay movies			
5. Warner Amex	Movie Channel/Warner Amex	1.75	24 hrs.
Pay movies			
6. SSS	WTBS/Turner Bcstg.	19.6	24 hrs.
Atlanta superstation			
7. (ESPN)	ESPN/Getty Oil	14.1	24 hrs.
Ad-supported all-sports			

Table D-6 (continued)

Satcom 3-R (continued)

Transponder (Owner)	Service/Major Owner	Subscribers in millions	Hours
8. CBN	CBN/n.p.	14	24 hrs.
Evangelical Christian TV.	Ad-supported.		
9. USA Network	USA Net/Time-Paramount-MCA	10	24 hrs. in May
Sports with general programs and weekend night rock. Ad-supported.			
9.	C-SPAN/n.p.	11	10 a.m. 6 p.m.
Coverage of House of Representatives, public affairs. Basic service.			
9.	Black Entertainment TV/ Johnson, TCI, Taft	8.8	3 hrs. Fri.
Black-oriented programming with sports. Ad-supported.			
10. Showtime	Showtime-Viacom-TPT	2.8	14 hrs.
Pay movie with specials (west coast feed)			
11. Warner Amex	MTV/Warner Amex	2.5	24 hrs.
Taped concerts, music promotional clips. Ad-supported.			
12. Showtime	Showtime/Viacom-TPT	2.8	24 hrs.
Pay movie with specials (east coast feed).			
13. HBO	HBO/Time	8.0	14 hrs.
Pay movie with specials (west coast feed)			

Table D-6 (continued)
Satcom 3-R (continued)

Transponder (Owner)	Service/Major Owner	Subscribers in millions	Hours
14. Turner Bcstg.	CNN/Turner Bcstg.	11.1	24 hrs.
All news. Ad-supported.			
15. Warner Amex	CNN 2/Turner Bcstg.	.8	24 hrs.
News headline service.			
16. Showtime-Appalachian Regional Commission	HTN Plus/Westinghouse	.16	4 p.m. 4 a.m.
Family-oriented pay movie network with special travel section.			
16.	Appalachian Community Service Network	1.1	6 a.m. 4 p.m. weekdays 6 a.m.- 1 p.m. weekends
Educational & community service.			
16.	National Jewish TV/n.p.	1.75	1-4 p.m. Sun.
Jewish-oriented programming			
17. Showtime	Eastern Microwave for WOR-TV/RKO General	4.2	24 hrs.
Ind. N.Y. station acting as passive superstation.			
18. Reuters	Galavision/SIN	.1	expanding
Spanish-speaking pay service.			

Table D-6 (continued)
Satcom 3-R (continued)

Transponder (Owner)	Service/Major Owner	Subscribers in millions	Hours
19. RCA	Occasional service	1	10 a.m. 1 a.m.
20. HBO	Cinemax/HBO	1	24 hrs.
Pay movie, targeted as HBO's second tier (east coast feed).			
21. Landmark	HTN/Westinghouse	.16	8-10 p.m.
Family-oriented low-priced movie			
22. HBO-MSN	HBO/Time	8.0	
Will be used to test scrambling systems			
22.	Modern Satellite Network Div. of Modern Talking Pictures	4.1	10 a.m.-5 p.m. weekdays
Ad-supported network with Shopping Show, Telefrance, with Hearst/ABC			
23. HBO	Cinemax/HBO	1	24 hours
Pay movie targeted as HBO's second tier (west coast feed)			
24. HBO	HBO/Time	8.0	24 hours
Pay movie service with specials (east coast feed).			

Table D-6 (continued)

Satcom 4

Transponder (Owner)	Service/Major Owner	Subscribers in millions	Hours
6. ESPN	Bravo/Rainbow (Cablevision, Cox, Daniels)	.046	8 a.m.-6.p.m.
Pay cultural programming.			
7. NCN	Nat. Christian Network/n.p.	.33	6 a.m. 8 p.m.
Non-denominational Christian program distribution service.			
7.	Escapade/Rainbow	.2	8 p.m.-6 a.m.
Pay adult service, becomes Playboy Channel next year.			
17. Trinity	Trinity/n.p.	1.2	24 hrs.
Religious programming			
18. HBO			
19. American Medical Bldgs.	American Network/AMB		5 p.m.-5 a.m.
Pay movie service for hotels, motels			
19.	Satellite Communications Network		5 a.m.-5 p.m.
Transponder leasing company with uplink facilities			

Table D-6 (continued)

Westar 3

Transponder (Owner)	Service/Major Owner	Subscribers in millions	Hours
6. CBS	CBS Cable/CPS-Fox	3	12 hrs.
Ad-supported cultural service.			
7. Wold	Financial News Network	N.A.	10 a.m. 5 p.m.
SIN	SIN/SIN	2.9	24 hrs.
Ad-supported Spanish language programming.			
9. SSS	Satellite Programming Network/SSS	3.6	24 hrs.
Ad-supported service largely family-oriented and foreign programming.			
12. Western Union	to Southern Satellite to Wold to Eternal Word Network/n.p.	.3	7-11 p.m.
Non-denominational Christian programming. Basic service.			
12.	Eros/Rest. Programming Inc.		11 p.m. 2 a.m. Thurs-Sat
Pay adult film service			

Source: Satellite Week, Feb. 29, 1982

4. Some Economic and Financial Aspects of Satellite Communications

In this part of the study, some of the economic and financial aspects of communications satellites and satellite services in the U.S. are examined. These issues which impact on the development and growth of the industry include costs of satellites and launching, transponder prices, transponder use, satellite capacity, efficient use of the geostationary orbit, and whether there is a current glut of satellite transponders.

(a) Growth of the Industry

It is difficult to determine a meaningful trend of the past growth of the satellite industry. Financial reports of such satellite carriers as AT&T, Western Union, etc. integrate revenues and assets associated with satellite communications with other communications operations. Projections of future growth, however, abound and most are very optimistic. The following sketches some of these projections.

In a recent report compiled by the U.S. Department of Commerce,[1] it was projected that the communications industry would be one of the top areas of industrial growth during the 1980's. Revenues of the traditional common carriers (telephone and telegraph services) are projected to grow at an inflation-adjusted rate of 7 per cent between 1981 and 1986, compared with the 9 per cent growth between 1972 and 1981. Measured in 1972 dollars, revenues of traditional carriers will

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[1] Dept. of Commerce, "1982 U.S. Industrial Outlook for 200 Industries, with Projections for 1986," Washington, 1982.

reach $82 billion in 1986. Revenues of the newer carriers and competing companies are projected to reach $6 billion in 1972 dollars in 1986.

Specialized common carriers had total revenues of $700 million in 1981, a 68 per cent increase over 1980. These carriers cover services in a total of 270 cities and towns across the country.

The Department of Commerce report states that service providers expect revenues from satellite communications to increase at an annual rate of 20-30 per cent over the 5-year period 1981-1986. The report also states, however, that "if the current trend in declining costs for manufacturing optical fibers and opto-electronic components continues, lightwave systems could become economically competitive with satellites for long distance communications . . . by the 1990's . . ."[1]

In a recent study of the world market for broadcast satellite systems, A.D. Little anticipates a rapid growth in the capital equipment market. The world broadcast satellite market was estimated at $505 million in 1982, growing to $775 million by 1985. Much of this growth is attributed to DBS where capital expenditures are expected to increase from $50 million in 1982 to $200 million in 1985.[2]

American Satellite Co. research projects the satellite communications market overall will exceed $1 billion by 1986. Its research shows the business data communications market

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[1]Dept. of Commerce, "1982 U.S. Industrial Outlook for 200 Industries."

[2]Reported in Satellite Communications, November 1982, p. 24.

growing at an annual rate of 30 per cent. One of ASC's owners, Fairchild Industries has predicted an 8-fold increase in satellite communication revenues to $2.5 billion by 1990. In the same report it was contended that 750 largest users of satellite services were spending in 1982 between $1-$10 million per year each to expand their networks.[1]

A recent Yankee Group study on long-haul communications predicts that increasing use of domestic satellites will increase revenues from about $100 million in 1979 to $2 billion by 1985. It sees growth accelerated by several major factors:

> common carriers continuing to integrate the satellite facility into nationwide long distance networks, with specialized common carriers concentrating on the most profitable nitche -- intercity routes, private networks, and the TV market of which CATV is the major user of satellite services . . .[2]

One of the growth areas, private satellite services, will see sales revenue rising from $146 million in 1981 to $1.2 billion in 1985 and to $2.9 billion by 1991 according to a recent Frost and Sullivan study.[3] The study notes that between 1970 and 1980 AT&T's revenues from WATS and private line services increased from $3 billion to $6.3 billion in constant dollars and it is these traditional services that stand to be replaced by private satellite networks. The Frost and Sullivan study projects private network earth station sales to increase from $86 million in 1982 to $304 million by 1986, and $739 million by 1990 (in constant 1981 dollars).[4]

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[1] Satellite Week, October 18, 1982.

[2] Communications News, January 1983, p. 34.

[3] Ibid.

[4] Ibid., p. 33.

The same study shows that at the beginning of 1982, there were 62 private companies and 13 government organizations operating private networks with the typical earth station valued in excess of $1 million.[1]

Quantum Science Corp. has predicted that satellite services will grow at 19.6 per cent annually through 1986, with the number of transponders increasing at an annual rate of 30 per cent, and installed earth stations at a rate of 20 per cent.[2]

The Department of Defense plans a sizeable increase in spending for military applications in space, including stepped up developments of communications. Annual net funding increases of over 10 per cent, after accounting for inflation, are being sought. Plans call for expansion of the network of over 40 satellites used by the U.S. military forces for communications, navigation, and other applications. The Reagan Administration also has proposed spending almost $20 billion to expand and protect the defense communications system.[3]

(b) Costs: Satellites, Launch, Transponders

Table D-7 illustrates some of the costs involved in satellite communications. Costs, of course, vary depending on the satellite, launch method, and the location of the satellites and use and conditions of use of transponders. The following

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[1] Satellite Week, October 18, 1982

[2] Ibid., July 19, 1982.

[3] Telephony, October 18, 1982, p. 18.

examines some of these aspects of cost in satellite communications.

(i) Transponder Prices

Transponder prices will vary with the demand for transponders on a particular satellite, the uses of the transponder, and the conditions of use. Transponders may be leased for a short or long period of time, and the transponder may be protected, unprotected or pre-emptible. The most costly is the protected transponder. The most sought-after and costly transponders for lease or sale are those used for cable TV and currently the most sought after satellite is RCA's Satcom IIIR, known since its 1981 launch as "the cable bird."[1] The main determinant of price of a transponder is its use and the number of earth dishes pointed at it. Satcom III-R has attracted the most popular cable programmers in the business (HBO, Showtime, Spotlight) as well as Ted Turner's round-the-clock Cable News Network. With the cost of installing a receiving dish at about $25,000, a cable operator is more likely to tune into a satellite if it is carrying a strong programming lineup and about 90 per cent of the 27 million cable TV households in the U.S. receive Satcom III-R fare.[2] Galaxy I, however, is making inroads into Satcom's business in cable, with a number of its transponders recently sold to broadcasters, including six to HBO.

AT&T recently made 12 transponders available on its

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[1] Fortune, December 13, 1982, p. 149.

[2] Ibid.

Comstar domestic satellite system for use on a pre-emptible basis at a monthly lease charge of $96,000 each for periods of at least 30 consecutive days. The offer began on November 7, 1982 with leases expiring by August 31, 1983. The transponders -- half of the 24 used by AT&T as protection for communications services on its satellites -- are for use primarily by customers with short-term needs, such as broadcasters covering special events.[1]

RCA Americom has been selling transponders on Satcom IV for a fixed price of $13 million each for the period beginning with the operation of the satellite through December 31, 1989.[2]

The American Hospital Video Network (AHVN) leased transponder six (the least pre-emptible/most protected position) on SBS-2 for $3.2 million per year. AHVN will use the transponder for dissemination of medical news and continuing education programs for health professionals. Forty hours of broadcasting are scheduled per week.

RCA Americom has an arrangement whereby it leases channels on the Satcom satellite system to MCI Telecommunications. A three-year agreement reached in 1981 called for the lease of 2,000 voice-grade channels for a total of $20 million over the period.[3] RCA Americom in turn leases four transponders on Alascom I for $1.6 million per transponder per year.[4]

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[1] Telephony, October 25, 1982, p. 16.

[2] Communications News, April 1982, p. 1.

[3] Ibid., p. 19.

[4] Satellite News, November 1, 1982.

TABLE D-7

Costs Associated With Communications Satellites
1982 Transactions

Hardware/Service	Orbital Capacity	($000)
Satellite		
(Geostationary - Communications 6/4 GHz)		30-40,000
(DBS High Frequency 14/12 GHz)		50-60,000
Launch		
Expendable Rocket		
Delta (NASA)	900 kg	26,000
Atlas-Centaur (NASA)	1790 kg	35-40,000
Ariane (French)	4840 kg	30,000
Shuttle Columbia (NASA)		
Standard Launch (established price 1977)		18,000
SBS-3		8,000
Anik-C		9,000
Standard Launch (established price 1985-88)		85-90,000
Delta equivalent payload		26,000
Atlas-Centaur equivalent payload		41,000
Transponders		
Lease (annual)		
Alascom I (6/4 GHz)		1,200
Early Satcom & Westar (6/4 GHz)		960
Early Comstar (AT&T sublease) (6/4 GHz) (pre-emptible)		1,152
New Westar V (6/4 GHz)		2,400
SBS-2 (AHVN Lease) (14/12 GHz) (protected)		3,200
Westar 3 (6/4 GHz) (video program distribution)		
Protected		172.5/mo.
Unprotected		96.0/mo.
Pre-emptible		75.9/mo.
Average price, 1982		2,000
Sale		
Hughes Galaxy I (HBO purchase price) (6/4 GHz)		10,000
RCA Satcom III-R (1981-1989) (6/4 GHz)		13,000
Earth Stations		
Private network operator		1,000
Cable TV operator		25

Source: NASA; FCC Reports, various communications journals, newsletters, etc.

In October 1982, the FCC allowed Western Union a 15 per cent increase for full-time leases of transponders with video program distribution. The rate for "fixed term transponder service" were established as: $172,500 per month for a protected transponder; $96,000 per month for an unprotected transponder; and $75,900 for a pre-emptible transponder.[1]

A recent Frost & Sullivan study notes that the average price paid by satellite users for transponder time is $2 million per transponder per year.[2]

(ii) Satellite & Launch Costs

Satellite and launch costs have been steadily increasing. Whereas the early Comstar, Satcom and Westar satellites could be built and launched for about $30 million (Westar I), more recently the costs have been in around $60 million (Westar IV). About one-half of this amount is the cost of the launch by NASA, using expendable rockets. RCA Americom has estimated that the cost of building, launching and operating its three Ku satellites, plus one spare, planned for 1985 is $306 million or approximately $76 million each.[3]

A satellite suitable for a DBS system costs between $75 million and $125 million, including launch and insurance.[4]

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[1] FCC Reports, October 1982.

[2] Communications News, January 1983, p. 35.

[3] Satellite Week, May 3, 1982.

[4] Canada's Anik-B, built by Hughes Aircraft Co., as a hybrid and experimental satellite and capable (with 14/12 GHz transponders in addition to the bulk of 6/4 GHz transponders) of direct broadcast service, cost $34 million in 1978. K. E. Degnan, et al.

Satellite Television Corp., Comsat's subsidiary, recently contracted with RCA Astro-Electronics to have two DBS satellites built for over $100 million.[1] The current applicants approved by the FCC for DBS are proposing either 3 or 4 satellite systems. A full 3-satellite system, including one in-orbit spare, requires four such satellites, or a cost of anywhere from $400-$500 million for the satellites, launch and insurance.[2]

In 1982 NASA contracted to launch 5 communications satellites for Telesat Canada. The agreement is reported to be worth close to $75 million. The first of these was Anik D, launched in August 1982 with a Delta, an expendable launch vehicle. The other four launches will use the Space Shuttle. Anik C was launched in November 1982 for a cost to Telesat of $9 million. The third satellite is planned for April 1982, and the remaining two for 1984 and 1985.

The cost of launching commercial satellites has escalated since the early launches. Table D-8 shows the trend in costs to Intelsat/Comsat launches since 1965. Costs are affected, of course, by the size of the launch vehicle and the weight of the spacecraft (payload) launched. The small Delta rockets are less expensive than the Atlas-Centaur. The increased costs are partly due to more powerful and more sophisticated rocketry and partly due to inflation. Included in launch costs is the support supplied by the Air Force in the launching of the

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[1] Communications News, December 1982, p. 1.

[2] Satellite Communications, August 1982, pp. 34-35.

vehicles (range costs) which have increased from $1.7 million in 1974 to a current level of about $3.5 million.[1]

Information on other launches show a similar increasing cost trend. For example, Westar I, launched in 1974 by a Delta rocket cost $10 million to launch. The launch cost for RCA's Satcom III in 1979, using a Delta, was about $19 million. Telesat Canada's Anik D satellite launched in 1982 aboard a newer, more powerful Delta (capable of a 2,800 lb. payload) cost around $30 million to launch.[2]

NASA Administrator J. Beggs has stated that costs of expendable rocket launchers will continue to increase. It is expected, he said, that the Delta will increase about 30 per cent by 1985, and the Atlas/Centaur about 40 per cent. The Titan 34D, on the other hand, is estimated to exceed $100 million by 1986.[3]

The space shuttle operated by NASA is expected to be competitive with other launch vehicles. NASA charged $9 million for each of the first two satellites launched from the space shuttle Columbia.[4] This reflects the price of $18 million for space shuttle launch services set in 1977. However, NASA was obligated to establish new prices for Shuttle

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[1] Information from NASA

[2] Ibid

[3] 1983 NASA Authorization, Hearings before the Subcommittee on Space Science & Applications, Feb.-Mar., 1982.

[4] In addition to the cost of the shuttle, SBS had to pay an additional $6 million for the propulsion system to propel the satellite from the shuttle and place it in proper orbit.

TABLE D-8

INTELSAT/COMSAT LAUNCHES

Mission	Vehicle	Launch Date	Actual Cost (M)	Spacecraft Weight (KG)
Intelsat I-F1	Delta #30	April 65	4.4	39
Intelsat II-F1	#42	October 66	3.6	87
II-F2	#44	January 67	4.6	87.1
II-F3	#47	March 67	4.6	87.1
II-F4	#52	September 67	4.0	87.1
Intelsat III-F1	#59	September 68	5.7	287
III-F2	#63	December 68	4.3	87
III-F3	#66	February 69	4.4	129
III-F4	#68	May 69	4.9	291
III-F5	#71	July 69	4.9	290
III-F6	#75	January 70	6.8	293
III-F7	#78	April 70	5.2	290
III-F8	#79	July 70	5.8	290
Marisat-A	#120	February 76	13.2	317
-B	#124	June 76	12.9	317
-C	#127	October 76	13.2	317
Intelsat IV	Centaur (AC-25)	January 71	16.5	1410
IV	(AC-26)	December 71	16.3	1410
IV	(AC-28)	January 72	15.7	1410
IV	(AC-29)	June 72	15.9	1410
IV	(AC-31)	August 73	20.2	1410
IV	(AC-32)	November 74	19.2	1410
IV	(AC-33)	February 75	20.4	1410
IV	(AC-35)	May 75	19.0	1410
IV-A	(AC-36)	September 75	21.0	1524
IV-A	(AC-37)	January 76	20.2	1524
IV-A	(AC-39)	May 77	26.2	1524
IV-A	(AC-43)	September 77	29.0 (est.)	1524
IV-A	(AC-46)	January 78	28.5 (est.)	1524
IV-A	(AC-48)	March 78	28.5 (est.)	1524
V-1	(AC-54)	December 80	37.8 (est.)	1950
V-2	(AC-56)	May 81	37.8 (est.)	1950

Table D-8 (continued)

Mission	Vehicle	Launch Date	Actual Cost (M)	Spacecraft Weight (KG)
Intelsat V-3	Centaur (AC-55)	December 81	37.8 (est.)	1950
V-4	(AC-58)	March 1982	37.8 (est.)	1950
V-5	(AC-60)	September 82	55.0	1950
VA-1	(AC-61)	1982	49.9 (est.)	2130
VA-2	(AC-62)	1984	49.9 (est.)	2290
VA-3	(AC-63)	1984	49.9 (est.)	2290
VA-4	(AC-64)	1984	49.9 (est.)	2290
Comstar-A	Centaur (AC-38)	May 76	24.1 (actual)	1525
-B	(AC-40)	July 76	24.5 (actual)	1525
-C	(AC-41)	June 78	24.6 (est.)	1530
-D	(AC-42)	February 81	32.0 (est.)	

Source: NASA

launches beyond 1985 three years prior to 1985.[1] Consequently, in June 1982, NASA increased the standard price for space shuttle launch services to approximately $71 million in 1982 dollars for payloads launched between 1985 and 1988. Under the new price schedule, launch could cost as much as $85-90 million in 1985 dollars.[2] Added to the standard price will be charges for optional services, which currently average $1.5 million and cost of the upper stage, which is about $6 million today. Since communications satellites require only part of the shuttle's launch capability, they will be priced according to a shared flight formula. Payloads similar to that carried on the Delta launch vehicle will cost about $26 million to launch into geosynchronous orbit in 1986, including estimated cost of the upper stage and optional services, while Atlas-Centaur class payloads will cost $41 million. NASA Associate Administrator S. Weiss contended that these shuttle prices would be very competitive with French Ariane prices, particularly for Delta-class communications satellites.[3]

Table D-9 illustrates NASA's planned launches for 1983. The launches include U.S. domestic communications satellites, satellites of other countries, and Defence Department payloads. The launches shown for the Shuttle Challenger, however, will be set back a few months given the difficulties experienced in a test of Challenger in early January 1983.

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[1] 1983 NASA Authorization, Hearings before the Subcommittee on Space Science & Applications, February-March, 1982, p. 286.

[2] Satellite Week, June 21, 1982.

[3] Ibid.

Table D-9

NASA LAUNCHES FOR 1983

Date	Launcher	Payload	Launch Site
Jan. 27	Shuttle Challenger	Tracking and Data Relay Satellite (TDRS)	Kennedy Space Center
Jan. 27	Delta	Infrared Astronomical Satellite	Western Test Range
Feb. 10	Atlas Centaur	Intelsat V	Cape Canaveral
Feb. 15	Atlas E	National Oceanic and Atmospheric Administration weather satellite with search-and-rescue beam	Tendenberg AFB
Mar. 3	Delta	RCA Americom's Satcom IR	Cape Canaveral
Apr. 20	Shuttle Challenger	1) Telsat Canada's second Anik C 2) Indonesia's Palapa 3) NASA's Office of Space and Terrestrial Applications' materials processing payload 4) German Shuttle Pallet Satellite	Kennedy Space Center
Apr. 28	Delta	NOAA Geostationary Operational Environmental Satellite	Cape Canaveral
June 9	Delta	Hughes' Galaxy I	Cape Canaveral
July 4	Shuttle Challenger	1) second TDRS 2) India's Insat-1B	Kennedy Space Center
July 28	Delta	AT&T Telstar	Cape Canaveral
early August	Delta	RCA's Satcom IIR	Cape Canaveral
August (tent.)	Atlas E	NOAA satellite, if relay for system needs to be replaced	Vandenberg AFB
Sept. 15	Delta	Hughes' Galaxy II	Cape Canaveral
Oct. 1	Shuttle Columbia	Spacelab I	Kennedy Space Center

Table D-9 (continued)

Date	Launcher	Payload	Launch Site
Oct. 27	Delta	NATO communications satellite	Cape Canaveral
Dec. 1	Atlas Centaur	Intelsat V-A	Cape Canaveral
Dec. 14	Shuttle Challenger	Defense Department payload	Kennedy Space Center

NOTE: Changes in this schedule could occur, according to NASA

Source: Satellite News, Jan. 3, 1983.

NASA may face some competition within a few years from some major U.S. aerospace companies who are planning to enter the business of lifting payloads into space. These companies believe that this will be a profitable venture before the end of the 1980's. It is estimated that each company will require an initial investment of $100 million to get started in space launching, but the returns are expected to be in multiples of this investment.[1]

The companies include: the newly formed Transpace Carriers Inc.; the conglomerate of UTC, Martin Marietta, and Aerojet General; General Dynamics; and Space Services Inc. The companies are considering going into competition with NASA using proved launch-rocket systems such as the Delta, Titan, and Atlas-Centaur rockets.[2]

Transpace Carriers Inc. has officially made a proposal to NASA to take over its Delta launch program, including about 100 NASA personnel beginning October 1983. The Delta rocket has proven very reliable. Manufactured by McDonnell Douglas Corp. it has made 165 successful space launches over the past 22 years.

The team of UTC, Marietta, and Aerojet General is expected to commercialize the Titan, an ex-military rocket, for their launch program. This team now builds and launches Titans for the U.S. government. They plan to apply to NASA to enter space launching, and if approval is obtained, expect

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[1] Business Week, Nov. 29, 1982, pp. 37-38.

[2] Satellite Communications, October 1982, p. 14.

to enter the market in early 1983.

Two other entries may be General Dynamics Corp., utilizing its huge Atlas-Centaur launch vehicle, and Texas-based Space Services Inc. which also has applied to NASA to use the Atlas-Centaur. Space Services Inc. may purchase the Atlas-Centaur, or pay General Dynamics to launch it and act as a payload marketer.

These companies will likely depend to a large degree on government facilities, including rocket launching pads. NASA would prescribe the conditions that they would have to meet to use these facilities. Approval to commercialize launch vehicles, however, will require a decision involving several government agencies, including NASA, the FCC, the State Department, and the Department of Transportation.[1] If approval is granted, NASA is still expected to have an edge on its competitors through its employment of the manned space shuttle. The space shuttle is capable of lofting huge payloads that other launch systems cannot. NASA, however, is expected to soon stop launching all other rockets, shifting the work they would have done to the 300 shuttle flights scheduled over the next 12 years. Two-thirds of the cargo space on these flights is reserved for the government (primarily military satellites), while the remaining one-third will be leased to private customers. It is in this latter business that NASA will compete with the new space-launch entrants.

Not only will NASA and the U.S. space-launch companies

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[1]Information from NASA.

compete among themselves, they will also have to compete with the rapidly developing foreign commercial space-launching operations. The European-based Ariane launch rocket is actively seeking commercial payloads and has contracted with some U.S. companies to launch commercial satellites. Japan is likewise developing space launching capabilities, and it is reported that the Soviet Union is considering entering the competitive, commercial space-launch business as a method of earning Western currency.

Arianespace is a private French company which was incorporated in 1980 by the 11-member European Space Agency. Shareholders include the main European aerospace companies and several important European banks. GTE Satellite Corp. has announced that its next pair of satellites will be launched by Arianespace which will provide an alternative to NASA. Cost per launch by Arianespace is expected to be 15 per cent cheaper than NASA.[1] The Arianespace launch vehicle is capable of launching one Atlas-Centaur class or two Delta class payloads.[2]

The Europeans are also successfully competing with U.S. satellite manufacturing companies. Companies such as Aerospatiale and Satcom International are concentrating their efforts on communications satellites, expecting that this is where the business will be in the next two decades. Aerospatiale recently won a $134 million contract against U.S. competition to built three satellites for Arabsat (which will provide

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[1] Fortune, March 22, 1982, p. 24.

[2] 1983 NASA Authorization, Hearings before the Subcommittee on Space Science & Applications, Feb.-Mar., 1982, p. 286.

telephone, telex and TV service to 22 Arab countries).

The customers for space launch services are expected to be varied. The large proportion of the payload currently consists of communications satellites, and it is estimated that about 350 communications satellites will be placed into orbit before the end of the century. But pharmaceutical and other materials-processing industries also expect to provide business for space launchers. These industries believe that the manufacture of certain products would be much more efficient in the weightlessness of space. It is reported that McDonnell Douglas and Johnson & Johnson's Ortho Pharmaceutical Corp. subsidiary are seeking to utilize space in the manufacture of a joint product.[1]

(c) Profitability of Communications Satellites

There is little information available from communications satellites owners/operators on the profitability of their satellite operations. Indications are that there are few operators who could claim a profit on their satellite operations. American Satellite Co. (ASC) is one of them. ASC is reportedly the first U.S. company to show a profit exclusively from selling satellite services directly to business users.[2] The company is expecting to make about $2 million in profits on revenues of $44 million. ASC expects to quintuple those earnings in 1983. It has forecast its assets to grow from $141 million in 1982

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[1] Business Week, Nov. 29, 1982, p. 38.

[2] Fortune, Nov. 15, 1982, p. 11.

to over a half a billion dollars by 1986.[1]

SBS, the high-powered consortium of IBM, Comsat, and Aetna, which launched its third satellite in late 1982, is not expected to make a profit from its "full services" capabilities until 1984.[2]

(d) Further Economic Issues

(i) Rate Making

As the FCC pointed out in its 1972 Decision, one of the benefits of satellite technology applied to domestic communications was that distance was no longer a significant cost factor in rate-making. Earlier, considerations of distance, cost and traffic volumes all combined to dictate that foreign rather than domestic rates be applied to services between mainland U.S. and Alaska, Hawaii and Puerto Rico. The FCC was of the view that the use of domestic satellites for services between these areas would dramatically reduce distance as a factor or justification for the historic high rates applied. Consequently, the Commission looked towards integrating Alaska, Hawaii, and Puerto Rico into the established rate scheme for communications services applicable to the mainland.

(ii) Satellites vs Fiber Optics

Some analysts have cautioned about exaggerating the economies of satellites in communications. According to a recent market analysis from Creative Strategies International

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[1] Satellite Communications, November 1982, p. 22.

[2] Fortune, Nov. 15, 1982, p. 11.

(CSI), a California based research and marketing firm, there is a tendency to regard satellite communications as a panacea for solving price/performance problems. According to CSI the best utilization of satellites would be to blend satellite with other transmission technologies, such as conventional channels, fiber optics, microwave, etc.[1]

There is considerable debate on the issue of the impact of the development of fiber optics on satellite communications. The attractiveness of fiber optics as a transmission medium is its huge capacity and freedom from interference. A 144 fiber cable about the size of a finger offers more circuit capacity than a coaxial cable about the size of an arm. The high capacity and small size solves many of the problems of installing high density underground trunk routes in congested metropolitan areas.

The diversity of applications and their ability to interface with a variety of other transmission media, such as satellites, makes the technology particularly attractive to countries with limited investment in terrestrial plant. Fiber optics enables these users to leapfrog an entire technological generation.

Telecommunications network planners around the world are weighing the advantages of lightwave technology of fiber optics against existing terrestrial and satellite communication alternatives. Communications requirements of business will undoubtedly create new applications of lightwave technology

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[1] Communications News, December 1982, p. 13.

that may surpass the capabilities of existing satellite systems. At the same time lightwave systems are useful for on-premises data-busing, inter-premises transmission, and other local distribution needs, solving one of the barriers to successful satellite-based business networks.

M. G. Phipps of AT&T concedes some impact of fiber optics growth on satellite use, but believes that it will be in the higher-speed services. Other analysts agree that there may be some impact, but contend that it is not a question of which is better, but rather a strategy of which is better for a particular application.[1]

W. Morgan, a satellite communications consultant and former executive in Comsat Labs and RCA Astro-Electronics contends that fiber optics and satellites will be complementary, with fiber optics handling short-haul traffic and satellites providing long-distance communications. However, he believes that dominance by optical fibers is a distinct possibility for trans-oceanic service.[2]

The Office of Technology Assessment, in a recent report to the Senate Committee on Commerce, Science, and Transportation had the following view on fiber optics and satellites:

> A potential competitor to satellite systems is transmission by fiber optics. By the 1990's, fiber optics will have come into its own as a major ground-based supplier of communications needs. However, no matter how well this technology performs, or how extensive its network becomes, it will not be on-line widely enough to fulfill the requirements of the expanding markets of

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[1] Communications News, June, 1982.

[2] Satellite News, December 6, 1982.

> the 1980's. Furthermore, unlike satellite beams, fibre optics is line-switched, not area covering, therefore it is not likely to be competitive for broadcast or distribution services.[1]

(iii) Satellite Capacity

Most of the communications satellites launched in recent years providing service in the C and Ku band are equipped with 24 transponders and the FCC has recently been reluctant to authorize satellites with fewer transponders. The degree of spacing between satellites and the number of transponders that can be placed on a satellite effectively limits the total number of satellites that can be placed in geostationary orbit and therefore total satellite capacity for communications purposes. Depending on the growth of demand, this limitation could have a major impact on future costs.

Changing technology, however, could increase satellite capacity. For example, engineers at Bell Telephone Laboratories have successfully demonstrated the ability to double the number of high-quality television signals that can be transmitted over a communications satellite. One broadcast-quality TV signal can be currently transmitted over a satellite's transponder. But the Bell Labs experimental system, recently demonstrated using the Bell System Comstar communications satellite, allows two broadcast-quality signals to be transmitted with no loss of picture quality. The system, called time-frequency multiplexing permits a single TV channel to be sent in half the usual transmission time, which is another way of saying that two TV

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[1] Office of Technology Assessment, Civilian Space Policy and Applications, Washington, June 1982, p. 49.

signals can be sent in the same amount of time.[1]

This development, if it becomes operational, has significant implications for DBS systems and orbital capacity as it would double transponder supply and conceivably reduce overcrowding. It also has significant implications for costs and the economics of satellite communications.

(iv) Excess Capacity

The opportunities for commercial satellite business, transponder requirements, etc. have been the subject of very optimistic forecasts in recent years. It appeared that literally the sky was the limit. Studies prepared for NASA estimated high-traffic domestic satellite transponder requirements would increase from 100 in 1980 to 200 in 1990.[2] The earth station market was projected to increase from a value of $80 million in 1981 to over $180 million by 1991.

These optimistic forecasts of demand for transponders have in recent months been subjected to serious debate.[3] Some see demand falling off and an excess supply of transponders over the next several years. A number of reasons have been put forward for this more cautious outlook: (1) It is reported that cable TV programmers who had formed a high demand market for transponders have begun to realize the difficulties of making profits; (2) the awaited boom in corporate use of

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[1] Telephony, November 29, 1982, pp. 22-23.

[2] Communication News, January 1982, p. 30.

[3] J. Cooney, "Lowering Skies for the Satellite Business," Fortune, December 13, 1982, pp. 148-161; Satellite Week, April 12, 1982.

satellites has not materialized, with new users not entering the market for satellite services as quickly as had been anticipated; (3) the increasing costs of satellite construction and launch have increased the cost of transponders so that transponder users are examining more carefully their utilization of transponders; (4) the theory that C-band (low frequency) facilities may be outmoded by coming Ku-band satellites which will operate with much smaller and less costly receive terminals; (5) the recession, which has severly hindered business expansion and investment.

In June 1982, observations at the FCC monitoring station in Laurel, MD. found 81 inactive C-band transponders on U.S. domestic satellites, or nearly 40 per cent of the 216 transponders available.[1] A monitoring in September 1982 showed 38 per cent of the transponders inactive as illustrated in Table D-10,[2] and a December 1982 monitoring showed 43 per cent inactive.[3]

The results of the FCC monitoring have been cited by some analysts as evidence of the glut in transponders. Others, particularly the carriers, dismiss the talk of a glut and argue that the FCC observations were simply a "snapshot of time," leading to false conclusions since not all transponders may be active every minute of the day, and some are incapable of operation during a limited period of the day. Western Union has argued that all of its Westar satellites are fully utilized,

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[1] Satellite Week, July 19, 1982, p. 1.

[2] Telecommunications Highlights, November 24, 1982.

[3] Ibid., Feb. 9, 1983. Monitored on different days and different times but generally in the early afternoon.

TABLE D-10

Transponder Loading:

Monitored by the FCC, September, December, 1982*

Transmission Service	Per Cent of Total Transponders	
	Sept.	Dec.
TV/FM	27	24
FDM/FM	23	19
SCPC	8	10
Wideband digital	3	3
Miscellaneous	1	2
Inactive	38	43
	100	100

*Each of the satellites may be monitored at a different date and at different times. Monitoring is usually done in the late morning and the afternoon. Total number of transponders monitored was 264.

Source: Telecom Highlights, November 24, 1982, February 9, 1983.

and while conceding that the rush to buy or lease has subsided, demand still exceeds supply. Southern Pacific Satellite Co. contends that any oversupply that may exist is only temporary.[1]

A common view, however, is that after several years during which demand clearly exceeded supply, supply currently exceeds demand. Some satellites are more glutted than others. It is contended that excess demand only applies to particular satellites, and that transponders are readily available on other satellites. Some companies with more transponder capacity than they need are subleasing. For example, a cable programmer with excess daytime capacity might try to sublease capacity to a corporation for a few hours of data transmission. Some industry analysts contend that the bloom is temporarily off cable for the satellite business. While about 40 satellites are scheduled for launch over the next five years, some consultants estimate that a good number may never get off the ground.[2]

(v) Research and Development

Major concern has been expressed in some circles over the level of research and development (R & D) on satellites in the U.S., with allegations that if the U.S. falls behind in this area, it could cost the country dearly in the future. This concern was reflected in a report issued by the House Subcommittee on Space Science and Applications in March 1982.[3] The report

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[1] Satellite Week, July 19, 1982.

[2] Fortune, December 13, 1982.

[3] Report, prepared for the Subcommittee on Space Science and Applications, March 1982.

reached several conclusions:

(1) No single private concern can afford to finance broad scale space communications R & D.

(2) NASA's space communications R & D has been successful in the past in developing systems which have given the U.S. a strong lead. This lead is threatened.

(3) The U.S. must pursue development of Ka-band (30/20 GHz) space systems. Without continuation of a strong federal program, foreign domination is likely of these systems and equipment for them, resulting in U.S. importation of 30/20 GHz equipment to the amount of $10 to $15 billion during the 1990-2000 period.

Congress has continued to include appropriations in NASA's budget for its 30/20 GHz program ($20 million allocation in 1983). If the funding continues at the present rate, NASA expects to launch a Ka-band satellite in 1988. The entire program is expected to cost between $350-$500 million, of which 10 per cent is being sought from the private sector in the form of self-funding of the ground segment. NASA is expected to experiment with the satellite for two years and then lease it or sell it back to the manufacturer for the remaining two years of its life.

The issue of the contribution of the satellite and satellite communications industry to the economy in terms of generating income and employment is not an insigificant one. The manufacture and service of hardware, installation, operation, etc. should not be overlooked. For example, Satellite Television Corp. estimated that construction and operation of its DBS

system would directly or indirectly support about 23,000 jobs at the peak and about 15,500 jobs in the long term. Many of these jobs would be in manufacture and installation of receiving equipment.

(vi) Overcrowding

The first geostationary satellite was launched in 1963. By 1982 there were 126 such satellites in orbit[1] of which 76 per cent were communications satellites, 13 per cent reconnaissance satellites, 8 per cent meteorological, and 2 per cent scientific research. Between 1970 and 1980 the number of geostationary satellites had increased at an average rate of 18 per cent annually.[2]

The continued launching of communications satellites in geostationary orbit reduces the number of locations for future satellites. Currently, communications satellites ringing the earth above the equator can be spaced no closer than 2° apart without interfering with each other. Given the 360° earth circumference, there are therefore only 180 slots available of which many are already accounted for. Some countries, particularly

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[1] In addition to the over 1,200 operating satellites currently in orbit, there are over 1,600 satellites whirling around the earth which have fallen silent, not to mention other space "junk." According to the North American Aerospace Defence Command, whose coders keep track of orbiting objects, there are more than 4,800 man-made objects circling the earth, including satellites, empty fuel tanks, remnants of rockets, etc. Some scientists express concern that if the number of orbiting objects continues to increase at the present rate, space travel could become quite risky within a decade. These objects could pose a considerable hazard for satellites. Some contend that it may be necessary to employ such vehicles as the shuttle to gather these debris and either return it to earth or rocket it into outer space and out of danger.

[2] Satellite Week, August 1982.

Third World countries, are concerned that the space powers will occupy all of the choice locations in geostationary orbit before they are ready to act. At the current rate of launch of communications satellites, it is feared that all of the slots will be occupied by the 1990's.

Theoretically useful North American geostationary arc appears to be between 55-143 degrees. This available 88 degrees in arc can, at 2° spacing, in theory support 44 C-band and 44 Ku-band slots. Operators, however, do not want to go out much further than 66 east or 135 west. In addition, Canada still has a part of this arc reserved for itself (109-116). So at 2° spacing there are only about 30 reasonably good U.S. slots, accommodating 30 C-band and 30 Ku-band satellites. At 3° spacing, orbit can accommodate around 20 slots, while at 4°, only 15 good slots.

The Office of Technology Assessment has expressed concern over the rapid filling of available slots and the consequent impact on the satellite industry and has stated:

> When the capacity of these satellites, operating at either C or Ku band, is fully utilized, the growth of this industry will come to a halt -- unless a solution is found and implemented. Two possible solutions . . . are Ka band technology and large communication platforms.[1]

FCC concern over efficient use of the geostationary orbit and overcrowding prompted it to initiate a proceeding examining the efficient use of the geostationary orbital spectrum. Some of the issues considered include minimum number of transponders for satellites, and reducing the spacing between satellites to two degrees.

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[1]Office of Technology Assessment, Civilian Space Agency Policy and Applications, Washington, June 1982, p. 48.

Two degree spacing appears to require advances in antenna design because as orbital spacing is reduced, interference between traffic on adjacent satellites increases.

What would two degree spacing between satellites mean to the current communications industry? It could be a boon to various segments of the industry. It would increase orbit capacity, and for manufacturers of space hardware this will mean a virtual doubling of their markets. For carriers, it will mean more satellite capacity, with which to serve more customers with more services. For earth station manufacturers, it will mean more demand for products, especially the larger antennas.

The industry segment that could lose, however, is the end user. Cable systems which now can achieve satisfactory reception with 4.5 meter antennas, would be forced to up-grade equipment to receive similar quality signals. Considerable investment may be required to upgrade systems which up to now have been quite adequate but may be rendered obsolete by two degree spacing.

Another consideration in reduced orbital spacing is international reaction. Two degree spacing might be viewed as a major "sky grab" by the U.S. The U.S. must remain consistent with its international commitments.

The final effects of two degree spacing will remain unknown until the satellites are in orbit.

5. Developing and Recently Authorized Satellite Services

Among the FCC decisions which were prominent in ushering in new and specialized telecommunications services were the 1972 Specialized Common Carrier decision, the Resale and Shared Use decisions of 1976 and 1980, and Computer Inquiry II of 1980. The 1976 decision reshaped the regulatory environment by requiring domestic common carriers to permit unlimited resale and sharing of their private line transmission services. In 1980 the FCC endorsed unlimited resale and shared use of MTS/WATS type services and effectively extended the pro-competition Specialized Common Carrier and Resale and Shared Use decisions to all domestic telecommunications services. Computer Inquiry II deregulated all but basic services.

The decisions fostered the introduction of new telecommunication services and extended existing services, offered by the established carriers and new entrants into the industry. With the 1972 Domsat decision, new services utilizing satellites included private voice and data services; message toll service; cable TV distribution; program distribution for broadcast television and radio; basic communications to remote areas; video-teleconferencing; and other new and innovative services.

More recently the FCC has been moving in the direction of facilitating the creation and expansion of private systems. The FCC has authorized the sale of domestic satellite transponders on a case-by-case basis and the construction of digital termination systems. Issues under FCC consideration which would further facilitate development of new services include

the possibility of reducing the number of degrees of orbital arc for geostationary domestic satellites from 4 degrees to 2 degrees, which would practically double transponder capacity. The FCC is, in general, examining its existing spectrum utilization policies and spectrum allocations to ascertain what additional services and providers can be accommodated.

Some of the more recently initiated and proposed services, still at the early stages of development, are discussed in the following pages.

(a) Direct Broadcast Satellite Services (DBS)

DBS service is a radiocommunication service in which signals from earth are transmitted by high power, geostationary satellites for direct reception by small, inexpensive earth terminals (dishes approximately two feet in diameter). In August, 1982 the FCC approved the first of eight currently authorized DBS systems expected to become operational by 1986.[1] The designs of the systems are varied.

USSB, a Hubbard Broadcasting subsidiary, plans an advertiser network connecting local commercial TV stations as well as reaching homes.[2] DBS intends to experiment with high-definition TV (HDTV) which would present pictures of 35 mm film quality. HDTV uses double the scanning lines of standard TV, but so far no TV manufacturer

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[1]The nine are: CBS Inc.; Direct Broadcast Satellite Co.; Graphic Scanning Corp.; RCA Americom; US Satellite Broadcasting Co.; Video Satellite Systems Inc.; Western Union Telegraph Co.; and Satellite Television Corp.

[2]USSB plans to seek out small cable systems with fewer than 1,500 subscribers, hotels, apartments, etc.

has developed a consumer-priced set able to receive high-definition signals.[1] RCA Americom proposes a six-channel service including two channels to test high-definition TV and national stereo radio. Western Union envisages a four-channel service with stereo TV and teletext functions, as well as "spot-beam service" to Alaska, Hawaii and the Virgin Islands. Spot beams provide service to narrowly focused regions. DBS Corp. claims its proposal is the most technologically advanced as it plans to deliver six TV channels with up to eight spot beams to the entire country. It has also proposed stereo TV, teletext, and high-definition TV.

One of the most ambitious plans comes from Satellite Television Corp. (STC), a subsidiary of Comsat. STC plans to spend $700 million by 1987 to launch a DBS service catering to the Eastern time zone. Later, three more satellites will be launched for each of the other time zones. The company plans to offer three channels of movies, sports, news and public affairs programming to consumers for $18 per month. Installation will cost another $100, while equipment rental will be about $10 monthly. Eventually, STC intends to add teletext, stereo, and second-channel audio.

RCA Americom estimated that its four-satellite DBS system will cost about $760 million, with $400 million of that to be for initial expenses for the first satellite, spare and

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[1] CBS has initiated a test of analog transmission of HDTV, which is compatible with standard TV sets in use today. This could be a low-cost means of marketing of the first generation of HDTV systems. See Satellite Communications, Nov. 1982, p. 20.

ground equipment. Andrew Inglis, RCA Americom president, has stated that an RCA study indicated that a DBS system could be economically feasible, with installation costs of less than $500 per home.[1] Inglis sees the market for DBS emerging from three sources: those viewers who do not have cable; viewers who have limited program offerings; and the hobbyist, who is intrigued with the idea of picking up a signal directly from a satellite. Inglis believes this adds up to an audience of about 15 to 20 million.[2]

Although DBS service has received FCC authorization for implementation, the financial, technical, regulatory, and market uncertainties faced by potential DBS operators are still formidable.

First a DBS system requires large financial resources, as estimated by DBS applicants. In the case of the first DBS authorization, the FCC limited the amount that Comsat could invest in DBS via its subsidiary Satellite Television Corp. (STC) to $225 mil. Since STC estimates that the system will cost approximately $700 million in the first four years, STC is actively seeking partners. STC's original joint venture partner, Sears, has withdrawn. An executive of STC has commented that "probably no such expensive and risky venture has ever been attempted with less indication of potential consumer acceptance."[3]

STC expects to obtain financial backing from major

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[1] Satellite Communications, August 1981, p. 20.

[2] Communications News, Sept. 1982, pp. 25-27.

[3] Video, January 1983, p. 121.

investment bankers. Its application included letters from Chase Manhattan Bank and First Boston Corp. Chase contended that STC could borrow up to $400 million over a four to seven year period from commercial banks, but loans would be conditional on a substantive review of the latest projections, corporate strategies and business plans.

Even though construction of DBS satellites have been authorized by the FCC, the applicants still face some potential difficulties from the Regional Administrative Radio Conference in July (RARC-1983). RARC-1983 will determine the orbital slots available to the U.S. as well as many of the technical parameters for broadcasting satellites operating in the Western Hemisphere. DBS operators could even be forced to alter the basic design of their systems, a potentially expensive process.

Competition from alternative pay TV distributors could be devastating to the DBS industry. A comparison of some of the features of CATV and DBS is illustrated in Table D-11.

Facing competition from over-the-air broadcast services, cable, multipoint distribution service (MDS), subscription television (STV), low-power television (LPTV), and medium-power direct satellite TV service, could reduce the size of demand for DBS services to below breakeven levels for even one system, let alone the nine systems which have received the go-ahead authorization. Robert Wold of Wold Communications has predicted that no more than three DBS systems will become operational.[1]

Many industry analysts do not expect DBS to make inroads

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[1] Satellite Week, March 22, 1982, p. 7.

into pay TV, arguing that it is not designed for the cable subscriber. Ted Turner of WTBS-TV contends that satellite broadcasting will merely fill in the gaps left by other technologies.[1] DBS's maximum six channels is expected to cost as much as 50 or more cable channels. Analysts view DBS services as aimed at people who do not live within reach of cable, a group that now totals 40 million in the U.S., which is expected to drop to 25 million by 1986.[2]

Inglis of RCA does not believe that the success of DBS will be determined by costs, but by programming.[3] If a viewer can get attractive programs on DBS that are not otherwise available on other media he would likely pay the price. But if DBS programs are available on other media the customer already has access to, any price is likely too much.

There is some evidence that early market entry is a critical market consideration. Research has shown that even single channel STV is able to maintain a substantial market share in competition with multi-channel cable if it becomes entrenched in the market prior to the arrival of its competitor.[4]

Cable was the initial pay TV provider throughout most of the country. Cable TV systems presently pass almost 60 per cent of American TV households with about 25 per cent of house-

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[1] Video, January 1983, p. 74.

[2] Ibid.

[3] Communications News, September 1982, p. 27.

[4] BBC research in Los Angeles. Satellite Communications, November 1982, p. 28.

Table D-11

CATV/DBS COMPARISON

	CATV	DBS
Cost/Home	$500-$700	$500-$700
Satellite Lease Cost (Annual)	$1.0-5.0 Million	$75 Million
Number of Channels	12-100	6-36
Local Programming	Yes	No
Broadcast TV	Yes	No
2-Way Potential	Yes	No

Source: Communications News, Sept. 1982, p. 26. Information provided by RCA Americom Inc.

holds receiving cable TV. MDS and STV, by contrast, are available only in a few large cities. LPTV is in the initial development stages, while DBS is a few years from becoming a reality. These two services are the last pay TV providers on a national basis but will be the first to supply premium TV to many rural areas.

It is contended that aggressive marketing has been the strength of many STV operators. They have a metropolitan-wide service area. Cable is more difficult to market because most metropolitan areas are split into relatively small cable franchise areas. DBS, however, is probably the most vulnerable to marketing problems. DBS subscribers will be spread throughout the U.S. The size of the DBS market may be too small to support national advertising, and yet DBS subscriber densities also may be too low to justify local or regional advertising.

There is some general agreement that cable will remain the dominant pay TV technology for the forseeable future. Cable has had a major head start throughout much of the U.S., it features the largest channel capacity and the lowest per channel prices, signal quality is reasonably adequate, and a variety of ancillary services such as security, transactional services, etc. may become marketable in the future.

The staff of the FCC is reported to be pessimistic about DBS chances for success based on their analysis of the DBS market. There is an apparent feeling among some FCC staff and Commissioners that the size of the marketplace for DBS service has been exaggerated.[1]

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[1] Satellite Communications, November 1982, p. 18. Also interviews with FCC.

(b) Medium-Power Direct-To-Home Satellite Broadcasting

Medium-power direct-to-home satellite broadcasting does not fit the FCC definition of DBS. DBS will be broadcast at the high-powered 12.2-12.7 GHz band, while medium-power is at 11.7-12.2 GHz. Medium-power satellite TV service is expected to be initiated in 1983 by United Satellite TV (USTV). Using the Canadian Anik C-2, and backed heavily by earth-station manufacturer General Instrument, USTV intends to offer four video channels to a 16-state region in the Northeast starting about Sept. 1983. Of the four channels, two will be pay channels similar to cable movie services now available, and two will be ad-supported news and sports channels. Front runners for the news channel are reported to be Ted Turner's Cable News Network and Group W/ABC's Satellite News Channels.

The service will be offered directly to homes for about $30 per month, which is comprised of $15 for programming and $15 for leasing receiving equipment, plus a $100 one-time installation charge.[1] Because these satellites are not as high-powered as DBS, consumers will need a slightly larger dish about four feet in diameter. These dishes must be placed to have a line-of-sight look at the satellites. Since the signals are not on the same frequency as broadcast-TV signals, consumers will require a downconverter to make programs viewable on standard TV sets. In addition, because the signals will be scrambled to deter piracy, viewers will also need an addressable

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[1] Video, Jan. 1983, p. 74.

decoder. An addressable decoder is one that the programmer can turn off and on by computer from its headquarters, and is therefore applicable for pay-per-view events. Sports events figure prominently here and Hollywood is experimenting with selling major movies in the same way ("Star Wars" was offered as a video pay-per-view event in September, 1982).

General Instruments estimates that the whole equipment package will cost about $750 wholesale (per customer) to produce at launch, dropping to $600 in 1985 when increased production is expected to bring economies of scale.

Oak Industries, the largest broadcast subscription TV company in the US had also planned to offer medium-power satellite TV broadcasting using Anik, but backed off contending that it did not wish to make a large, risky capital investment and cope with the additional expense of changing to domestic satellite and of changing users' antennas later for DBS service, which it plans to initiate in 1988.[1]

(c) Videoconferencing

Video teleconference system use has been forecast to grow ten-fold between 1985 and 1991, fueled by sharply rising travel costs, escalating labor costs associated with conferences, and a decline in communications costs. The forecast, published by Gnostic Concepts of California, predicts that total end user

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[1] Satellite Communications, Nov. 1982, p. 10.

expenditures on teleconferencing (equipment and transmission) will increase from about $50 million in 1980 to $250 million in 1985 to almost $1 billion by 1990.[1] Gnostic estimates that key company officials spend about 45 percent of their time in face-to-face meetings and that travel to and from such meetings averages three hours per meeting. Video conferencing can reduce the time element substantially.

While some companies are using or installing private teleconferencing systems, many are turning to ad hoc networks. Some of the ad hoc network suppliers (set up specifically for one meeting) include Holiday Inn (Hi-Net), The Darome Connection, Netcom International, Public Service Satellite Consortium, VideoNet, Videostar Connections, WNET in New York City, Wold Communications, and Bell & Howell. Holiday Inn's video network was created in June 1980 and presently has more than 260 satellite earth stations in place with more being added.[2] Hilton Hotels also recently launched its nationwide video-conferencing service, called the Hilton Communications Network.

It has been estimated that ad hoc teleconferencing is growing at an average of 21 percent on a quarterly basis.[3] Automobile manufacturers are among those companies that have utilized this service. In 1981 Ford held a nationwide sales meeting to introduce its new EXP car. Chrysler also used a

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[1] Communications News, May 1982, p. 15; and Feb.1983, pp. 54-55.

[2] Ibid., Feb. 1982, p. 44.

[3] Ibid.

video conferencing network reaching 9,000 salespeople in 21 locations. Other recent examples include VideoNet's 25 city variety show for Firestone; SatServ coordinated a 12 site transmission for United Technologies; BSC coordinated a 21 city telethon for the March of Dimes; Wetacom transmitted an insurance seminar to 78 sites; SNA created a 13 city program for Boche.

Western Union Corp. recently announced the formation of Western Union VideoConferencing, Inc. to offer customers totally integrated end-to-end videoconferencing services. In announcing the service, the president of the new subsidiary stated:

> Until now, videoconferencing services have been fragmented. One company usually handled production aspects, another would handle transmission and networking facilities, and yet another would handle marketing. Now, Western Union will simplify this situation by serving as a single source of customer contact and responsibility for all video-conferencing services from beginning to end.[1]

In July 1982, AT&T inaugurated its new two-way color video teleconferencing service between New York and Washington and in September added Philadelphia and San Francisco to the system. AT&T plans to make its Picturephone Meeting Service available in 42 cities by the end of 1983. Charges for a customer for a one-hour meeting is about $2,400 between Philadelphia and San Francisco. Charges for customers installing a typical room would pay Bell installation charges of $117,000 plus monthly equipment rental and access fees of $11,760.[2]

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[1] Telephony, August 23, 1982, p. 16.

[2] Communications News, September 1982, p. 2.

Some initial users of satellite services for teleconferencing, such as Allstate Insurance Co., have gone from being users to being vendors of satellite services. The company offers resold common carrier satellite service through Allstate Communications Co.

Teleconferencing is being viewed as well on the road to becoming an established feature of American business.[1]

(d) Cellular Radio Systems

The existing mobile telephone service was introduced by Bell in 1964. It never developed into widespread use because of its limitations. In any one city, only 23 channels are offered and New York has about 700 customers. Even with this small number of customers there were usually long waiting periods for a free circuit during rush hours -- the very time when a mobile phone would be most useful. In addition, the quality of the circuit was bad.

Cellular is far superior to conventional mobile phones. It has 666 channels as compared to 23 and channels can be reused several times in each city. In cellular systems, the radio transmitters use very low power and frequencies that do not carry far. While conventional mobile phones must rely on a single antenna and transmission station in each city, cellular systems use many stations -- over 60 in some of the systems proposed. Each station serves one "cell" two to ten miles wide.

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[1] See Communications News, Feb. 1982, pp. 44-66 for several industry views on the features, uses, and potential of video-conferencing.

When a user places a call, the nearest transmitter relays it to a central computer which relays it into the local telephone system. When the caller moves from one cell to another, the computer, reading the strength of the signals in the cells, cuts his connection to the cell he is leaving (weak signal) and links him to the new one (strong signal), changing channels in the process. The process of changing is unnoticeable to the user and the signal quality is generally as good as on a conventional telephone.

Test marketing of cellular telephones by AT&T in Chicago, and by American Radio Telephone Service in Baltimore indicate a tremendous potential demand for high-quality mobile telephones.[1] The FCC has approved cellular service and began receiving applications for licenses in June 1982 for the top 30 markets. Applications for additional markets were added later and a flood of some 400 applications were received. The applicants range from the established telephone companies, led by AT&T, to competing long-distance carriers such as MCI and Western Union, to a host of paging and mobile-phone companies called radio common carriers (RCCs), to a scattering of venture capitalists.

Under the rules established by the FCC for licenses, the FCC has reserved half the cellular spectrum in each of the top 30 markets for the local telephone companies. This "set aside" policy was justified by the FCC on the grounds that these

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[1] Fortune, July 12, 1982, p. 102.

phone companies are in the best position to get a reliable system operating quickly. Other applicants, however, are strongly opposed to this "set aside" policy and intend to contest it in the courts.[1]

Most applicants are proposing to sell mobile-telephone services for a basic charge of $25 to $35 per month, with user charges ranging from 15 cents to 30 cents per minute. It has been estimated that there is an immediate market for 1.5 million mobile units in the top 30 markets, and that these markets can be expected to generate $2.7 billion by 1987.[2] This would mean an industry as large as recorded music or motion pictures in those markets alone.

How do cellular systems relate to satellites? In the Fourth Annual Satellite Communications Users Conference held in Denver in August 1982, it was predicted that a close relationship would be developed between cellular and satellite communications by 1987 or 1988. For local distribution in teleconferencing it was argued that cellular radio systems could become a necessity to users interested in avoiding wireline carriers.[3]

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[1] Fortune, July 12, 1982, p. 104.

[2] Estimate by Lehman Brothers Kuhn Loeb, reported in Fortune, July 12, 1982, p. 104.

[3] Telephony, September 13, 1982, p. 108.

(e) Message and Data Services

The decisions of the FCC have led to the expansion and development of message and data services. Decisions such as the authorization of domestic satellite transponder sales on a case-by-case basis have facilitated the creation and expansion of private systems.

SBS plans to offer a new interstate long distance telephone service for residential and small business customers in early 1983. The service, called SBS Skyline, would be provided via a nationwide network of SBS satellites, earth stations and switching centers. SBS claimed that it would offer customers savings of 15 per cent over Bell System direct dial service. The new service would begin in Washington, then expand to Philadelphia and Minneapolis. During 1983 service could be made available to 17 other cities across the nation.[1]

The Skyline service is designed to supplement SBS's interstate long distance telephone service for large business customers. That service, Message Service I, began in the first quarter of 1982.

SBS has filed a tariff for the Skyline service with the FCC. Customers of the SBS Skyline service will pay a $16 charge to establish the service, a minimum user charge of $15 per month, plus payment for calls on a usage basis above the minimum charge.

In December, 1982, SBS and Intalcable, the Italian intercontinental communications carrier, signed an agreement to

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[1] Telephony, Dec. 13, 1982, p. 11, 64.

develop and provide transatlantic telecommunications between the two countries. The companies would use existing Intelsat satellite communications facilities for the intercontinental portion of the jointly provided services. SBS will file with the FCC for permission to offer the service.[1]

MCI Communications Corp. is getting set to begin testing a technique intended to allow cable television (CATV) subscribers to gain access to the company's long distance telephone network. MCI believes that there is a natural relationship between cable TV companies and the specialized common carriers like MCI. Provision to customers of direct access to MCI's long distance network would result, believes the company, in substantial revenue.[2]

NASA petitioned the FCC in late 1982 to consider reserving frequencies for possible use in creation of a "land mobile satellite service" in rural areas. NASA claimed that such a service would complement cellular mobile radio systems being planned, and other mobile networks in use. Despite denial in 1981 by the FCC of a similar filing, NASA insisted that such a system was technically feasible and that there was a large demand for such use of satellites. NASA predicted 288,000 subscribers by 1990 in rural areas. NASA warned that other nations were developing mobile satellite services using available frequencies and unless the FCC "acted promptly to provide frequencies for such satellite services, this country's leadership position in satellite communications and in mobile

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[1] Telephony, December 20, 1982, p. 11.

[2] Ibid., Nov. 29, 1982, pp. 15-17.

communications equipment will be jeopardized."[1]

Another company which has taken advantage of freer entry into the telecommunications industry and is making use of satellites is Starnet Corp. Starnet has recently installed a long distance satellite network to provide telephone service to hotel guests in Las Vegas hotels. The network bypasses the telephone equipment provided by Central Telephone-Nevada. Outgoing long distance calls are microwaved from the hotels (MGM Grand Hotel, Tropicana, Caesars Palace) to a Starnet switch in Las Vegas. Calls are then routed either through wide area telecommunications (WATS) lines or via leased AT&T circuits to an RCA Americom satellite where the calls are sent down to earth stations in Chicago, New York, Atlanta, Houston, or Miami, to be sent on to their final destinations. According to the President of Starnet, the company plans to have switches in 15 cities shortly.[2]

Las Vegas seems ideally suited for such a service. It is reported that one hotel alone, MGM Grand, generates $1 million annually in calls, with over 98 per cent of the calls going outside the state.[3]

Starnet's service is tariffed and regulated by the FCC.

Market tests for teletext and videotext[4] in the U.S.

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[1] Telephony, Dec. 13, 1982, pp. 16-17.

[2] Ibid., August 12, 1982, p. 11.

[3] Ibid., p. 16.

[4] Teletext is a one-way delivery of text and graphic information on a television screen. Videotext is a two-way information service using a telephone line or cable.

appear to be in full swing with a variety of experiments. The major question is to determine whether people want it. One factor appearing to favor the development of teletext services is the relative ease and economy of distribution of teletext data by satellite. While one transponder can transmit at any one time a single TV channel or about 350 telephone calls, it can transmit 5,000 pages of information in about 10 seconds. Satellite operators and transponder users may benefit considerably from this new technology. For example, broadcasters may have an additional incentive to install earth stations. Schools and universities may install earth stations to receive teletext educational services broadcast on DBS frequencies.

CBS Inc. recently announced that its TV network would launch a national teletext service (Extravision) that would be available to viewers through its 200 network affiliates. The CBS announcement marks the first attempt by any company to offer teletext nationally. Extravision will have 100 pages of text including information about airline schedules, movie listings, weather, and stock market reports.[1]

(f) Distribution Services for TV Networks and Radio Broadcasters

New services are being initiated and developed for TV and radio distribution. A recent aggressive entrant into this area is AT&T. Up until now, AT&T has used the satellite system principally to provide long distance telephone service. AT&T recently initiated its first special service on domestic sat-

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[1] Wall Street Journal, Wed. Jan. 26, 1983, p. 42.

ellites called Satellite Television Service (STS). STS relays TV feeds via the Comstar satellite system. It is an end-to-end service making available to customers not only the satellite channel but also earth stations and terrestrial links. The major TV networks have begun to use these services. NBC, the services' initial customer, has linked its East and West coast facilities employing two transmit/receive earth stations supplied by AT&T -- one in New York and the other at NBC's Burbank, California site. The service enabled the network to skip long chains of ground stations and deliver a "technically superb quality" signal to a distant point in the network. NBC's executive vice president stated that "in three or four years we expect to be distributing a great deal of our programming this way."[1] The advantages of satellite transmission include the ability to provide multiple feeds of program material simultaneously to affiliates, a more consistent signal than when a feed has to travel a long distance terrestrially, and the ability to distribute signals to many points with distance not affecting costs.

An AT&T proposal for audio distribution by satellite was presented before the FCC in 1982. AT&T proposed to provide radio broadcasters and programmers across the country with a high-quality versatile means of transmitting radio programs by satellite. The service would provide Bell System customers with multiple audio circuits that would enable them to transmit in stereo or to use each circuit individually for different

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[1] Satellite Communications, April 1982, p. 36.

transmissions. DIR Broadcasting, a nationwide radio program producer, is expected to be the first customer to use the service under the name Satellite Radio Services. DIR plans to use the service for 24-hour stereo broadcasting to 50 stations nationwide in 1982 and to 200 stations by 1983. The president of DIR explained: "Satellites allow us to broadcast shows nationally in top quality stereo at affordable rates and to an unlimited number of stations."[1]

[1] Satellite Communications, April 1982, p. 37.

(g) Satellites and New Opportunities for Telephone Companies

The combination of economical satellite communications and the deregulation-competition climate in Washington has set the stage for substantial changes in long distance telecommunications.

In 1972 at the time of the FCC's Domestic Satellite Decision, there were eight applications before the FCC for satellite systems. The announced service plans were for video, telephone, and private line telephone. Of these eight, four were abandoned[1] and Satcom (RCA) and Westar (Western Union) were the first to become operational. The early years of Satcom and Westar were marked by many vacant transponders. There was very little long distance private line voice traffic available and even the use by AT&T and GTE of Comstar was small. In some cases the satellites took traffic away from the terrestrial microwave and cable links of their owners.

Television offered a quick way to fill up empty transponders and the pioneering efforts of Home Box Office and the Public Broadcasting System verified that the domestic satellites could readily provide multipoint video services.

The picture for satellite utilization in the 1980s is quite different from 1970. Many satellite systems that did develop and sought new authorizations in the early 1980s, along with some new entrants, have substantial telephone holdings and appear to have designs on the long distance tele-

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[1] Hughes National Satellite Systems, Fairchild Hiller, Western Telecommunications and Comsat (alone).

phone market. In the 1980's it will not be just the private lines, but also certain amounts of traffic between telephone operating companies. As far as long distance communications are concerned, a satellite is an alternative to construction of terrestrial links. Evidence of this shows in the acquisition by Continental Telephone Corp. of a share of American Satellite Corp.; the plans of Southern Pacific Communications Corp. for a satellite system; the filing by MCI Telecommunications Corp. for use of satellites to provide its long distance services; the planned GTE G star system; AT&T's Telstar system. In addition, non-telecommunications entities of end users such as large business organizations are taking interest in establishing their own long distance network systems using satellites (teleconferencing).

The combination of satellites (for long distance traffic) and the local distribution networks pose opportunities to every level of the telephone industry. Satellite traffic today is small compared to long haul terrestrial links but it is growing rapidly. If the growth of traffic on Intelsat can be used as a guide, domestic traffic can be expected to double every 3 to 4 years. In 1970, the total number of satellite circuits completed on Intelsat was 2.1 million. By the end of 1980 the number was in excess of 18 million and is projected to increase to 44 million by 1984.[1]

The combination of local telcos and satellites can be used for the generation of new types of business, not just the types that the long distance carriers and data carriers are

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[1] Telephony, Jan. 26, 1981, p. 42.

offering. Other types of new services include teletext and videotext using telephone circuits as part of the link and some of these services, as discussed in the previous pages, are currently being developed.

(h) Notes on International Services

The FCC's efforts in the international area and the domestic segment of international traffic have in many respects paralleled its efforts in the domestic arena, although at a slower pace. The philosophy, as in the domestic scene, appears to be to eliminate barriers to entry and to promote competition.

The Datel and Dataphone decisions allowed AT&T to provide record service on an ancillary basis, and the international record carriers (IRC's) to provide voice on an ancillary basis. The Gateway decision increased the number of domestic points of operation the IRC's could establish. In December 1981, the FCC authorized IRC's to provide wholly domestic record service in competition with Western Union. At the same time Congress passed the Record Carrier Competition Act, amending the Communications Act to remove the long-standing bar against Western Union to compete in the international record market.

In another action to promote entry and competition in telecommunications facilities and services, the FCC in October 1981 authorized use of the U.S. and Canadian satellites for limited transborder services. Transponders for video and data signals were made available following bilateral agreements with

Canada and coordinated with Intelsat. Recently, several U.S. firms applied and received FCC authority to use transponders on Canada's Anik satellites for U.S.-only service. In addition, the FCC, after a lengthy examination of Comsat's structure, authorized a restructuring to permit Comsat to deal directly with customers instead of being authorized to offer its services through another common carrier.

The FCC has also raised the possibility of permitting private users to directly access Intelsat space segment, and similar thoughts underlie initiatives occurring in the earth station ownership area.[1] The FCC has also ruled that the Computer Inquiry II enhanced services decision applies to international traffic on the underlying theory that the deregulation of enhanced international services will promote competition and lower prices.

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[1] Communications News, Dec. 1982, p. 96.

6. Satellite/Cable/Broadcaster Relationships

a) Blurring of Distinctions

The rapid advances in technology and changing regulations of recent years has placed the entire telecommunications industry in a state of transition. Conventional criteria (distribution, services, content and rates) distinguishing the various categories of services are no longer as clear as they once were. Lines of distinction are blurring as service providers move from one category to another.

Common carriage has traditionally been regarded as point-to-point transmission of voice, data, and to a limited degree, video, for private, paying customers. Broadcasting, on the other hand, has traditionally been considered point-to-multipoint distribution of TV and radio program over public airwaves, free to the home. Broadcast services were considered local in nature, whereas common carrier services were considered long distance.

Technological advances and regulatory changes are tending to blur the distinction between common carriers and broadcasters. Satellites have reduced long-haul transmission costs. Commercial TV networks are beginning a transition from terrestrial microwave to satellite distribution. The simultaneous transmission of multiple program feeds will provide local broadcasters with a diversity of program services and enable them to arrange local programming to best suit the needs and desires of local audiences. Since 1978, PBS stations have been custom-designing local schedules from programming on Westar transponders. It

pp 265-267 behind p. 276

has been submitted that broadcasters are tending to become "narrowcasters" rather than mass distributors.[1] The development of spot beams for the future will, it is argued, further enhance broadcasters' ability to zero in with targeted programming for specific audiences.

As broadcasters become narrowcasters, carriers are becoming multi-point distributors. Carriers use a combination of private terrestrial networks, satellites, and local multi-distributional services (MDS) to obtain access to customers throughout the country. High-speed digital satellite communications is fostering a new generation of private networks, including American Satellite Co., SBS, & GTE. Common carriers are placing increased emphasis on data and video services to supplement their traditional voice offerings as evidenced by common carrier companies' entrance into DBS services (RCA Americom, Western Union, Comsat). Entering the TV programming business, common carriers will control information content as well as the transmission lines for such content.

Broadcasters are diversifying their services, no longer limiting themselves to delivering radio and TV. CBS, NBC & PBS stations have begun delivering data to the home as teletext. Two PBS member stations, WNET-TV in New York and WETA in Washington have ventured into teleconferencing to maximize use of their production studios and capitalize on their networking expertise.[2]

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[1] Satellite Communications, April 1982, p. 53.

[2] Ibid., p. 54.

Ad supported programming must now compete with subscriber-supported TV and new, hybrid broadcast services such as STV, MDS, SMATV, and potentially DBS, are joining cable TV in eroding the network positions in the TV market. The ever-increasing market competition in these services is viewed by some as decreasing the need for FCC regulations, and perhaps eliminating regulation completely.

This blurring of boundaries between broadcasters and common carriers is reflected in the recent FCC decision on DBS services. The Commission deferred from establishing a particular service classification for DBS, contending that there was "no reason why a DBS operator could not function as broadcaster with respect to some channels and a common carrier with respect to others."[1] Furthermore, the FCC declined to license and classify common carrier DBS customers as broadcasters.

The total number of TV broadcasting stations that have access to domestic satellite transmission is continuing to grow and nationally number 264 TV stations.[2] Radio stations are also now going to digital and audio satellite communications. RCA has signal contracts with three networks.

(b) Satellites and Cable

Cable TV was an early application of satellite transponders, which were leased from the satellite common carriers, and it was one way of making use of excess satellite capacity.

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[1] FCC Reports, 90 FCC 2d (1982), p. 709.

[2] Communications News, May 1982.

The relationship was quick to develop into one of the most dramatic in the history of television .

An examination of transponder use of the first three satellite communications systems, Comstar, Westar, and Satcom shows the majority of the transponders of Westar and Comsat transponders loaded for television. In 1980, of the 36 transponders in the Westar system (Westar I, II, III), 70 percent were used for radio or television, and of the 59 transponders in the Satcom system (Satcom I, II, and Comstar D-2 -- leased due to the loss of Satcom III), 31 or 53 percent were used for television.[1]

Satellites provided an economical means of distributing program material and the potential for bringing new program sources, even into the largest metropolitan centers with a number of local TV stations. Whereas cable had previously been confined to areas with limited local broadcast services, with satellites it became economically feasible everywhere except in the most sparsely populated areas. The pioneer program suppliers were HBO, a subsidiary of Time, Inc. and WTBS, Ted Turner's Atlanta TV station.[2] As with most entrepreneurial

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[1] Satellite Communications/Direct Broadcast Satellites, Hearings Before the Subcommittee on Telecommunications, Consumer Protection and Finance, Dec. 15, 1981, pp. 268-269.

[2] Turner's station is picked up off-the-air by a small common carrier, Southern Satellite Systems. The signal is transmitted to a Satcom satellite and rebroadcast to cable systems all over the country. This gives the cable operator and his subscribers an additional source of programming; Southern Satellite collects the revenue for this; Turner gets nationwide advertising coverage at no extra cost; and RCA gets a good customers.

enterprises, the success of these businesses was not assured and it was not until two years after initiating the service, that profitability seemed certain. This created a rush for transponder space and a shortage.

The growth of cable and pay cable TV is illustrated in Tables D-12 and D-13. The cable TV industry (CATV) owes much of its success and growth to satellites, with programmers making their packages available nationwide to CATV systems to provide a greater abundance and diversity in programming options. In a recent count, the National Cable Television Association found 43 programmers presently supplying services via cable satellite, with another 18 planning to introduce services.[1] Of those operational, 34 are on RCA's Satcom system, 8 are on Comstar, and 5 on Westar. Hughes Communications Inc. is also entering the satellite TV scene and has sold a number of the transponders on its Galaxy I satellite, scheduled for a June 1983 launch, to broadcasting interests. Still another entry is by Southern Pacific Communications which plans to launch a cable TV satellite (Spacenet I) in early 1984. The satellite will be used by a consortium of Satellite Syndicated Systems and other transponder lessors with a plan to place 1,000 earth stations, serving 70 per cent of all cable homes, to receive programming from the satellite.

Cable subscribers want, besides the usual TV entertainment fare, news, contemporary music, and safety services such as fire and burglar alarm systems, medical alert service, etc.

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[1]The largest group of program suppliers is the group that provide a pay TV service.

according to a recent survey. The survey's findings indicate the potential growth areas for new cable system operators and the program suppliers who serve them and indicate a huge potential market. The offering of an ever-wider array of satellite-delivered programming for a potentially huge market is viewed as maintaining a high demand for satellite transponders.

The FCC has recently reaffirmed its 1981 action requiring telephone companies seeking to buy a cable TV system or to compete for an expiring franchise in a rural service area to obtain a waiver of telco-cable TV cross-ownership rules (FCC Docket 80-767).[1] The 1981 order allowed an exemption from cross-ownership rules allowing telcos to establish and operate cable systems in rural service areas where no such service is provided or under construction.

Corporations are also creating large growth markets for satellite carriers, and there is some speculation that satellites and the cable TV industry will join to service this potentially major new customer class. It is contended that just as the cable-satellite connection has served the entertainment market, so too can it be turned to business applications.

Business communicators recognize that satellite transmission of their voice, video and data messages brings them efficient, cost-effective communications. More and more corporations with a need for high-speed communications are

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[1] Telephony, Nov. 15, 1982, p. 16.

TABLE D-12

A Decade of Cable TV Growth

Year	TV Homes	Systems	Subscribers	Percent of Cable Penetration of TV Homes
1970	59,389,000	2,490	4,500,000	7.6
1971	60,775,000	2,639	5,300,000	8.7
1972	62,969,000	2,841	6,000,000	9.5
1973	65,244,000	2,991	7,300,000	11.2
1974	66,575,000	3,158	8,700,000	13.1
1975	68,771,000	3,506	9,800,000	14.3
1976	70,573,000	3,681	10,800,000	15.3
1977	71,556,000	3,832	11,900,000	16.6
1978	73,307,000	3,875	13,000,000	17.7
1979	73,901,000	4,150	14,100,000	19.0
1980	75,793,500	4,225	15,500,000	20.0

Source: Communications News, January 1982.

Table D-13

Growth of the Pay Cable Industry

Date	Pay Cable Subscribers	Systems with Pay Cable	Percent of Penetration of Homes Passed	Average Pay Rate
7/15/73	35,000			
12/31/74	140,000			
12/31/75	469,000	170	11.1	$7.85
12/31/76	978,000	364	10.6	7.87
12/31/77	1,642,000	604	12.2	7.92
12/31/78	3,289,000	1,029	17.9	8.09
12/31/79	5,732,000	1,822	22.3	8.44
12/31/80	9,144,000	3,072	27.9	8.80
6/30/81	11,320,000			

Source: Communications News, January 1982

becoming users of satellite transmission. Satellite common carriers specializing in voice, data, and record transmission are competing with traditional terrestrial carriers for business communications services. In addition to AT&T, American Satellite, Western Union, RCA and SBS are providing private line satellite communications to business users.

But as this industry grows with ever-increasing numbers of users it is open to speculation whether the direction will be towards literally hundreds of rooftop and parking lot antennas aimed at a variety of business satellites, or towards cable routing all manner of transmissions to a centrally located, shared earth station. The latter direction would see a cable system network routing voice, data, and video messages to a regional switching center, and transmitting them via satellites to other similar centers. The system would be an industrial network, a business extension of today's cable TV systems created by the marriage of cable operators, satellite carriers and business communicators. Some see this as a natural marriage between the cable operator and the satellite carrier to deliver both entertainment video and business signals throughout the country.

To a degree SBS offers its customers a choice of either system. SBS will install a rooftop antenna on a company's premise and route transactions via a dedicated business satellite to another rooftop dish at the company's premise in another location. Alternatively, SBS groups users onto a dedicated SBS earth station, and utilizes local distribution systems for message delivery via microwave or land lines. Customers thereby share the cost of the earth station.

7. U.S.-Canadian Satellite Relationships

Co-operation between Canada and the U.S. in the launch and use of satellites has existed from the beginning of the satellite program in Canada, and continues with Canada's contribution to the development of the Shuttle (Shuttle arm) and the use of the Shuttle to launch Telesat's Anik-C in November 1982.

In the commercial use of satellites for telecommunications, RCA started its operation of domestic telecommunications satellites in 1973 with the use of Telesat Canada's Anik satellite. Since that time Telesat has continued to make transponders available to U.S. carriers. For example, Telesat has an agreement to lease on Anik C-2 scheduled for a spring 1983 launch, 10 transponders to GTE Satellite Corp., which in turn plans to sublease them to United Satellite TV. USTV plans to deliver two basic, two pay channels to cable systems, hotels/motels, multi-unit dwellings and institutions. The Anik C is said to offer excellent coverage of the top half of the 48 states. The one-year contract with Telesat is reported to be worth $32 million.[1] USTV spokesmen said that Canada strongly supported the move, being "very eager" to use the transponders.

In May 1982, the CRTC approved a similar lease of six Telesat transponders to Argo Communications of New York, a resale carrier. Telesat had announced in March 1982 that it was

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[1] Canadian Communications Reports, August 31, 1982.

seeking temporarily to lease surplus transponders to U.S. users and expected that it might sell $62 million worth of leases.

An indicator of U.S. satellite operators' and earth station operators' interest in the Canadian market has been several recent applications before the FCC for authority to extend their presently authorized domestic satellite program services to receive points in Canada.[1] These applicants include companies which have leased facilities (channels) from satellite common carriers and wish to expand TV programming to points in Canada, as well as companies which seek to expand their authorized earth station facilities to provide TV service to points in Canada via Telesat Canada's Anik satellite system. Applicants seeking the latter authorizations in late 1981 included 220 Television, Visions Ltd., and Satellite Signals Unlimited, Inc. Companies applying for the former service included Southern Satellite Systems Inc., RCA American Communications Inc., and United Video. Several of the applicants for U.S.-Canada service advanced the argument that transborder television services as proposed in their applications is incidental and peripheral to their domestic operations. It is a means of inexpensively and efficiently extending their TV programming services as opposed to using the more costly terrestrial facilities which some of them were already using to provide services to Canada.

At the same time the FCC received a number of applications

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[1] FCC Reports 88 FCC 2d 258 (1981) Transborder Satellite Video Services.

for authority to utilize U.S. domsats for specialized digital data network services between points in the U.S. and points in Canada. Two of these applications came from Satellite Business Systems[1] and from American Satellite Corp.[2]

Despite the opposition of Comsat that transborder services between Canada and the U.S. were international and thereby under the terms of the Satellite Act of 1962 were under the sole jurisdiction of Comsat, the FCC granted authority for transborder services. The FCC ruled that authorization of such services for domsats was consistent with the 1962 Satellite Act, the Intelsat Agreements, and with domestic satellite communications policy. In the words of the FCC, "the present and future public convenience and necessity require a grant of the . . . applications . . ."[3] The FCC expected, however, that the applicants would abide by any conditions imposed by the other countries participating in the provision/reception of such services.

The FCC concurred with the applicants arguments that extension of services to transborder locations would result in additional revenues to U.S. programmers and carriers, together with potential for increased trade of U.S. video equipment and program material.

In late 1981, SBS received FCC approval to extend its private network services to Canada. Implementation would

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[1] FCC Reports, 88 FCC 2d, 195 (1981).

[2] Ibid.

[3] 88 FCC 2d (1981), p. 283.

require Canadian government approval and specific arrangements between SBS and the Canadian carriers, which would operate the earth stations in Canada. At about the same time the American Satellite Co. reached agreement with the TransCanada Telephone System (TCTS) for transborder satellite transmission between the U.S. and Canada of voice, data, facsimile, and video teleconferencing to business users. Service would be provided through ASC's ownership in the Westar Satellite System and Telesat Canada's Anik satellites.

In August 1982 the U.S. and Canada exchanged letters of agreement to allow transborder satellite use. Telesat has stated that it will seek agreements with all U.S. domsats, including the eight FCC approved applications by U.S. companies to serve Canada.

ASC recently signed an agreement in principle with Mitel under which a new U.S. specialized common carrier will be formed. The new carrier, which will combine ASC's satellite transmission capabilities with the Mitel SX-2000 integrated communications system, will provide switched long-distance voice, data, video-conferencing and value-added services via satellite to business users. Service, which is expected to begin early in 1984, will be a private business network exchange through which switched voice communications will be provided. ASC will own 75 per cent of the new carrier and Mitel will own the remaining 25 per cent.[1]

Two satellite carriers which have been actively seeking

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[1] Telephony, January 10, 1983, p. 13.

to expand their services into the Canadian market are SBS and ASC. SBS is interested in extending its business network to U.S. subsidiary companies in Canada (i.e. General Motors). SBS is anxious to extend its new Skyline services to Canadian locations, particularly to Ontario and British Columbia, but has not been able to obtain favorable terms. One of the problems SBS faces is that it wishes to use its own satellite transponders for Canadian service, whereas Canada demands that 50 per cent of the traffic be carried on the Anik satellite. SBS claims that it is not economical to divide the service in this manner. SBS claims it would cause traffic routing problems for SBS because the traffic would be mostly U.S. to Canada. Antennas on business premises pointed at SBS satellites cannot use Anik and vice versa.[1]

While ASC recently reached an agreement with the Trans Canada Telephone System (TCTS) via Telesat for transborder satellite transmission between Canada and the U.S., ASC does not see a major market in Canada for its voice, data, etc. services. ASC sees Canada as an extension of the U.S. market, and since a satellite can serve both areas, and if there is a demand for ASC services, ASC will naturally explore possibilities in the Canadian market and is prepared to try to supply the demand.[2] In other words, given the fixed cost of the satellite, and if marginal costs of expansion of services are not excessive, an extension of services to any market that is

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[1]Information from Satellite Business Systems.

[2]Information from American Satellite Co.

open, results in a reduction in average total costs of the system.

8. Industry/Regulator Views: Industry Developments, Markets, Regulatory Policy

There are a great variety of views on the satellite communications industry, its potential, and the regulatory policies impacting on satellite communications. This section presents some of the views expressed by industry representatives, analysts, and regulators, particularly FCC authorities.[1]

(a) Views On The Industry

Mr. L. Paschall, President of American Satellite Co. (ASC), sees dramatic growth in certain categories of satellite communications, particularly videoconferencing and data and private line services. He observes that voice traffic is growing at 10 per cent and data traffic at about 30 per cent annually.[2] His own company expects to concentrate on the high growth components and to look for new product lines, new services, and methods of adding services to the existing earth station structure.

Mr. Paschall has stated that ASC does not intend to compete with AT&T and others for the long distance telephone market because he has some reservations about the long-run profitability of this service. He is reported as saying:

> As we look at what's happening in the regulatory world, it's quite clear that subsidy has been flowing to the local telephone from the long distance call. That is going to disappear. When that happens, the price of long distance will come down. There's going to be a lot of pressure on the margins.[3]

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[1] The sources of the views are: the statements of individuals as recorded in journal and magazine articles and reports; addresses before conventions and conferences; and interviews.

[2] Satellite Week, October 4, 1982.

[3] Ibid.

Mr. Paschall is of the view that the softest part of the satellite market is the television segment (the "cable birds") in terms of the numbers of transponders being used and offered for television services. Given the launch activity planned in the satellite industry, while Paschall did not foresee a glut of transponders in the 1980's, he was of the opinion that their number will not likely cause them to be priced on a scarcity basis.

Ray Fentriss, vice-president of marketing for Satellite Business Systems, sees the convergence of computers and communications, fibre optics/lasers and satellite technology as creating a whole new world of communications. He is highly optimistic about the future and the benefits of the unique aspects of satellites, including: distance-insensitivity, allowing carriers to reduce costs; movable capacity, allowing immediate interconnection wherever an earth station is placed; and the advantages of all-digital system capability. Two areas of expansion emphasized by Fentriss in satellite communications are video teleconferencing and voice or telephone communications.[1] He pointed out that SBS, with two orbiting satellites and 70 earth stations was handling 10,000 phone calls per day, and this was growing at a rapid rate. He noted that in mid-1982 there were about 50 companies operating full-time teleconferencing systems.

Mr. Philip Schneider, a vice-president of Western Union, agrees with the practice of selling transponders and sees this

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[1] Communications News, June 1982.

practice growing. The practice, he contends, is the result of rising construction and launching costs. Schneider conceded that to date Western Union's role in video teleconferencing has been small, but this is an area where WU has planned expansion.[2]

Mr. G. Phipps, marketing manager of video, switched data and satellites for AT&T Long Lines envisages AT&T vigorously pursuing most areas of satellite communications. He points out that AT&T's satellite system has evolved from one carrying only basic telephone service in the late 1970's (required by the FCC for the first three years) to many other services including satellite TV service, and plans for a pure digital service. Phipps does not foresee AT&T abandoning its terrestrial business in favor of satellites, but will continue to offer expanding satellite services, and integrate them with its terrestrial facilities.[1]

RCA Americom recently established a new subsidiary, RCA Network Services, which is designed to offer a combination of space and terrestrial communications technologies to the corporate telecommunications user. Andrew Inglis, President of RCA Americom sees his company as continuing its close association with the cable industry as satellite services develop and expand.[2]

A recent intensive examination of U.S. space policies, programs, and industry by the Subcommittee on Space Science

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[1] Communications News, June 1982, p. 59.

[2] Satellite Communications, May 1981, p. 25.

and Applications led the Subcommittee to conclude:

> At least one aspect of space has been a success in the private sector -- satellite communications. This example had led many to look for the next space activity that will be commercialized by the private sector.[1]

There was considerable testimony before the Subcommittee that the government should encourage the private sector and that the government should adopt policies that would encourage greater independent private sector activity in research and development and the commercialization of various elements of space.

(b) Views On Regulation

A recent bill (S. 898) "Telecommunications Competition and the Deregulation Act of 1981" introduced in the Senate by Senator Rockwood (R.-Ore.) and several of his colleagues on the Commerce, Science and Transportation Committee passed the Committee by a 16 to 1 vote and is making a strong bid for U.S. senate approval. Unlike several other attempts to reform the outdated Communications Act of 1934 by the House Telecommunications Subcommittee in the last 4 or 5 years, S. 898 has the support of AT&T.

AT&T Chairman Charles Brown welcomed the bill to clear up much of the uncertainty in the telecommunications industry and enable AT&T to plan for the future in the various areas of telecommunications.[2]

The bill to a large extent deregulates major portions of the industry where there is sufficient marketplace competition.

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[1] Future Space Programs, report prepared by the Subcommittee on Space Science and Applications, May 1982.

[2] Satellite Communications, August 1981.

S. 898 states:

> It is the policy of the U.S. to rely wherever and whenever possible on marketplace competition and on the private sector to provide all telecommunications services, and thereby to reduce and eliminate unnecessary regulation.[1]

This would apply to the satellite communications industry where there is a degree of competition. But many in the industry fear that the power of AT&T and the vast resources at its disposal would, in a freely competitive, unregulated system, soon put them out of business.

The solution found in S. 898 is that any designated "dominant-regulated carrier" create a fully separated affiliate to conduct business in a deregulated market. Under the provisions of the bill, the FCC would have to approve creation of the affiliate.

GTE, an ally with Bell in satellite communications, expressed concern over S. 898, arguing that AT&T's sheer size would overwhelm competitors in an unregulated satellite market. GTE's president, Theodore Brophy and others contended that S. 898's provisions regarding creation of a subsidiary were too weak. SBS President Robert Hall argued that the bill should require a significant amount of continuing scrutiny and regulation of business transactions and assets flowing between AT&T and its affiliate. G. G. Grant, president of Southern Pacific Communications maintained that in today's complex corporate world it was almost impossible to have a subsidiary fully

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[1] Satellite Communications, August 1981.

separated from its parent.[1]

Also critical of S. 898 were newspaper publishers. They feared that AT&T's entry into unregulated, competitive markets would lead to the creation of an "electronic Yellow Pages" which would have a serious effect on the revenue daily papers derive from advertising.

Many of the issues currently facing the telecommunications industry were discussed at the 94th Annual Convention of the National Association of Regulatory Utility Commissioners (NARUC) held in November 1982 in Boston.[2] The theme was "The public interest: adequate and affordable service for all." While the main concern was the AT&T - DOJ consent decree on AT&T divesture and its possible effects, many other issues were also addressed. The prime concerns of state public utility commissioners and state regulators were preservation of basic universal phone service and the impact of deregulation on residents in their respective states. Many viewed the losers of recent developments and FCC deregulatory actions to be low income and rural customers who may not be able to afford basic telephone service. The winners, it was claimed, would be the large business users of enhanced telecommunications services, and the telcos that get out of the business of providing basic phone service to residential customers.

An NARUC ad hoc committee report echoed the concerns expressed at the convention. The report contends that in

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[1] Satellite Communications, August 1981.

[2] Telephony, December 6, 1982, pp. 110-114.

developing a regulatory strategy, two long range goals must somehow be balanced: to assure universal service at affordable prices and to encourage competition which will make available new products and services.[1]

The President of RCA Americom, in a recent Congressional Hearing, set forth the following views on issues relating to domestic communications satellite policies:

> . . . Domestic satellite carriers should be able to utilize sound market-based procedures, such as our recent auction, to allocate satellite facilities when demand for these facilities temporarily exceeds supply; . . . We take a similar position on the question of the sale of transponders; . . . We favor measures to encourage more efficient use of the available orbital arc by reduced satellite spacing; . . . We . . . are vitally interested in assuring an orderly environment for the provision of DBS services.[2]

He defended the auction system on the basis that:

> An auction of limited satellite capacity leaves the problem of allocation to the marketplace, [and] An auction comports with the same mechanism used in unregulated sectors of the economy to allocate virtually every other product and service: i.e. free-market pricing.[3]

In defense of deregulation, he expressed impatience with those who claim that there is little competition among domestic satellite carriers. He acknowledged that as of the end of 1981 there was a scarcity of transponders insofar as television distribution services were concerned, but claimed that the new FCC authorizations for additional satellites (20 in the 1981-84 time frame) would change the situation. He furthermore pointed out that in other services there was considerable competition:

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[1]Telephony, December 6, 1982, pp. 110-114.

[2]Satellite Communications/Direct Broadcast Satellites, Hearings before the Subcommittee on Telecommunications, Consumer Protection and Finance, December 15, 1981, p. 25.

[3]Ibid.

> . . . it should be emphasized that the television distribution service is well less than half of the total services that we provide via the domestic satellite system. There is very real competition in the private line services provided to commercial users and also to the services provided to the U.S. Department of Defence and NASA.[1]

Furthermore, he pointed out,

> . . . AT&T also competes with the domestic satellite carriers in the private line area and will be becoming increasingly active certainly in the broadcast television distribution area.[2]

Among those in favor of the FCC's free entry policy is the National Telecommunications and Information Administration which observed:

> A vital and expanding telecommunications industry is essential to this Nation's future economic well being. We must maintain our lead in technology so that American industry can improve its productivity and strengthen its role in international trade . . . Unless we are willing to free U.S. industry in DBS and other areas of telecommunications, to experiment, we stand to lose many possible benefits. Instead we will see other countries advance in areas we originally pioneered.[3]

Among those who have opposed FCC policies of deregulation and competition is SIN, the Spanish National Television Network with about 160 broadcast and cable affiliates in the U.S. SIN has argued that regulation has led to abuses and discriminatory pricing and service practices by the carriers. SIN is of the opinion that demand will continue to exceed supply of transponders and as long as such is the case, there is no competitive marketplace -- no competition among domestic satellite carriers. Without supply and demand parity, the carriers can act as

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[1] Satellite Communications/DBS Hearings, Dec. 15, 1981.

[2] Ibid.

[3] Ibid., p. 197.

monopolies, and without regulation could reap windfall profits.[1]

DBS was vigorously opposed by the National Association of Broadcasters. The NAB argued that the FCC was not adequately examining many critical questions on the impact of DBS on local broadcasters. It submitted that DBS would wreak havoc on the locally-based TV broadcast system and the public interest it serves. It contended that the DBS spectrum should be preserved for innovative, high-technology uses that best serve the public interest.

The NAB has been highly critical of the FCC for what it contends is a dereliction of duty in the efficient allocation of spectrum. The NAB argues: "the FCC cannot simply say that any type of service can utilize this spectrum [12 GHz]. Rather, it must pick and choose among various uses and do so on the basis of spectrum efficiency and public benefits. This it has not done."[2] The NAB has been highly critical of an FCC staff report which stated:

> The Commission can assign frequencies to applicants as long as there is more spectrum available than there are applicants. Thereafter, it will have to choose among applicants.[3]

What the NAB is saying is that the open-entry in a sense first-come first-serve policy of the FCC neglects the question of opportunity cost. For example, orbital space is assigned to

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[1] Satellite Communications/DBS Hearings. Robert Wold Co. made the same argument about lack of equilibrium between supply and demand in its opposition to deregulation and the sale of transponders.

[2] Ibid., p. 220.

[3] Ibid., p. 222.

DBS on the grounds that DBS is in the public interest. But no attempt, argues the NAB, was made to determine alternative uses of scarce spectrum, which perhaps could benefit the public far more than DBS. In the words of the NAB:

> The true issue . . . is whether DBS will be the most beneficial use of the spectrum. Are there competing uses of this dwindling resource which will be more beneficial in public interest terms? . . . the spectrum available for domestic DBS allocation may be used for a variety of services; fixed terrestrial service, terrestrial broadcasting, mobile service, fixed satellite service . . . A study prepared for NAB concluded that demand for fixed satellite use will exceed the supply of available frequencies in the latter half of this decade. This spectrum crunch could be alleviated by allocation [of spectrum] to fixed satellite service rather than to DBS . . . Current evidence suggests that demand for DBS service and its potential benefit to the public are minimal . . . DBS really offers nothing more than a different means of providing service already available to the public.[1]

A similar argument was made by the County of Los Angeles, which contended that it relied on the 12 GHz frequencies for its microwave communications system and its loss would have a devastating effect on Los Angeles ability to provide police, fire, paramedic, ambulance and other essential service. The position of the County was that "a public interest determination of DBS must consider the services it would replace."[2] A similar case was made by the Oklahoma State Regents for higher education:

> The FCC's finding that the public interest requires that DBS systems take precedence over existing terrestrial users in the 12.2 - 12.7 GHz band ignored existing operators who directly serve the public interest.[3]

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[1] Federal Communications Commission Oversight, Hearings before a subcommittee of the Committee on Government Operations, House of Representatives, Sept. 16 & 22, 1981, pp. 140-141.

[2] Ibid., p. 336.

[3] Ibid., p. 328.

In early January 1983, the FCC proposed four alternative blocks of spectrum for the terrestrial users being displaced by the introduction of DBS. These blocks, starting with the least expensive are: 12.7-13.25 GHz; 6.525-7.125 GHz; 1.99-2.11 GHz; and 17.7-19.7 GHz. Most of the terrestrial users' existing 12 GHz equipment could be used in some of the spectrum (i.e. 12.7-13.25), but the 17.7-19.7 GHz band would require completely new hardware.[1]

The National Association of Broadcasters (NAB) desired Congress to legislate satellite policy. As the NAB president recently remarked:

> Broadcasters support the use of satellite technology. We have utilized it for 15 years in service to our audience. But with such important . . . issues at stake . . . we have called for the Congressional establishment of national satellite policy.[2]

Mr. Mark Fowler, Chairman of the FCC, is a strong believer in the marketplace and in numerous speeches, appearances before Congressional Committees, and in written articles, has asserted his position on this issue: "I am a fundamental believer in our free enterprise system."[3] He sees a "growing national consensus" that the forces of the marketplace are preferable to directions by government.[4] He sees the marketplace as "the cornerstone of telecommunications policy making"[5] and has urged

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[1] View of the Office of Science and Technology as reported in Satellite News, January 17, 1983, p. 4.

[2] Satellite Communications, August 1982, p. 13.

[3] Communications News, June 1982, p. 56.

[4] Ibid., April 1982, p. 58.

[5] Ibid.

Congress to provide legislation which will guide the FCC on the matter.

Not all FCC Commissioners share Fowler's enthusiasm for marketplace reliance in telecommunications. Commissioner J. Fogarty, on numerous occasions has reminded his colleagues that the law requires the FCC as well as the marketplace to set the course and protect the public's access to telecommunications facilities at reasonable rates. Fogarty, for example, has opposed what he considers the lack of FCC oversight on transponder tariffs. He believed that the recent (1982) RCA tariff of $13 million-per-transponder was excessive and would adversely affect users and those who could not afford such high prices:

> . . . the parties who are left out, those who don't have the $13 million, they will never have relief . . . This is the death knell of traditional common carrier rate regulation of satellite services.[1]

FCC staff, however, believed the rate was on sound legal grounds and could not be rejected by the FCC.

Industry reaction to FCC consideration of reducing spacing for domestic satellites to 2° has been unenthusiastic. While Domsat operators have contended that 3° or 2.5° spacing could be desirable, the cost of moving to 2° spacing could outweigh benefits. Among those expressing reservations about 2° spacing in the FCC investigation into the issue (Docket 81-704) are AT&T, Comsat, GTE Satellite and Alascom.

Mr. Andrew Inglis, President of RCA Americom, sees the issue of reduced spacing as particularly critical to the

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[1] Satellite Week, March 29, 1982.

satellite industry. It was the feeling of Inglis, based on the comments put by the industry before the FCC, that two-degree spacing would not likely be authorized in the very near future.[1]

Inglis also contended that cable TV would suffer from the Ku-band or high-frequency satellites because of SMATV. In this service, hotels, hospitals and multi-unit dwellings could erect antennas on their premises to receive signals directly from the satellite.

In the area of international communications, FCC Chariman Fowler is also a strong advocate for "less restrictions and more flexible multilateral, bilateral and private telecommunications arrangements."[2] He acknowledges, however, that this view is not shared by many nations:

> Many nations view communications as a vehicle for achieving either national or international goals rather than a goal in itself. Communications is seen as a means to foster national development, to preserve cultural or religious values . . . Because an open-entry communications approach can threaten these other goals, international policy-making can become bluntly political.[3]

Fowler views the policy objectives that the FCC seeks to promote on an international level as:

(1) Promote the acceptance by others of free flow of information and ideas;

(2) Promote equitable access to the radio frequency spectrum;

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[1] Communications News, September 1982, p. 26.

[2] Ibid., June 1982, p. 57. Chairman Fowler's presentation before the 35th Annual Conference of the International Communications Association in New Orleans in June 1982.

[3] Ibid.

(3) Broaden opportunities for competition and investment world wide.[1]

Fowler has argued that "private enterprise has given us the most reliable and advanced national telecommunications systems in the world" and that "other nations should consider this success."[2]

Many in the telecommunications industry and in the Congress tend to share Fowler's views on increased competition and reduced regulation in international telecommunications. This was evidenced in the presentations and discussions on Bill S.2469 (International Telecommunications Deregulation Act of 1982) in the Hearings before the Subcommittee on Communications in the summer of 1982.[3] The aim of the Bill was to amend the Communications Act of 1934 in recognition that competition is a more efficient regulator than the government and that deregulation of international telecommunications services should occur when effective competition is present. Representatives from GTE Telenet, Citibank and IBM among others applauded Bill S.2469, and encouraged efforts to establish a policy and seek to achieve the objectives through co-ordinated negotiations with foreign suppliers, users, PTT's, and government officials.

In August 1982 the FCC took a major step in increasing competition in international satellite communications by

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[1] Communications News, June 1982, p. 56.

[2] Ibid.

[3] International Telecommunications Deregulation Act of 1982. Hearings before the Subcommittee on Communications on S. 2469, June 14, 15 & 17, 1982.

permitting Comsat to provide satellite communications service overseas directly to end-users, through a separate subsidiary. This permitted Comsat to compete with the same companies it had been serving in its role as a carrier's carrier. Comsat will provide all customers with service beginning or ending at the U.S. Intelsat earth stations. At the same time, the FCC continued to advance its policy of deregulation by announcing that it intended to move away from its policy of establishing levels of use between existing satellite and cable facilities, and establishing a satellite/cable mix for new facilities. According to W. Demory, assistant chief of international communications for the FCC's Common Carrier Bureau, the FCC desires "to extricate ourselves from allocating traffic flow."[1] But Demory conceded that the FCC won't be moving quickly away from overseeing the mix of international satellite and cable facilities, and will continue to monitor the traffic flow for some time.

There was some disagreement among FCC Commissioners in their discussion leading to this decision. Commissioner Fogarty favored continued surveillance of traffic as in the past, and favored continuing the FCC's role in deciding how satellite and cable should be balanced while authorizing new international capacity. Commissioner Jones favored deregulation, arguing: "Why should we be involved in deciding what facilities should be built? Why not let the marketplace forces work?"[2]

It is reported that the FCC is concerned with the issue

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[1] Satellite News, August 9, 1982, p. 1.

[2] Ibid.

of satellites vs fiber optics, particularly in the area of overseas communications. In a recent paper, T. Rutkowski of the Technical Analysis Division of the Office of Science and Technology (FCC) praised the advantages of fiber optic technology over satellites, but cautioned that he was not speaking for the FCC.[1] In a January 1983 interview, M. Marcus, Chief of this division stated that the FCC's involvement stemmed from its role in ensuring that communications routes are "cost-effective and operationally adequate,"[2] but he also pointed out that cost-effectiveness is not the sole criteria in determining the mix of undersea cable and satellites. National security interests are also a consideration. Marcus was also emphatic that the FCC "was not going to be a proponent of technology A or technology B."[3] He went on to state:

> While we have not been concentrating on fibre vs non-fiber questions per se, . . . we have been looking at the long-term requirements of undersea cable vs satellite in trying to determine what the optimum mix is . . . the commission has been seeking comments from economic, national security, and operational viewpoints.[4]

The FCC derives its authority in this matter under section 214 of the Communications Act of 1934. The Act gives the FCC authority to determine the authorization and construction of both interstate and international communications systems, and no such system can be built without FCC authorization. Hence, the FCC decides on the launching of new satellites and

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[1] Satellite News, December 6, 1982, p. 3.

[2] Satellite News, January 17, 1982, p. 6.

[3] Ibid.

[4] Ibid.

laying of undersea cables.

Not all industry analysts and representatives, while favoring competition, favor deregulation. Mr. P. V. Permut, former FCC official, has cautioned about thinking of competition and deregulation as synonymous.[1] Removing regulation will not necessarily open the way for marketplace forces to become fully operational in telecommunications because of the presence of AT&T. He argues that while the FCC has been promoting competition, it has not been fully successful in reaching its objectives. Indeed, the reason that competition exists at all, and can survive in the midst of a market structure so dominated by AT&T is attributable primarily to active FCC regulation. The FCC has taken steps to encourage and ease entry into transmission markets, but also has adopted measures intended to ensure that AT&T does not use its monopoly to deny new entrants a full and fair opportunity to compete. Permut emphasized that "competition, not deregulation, should be the national policy for the domestic telecommunications industry."[2] Deregulation, he argues, is warranted only where sufficient competition exists to permit the withdrawal of government oversight.

Earlier in this report it was observed that there appeared to be a trend to a greater degree of oversight of satellite communications by the FCC, arising from concern for the efficient use of the spectrum. Both industry representatives

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[1] Status of Competition and Deregulation in the Telecommunications Industry, Hearings before the Subcommittee on Telecommunications, Consumer Protection and Finance, May 1981, pp. 579-590.

[2] Ibid., p. 590.

and FCC staff have expressed optimism or hope that the FCC will not be forced to engage in more rigorous regulation as the geostationary spectrum gets full. Some expected that advances in technology, including increased transponder capability, possible 2° spacing and development of increasingly higher frequency bands would overcome the crowding problem and ensure efficiency in spectrum efficiency without increased FCC regulatory involvement.[1] The FCC would be highly reluctant to introduce rigorous regulation and become involved in determining or choosing which services get available slots and which do not.

FCC staff have expressed the view that the philosophy of the FCC reflected in the "open entry" and flexible regulatory policy of the Domsat decisions in the early 1970's has not changed, and that the principles and objectives outlined in those decisions still hold and are adhered to today. The view is that the policy has worked well and has been successful in helping promote a growing and viable satellite communication industry.[2] The FCC staff point to the new entrants in the industry, new and expanding services meeting the needs and demands of customers, and in competition and integrating with terrestrial carriers. Some staff members would even go as far as to say that the development of the industry has surpassed all expectations.

Views expressed both in the industry and the FCC,

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[1] Information from FCC.

[2] Ibid.

however, point to some difficulties ahead.[1] There appears to be a concensus that not all of the proposed DBS systems will actually be realized, with only two or three systems achieving any degree of success. There is no question that the large number of satellite systems in the U.S. has been encouraged by the open skies policy, together with the keenness of U.S. telecommunications carriers not to be left behind in the race into space. Even though the U.S. offers a large telecommunications market, the number of systems available indicates that supply has caught up with demand. Many are of the opinion that there is an oversupply of capacity. This supply, together with competition from traditional terrestrial carriers offering high capacity and diversity of routing, appear to have combined to leave individual satellite operators in a weaker financial position than otherwise might have been the case (i.e. few are currently profitable).

Some have come to the conclusion that in the coming years, there will be a shake-out of satellite operators and systems, which may even lead to the entrenching of the traditional patterns which have made AT&T, Western Union, RCA, and others world leaders in the profitable exploitation of telecommunications services in the nation.[2]

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[1] Observations gained from interviews.

[2] Such was the expectation of the Australian Task Force on Communications Satellite Systems after examining developments in the U.S. Commonwealth Government Task Force, National Communications Satellite Systems, Report. July 1978, Australian Government Printing Service, 1978.

9. Summary

Rapid changes in technology, combined with changes in the regulatory climate, have had a major impact on the telecommunications industry in the U.S. This is particularly true in the area of satellite communications. Following the 1972 FCC Domsat decision declaring a policy of "open entry" and flexible approach to the regulation of satellite services and earth stations, the domestic satellite industry was at first rather slow to get started. Domestic communications satellites of the mid-1970's included Western Union's Westars, RCA Americom's Satcoms, and Comsat's Comstars. The Comstars were leased by AT&T and GTE to provide basic telecommunications services. Westars were integrated with Western Union's terrestrial systems, and the Satcoms found an early market in television services. Services were gradually expanded to include private line voice and data communications, with new companies appearing and leasing facilities from the carriers.

The late 1970's and early 1980's witnessed a rapid acceleration of satellite services as more and more new entrants into the industry appeared. Companies such as Satellite Business Systems (SBS) and American Satellite Co. (SDC), subsidiaries of some giant firms in the aerospace, communications, and electronics industries, began to aggressively explore new markets and develop services to serve both the newer and the established markets. The FCC policy of open entry and few restrictions on operations permitted, as was the FCC's intention, the industry freedom in development -- in designing satellites and systems to meet market demands as perceived by the industry.

From three systems in the mid-1970's, the satellite

communications industry has grown to include approximately twenty satellite carriers who have either launched and begun satellite operations or have the FCC authorization to do so. Included in this number are several new entrants authorized to offer direct broadcast satellite services (DBS).

Besides DBS services, some of the newer developments utilizing satellites in communications include: teleconferencing and videoconferencing; medium-power-direct-to-home satellite broadcasting; expanding message and data services such as SBS Skyline, Southern Pacific's Sprint for large and small business users; distribution services for TV networks and radio broadcasters such as AT&T's new Satellite Television Service; ever expanding use of satellites for cable television; and several developing technologies which have considerable potential for integrating with satellites to widen their applications including cellular radio, cable, and fiber optics.

As the industry has developed and expanded in this favorable regulatory climate, it has experienced some growing pains, and potential problems and limitations have recently appeared on the horizon. One of the potentially most serious limitations is the crowding of the geostationary orbit used by communications satellites. There are few useful slots remaining for U.S. satellites in geostationary orbit and once the slots are filled and the capacity of the satellites operating at the C and Ku bands is fully utilized the growth of the industry will essentially come to a halt. Temporary solutions lie in reducing spacing from 4° and 3° to 2°, and this is currently being considered by the FCC. Reduced spacing, however, will involve

costs, particularly for the cable TV industry. Other longer-run solutions rest in technology, such as developing the Ka band and increasingly higher frequencies and large communications platforms. In the meantime, while waiting for technological change to provide solutions to these problems and limitations, the FCC may be forced to exercise increasingly more oversight in satellite communications, including examining carefully the need for additional satellites and the services proposed, establishing minimum requirements on the number of transponders that a proposed satellite must have, and choosing from competing carriers and proposed services in allocating the scarce slots.

The extent to which the above problems materialize, however, will be determined by the demand for satellite carrier services. There is evidence that the growth of demand has tended to soften in the last year, and that supply of transponders has caught up with demand. There is some evidence (albeit disputed) that satellite capacity is currently underutilized and that there is a glut of transponders. While some satellites are in heavy demand (those with popular programming for cable TV such as RCA's Satcom 3 and 4), others are underutilized. Explanations of excess capacity range from a temporary slackening of demand due to the recession, to increasing costs, to problems of profitability in the cable industry, to a slower development of corporate use of satellite communications facilities than anticipated.

Both costs of satellites and launch have increased and continue to escalate. Whereas communications satellites could be built and launched at a cost of about $30 million in the mid-

1970's, the current cost is about $60 million. Launch costs for a payload of approximately 1500 kg by the Atlas-Centaur vehicle have increased from $21 million in 1975 to approximately $35 million in 1982. NASA's prices for a standard mission for the space shuttle have been increased from the current $18 million to $71 million for the 1985-88 period. But since communications satellites require only part of the shuttle's launch capacity, and will be priced according to a shared flight formula, NASA is predicting that the shuttle will be competitive with the expendable launch vehicles such as the Delta and Atlas-Centaur, and the French vehicle Ariane.

The U.S. domestic satellite carriers are also seeking to expand their operations into international communications, including transborder services with Canada. A recent U.S./ Canadian agreement permitted such services and companies such as ASC and SBS have received FCC approval to extend their private network services to Canada. These companies do not view Canada as a major or unique market but as an extension of the U.S. market and if demand for services exist in Canada they are prepared to explore possibilities of meeting the demand.

Views of industry representatives and analysts and of regulators on industry development, potential, and regulatory policies vary. Some see business voice and data communications as a largely untapped market, with extensive potential. Others tend to favor the video market (cable TV, DBS) as the major application of satellite communications. There is no concensus on the potential impact of fiber optics on satellites, although the general feeling is that fiber optic technology is not likely

to displace satellites for long distance transmission.

The domestic satellite communications industry in general supports strongly the FCC policies of open entry, competition, and flexibility in regulation. Even AT&T favors competition but contends that it must be open competition without special restrictions placed on AT&T. The FCC, in turn, views its pro-competition policies as successful, having achieved in large measure the goals enunciated in the 1972 Domsat decision. There is an expectation within the FCC that potential problems in the industry will be solved through technological change and the marketplace rather than a backtrack to regulation.

The FCC is now promoting increased competition and deregulation in the international satellite communications arena and favors more multilateral, bilateral and private telecommunications arrangements.

In general, in 1972 the FCC opted for an open-entry policy, competition and a flexible approach to satellite communications. The uncertainty of where the technology would lead persuaded the regulators that it would be in the public interest to let the marketplace, rather than government, determine the development and design of satellites and satellite services, as well as the success of new services. The evidence from observations on the development of the industry, together with the views of the industry and regulators, tend to lead to the conclusion, that in general, the U.S. regulatory approach and policies have successfully served the industry and the consumer.

SECTION E

SATELLITE COMMUNICATIONS ISSUES IN CANADA

This brief section of the study will only touch on some of the major issues raised with respect to the objectives, development, operation and regulation of Canadian satellites with some reference to the U.S. satellite environment as applicable in this context.

1. Objectives of Satellite Development

Some 21 years ago (1962) Canada launched its first satellite (Alouette I) with the objective of scientific inquiry in space most particularly related to ionespheric studies. By 1966, there was a much more general awareness that this nation should be actively involved in space and that Canada's role should be defined. In 1967 a study group reported that Canada's prime objective should be in application of the technology to domestic telecommunications and resource survey work. This was a redirection from the earlier more pure science approach and led to termination of the Alouette-Isis projects. With the publishing of A Domestic Satellite Policy for Canada (white paper) in 1968 the government aired its major concerns. These included facilitating communications throughout a huge but sparsely populated nation, extending English and French services, developing a Canadian space industry, and securing orbital

positions in space.

With the active support of industry and the urgings of many interest groups, parliament debated the issue and in 1969 through the Telesat Canada Act created Telesat to be the instrument for Canada's operational satellite program. It should be noted that the breadth of the objectives considered were not reflected in the legislation. Very simply under Section 5-1 of the Act, Telesat is only obliged to be a commercial enterprise, with some obligations regarding the purchase of Canadian equipment. There is no direction to be responsive to any other goals such as is the case of broadcasters in broadcasting. It should also be noted, as the issue has arisen since, some of the earlier practices of Telesat (e.g. only full RF Channel long term leases to be marketed) were suggested by telephone interests for adoption in the Act. While the Act contains no such direction, this was until very recently the practice.

With the formation of a Department of Communications, the recognition that broadcasting and telecommunication technologies were now inseparable, and the awareness that Canada's cultural, social, economic and political growth, indeed its very sovereignty was bound up in communications revolution, the government introduced its "A Communications Policy for Canada" (green paper) in 1973 — the same year that Telesat began its commercial operations.

The thrust of this policy statement was an appeal for joint Federal/Provincial co-operation so that a coherent wholistic communications policy could be devised for Canada which overcame the fragmented jurisdictions and bound the

country together in east-west ties likened to the twin bands of steel of 1867.

After inclusive talks with the provinces the federal government in 1975 issued "Some Federal Proposals" (grey paper) suggesting two phases of legislation. In the first phase the federal government could act unilaterally and combine all broadcast and telecommunications regulation into a single body — the CRTC — which was accomplished through the CRTC Act of 1975/76 and could begin to place all the communications of cultural concerns within or allied to the Department of Communications. This speaks to an inseparability of carriage and content.

On the one hand the CRTC in its position as the single authority could better interpret the broader public interest in regulating all communications amenable to federal jurisdiction with a sense of the interrelated competitive, cultural, and social objectives. On the other hand, in working toward phase II which would be the adoption of a legislation which reflected the agreed objectives of the Federal Government and the provinces, the governments would reserve some ability to give direction to the CRTC and determine its role on possibily a province by province basis, i.e. making the CRTC more amenable to the elected representatives of the people.

In the constitutional debates with the provinces, communications became a negotiable issue but in the absence of a larger agreement and the subsequent adoption of the Canada Act, no further legislative progress has been made which gives substance in law to the many statements of objectives which have been variously prepared.

On the communications side the Clyne Committee in 1979 primarily addressed telecommunications and Canadian sovereignty and was followed in 1980 by the Therrien Report (a joint CRTC/provincial committee) which made recommendations with respect to extension of services to the Northern and remote communities in terms of the roles in the 80's of broadcasting, satellites, and pay TV. More recently the Appelbaum-Hebert Committee recommended on cultural policy.

The commonality in these reports make clear that communications, culture and national sovereignty are inextricably bound together. They point to the economic and cultural difficulties in the face of heavy foreign "spillover" in the past and foresee much more in the future. They see the role of (tele)communications as having a broad responsibility to extend services generally but most importantly to extend Canadian services carrying Canadian programs which would attract Canadian audiences.

As more definitive guidance — still couched in motherhood terms — of what the public (legislatures) see as the objective and guidelines, a statement emerged in 1979 as a result of federal/provincial conferences. While at first unanimity was not reached, a general consensus adopted the following satellite distribution and television programming objectives and guidelines:

Objectives

1. To extend services to inadequately served areas of the country, in both official languages, in order to upgrade the level of service throughout the country.

2. To provide a broad range of satellite television services in a manner that will respond to viewer preferences and demands, and will enhance Canadian broadcasting and program production, their future development, and the cultural sovereignty of the country.

3. To make more efficient use of satellite technology as one of several alternative transmission and distribution technologies.

4. To provide an attractive alternative to the reception of foreign satellite signals, and ensure the orderly development of satellite television reception in Canada.

5. To encourage equalization mechanisms between urban and rural/remote areas.

6. To develop satellite television services in a manner which takes into account the efforts of individual provincial governments to extend services within their boundaries.

Guidelines

1. The total satellite delivered service made available to the Canadian viewer (including the possible reception of US satellite signals) should be predominately Canadian.

2. Pursuant to the above, any foreign signal importation and distribution should be subject to established regulatory and licensing procedures.

3. The introduction of satellite television services in Canada should be in harmony with policy initiatives designed to increase audiences for Canadian television programs, and the development of a more contemporary national broadcasting

service.

4. Satellite television services should not impede the further development of local and regional programming. This is particularly important in regard to the cultural needs of the native peoples in northern areas.

Since the above is the best consensus of objectives and guidelines yet brought forward, it deserves some examination. It does enjoy some federal and provincial agreement but points to areas of concern to those provinces which regulate their own telecommunications and may fear competition or reduced shares of long distance revenues. It speaks in terms of content and its extension but warns of impeding local or regional programming or acculturation of the northern native peoples. It suggests that responsiveness to viewer's preferences and demands enhance Canadian broadcasting and program production — objectives which at times have been seen to be mutually exclusive and therefore the suggestion of more attractive Canadian offerings.

However, it is hard to find any relevance in the objectives to the forward planning and day-to-day operations of Telesat. Very simply Telesat is a carrier, in fact, a carriers' carrier. It is enjoined in law to be a commercial enterprise and by agreement can only act in concert with the other members of TCTS.

It is in the regulatory arena that the behavior of Telesat in relation to the public interest has received the most attention. In this arena the issues are those amenable to interpretations of the law — law which does not address in

particular any of the objectives noted above. Therefore, purposes and objectives on which Canada embarked into space remain as some vague guidance toward practises which foster Canada's interest.

Before entering the more complex regulating issues, it is best to describe the development and present status of Telesat. Many of the regulatory issues are bound up with the actual practises of the company.

2. Regulatory Issues

As noted earlier, the objectives for satellites in Canada formulated by many commissions, study groups, conferences, etc. bear little relation to the formal direction given to Telesat. This is a reflection of the confrontation between idealized social purpose and economic and political realities. While the parliamentary debates of 1969 leading to the Telesat Canada Act were filled with discussions of social benefits, the hard economic facts would appear to be that the costs would have to be shared and any hope at sustained viability depended on heavy utilization by the telephone companies who only a decade earlier had completed an elaborate terrestrial microwave system.

In the case of Telesat the Federal government made clear that this entity was not similar to a crown corporation or governmental agency. The governmental role was as an equity investor in a business committed to profitable operations. From the outset the government stated that Telesat would be a carrier's carrier. The government and a group of major Canadian telecommunications common carriers each assumed 50 per cent of the equity and costs. Each appointed equal numbers to the Board with a deciding vote (and one share) residing in the hands of the Telesat President. It was further contemplated that a future share offering would permit the public up to one-third ownership — an idea which was never carried out.

The initial capitalization provided for the first series of Anik (I, II, III) and Anik B satellites and operations commenced in January 1973.

It appears that from the earliest stages the government's

problem was one of reconciling the competitive nature of a distance insensitive spatial delivery system with the existing terrestrial system. Much was said about harmony and orderly development.

More simply the largest potential investors and users were also possessed of alternate delivery via their distance-related terrestrial microwave system. The revenues from this system were shared according to a connecting agreement among the member telephone companies whose territories spanned the nation. It followed then that many of these members received extensive long distance revenues on traffic which neither originated nor terminated in their operating areas. The problem is further compounded by the fragmented jurisdictions with respect to the nine member companies. Two are federally regulated (BC Tel, Bell); four are provincially regulated and privately owned (Island Tel., Nfld. Tel., Maritime T & T, NB Tel); and three are provincially owned and regulated (AGT, Sask Tel, Manitoba Tel). Particularly in the case of the prairie members, the provincial governments have tended to regard these enterprises as important in carrying out their social objectives and they are likely subsidized through their shares of the long distance revenues.

TCTS is an organization created by the members who act only in unanimity but has no official status as a legal entity, i.e. it is not a corporation and therefore is not directly amenable to any regulation.

This unusual preamble to a discussion of the regulatory aspects of Telesat is felt necessary because the Canadian

situation is unlike the U.S. situation which, while complex, follows a far more logical judicial/regulatory approach primarily based in considerations of competition and monopoly. The Canadian situation is responsive at various times and in varying intensities to such concerns as underlying social purposes which may need cross subsidization, questions of competition and complementarity, the make or break clout of TCTS, federal/provincial issues in which communication concerns may be part of larger negotiations, and the needs for a comprehensive telecommunications policy in the interests of national sovereignty.

a) Regulatory Jurisdictions

The authority to regulate with respect to Telesat can be traced from the British North America Act which gives the federal government by exclusion control over steamships, railways, telegraphs and anything which crosses provincial boundaries.

Shortly after acquiring provincial status (1905 - Alberta, Saskatchewan and augmented Manitoba), the three prairie provinces felt it necessary to take over the existing telephone services through reasons of dissatisfaction. In their view the major centres were being "cream-skimmed" without regard to extending and cross subsidizing these vital services to the large rural population. The maritime provinces assumed regulatory control of the existing privately owned system.

Whereas it has been argued that by virtue of the BNA Act the federal authority should have jurisdiction over telephones, or certainly over the interprovincial aspects, a situation has

arisen through "historic accident" of fragmented jurisdiction.

In the case of broadcasting, the issue of jurisdiction was settled in the 1931 Privy Council decision which pointed to the inseparability of the receiver and transmitter in that they were parts of a whole which crossed boundaries. In 1975 the Supreme Court recognized this principle and extended it to cable systems which make use of broadcast signals in so far as they were, in reality, extensions of a receiver. A purely closed circuit cable system, therefore, would be a local work or undertaking amenable just to provincial authority. However, in this area, too, there is the inconsistency of Manitoba and Saskatchewan where provincial telephone ownership of cable has introduced some common carrier practises and a dubious distinction that part of the bandwidth carried in the cable is broadcast related and the remainder closed circuit.

It was in 1975 also that the CRTC Act passed the powers of the telecommunications section of the Canadian Transport Commission to the CRTC, powers which stemmed from the Railway Act and the National Transportation Act (see Objectives above for rationale). The CRTC was made the regulator of Telesat, BC Tel, and Bell Canada and two other minor telephone companies. It had no power over TCTS except for consideration of the long distance tariffs proposed by those members it did regulate.

b) TCTS/Telesat Connecting Agreement

By 1975 the planning for replacements for the Anik A series of satellites was necessary. Although Telesat had an operating profit, it did not have the resources to commission the replacement series. In late 1976, TCTS offered Telesat

membership through creation of a Connecting Agreement which furnished Telesat with the TCTS share of the new capitalization needed, a guaranteed rate of return and ultimately 50 per cent of the profits above this figure.

With the exception of scientific studies by the federal government, the Agreement limited the direct leasing of the satellite channels to 13 regulated common carriers who in turn could only re-lease the space on a long term minimum full RF channel basis. While ownership of earth stations resided in Telesat, the siting, site ownership and first line maintenance would be the responsibility of TCTS members. Becoming the tenth member of TCTS, Telesat would be governed by the principle of unanimity in all collective decisions.

The CRTC, over many objections, in 1977 assumed a jurisdiction and considered the merits of the Agreement in terms of its authority under the Railway Act (sections 320, 321 which concern just and reasonable rates and questions of fairness). In its investigation the Commission determined that the agreement was anti-competitive. Viewed as Telesat users, the TCTS carriers were given the advantages of designating earth station sites; of having satellites designed in a manner that was compatible with TCTS economic and performance requirements and service plans; of receiving from Telesat "in a timely manner . . . satellite design concepts and other information to fully support TCTS planning activities . . .,"[1] and numerous other advantages. Taken together, the

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[1]CRTC Telecom Decision 77-10; 3 C.R.T. 265 at 284.

advantages to TCTS members inherent in the situation to be created by Telesat's membership in TCTS, combined with those in the provisions of the Agreement, appeared to the Commission to raise a substantial likelihood of undue advantage or preference.

Furthermore, the Commission found with respect to the restriction of direct access to only those thirteen carriers named in the Agreement; "while the requirement that only complete RF channels may be leased from Telesat itself constitutes a limitation of access to the satellite to very large users, the carrier restriction entails a further and more deliberate limitation of direct access by denying it to present customers such as the CBC and potential ones such as northern pipeline concerns and cable television consortia."[1] In addition, by restricting the right to market services based on portions of RF channels to the recognized carriers, it explicitly prohibited cable companies and others, individually or in consortia, from leasing whole r.f. channels and marketing services based on portions of such channels. In the Commission's view these specific restrictions give real advantage to those carriers over all other potential satellite users, in a manner not justified by the evidence presented in its proceeding.[2]

And finally, with respect to its ability to discharge its duties the Commission determined that the nature of the TCTS/Telesat relationship would, in the Commission's view, make it

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[1] CRTC Telecom Decision 77-10; 3 C.R.T. 265 at 284.

[2] Ibid.

very difficult to unravel the facts in specific cases of alleged undue preference, or discrimination with regard to CNCP, to other carriers and non-carriers. Generally the Agreement could cause serious problems in regulating the activities of Telesat Canada in terms of its conformity with Section 321(2) of the Railway Act relating to undue preference or advantage.[1]

On petition by the applicants to the Governor-in-Council pursuant to the National Transport Act s 64(1), Order-in-Council pc 1977-3152 was issued which noted that in the view of the Governor the public interest would be better served if the Agreement were approved. It stated that, in its opinion, the CRTC's powers under the Railway Act to approve or disapprove rates charged Telesat or to order Telesat to provide access on terms that the Commission deemed just and expedient were not derogated. In any case it pointed to the fact that the Agreement provided that no federal or provincial Act could be overridden. The Order-in-Council approved the Agreement.[2]

The Commission responded in November 1977 that it anticipated:

> Substantial problems in carrying out effective rate regulation, and in discharging its obligation to ensure that there will be no unjust discrimination or undue preference . . . [it would] continue, however, to exercise its independent judgement on matters falling within its jurisdiction. In particular, given the existence of the Agreement, the Commission is convinced that as a minimum, a much fuller review of the operations; finances and practises of TCTS and its individual members will be required than has ever been the case before.[3]

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[1] CRTC, Telecom Decision 77-10; 3 C.R.T. 265 at 285.

[2] Canada, Order-in-Council, PC 1977-3152

[3] As reported in CRTC Telecom Decision 81-83.

Although the Agreement was approved, the CRTC was left with many issues it wished resolved. Over objections that it was barred from such considerations since an Order in Council pursuant to Section 64(1) of the National Transportation Act was "binding on all parties," the Commission, after hearing lengthy arguments, concluded that it could deal with these issues which were broader than simply tariff approval or rejection. In effect, while the Agreement was binding, the Agreement could not supersede the law, and acts and practices stemming from the agreement would be examined on their merits.

The Governor-in-Council, in following up on PC 1977-3152 which had observed that the Agreement will not "affect the powers of the Minister of Communications under the Radio Act with respect to the operations of earth stations and associated terrestrial radio relay facilities,"[1] broadened earth receiving station ownership to all regulated carriers and broadcasters which by definition included educational broadcasters and cable owners. This action was indicative that the cabinet, while having approved the Agreement, was pursuing a line of expanding participation and access.

Speculation of why the cabinet found it necessary to overturn the CRTC disapproval of the Agreement points to larger concerns in federal/provincial relations (nine of ten provinces were opposed) and questions of who would pay for and use the next generation of satellites if TCTS were to withdraw entirely. Political and economic realities can not be separated from the niceties of the Railway Act. It may have been a question

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[1]Canada, Order-in-Council, PC 1977-3152.

of having an imperfect system or no system.

c) CRTC Telecom Decision 81-13

It followed that when Telesat, BC Tel and Bell (all amenable to toll regulation by the CRTC) came forward with proposed tariffs, the CRTC opened up the whole area of practises which it questioned. The history and arguments may be found in CRTC Telecom Decision 81-13 which runs some 200 pages entitled, Increases and Decreases in Rates for Service and Facilities Furnished on a Canada-Wide Basis by Members of the TransCanada Telephone System.[1]

This Decision dealt with two aspects. One aspect, while not directly of relevance to this study, was the TCTS Revenue Settlement Plan (RSP). The Commission identified a number of problems which could be summarized as a possible unfair burden on Bell and BC Tel long distance users in sharing revenues with the rest of the members. It was noted, also, that a cost-based prorating formula tended to maximize inefficiencies and investment expense. There were inconsistencies in treating various classes of service which may have included anti-competitive (predatory) pricing. Finally, in the absence of enough knowledge the Commission accepted the current methodology for distributing the excess above costs. Turning its attention to Bell and BC Tel rates the Commission observed, "[that] the fact that the member companies of TCTS have reached unanimous agreement on the proposed rates is not, by itself, a sufficient criterion to demonstrate that the rates are just and reasonable."[2]

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[1]CRTC, Telecom Decision 81-13.

[2]Ibid.

The Commission also noted that while there is a need to ensure that long distance facilities should be in a healthy state (cross-subsidization for universitality), excessive long distance rates (much higher than in the U.S. or to the U.S.) would not facilitate the flow of telecommunications in Canada.

The second aspect concerned Telesat. Here the discussion centered on the following issues: Telesat's proposed Tariff CRTC 8001 for space and earth segment services for the 6/4 GHz satellites; the agreement of CBC/TCTS establishing terms, conditions, and charges for earth and space services to which Bell and BC Tel were signatories; and proposed Special Assembly Tariff CRTC No. 1 which dealt with provision of the CBC earth segment by Telesat to TCTS for resale to the CBC.

Telesat's Tariff CRTC 8001 was the first full rate card for all satellite services; past sales had been done by Special Assemblies. The tariff proposed both full time use and partial time use (occasional use) of channels. Three classes of services pertain to full time use; namely, fully protected (FP-immediate replacement), unprotected non-premptible (UNP - back-up but can't be taken away to serve a protected subscriber) and unprotected premptible (UP). In addition five categories of bulk discounts were offered depending on the number of full channels leased. This was contentious in so far as the CBC and TCTS were the only bulk users and given the channel availability at that time, no other customer could purchase a sufficient number of channels to earn the maximum discount. The Commission ordered that Option Five ($140,000 FP; $100,000 UNP; $90,000 UP monthly) become the basic rate. The occasional use

tariff was adopted but interpolated from Option Five. Earth segment services appeared to be subsidized by the space segment and were requested to be revised.

The issue of less than long term use had been dealt with but not the question of less than full channel use. Many services do not require the full 36 MHz bandwidth of an RF channel. The Commission noted:

> This restriction was embodied in service contracts with Telesat customers dating back to 1973. This policy has been challenged on a number of occasions, including the present proceeding, on the grounds that it confers an undue advantage upon larger carriers, whose requirements can justify full channels over smaller ones that cannot. Smaller carriers are required to obtain partial channels from the larger carriers, who may well be their competitors and who offer channels obtained wholesale on a retail basis.
>
> The obvious effect of this limitation upon the small carrier wishing to offer a service to the public based upon a partial RF satellite channel is to force this carrier to hold a full channel in inventory, which

> necessarily affects the cost of providing the partial channel service it wishes to offer.[1]

Telesat pointed out that this full channel restriction was based on Section 13 of the Connecting Agreement and was honouring a commitment made by the Government of Canada in the Telesat debate of 1969.

With respect to up-link facilities the Commission stated:

> The arguments advanced by parties for liberalized ownership of up-link earth stations were that this would lead to greater system utilization and lower costs to users; that the benefits of wider ownership of up-link stations had been demonstrated in the U.S.; and that there was no evidence of technical or economic justifications for the policy restricting ownership to Telesat exclusively (emphasis added).
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> In the Commission's view, there does not appear to be justification pursuant to the Railway Act for Telesat being the exclusive owner of up-link facilities.[2]

And finally (for purposes of this study) the issue of resale and sharing of satellite services was examined. A number of the intervenors pointed out that TCTS members were sharing channel space or occasional use which gave them an unfair advantage. The Commission noted:

> . . . It was argued that resale and sharing would increase efficiency, promote utilization, and reduce costs to end users. It was further argued that in the U.S. restrictions on resale and sharing had been found to be unjust, unreasonable and unlawfully discriminatory by the FCC.[3] (emphasis added)

The counter-argument was that TCTS/Telesat was in the business of "selling services and not facilities." Customers should only buy what they needed. Although, for example, the

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[1]CRTC, Telecom Decision 81-13 at 193.

[2]Ibid., 81-13 at 203.

[3]Ibid., 81-13 at 206.

CBC was enjoined from any assignment, sublet or transfer of facilities in the CBC/TCTS without permission of TCTS and the Commission, this permission "would not be unreasonably withheld."[1]

The Commission found this area in need of review in a larger context and maintained the status quo. Subsequently to CRTC 81-13 few of the issues were definitively settled. TCTS petitioned cabinet to vary Decision 81-13 and in December 1981 PC 1981-3456 upheld the direct sale by Telesat of full channels to broadcasters. Partial channel use is possible but only on a full time basis and only through a federally regulated common carrier. Therefore Telesat will wholesale at its partial use of channel rate and the carrier will place a 10 per cent mark-up on this. Nothing further was done about resale or sharing. In essence Telesat would remain in large part a carriers' carrier.

d) Other Issues

Strongly critical of Telesat's compliance with the directive of the Commission and the Cabinet has been the Canadian Industrial Communications Assembly said to be Canada's largest user association. It feels that Telesat's partial channel use rates are excessive particularly when marked-up and likely to cause underutilization of the service. Criticism has also been directed toward the permitting of U.S. leasors who it is felt will have easier abilities to enter into resale and sharing.

Many issues are still highly contentious. A more recent Order-in-Council (P.C. 1982-2558) has increased Telesat rates

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[1]CRTC Telecom Decision 81-13.

for full channel, partial use, and occasional use by 6 per cent. Telesat has made application to revise tariff CRTC 8001 to include changes to reflect recent earth station ownership considerations, new inspection rights for Telesat with respect to customer facilities and the Anik C (14/12 GHz) tolls including quarter-Canada and half-Canada coverage.

Another dimension to the regulating arena concerns trans-border communication flows. In 1972 bilateral letters were exchanged with the U.S. permitting limited use of satellites in communications between Canada and the U.S. More recently this was extended with an exchange of letters in August of 1982 permitting direct satellite communications between Canada and the U.S. for business users.

The principles set out are:

a) Services are to be provided jointly by the entities authorized by the Canadian government (regulated common carriers) and recognized U.S. operating entities, with satellite facilities of each country to be used as appropriate.

b) Services shall be provided in accordance with applicable governmental and regulatory approval procedures of each country.

c) Earth stations and terrestrial facilities used in Canada will be owned and operated by authorized Canadian entities and related U.S. facilities shall be owned and operated in accordance with U.S. law; and

d) Both governments continue to support the global Intelsat system.[1]

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[1]Letter from the Canadian Embassy to the Department of State, August 24, 1982.

The rationale behind these principles seems to be to secure Canadian participation in transborder communication flows. It may be felt that doing nothing will lead ultimately to insurmountable pressure by Canadian business for direct access to U.S. satellites and complete withdrawal from Canadian systems for North/South communications. The restriction of ownership of earth stations and back-haul facilities to carriers, unlike user-owners in the U.S. may reassure Canada's sense of national control but could prove to keep costs artificially high. The reference in the letter to Intelsat does recognize that while nominally all transborder satellite traffic should be carried by it since both the U.S. and Canada are signatories, there are a number of clauses which may be interpreted by the member to override this requirement. As well, in a period of channel scarcity in the U.S., Telesat has made a number of advantageous contracts with U.S. operators for purely internal distribution.

3. Summary

The launch of satellites began in Canada as a purely scientific venture with the launch of Alouette I. As awareness of the potential of satellites in communications grew, Canada began to examine its role in the utilization of this technology. Following the White Paper of 1968, Telesat was created in 1969 as the instrument of Canada's operational satellite program.

The legislation creating Telesat did not enunciate general national or public goals for Telesat. Several attempts were subsequently made, including co-operation with the Provinces, to arrive at a national communications policy. One such attempt produced a general Federal/Provincial concensus in 1979 on satellite distribution and television programming objectives and guidelines.

Most of the attention regarding satellite communications in Canada and the behavior of Telesat in relation to the public interest has been in the regulatory arena involving the CRTC. In 1977 the proposal for Telesat to join the TCTS was rejected by the CRTC as not in the public interest. The Cabinet, however, through Order-in-Council approved the Connecting Agreement.

In 1981 the CRTC issued a major decision regarding Telesat which, among other directives, lifted some restrictions on Telesat operating solely as a carriers' carrier, and permitted Telesat to deal directly with customers other than telecommunications carriers listed in the Connecting Agreement. Once again the Cabinet through Order-in-Council varied the CRTC decision and retained Telesat as primarily a carriers' carrier.

This analysis tends to suggest that the regulation of

Canada's satellite system is a very ad hoc affair which does have some advantages of flexibility and expediency in determining policy. It would appear that interpretations of law with respect to just and reasonable rates and to undue preference and advantage which are the foundations of rate-based regulation by the Commission are secondary to more expedient concerns of the government in a larger context. By most reasonable interpretations, the Telesat membership in TCTS would be a merger (forbidden in the Telesat Act). However, this does not seem to be the case in law. The direction of the Commission has been to try and prevent as far as possible the anti-competitive aspects of the alliance. The cabinet would appear to be following the route of removing restrictions but at a slower pace. Whereas utilization might well be increased with freer access, resale and sharing, broader terminal ownership to include business, etc., the problems of cream skimming at the expense of the distance sensitive systems (particularly the provincially regulated telcos) remain. Cream skimming is a major argument employed by the established carriers in the U.S. in their opposition to permit competition in telecommunications, and while acknowledged by the FCC, the FCC viewed the merits of competition to the public interest to outweigh any potential adverse cream-skimming effects on the established carriers.

Probably still fundamental to the problem is the power of TCTS to withdraw its traffic entirely. At one time (1977) this was an absolute power but now this may not be the case. Telesat's membership in TCTS may not be the only course. Such

a consideration begs again for a comprehensive wholistic telecommunications policy for Canada with a rationalizing of the interprovincial and international aspects.

SECTION F

APPLICABILITY OF U.S. SATELLITE POLICIES TO CANADA

This Section presents a comparative overview of the U.S. and Canadian satellite industry and regulatory structures, as well as a comparison of objectives in the development of satellite communications in the two countries, drawing on the material in the preceding sections. Within the context of this overview the issue of the applicability of the U.S. satellite policy and regulatory measures to Canada is considered, taking into account any distinct features in various segments of satellite communications in the two countries.

1. Features of Canadian and U.S. Satellite Industries

a) Industry Dominance

A comparison of the structure and operations of Canadian and U.S. satellite communications industries cannot ignore the general telecommunications industry of which satellites are but a small segment. In the U.S., one firm, AT&T, dominates domestic telecommunications. It provides virtually all interstate long-distance services. Among the other firms engaged in terrestrial telecommunications, GTE is the most prominent. Several of the remaining telecommunications companies are relative newcomers and include MCI and Southern Pacific. These newcomers received their start in telecommunications in the late 1960's and early 1970's, but were at first restricted to specialized private line services. Only in the later 1970's and early 1980's was competition with AT&T in message toll service approved. Beginning with a small base, AT&T's competitors are growing and intend to offer alternative and supplementary services to the Bell system. But without FCC regulation and restrictions on AT&T, these competitors freely admit that they would not survive long against the telecommunications giant. This applies to every aspect of telecommunications, including satellites, despite some of the very large firms involved in satellite systems.

Firms such as RCA, Hughes Aircraft, IBM, Fairchild, Southern Pacific, Aetna, etc., while quite dominant in their own industry sector, do not possess the vast telecommunications network of AT&T. Through subsidiaries they operate or have authorization to introduce satellite systems. But the services

they offer are fairly limited and specialized (private line voice and data; video-conferencing), and some are more interested in simply leasing or selling transponders (Hughes) than in establishing end-to-end services to the public. While RCA's Satcom appears as a major satellite system, it is the video vendor or program supplier such as HBO which provides the service to the public, and it is the programming that induces earth station operators to point their dishes at Satcom. It would appear that the dominant video program suppliers such as HBO and Showtime have inserted a degree of monopsony (dominant buyers) into the satellite TV distribution market, and keen competition may be developing among satellite transponder suppliers for HBO and Showtime business (witness Hughes' sale of Galaxy transponders to HBO, which to date has used RCA's Satcom satellites). Given the major role or place of video in satellite utilization, the system that manages to attract and hold the major TV (pay and cable) program suppliers will likely be in a more viable position than others.

AT&T, on the other hand, does not have to rely on lease or sale of satellite capacity as it integrates its satellite capacity (up to now leased from Comsat General) with its terrestrial facilities to provide basic telephone services. This is also true, but to a lesser degree, of Western Union. While technically and legally AT&T no longer possesses the monopoly in MTS, WATS, and other telecommunications services that it once did, and newcomers in message transmission such as MCI, RCA Americom, and SBS are becoming involved in these services, given the continuous growth of the U.S. telecommuni-

cations market, AT&T is in no immediate (or even long-term) danger of having its dominant position eroded in traditional telecommunications services. Nor does it appear concerned about potential displacement of business on its proposed Telstar satellites since AT&T does not have to rely on selling or leasing or developing new services or finding new customers for its use of these satellites.

Therefore, while open-entry has fostered competition in the satellite communications market, and a number of firms have established satellite systems, AT&T possesses very definite advantages over its upstart competitors with its huge resources and facilities in terrestrial systems into which satellites can be integrated and used as supplements and complements. Elements of competition in the market are only preserved through FCC oversight and judicial recourse. The telecommunications market/industry, including the satellite segment, is in a sense a government regulated-protected competitive market.

In Canada, the telecommunications carrier/industry, including the satellite segment, is a government regulated-protected, monopolistic market.

The Canadian telecommunications industry structure includes the member telephone companies of the Trans Canada Telephone System (TCTS), TCTS itself, CNCP Telecommunications, and a number of small, independent companies. TCTS and CNCP form the two national telecommunications systems in Canada.

TCTS is not a company or corporate entity. It is a consortium of the principle telephone companies in each province plus Telesat Canada who, by means of a master agreement, have

interconnected their facilities to provide a nationwide telephone network. TCTS itself owns no property; rather its facilities are owned and operated by its member companies. Each member company has a virtual monopoly in telephone services in its respective geographical area, and the members jointly supply long distance telephone services in Canada. TCTS functions under a system of committees, with representatives from all of the member companies, and members are obligated to observe the agreed terms so long as they remain members. One of the main functions of TCTS is the division of revenues generated by interprovincial telephone calls. In addition to the TCTS master agreement, members may enter into other arrangements for the interchange of traffic between them (i.e. agreement between Bell and Manitoba Tel.) or enter agreements with independent telephone companies.

TCTS is dominated by Bell Canada which accounts for approximately 60 per cent of Canadian telephones. The other members of TCTS are: British Columbia Telephone Co., Alberta Government Telephones, Manitoba Telephone System, Saskatchewan Telecommunications, Maritime Telegraph and Telephone Co., New Brunswick Telephone Co., the Island Telephone Co., Newfoundland Telephone Co., and Telesat Canada. Bell Canada operates primarily in Ontario and Quebec and has control of most intraprovincial and exchange service in this area. In addition, it is represented in the Maritime provinces through the Maritime Telegraph and Telephone Co. and the New Brunswick Telephone Co., both 41 per cent owned by Bell. The BC Telephone Co. is owned by General Telephone and Electronics Corporation (GTE) whereas

the three prairie province telephone companies are publicly operated corporations.

CNCP Telecommunications is a partnership, consisting of CP Telecommunications and CN Telecommunications. It has a monopoly in the provision of public message telegraph service, and is competitive with TCTS in the provision of certain other services such as data communications. CNCP also owns Northwestel (providing telephone services in northern BC, the Yukon Territory and NW Territories), and Terra Nova Tel (providing telephone services in parts of Newfoundland and Labrador).

Other telephone companies, which are not members of TCTS, include edmonton telephones, providing 2.5 per cent of Canadian telephones, and Quebec Telephone, serving 1.7 per cent of Canadian customers. There are 31 small independent telephone companies in Ontario, which are not part of federally regulated Bell Canada, which account for about 5 per cent of the telephones in the province.

Telesat was incorporated in September 1969, and operates Canada's domestic satellite communications system. It is neither a Crown corporation nor a government agency. Telesat has mixed ownership with 50 per cent of its shares being controlled by the Canadian government and the remaining 50 per cent being controlled by the major Canadian telecommunications carriers.

Legislation places restrictions on Telesat on the issues of its shares and identifies that its prime objective is the provision of commercial rather than experimental satellites. It is expected to be financially viable or profitable. Legis-

lation also restricts the amount of equipment of non-Canadian origin that may be purchased by Telesat (Canadian content ranges between 70 and 75 per cent).

Telesat leases channels to the carriers and broadcasters. In 1977 Telesat became a member of TCTS thereby integrating terrestrial and space communications systems in Canada. Under the agreement, TCTS committed itself to a large percentage of the available capacity. Telesat would continue to own the earth station equipment, and lease channels only to approved telecommunications carriers. Telesat basically acts as a complement to and not a competitor of the other common carriers, and is regulated by the CRTC.

Interestingly, in August 1977, the CRTC refused to approve the proposed Connecting Agreement under which Telesat would become a member of TCTS. In the view of the CRTC the proposal was not in the public interest. The Governor-in-Council, however, in November 1977, waived the decision of the CRTC and approved the Agreement. The Telesat system serves a number of different purposes, the major ones being:

(1) the distribution of TV programs for the CBC, CTV, and pay-cable to various parts of the country, including isolated areas;

(2) the distribution of radio programs for the CBC to isolated areas in the far north;

(3) the provision of capacity for telephone service, private line, and business network service as a supplement to the terrestrial system;

(4) the provision of telephone service linking isolated areas in the north with each other and with southern centres,

including native (Inuit) video and radio broadcasting services;

(5) the provision of regional TV service (ATV, NTV);

(6) the negotiation of agreements for transborder services with U.S. carriers.

The Telesat system, with Anik satellites in geostationary orbit providing services at both 6/4 GHz and 14/12 GHz frequency bands, covers all of Canada including the Arctic region. It includes several hundred earth stations owned and operated by Telesat, the CBC, cable operators, and others. Customers and end users of the Telesat system include the members of TCTS, CTV, TVA Global, CBC TV networks, Cancom,[1] broadcasters, cable TV operators, major oil companies, government departments, and businesses. Among the businesses is the Toronto Globe and Mail which uses satellite services to transmit the prepared contents of its national edition to printing plants in the West and the East.

Mention should also be made of Teleglobe Canada which is Canada's representative in Intelsat and Inmarsat and serves Canada's overseas communications needs as does Comsat in the U.S. Teleglobe is owned and operated by the Canadian government and provides facilities and arrangements for telecommunications between Canada and abroad.

There is therefore virtually no competition in Canada'a long distance message business or in local telecommunications between telephone companies. There exist, with Bell operating in Ontario and Quebec, GTE in B.C., and other provincial systems,

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[1]Canadian Satellite Communications Inc., providing TV signals to remote areas of Canada's north and other underserved areas.

a set of geographical monopolies, co-operating in long distance message through TCTS. The only competition that exists is that provided by CNCP, which receives most of its revenues from services provided in competition with those offered by the telephone companies. The long-run goal of CNCP is to become a comprehensive national carrier, which would be the only such carrier operating as a single entity.

CNCP has CRTC authorization to offer private line service to customers in Ontario, Quebec and B.C. with dial access and services interconnected with the local telephone companies' networks. CNCP customers can dial into CNCP services over the telephones they already have, and can have computers and other attachments linked to the telephone and CNCP networks. CNCP has been unable, however, to obtain access to the provincially-owned and operated telephone companies for interconnection.

While CNCP has had permission to establish interconnected private voice services since 1979, as of mid-1982 it had only about 40 customers.[1]

Therefore in Canada there does not exist a one-entity transCanada telecommunication operation along the lines of AT&T. The market is fragmented into regions with regional monopolies. While Bell Canada is the single largest firm, it does not operate in a number of Provinces. CNCP provides competition only to Bell and BC Tel being unsuccessful in reaching interconnect agreements with provincially-owned and regulated telephone companies. Telesat has a monopoly on satellites and serves as

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[1] Communication Systems, June-July, 1982, p. 18.

a carrier's carrier for business communications, and just recently was permitted to deal directly with broadcasters.

The distinct features of the telecommunications industries in the U.S. and Canada thus include:

(i) a dominant firm (AT&T) in the U.S. in offering basic telecommunications services nationally; no such national firm in Canada, but rather several telephone companies co-operating to provide national services.

(ii) competition in message transmission in the U.S. with several companies interconnecting with the Bell system to offer WATS, MTS and a variety of services; competition in Canada offered only in Ontario, Quebec and B.C. with CNCP interconnecting with Bell Canada and BC Tel.

(iii) Several competing satellite systems in the U.S. offering a variety of services including message (voice and data) and video; a monopoly satellite system in Canada operated by Telesat and leasing transponders to the carriers and broadcasters.

b) Satellite Industry Organization and Environment

The satellite communications industrial organization structure in the U.S. was outlined in Section D in the profiles presented on the companies involved and their various alignments. A degree of vertical integration was apparent in the telecommunications industry, with telephone companies such at AT&T, GTE, and Continental Tel. establishing satellite systems through subsidiaries; Western Union operating its Westar system; and several giant firms in other industry sectors establishing

either solely or jointly subsidiaries owning and operating satellite systems (IBM, Aetna, Hughes, Fairchild, Southern Pacific). A noteworthy feature of the industrial alignments is the huge amount of resources commanded by the firms involved in establishing satellite systems. Although the issue of how readily these firms are prepared to make their resources available to finance or expand their satellite subsidiaries is subject to debate, the mere involvement of these giant firms lends credibility and an aura of financial soundness to these satellite companies in the eyes of the public and potential customers. Even if the satellite subsidiaries do not have ready and open access to the parents' resources, as ASC and SBS claim, the fact that they are subsidiaries of huge and viable firms, no doubt is an asset when approaching banking and other financial institutions for lines of credit (i.e. ASC's line of credit with Bank of America and a consortium of banks). Firms such as AT&T, Western Union, IBM, etc. experience little difficulty in raising capital in the capital markets. Comsat itself has recently marketed a major stock issue to obtain working and expansion capital.

No comparable industry organizational alignments exist in Canada's satellite operations. The ownership of Telesat is distributed as follows: Government of Canada, 50 per cent; Bell Canada, 25 per cent; other telephone companies which are TCTS members, 16 per cent; and other common carriers, 9 per cent. The authorized capital of Telesat is comprised of 10 million common shares without nominal or par value, and 5 million preferred shares with a nominal or par value of $10 per

share. As of December 31, 1981, the issued stock of the company was 6 million common shares for a stated value of $60 million.[1] The company's financial statements showed total assets of $200 million ($132 million in satellites, and $87 million in earth stations); shareholders' equity of $108 million and long term debt of $140 million. Net operating revenues increased from $12.2 million in 1980 to $15 million in 1981, although total operating revenues decreased from $57.8 million to $51.2 million.

To an extent the current organizational structure and operations of Telesat in Canada's domestic satellite communications finds a parallel in the organization and operations of Comsat in the U.S. At its creation Comsat was given a monopoly in U.S. international satellite communications, it served solely as a carriers' carrier, and it was owned 50 per cent by the common carriers and 50 per cent by the general public. In the 1970's Comsat launched domestic satellites and leased them to AT&T, continuing thereby to act as a carriers' carrier.

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[1] Telesat Annual Report, 1981, Ottawa: 1982.

[2] Ibid.

2. Objectives and Development of Satellite Systems

Certain parallels can be observed in the initial development of a satellite communications system in the U.S. and Canada. Some of these are summarized below.

In 1961 President Kennedy issued a policy statement calling for the speedy development of a satellite system to serve national interests and promote the U.S. as a leader in space technology.[1] This was a noteable departure in policy as communications had not previously been used as an instrument for national policy.

In 1968, the White Paper on Domestic Satellite Communications outlined the Canadian government's objective for satellite development as being economic, political, and national:

> . . . it is the Government's conclusion that a domestic satellite communications system is of vital importance for the growth, prosperity, and unity of Canada, and should be established as a matter of priority.[2]

The Canadian decision to proceed, while being concerned with the economics of the operation, was designed to achieve fairly wide purposes, including reliable communications to isolated or sparcely populated areas and to keep abreast of even pioneer technology and services in satellite communications.

In the late 1950's in the U.S., proposals for a satellite system included a private, carrier-owned system; a government-owned system; or some joint government-private interest venture. The Eisenhower policy favored a privately developed operated

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[1] See Section B for statement of Kennedy policy and early development of Comsat.

[2] Canada, White Paper on a Domestic Satellite Communications System for Canada, Ottawa: 1968, p. 10.

system; the common carriers favored a system developed, owned, and operated by the carriers; others favored a separate private entity; the Kennedy administration opted for private interest ownership but government oversight to serve the national interest. Comsat was created in 1962 along the guidelines expressed by the Kennedy Executive office.

In 1967, TCTS and CNCP proposed to establish and operate a satellite communications system and to operate it in conjunction with terrestrial facilities. The Canadian government in its White Paper proposed a joint government-private-interest venture. The carriers agreed to co-operate but continued to express their preference for a private system, owned and operated by the existing common carriers. Telesat was créated as a joint carrier-government venture.

Comsat was created to operate the U.S. international communications satellite system; to lease satellite capacity to the international carriers. It was to function as a carriers' carrier and not to compete with the carriers.

When Telesat was created it was stated that Telesat would operate as a carriers' carrier in domestic satellite use, and act "as a complement, not as a competitor, to the common carriers."[1]

The economics of the Telesat system has been heavily influenced by certain decisions taken when it was established and which have constrained Telesat's commercial freedom. Telesat was constrained from leasing capacity in units of less than

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[1] R. Dohoo, "Canada's Satellite Policies and How They Grew," In Search, Spring, 1979, p. 18.

one full transponder,[1] and its market was therefore effectively limited to the telecommunications carriers and to TV program distribution. The CBC would be a customer, but "no other was found outside the carriers during the first five years of Telesat operation."[2]

In 1977 Telesat joined the TCTS and entered into a financial pooling arrangement to ensure Telesat's financial ability to develop its system. This arrangement effectively eliminated the possibility of Telesat acting as a competitor with the established Canadian telephone companies.[3] In 1978 TCTS was only using about 25 per cent of the capacity it leased from Telesat for east and west communications.[4]

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[1] In contrast, some countries lease as little as one quarter of one transponder from Intelsat for their national telecommunications purposes.

[2] R. Dohoo, "Canada's Satellite Policies and How They Grew," In Search, Spring, 1979.

[3] The TCTS/Telesat agreement was criticized on a number of grounds, including: impediment to efficient marketing and development of satellite services; undue preference provided to TCTS and consequent impact on CNCP and non-carrier users of satellite facilities; and the effect on the regulatory environment in terms of the impaired ability of the CRTC to carry out its regulatory responsibilities and the potential for Cabinet appeals to undermine the agencies credibility and autonomy. For a review of these contentions, see Janet Yale, Telesat Canada's Membership in Trans-Canada Telephone System: A Critique, Paper presented to the International Telecommunications Conference, Montreal, March 1981.

[4] Commonwealth Government Task Force, National Communications Satellite Systems, Report, July 1978. Australian Government Printing Service, 1978.

Similarly, during the early years of Comsat's operations, the international carriers were required to combine cable and satellite facilities and to use satellite facilities when it appeared they would have favored the use of cable.

By the late 1960's Comsat had to a large degree served the purposes for which it was created. Through Comsat the U.S. had become firmly entrenched and a world leader in satellite communications. The political urgency and national concerns found in the years immediately preceding Comsat that gave rise to the Comsat structure had changed. Attention turned to the establishment of domestic satellite facilities. As outlined earlier the Executive Branch favored a competitive environment which was eventually adopted and has continued to develop to the present time.

It was shown earlier how, at the time of the Domsat decision in 1972, the FCC was tending to favor increased competition and deregulation. Both the Executive and the FCC (in Domsat 1972) had turned to view competition and free entry as the most appropriate means of developing domestic satellite services, and bringing these services to the public. The general objective was to serve the public interest. The U.S. government and its telecommunications regulatory agency, viewed competition and not monopoly, the marketplace and not the government, as the vehicles directing the development of satellite systems and services in response to public demands and needs, and fostering technological innovations and new services. Many industry representatives and analysts, together with the regulators, view this approach and philosophy as having successfully achieved

these objectives to date.[1]

The U.S. approach and developments in promoting and establishing an open-entry, competitive domestic satellite communications industry has not been imitated in Canada. There were signs, however, that the CRTC was attempting to proceed in this direction with its Telecom Decision CRTC 81-13. This decision permitted Telesat to serve end users directly and in effect lifted the restriction limiting Telesat's role to that of carriers' carrier. The established carriers opposed the move and appealed to the Federal Cabinet.

[1]These views are presented in Sections B & D.

3. Regulation and Regulatory Trends

There has been a definite and persistent trend toward increased competition and deregulation in the telecommunications industry in both Canada and the U.S., fostered by decisions of the CRTC and the FCC and the Courts. In the U.S. this trend which began to take shape in the late 1950's and 1960's, accelerated during the 1970's and continued into the 1980's. Beginning in the terminal attachments market, competition was in stages extended to private-line transmission and special services, satellite services, and finally to MTS and WATS and virtually all areas of telecommunications. To a degree, the U.S. liberalized policies were parallelled in Canada, although with some time lag.

Competition in the U.S. in the terminal equipment market began with the U.S. Court of Appeals Hush-a-Phone decision (1956) and FCC Carterfone decision (1968) which permitted the interconnection of non-Bell equipment to the Bell system telephone lines. These decisions opened up the terminal equipment market for new entrants, resulting in a proliferation of new companies in the telephone equipment manufacturing industry, and spurring the introduction of new and innovative products.

Competition in transmission services was promoted with a number of FCC decisions including the Above 890 Decision (1959), making some microwave frequencies available for privately operated communication services; the Microwave Communications Inc. Decision (1969), approving the establishment of specialized common carrier microwave facilities; the landmark Specialized Common Carrier Decision (1971) authorizing the

entry of specialized service carriers in the interstate business and data transmission market; policy in satellite communications; the Resale and Shared-Use Decision (1976) permitting unlimited sharing of private line facilities; the Computer Inquiry II Decision (1980) deregulating non-basic services; the MTS/WATS Decision (1980), opening these services to competition. Specifically in the area of domestic satellite communications, there was the landmark Domestic Satellite Decision (1972) introducing the open-entry policy and flexible regulatory approach to satellite communications; and more recently (as described earlier) the transponder sale decision, the DBS decision, the satellite transborder decision, and the Comsat restructure decision lifting the restrictions on Comsat.

These decisions changed the telecommunications industry in the U.S. from a government protected, regulated monopoly in both telecommunications terminal attachments and transmission, to an industry where a host of new companies compete with and supplement equipment and services provided by the Bell System. Restrictions and vigorous oversight by the FCC on AT&T continues, however, to ensure that AT&T does not engage in unfair competitive practices, including cross-subsidization of services, predatory pricing, and refusal to permit interconnection at reasonable tariffs.

While some similar trends to promote competition can be found in Canada, these must be viewed in the context of the regulatory structure in this country. There is no one agency in Canada comparable to the FCC in that it has jurisdiction over all inter-provincial or national telecommunications. Tele-

communications carriers are regulated either by the CRTC, provincial utility boards or commissions, and even by a municipal agency. The various carriers and their regulatory agents are illustrated in Table F-1. The CRTC has jurisdiction over Bell Canada (Quebec and Ontario), BC Tel, Terra Nova, Northwestel, CNCP and Telesat. Provincial government agencies in the remaining Provinces determine telecommunications regulatory policy in their respective jurisdictions.

The CRTC and its provincial regulatory counterparts are responsible for approving rates and other aspects of telecommunications under their respective jurisdictions. When TCTS members agree on uniform rates and practices for services offered collectively or on a cross-Canada basis, these rates and conditions become effective by being approved as part of each members' tariff. The issue of attachment or interconnection of equipment and systems to Provincial telephone systems is governed by legislation in those provinces, and in certain provinces (i.e. Saskatchewan) the legislation expressly forbid such attachments or interconnections (this is currently under review by the Saskatchewan government).

In Canada the CRTC has viewed competition and deregulation much more favorably than its provincial counterparts. As in the U.S. competition began in Canada in the area of terminal attachments and systems interconnection. In 1977 the CRTC ruled to give Challenge Communications permission to sell mobile telephone equipment which could access the Bell network. Similarly in 1977, the Quebec Superior Court prevented Bell Canada from interfering with Harding Communication's service

which involved attaching communications devices to the Bell system. These two cases in Canada were similar to the Carterfone decision in the U.S. Another important development was the CRTC's decision in 1979 authorizing CNCP to interconnect its facilities with Bell's local telephone network to provide private line voice and data services. A similar decision in 1981 permitted CNCP to interconnect with the facilities of BC Telephone Co. These interconnect decisions increased CNCP's ability to compete with TCTS in the provision of business voice and data services.

In 1980 the CRTC permitted the attachment of subscriber-owned terminal equipment to the Bell system for an interim period and in November 1982 (CRTC 82-14) announced its decision permitting such attachments.

When Telesat was established the government policy was that licenses for ownership of earth stations would only be issued to Telesat. The Connecting Agreement between TCTS and Telesat in 1977 reaffirmed this policy by assigning to Telesat the design, procurement and ownership of earth stations used for TCTS purposes. This policy was later relaxed permitting several classes of private ownership of earth stations which use the Telesat system. In 1979 a new government policy allowed cable TV companies, broadcasters, and telecommunications common carriers to own and operate their own satellite earth stations in certain circumstances. Cable, broadcasters, and carriers were permitted to own TV receive-only (TVRO) stations, with carriers able to apply for transmit-receive stations. The policy was designed to improve access to satellite service,

provide opportunities for the extension of TV programming in Canada, and stimulate the utilization of the Anik satellites. It also provided CNCP with the same access to earth stations as the telephone companies. The policy, however, retained the principle of not granting licenses to earth stations for the reception of signals from U.S. satellites.

In June 1981, the CRTC released Telecom Decision CRTC 81-13, a detailed examination of the structure and operation of TCTS including Telesat. The main provision pertaining to Telesat was the requirement that Telesat offer satellite transmission services, including partial channels, directly to customers. The decision thus removed the restriction that Telesat operate only as a carriers' carrier. In essence, this decision was similar to a later FCC decision in 1982 lifting the restrictions on Comsat and permitting it to offer end-to-end services. In July, 1981, members of TCTS petitioned the Governor-in-Council to rescind the CRTC order pertaining to Telesat. On December 10, 1981, the Governor-in-Council issued its decision on the petition.[1] The requirement that Telesat offer satellite channels to all customers was varied to require Telesat to offer whole satellite channels directly to broadcasters and approved common carriers only. Telesat was required to offer partial channels only to the approved common carriers.[2] Bell Canada and BC Tel were required by the Governor-in-Council to offer services provided by partial satellite channels at

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[1]Dept. of Communications, Statement by the Honourable Francis Fox in Respect of an Order in Council to Further Vary Telecom Decision 81-13, Thursday, December 10, 1981, and CRTC Annual Report, 1981-82, Ottawa, 1982.

[2]Ibid.

rates that were insensitive to distance and number of locations served. The decision by the Governor-in-Council reasserted the government's original intention that Telesat should act as a complement to and not a competitor of the other common carriers.

Both carriers and broadcasters stand to benefit from the decision in that carriers could now lease partial channels and broadcasters could lease directly rather than through TCTS. Similarly CNCP could now obtain partial channels directly from Telesat, which could encourage CNCP to become more involved in the satellite business, and offer more competition to TCTS.

The trend toward increased competition fostered by the CRTC, however, was not parallelled at the Provincial level. Provincially regulated telephone companies such as Sask Tel, Manitoba Tel, and the Island Telephone Co., have been more successful in holding off terminal attachments and systems interconnection than the federally regulated telecos. In 1980 the Saskatchewan government passed an amendment to the Saskatchewan Telecommunications Act which in effect strengthened the monopoly position of Sask Tel.[1] Telcos such as Sask Tel contended that prohibition of non-network attachments and interconnection was necessary to protect the integrity of the Provincial systems and protect the erosion of the telecos financial base. This was the argument used for years by the Bell systems in the U.S. and Canada — that competition would result in creamskimming by new entrants, an erosion of business and revenues of the established carriers, with the end result being higher rates for basic telephone services to the detriment of the general public.

[1]The Saskatchewan government is currently undertaking some liberalization to its terminal attachments policy.

TABLE F-1

MAJOR CANADIAN TELECOMMUNICATIONS CARRIERS
AND THEIR REGULATORY AGENCIES

CARRIER	REGULATORY AGENCY
Bell Canada British Columbia Telephone Co. CNCP Telecommunications Telesat Canada Northwestel Terra Nova Telecommunications	Canadian Radio-television and Telecommunications Commission (CRTC)
Alberta Government Telephones	Alberta Public Utilities Board
Saskatchewan Telecommunications	Cabinet (under review)
Manitoba Telephone System	Manitoba Public Utilities Board
New Brunswick Telephone Co. Ltd.	New Brunswick Board of Commissioners of Public Utilities
Maritime Telegraph and Telephone Co.	Nova Scotia Board of Commissioners of Public Utilities
Island Telephone Co. Ltd.	Prince Edward Island Public Utilities Commission
Newfoundland Telephone Co. Ltd.	Newfoundland Board of Commissioners of Public Utilities
Edmonton telephones	City of Edmonton
Northern Telephone	Ontario Telephone Service Commission
Quebec Telephone	Regie des services publics du Quebec
Telebec Ltee	Regie des services publics du Quebec
Teleglobe Canada	Federal government
Thunder Bay Telephone System	City of Thunder Bay

Source: Department of Communications, Canada: National Presentation in Telecommunications, Ottawa, December 1982.

4. Considerations Regarding the Adaptability of U.S. Policies

a) Market Fragmentation

A major consideration and possible constraint in adopting an open-entry, competitive policy for satellite systems in Canada is Canada's relatively small and already fragmented telecommunications market. This was not a factor in the U.S. It can be argued that the structure of the telecommunications industry in the U.S. and the sheer size of the market lends itself to a competitive satellite component. AT&T, Western Union, GTE have the facilities and a sufficiently large market to utilize satellite facilities and provide nation-wide services. Even newly established terrestrial carriers such as MCI offering MTS and WATS, as well as specialized services, because of its access to the Bell system, can utilize satellite facilities to incorporate with its terrestrial facilities in offering its services.

Broadcasters also place a high demand on satellite facilities and rapidly expanding cable and pay TV services provide a growing market for satellite video services. Major video operators such as HBO and Showtime operate nationally and there is a large demand by cable operators for their programs and on the satellite transponders on which the programs are distributed. Video was a major use of early satellite capacity and continues to be a mainstay of satellite use. Video provides a demand for satellite capacity and satellite companies compete for the major video operations.

The Canadian telecommunications market is relatively small in comparison to the U.S. and is fragmented into regional

monopolies. No single entity can provide a completely national telephone service. Interconnection is at the discretion of the various regulatory agencies. These factors tend to act as constraints in the use of satellites for basic telecommunications services. Competing satellite systems would tend to further fragment this market which would tend to reduce the economic viability of the satellite systems.

In the broadcast area the CBC is a major customer of satellite facilities, providing services via satellite to various parts of the country including the north. Cancom, CTV and Global also avail themselves of satellite facilities. But it remains questionable whether there is a sufficient broadcast and video market to maintain a number of satellite systems. This issue becomes particularly crucial when one considers that Canadian video and broadcast distributors do not only have to compete among themselves, but along the southern-most populated fringe of Canada, they must also compete with U.S. video and broadcast distributors which tends to further fragment an already thin market.

b) Financial and Economic Considerations

The possibility of development of the type of industry and financial alignments for satellite ownership and operations in Canada as has developed in the U.S. is questionable at the current time. As already pointed out, the relatively small Canadian market raises the issue of the number of satellite systems that Canada could support. Large initial investments are required to construct, launch and operate a satellite system

as discussed earlier. SBS was given a fund of $600 million by its parents IBM, Comsat and Aetna to establish its system. It has yet to make a profit. Such large investments combined with substantial risks and uncertainty and a small market cannot lightly be discounted by potential entrants into satellite systems. Bell Canada with consolidated total revenues of over $7 billion in 1981 could conceivably afford to launch a system and possibly slowly develop it into a profitable operation, but Provincial telcos or CNCP do not have the resources of Bell. Nor is it readily apparent that any of the major firms in Canada not connected with telecommunications (automobile firms, oil companies, financial institutions, etc.), many of which are U.S. subsidiaries, would be prepared to finance such costly operations. Opportunities are currently available to Bell, the Provincial telcos, broadcasters, and other interests to lease Telesat transponders (some can lease directly, while others must go through TCTS), but other than the services offered by the CBC, Cancom, and other broadcasters, and the data and voice services developed by TCTS, operators such as those found in the U.S. which operate through leased facilities (ASC, SBS, Southern Pacific) to provide private line voice and data, videoconferencing, etc, services have not developed.

Rather than the establishment of costly satellite systems complete with earth stations and services, an alternative path that might be followed in an open-entry environment is for some firm or group of firms to imitate RCA, Hughes, and Rainbow, and lease or sell transponders. Hughes sold 16 transponders

on Galaxy I for a total of approximately $160 million. Given the $60-$70 million satellite construction and launch cost, and even with the continuing cost of maintaining the system, it has been claimed that Hughes made a substantial profit on Galaxy I. Could not competing Canadian satellite systems follow this path? There are some major factors to be considered. First, Hughes' sale was primarily to major video vendors, including HBO, which have been prepared to pay from $10 million to $13 million for transponders given the huge U.S. market served and the potential profits involved. A market of this size does not exist in Canada, and there has been no rush by Canadian users for the transponders made available by Telesat. In fact, Telesat has had to rely on leasing satellites to U.S. interests in order to reduce excess capacity and idle transponders. However, as supply of transponders catches up with demand in the U.S., as it appears to have done within the last year, Telesat's ability to lease transponders to U.S. operators will become more difficult.[1] In the past, operators in the U.S. began operations using Canada's Anik, only to switch later to U.S. satellites as capacity became available. Agreements for transborder business satellite services, in which half of the transmission is required to be carried on Anik, have also helped Telesat in utilizing its capacity. However, U.S. satellite carriers do not view Canada as a major or unique market. The north-south satellite service market in business communications is primarily restricted to Canada's industrial heartland and BC and is a relatively small market.

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[1]Acknowledged by E. Thompson, President of Telesat. Canadian Communication Reports, Dec. 31, 1981.

Given the financial and market considerations it appears reasonable to assume that the adoption of an open skies policy in Canada, permitting any viable financial or business entity to launch a satellite system, would not likely at least in the short run, result in the CRTC being flooded with applications. Furthermore, it is unlikely that any such proposed system would become fully operational and profitable for possibly several years. Such a time lag for returns, combined with the large initial investments, market risks and uncertainties, and the fact that Telesat is already established and presumably would be permitted to serve customers directly in an open-entry policy, would be major factors for consideration by any potential entrants.

c) Regulatory Structures

A significant consideration for the development of satellite services in Canada is the regulatory structure. There is not the same consideration in the U.S. where the FCC has sole jurisdiction for all interstate and international telecommunications traffic. The fragmented authority of regulation in Canada makes the establishment of a uniform or national policy in telecommunications difficult. While the CRTC may promote competition and permit network interconnection and terminal attachments, Provincial authorities are not compelled to follow. This would be of particular concern in satellite communications for satellite services requiring access to the telephone companies lines. If approved by CRTC such services could be provided in BC, Ontario and Quebec, but

to date Provincial regulators have opposed systems interconnection, as well as attachments of equipment unless leased from the telephone company. Potential satellite operators no doubt would take this factor into serious consideration before undertaking the development of a satellite system.

d) Telesat

What impact might an open-entry policy have on Telesat and Telesat's role in telecommunications in Canada? The President of Telesat, E. Thompson has contended that the Canadian market is too small for an open skies policy and that there is insufficient room for both Telesat and other Canadian satellite systems.[1] It would lead to a reduction in the scale of Telesat's operations and revenues. But at the same time Thompson is not satisfied with current CRTC policy and the restrictions placed on Telesat. He has argued for freedom to make the maximum possible commercial use of the channel capacity of Telesat and to enter into arrangements with U.S. customers to utilize Telesat's capacity rather than keep capacity idle waiting for as yet unauthorized and undefined Canadian services. Telesat was therefore pleased with the recent exchange of letters between Canada and the U.S.

Thompson has also argued for the establishment of a DBS system in Canada to provide an alternative to the DBS systems being planned in the U.S. Canadians currently are potentially exposed to the broadcasts transmitted by U.S. satellites, and

[1] Canadian Communication Reports, December 31, 1981.

DBS in the U.S. will increase this potential exposure. Many believe that the answer to U.S. DBS systems is to develop a Canadian DBS system alternative offering popular Canadian entertainment of a quality high enough to attract audiences now viewing U.S. stations and potentially viewing American DBS. Also Canadian satellite services could carry the best of U.S. entertainment and be as attractive as the broadcasts of U.S. operators, whether carried by satellite or cable.[1] A DBS system in Canada could provide a market for Telesat's Anik C satellites, just as the recently approved and introduced satellite-delivered pay-TV services resulted in the use of Anik capacity.

Alternative satellite capacity from other satellite systems which might be established in an open entry environment would force Telesat to compete for cable/pay TV business and for business of broadcasters in general. This of course would be favored by broadcast satellite users in terms of the services and rates that they might expect from such competition. Competition could lead to the availability of partial channels to all potential users and other services as the competitors are forced to market their satellite services. The current policy of full-channel leasing has been of greatest concern to broadcasters, who have argued that TCTS has not been responsive to users' needs.[2] Broadcasters consequently had supported the CRTC's Telecom Decision 81-13 (1981) that Telesat offer

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[1] CRTC, The 1980s: A Decade of Diversity, Report of the Committee on Extension of Service to Northern and Remote Communities, Ottawa: 1980.

[2] Communication Systems, Nov/Dec, 1981.

satellite channels, including partial channels, directly to all customers. It was estimated that the members of the Canadian Cable Television Association (CCTA) could save up to 27 per cent if Telesat's tariffs had been changed in accordance with the 81-13 decision.[1]

Competition in a limited market, however, could produce serious problems for Telesat's financial viability, as well as the viability of competitors. Financial strains would be imposed on Telesat and competitors if open-entry led to an excess of supply of capacity over demand, leaving unused capacity.

Under the current telecommunications structure, with Telesat a member of TCTS, Telesat would likely enjoy a favored position in relation to competitors (assuming they would not be members of TCTS) in the use of satellites by the telecommunications carriers who are also members. Use of satellites by TCTS is likely to grow as witnessed by the 1981 announcement by TCTS of plans for a national satellite business network combining voice, video and data communications services for Canadian business organizations (Integrated Satellite Business Network or ISBN). However, serious consideration would have to be given, in the interests of promoting fair competition, as to whether Telesat should be allowed to maintain its membership in TCTS should an open-entry, competitive satellite communications policy be adopted. CNCP, for example, has been extremely critical of Telesat's membership in TCTS, with which CNCP

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[1] Communications Systems, Nov/Dec. 1981.

competes. CNCP views Telesat's membership as making Telesat not merely a supplier to CNCP but a competitor. In the same manner, competitor satellite systems might view Telesat not as a mere competitor for the supply of services to TCTS, but as an integral part of TCTS from which competitors seek business.

e) Satellite/Cable Non-Programming Services

The most compelling argument made for competition in satellite communications is that competition promotes the development of new services and consequently the utilization of satellites and produces greater responsiveness to user needs. One of the areas appearing to offer considerable potential in the utilization of satellites for new services is the integration of satellites and cable/TV systems for the distribution of non-programming services. These include video teleconferencing, videotex, teleshopping, opinion polling, video games, information services, etc. In December 1981 the CRTC decided to approve a variety of applications for cable distribution of such services. Equitable access to cable TV systems by third parties wishing to provide such non-programming services could pave the way for the development of such services regionally and on a national scale using satellite capacity.

Satellites could also be utilized in conjunction with cable for provision of business data communications services. This could conceivably run into roadblocks from regulatory agencies in provinces maintaining their jurisdiction over cable, but it would avoid using telephone facilities for such services, including the provincial telcos. The utilization of a combina-

tion of satellites, earth stations/telecommunication switches, and cable networks, given the large proportion of the country wired for cable, could eventually produce a satellite-carried national network of communications for long-distance business telecommunications services offering competition to TCTS.[1] The telephone carriers (members of TCTS) might oppose such a proposal in their belief that they are in the best position, given their facilities, to provide data and voice communications and that they can satisfy all data and voice transmission needs.

Assuming co-operation by provincial authorities to the extent that their approval may be required, the marriage and utilization of satellite and cable for non-programming services could conceivably be more readily realized through a competitive satellite service environment, combined with flexible earth station and interconnection policies than in a monopolistic environment. Perhaps sufficient business could be generated in Canada through competition in this area, and with competition in other satellite service areas, together with connections with U.S. systems, a viable, diversified and dynamic satellite communications industry could be maintained.

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[1] A suggestion along these lines was presented in Canadian Communications Regulation and Policy, January, 1983.

5. Summary and Conclusion

There is ample evidence from the U.S. telecommunications industry that competition and the flexible regulatory approach of the FCC served as a stimulus in developing new products and services, in promoting technological innovation and in reducing the time lag between innovation and the marketing of the new product or service. With specific reference to satellite communications, there is general agreement in the industry and government that open entry, transponder sharing and resale, liberal interconnection and earth ownership policies, facilitated the rapid development and utilization of satellite services. These policies achieved the general objectives established in satellite communications.

It would be inappropriate, however, to conclude that because the U.S. satellite policies and regulatory measures appear to have been successful in that country in the development of satellite communications, they could be imitated in Canada and achieve the same degree of success. The success of policies in the U.S. must be viewed in the context of the aims and objectives established by the U.S. Administration and the FCC for satellite communications and within the wider context of the nature and structure of the telecommunications industry and market. Similarly the adaptability of these same policies to Canada must be viewed within the context of Canadian aims and objectives, and within the context of any distinctive features of the Canadian telecommunications industry and markets.

It is generally conceded that U.S. policies adopted in 1962 achieved the objectives set in 1962 under the Comsat

structure. As conditions changed during the 1960's along with new objectives, it is conceded that the objectives for satellite communications that the Administration and the FCC established in the early 1970's are also being achieved under the open entry policy. In 1972 the overall objective was to make the technology available for public benefit through domestic systems and to foster and promote the development and utilization of this technology. It was decided that the direction of domestic satellite development, satellite applications and satellite successes would be most appropriately determined through the marketplace. Other objectives or motives relating to issues such as national or international interests were not declared to be at the fore in 1972, in contrast to the situation in 1962 when Comsat was created. Following the 1972 FCC decision, most applications for satellite services submitted were approved on the grounds that the public interest would be served. Contentions that the approval of certain satellite services would adversely affect existing entities and/or services were generally overridden by findings that they would yield a net public benefit. The position of the FCC in such instances was most clearly demonstrated in the decision authorizing direct broadcast satellite services, despite the objections of the National Broadcasting Association that DBS would severely affect local broadcasters.

Throughout the various inquiries conducted by the FCC on numerous aspects of telecommunications in the past two decades, the FCC appeared to become increasingly convinced that competition and not monopoly was the most appropriate

means of achieving U.S. objectives in telecommunications. Repeated references were made to preceding pro-competition decisions and liberalization policies and that, despite claims to the contrary, no decisive evidence was presented to convince the FCC that these past decisions had adversely affected the public interest, or indeed, had serious adverse effects on existing operations and services.

Therefore it would not appear that competition and the flexible regulatory approach has adversely affected the development of the telecommunications industry in the U.S., including the satellite segment, or has been detrimental to the public interest. On the contrary, the evidence appears to highly favor a competitive environment for telecommunications including satellites. Witness the number of firms in the industry in competition with one another, the fact that a notable shortage of satellite capacity in the late 1970's has been erased, the multitude of new satellite services that have been provided or are being developed, and the choice being presented to potential customers. Competition is viewed as the stimulus for technological innovation, development of new services and bringing these services to market. The Chairman of AT&T once admitted that competition had greatly reduced the time lag between the development of a new service or innovation by Bell Labs and its appearance in the marketplace. There is consequently ample evidence that if the objective is to accelerate the development and utilization of a service in response to public demands and needs, the competitive marketplace provides much more incentive than does monopoly. This

appears to have been the case with satellite communication in the U.S.

There may exist, however, government or public objectives other than those established in the marketplace in the development of a technology or service. Considerations of national security, national interests and social and cultural objectives as perceived or established by government may enter to temper reliance on the marketplace. These considerations played a prominent part in the 1962 Comsat creation in the U.S., and the creation of Telesat in Canada. Such considerations, to the extent they currently exist in the U.S., are presumably judged to be adequately provided for through the operation of the marketplace.

There are also various economic and market factors which may influence the manner in which a technology such as satellite communications is utilized and the way in which the industry evolves and which deserve careful consideration.

The environment in the U.S. in which the satellite open-entry policy has operated contained several favorable economic, market, and regulatory factors for its success, including: the large and growing telecommunications market including pay/cable TV; the FCC rein on AT&T to prevent unfair competition; the regulatory structure with FCC jurisdiction over all interstate telecommunications; favorable FCC decisions in complementary areas of telecommunications; the participation in the establishment of satellite systems of telecommunications companies with nation-wide terrestrial facilities into which satellite facilities could be integrated; and the participation of

corporate giants (RCA, IBM, Aetna) providing the initial risk capital and establishing satellite communications systems through subsidiaries. It can be argued that the structure of the telecommunications industry in the U.S. and the sheer size of the market lend itself to a competitive satellite component.

In Canada, in contrast, the market is relatively small, jurisdiction over telecommunications is fragmented, which in turn has resulted in fragmentation of the market.

It would appear that potential does exist in Canada for more extensive utilization of satellite services, for satellite carriers to become more responsive to user needs, for possibly reduced costs, etc. Increased competition could conceivably exploit this potential as it has in the U.S. But on the other hand, there exist numerous factors and issues which must be addressed before attempting an imitation of U.S. policies and regulatory measures. There are issues of whether the Canadian market, which is approximately one-tenth the size of the U.S. market, is sufficient to support competing satellite systems; whether sufficient risk capital would be forthcoming in a free market, without government assistance or involvement to develop and provide satellite systems and services; whether the fragmented regulatory structure might not add to the risks and uncertainties associated with telecommunications systems; the effect of competition on the economic viability of Telesat; the potential for new services development; and whether sufficient economies of scale might be generated from competing systems to maintain costs competitive with terrestrial systems. It may well be that the above factors, combined with the high

and ever increasing costs of launching and operating satellite systems, together with the risks and uncertainties involved, could mitigate against the possible success of a U.S.-style open entry policy.

While some observations have been made regarding the above issues, this study does not attempt to provide definitive answers to these questions. It was not intended to provide recommendations regarding the most appropriate market and regulatory structure for satellite communications in Canada. The study, through its detailed examination of U.S. satellite policy, the satellite industry and satellite communications developments, has traced the factors and developments which led to the adoption of, and which appear to have contributed to the success of, policy in that country. In the process, it identifies the relevant factors for consideration if similar policies were contemplated for Canada. But it remains for further study and analysis to determine whether U.S. policies, or some version of these policies, would be appropriate for Canada.

APPENDIX I

U.S. SPACE PROGRAM

TABLE I-1

Selected Groups of Civilian Satellites Launched by NASA from 1950 to 1980

Purpose	Satellites	Sponsor (if not NASA)	Number Successful/ Total	Years
Astrophysics	Explorer, Orbiting Observatories		60/74	1961-80
Planetary	Pioneer, Mariner, Viking, Voyager		20/24	1962-78
Communications-- R & D				
Operational	Echo, Relay, Syncom, ATS	Commercial	13/16	1960-74
	Intelsat, Westar, etc.		39/43	1962-80
Meterology - R & D				
Operational	Tiros, Nimbus, SMS(1)		22/24	1959-78
	ITOS, GOES, NOAA (2)	NOAA	19/22	1966-80
Geodesy	Explorer, PAGEOS, GEOS, LAGEOS (3)		7/7	1964-76
Terrestrial	ERTS, Landsat		3/3	1972-78
Oceanography	Seasat (4)		1/1	1978

Source: NASA, Civilian Space Policy and Applications, Office of Technology Assessment, Washington, 1982.

TABLE I-2

U.S. Military Satellite Systems

Program	Satellites	Functions
Defense Satellite Communications System II (DSCS 11)	4 active 2 dormant spares	High capacity super high frequency communications. Part of Worldwide Military Command and Control System (WWMCCS). Carries AFSATCOM transponders.
Satellite Data System (SDS)	3	
Air Force Satellite Communications System (AFSATCOM)	Radio transponders carried on SDS, FLTSATCOM (other satellites?)	UHF communications among National Command authority, Joint Chiefs, Military Commanders in Chief, and nuclear capable forces.
Fleet Satellite Communications (FLTSATCOM)	3	UHF and separate SHF uplink Naval Communications System operates over U.S. Atlantic Ocean, Indian Ocean, Contains some jam-resistant 5-KHz channels for AFSATCOM, 1,500 KHZ channel for Presidential support for network of regional commands.
Defense Support Program (DSP)	3	Early warning of ICBM, SLBM launches by infrared detection of rocket plumes. Also carrier visible light detectors and radiation sensors for detecting nuclear

Table I-2 (continued)

Program	Satellites	Functions
		explosions. Provides surveillance of missile test launches.
Photographic Reconnaissance	2 types	Area-search and close-lock remote sensing.
Electronic (Signals) Intelligence	At least 5 launches since 1973	
Geodetic Satellite	6	Photographic mapping in three dimensions. Radar altimeter for topographical mapping of land and seacoasts.
Defense Meterological	2 block 5D spacecraft	Visual and infrared images satellite programs (most recent launch weather conditions, global tailed) coverage four times a day.
Navy Navigation Satellite System	TRANSIT (5 operating?) NOVA	Measurement in Doppler shift of radio emissions from satellites permits ship and aircraft navigators to find position.
Global Positioning System (GPS)	6 NAVSTAR (16 now planned)	Precisely timed radio beacons will allow users to determine position in three dimensions to within 10 m velocity to 0.1 m/sec.
Integrated Operational Nuclear Detection System (IONDS)	Aboard GPS, beginning with NAVSTAR 5	Detect and monitor nuclear explosions worldwide using bhangmeter sensors and GPS location data.

Table I-2 (continued)

Program	Satellites	Functions
Space Detection and Tracking System	Ground-based cameras, radar, and radio receivers	Data funneled into Aerospace Defense Command Space Defense Operations Center, Colorado Springs, Colo. identification and tracking of objects in space.

Source: NASA, Civilian Space Policy and Applications, Office of Technology Assessment, Washington, 1982.

TABLE I-3

NASA BUDGET 1959-1979

Fiscal Year	Appropriation	1967 Dollars
1959	184.3	214.9
1960	523.6	598.1
1961	964.0	1,086.2
1962	1,825.3	2,032.6
1963	3,674.1	4,024.2
1964	5,100.0	5,505.8
1965	5,250.0	5,565.6
1966	5,175.0	5,341.1
1967	4,968.0	4,968.0
1968	4,588.9	4,429.4
1969	3,995.3	3,682.3
1970	3,749.2	3,274.4
1971	3,312.6	2,751.3
1972	3,310.1	2,629.2
1973	3,407.6	2,593.3
1974	3,039.7	2,142.1
1975	3,231.2	2,052.8
1976	3,551.8	2,099.1
1977	3,819.1	2,130.0
1978	4,063.7	2,112.1
1979 (estimate)	4,566.2	2,226.3

Source: U.S. Civilian Space Programs, 1958-1978. Report Prepared for the Subcommittee on Space Science and Applications, Vol. 1, January 1981.

TABLE I-4

SPACE ACTIVITIES OF THE U.S. GOVERNMENT

Historical Budget Summary - Budget Authority
(in millions of dollars)

Fiscal Year	Total	Space	Defense	Energy	Commerce	Interior	Agriculture	NSF	Total Space
1959	330.9	260.9	489.5	34.5	--	--	--	--	784.7
1960	423.6	461.5	560.9	43.3	--	--	--	0.1	1065.8
1961	964.0	926.0	813.9	67.7	--	--	--	.5	1808.2
1962	1824.9	1796.8	1298.2	147.8	50.7	--	--	1.3	3294.8
1963	3673.0	3626.0	1549.9	213.9	43.2	--	--	1.5	5434.5
1964	5099.7	5016.3	1599.3	210.0	2.8	--	--	3.0	6831.4
1965	5249.7	5137.6	1573.9	228.6	12.2	--	--	3.2	6955.5
1966	5174.9	5064.5	1688.8	186.8	26.5	--	--	3.2	6969.8
1967	4965.6	4830.2	1663.6	183.6	29.3	--	--	2.8	6709.5
1968	4587.3	4430.0	1921.8	145.1	28.1	0.2	0.5	3.2	6528.9
1969	3990.9	3922.0	2013.0	118.0	20.0	.2	.7	1.9	5975.8
1970	3745.8	3547.0	1678.4	102.8	8.0	1.1	.8	2.4	5340.5
1971	3311.2	3101.3	1512.3	94.8	27.4	1.9	.8	2.4	4740.9
1972	3306.6	3071.0	1407.0	55.2	31.3	5.8	1.6	2.8	4574.7
1973	3406.2	3093.2	1623.0	54.2	39.7	10.3	1.9	2.6	4824.9
1974	3036.9	2758.5	1766.0	41.7	60.2	9.0	3.1	1.8	4640.3
1975	3229.1	2915.3	1892.4	29.6	64.4	3.3	2.3	2.0	4914.3
1976	3550.3	3225.4	1983.3	23.3	71.5	10.4	3.6	2.4	5319.9
1977	3817.8	3440.2	2411.9	21.7	90.8	9.5	6.3	2.4	5982.8
1978	4060.1	3622.9	2728.8	34.4	102.8	9.7	7.7	2.4	6508.7
1979	4595.5	4030.4	3211.3	58.6	98.4	9.9	8.2	2.4	7419.2
1980	5240.1	4680.4	3848.4	39.6	92.6	11.7	13.7	2.4	8688.8
1981 (est)	5519.1	4997.2	4789.4	42.0	91.9	12.1	15.5	2.4	9950.5
1982 (est)	6118.3	5617.3	5916.3	38.0	126.3	12.6	17.2	2.0	11729.7

Source: 1983 NASA Authorization, Hearings before the Subcommittee on Space Science and Applications, Feb.-Mar. 1982.

APPENDIX II

FCC TELECOMMUNICATIONS

PRO-COMPETITION DECISIONS

The "open skies" or free entry policy adopted by the FCC on communications satellites was consistent with the general trend towards increased competition in U.S. telecommunications. Competition was viewed by the FCC and Congress as a means of stimulating technological development in the industry, fostering new services to meet changing needs, improving services, and reducing rates. Competition incorporated more open and easier entry into the industry, and a greater reliance on market forces to act as the regulator of the industry.

The trend toward competition began in the 1950's, took more definite shape in the 1960's, and accelerated during the 1970's. It was fostered first in terminal interconnection, followed by private-line transmission services and special services, and finally extended to practically all areas of telecommunications.

The following traces the developments that changed the telecommunications industry from a primarily government protected monopoly to a relatively open-entry, competitive system.

1. Terminal Attachments

New developments in terminal equipment and its manufacture in the 1940's gave rise to the terminal interconnect issue. In 1949 the FCC upheld Bell's interconnect restriction as applied to the Hush-a-Phone, a small plastic device attached

to a telephone headset to reduce background noise, and in 1954 it turned down a petition from manufacturers of electronic telephone answering devices to attach their devices on the grounds that there was no interstate demand for the product. In 1956, however, the Hush-a-Phone decision was overruled by the U.S. Court of Appeals which concluded that Bell's interconnection restrictions were an unwarranted interference with telephone subscribers rights to use the telephone in ways which were privately beneficial without being publicly detrimental.[1] The FCC subsequently implemented the Court's findings.

The Hush-a-Phone decision was used as a precedent when the interconnect issue again appeared. In the Carterfone Decision of 1968[2] the FCC ruled against AT&T's tariffs which prohibited the interconnection of a private land mobile radio unit to the telephone network through the means of an acoustic coupler. The FCC contended that interconnection did not adversely affect the telephone company's operations or the telephone system's utility for others. The tariffs were particularly discriminatory when AT&T's own interconnect equipment was approved for use. The significance of the Carterfone decision was that it paved the way for the attachment of customer-owned terminal devices to the telephone companies lines and allowed customers to choose the kinds of terminal equipment they needed.

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[1] 238 FCC 2d, 1956.

[2] 13 FCC 2d, 1968.

2. Private-Line Service

Microwave radio as a communications carrier was developed during the Second World War and was extended to civilian use. Petitions were made to the FCC to permit the development of private microwave systems in competition with common carrier supplied services. In the Above 890 Decision of 1959[1] the FCC made some frequencies available for use by privately operated communications services on the grounds that there were uses that could not be met by the established common carriers and that the economic impact on the common carriers would be insignificant. This was the beginning of private line competition to the established carriers.

The initial private line competition introduced by the Above 890 decision was followed by the Microwave Communications Inc. Decision (MCI) in 1969.[2] In this decision the FCC finally approved, after a six year controversy, the first application to build and operate specialized common carrier microwave facilities, servicing interplant and interoffice communications between St. Louis and Chicago. The FCC reasoned that the provision of private line microwave services by carriers other than AT&T would allow more efficient use of the spectrum, would bring small businessmen new services and fulfill public needs, while not posing a threat to the established common carriers.

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[1] 27 FCC 1959.

[2] 18 FCC 2d 1969.

3. Specialized Services

In 1971 the FCC handed down its landmark Specialized Common Carrier Decision[1] which authorized the entry of special service carriers to the market. It was believed that there was an unmet need for specialized services in the interstate business and data transmission market and the increased competition would provide a wider range of specialized services. At the same time, this would not significantly affect telephone industry revenues or the rates of basic telephone services. It was also argued that competition in the specialized communications field would enlarge the equipment market for manufacturers and stimulate innovation and the introduction of new techniques by both new entrants and AT&T itself. Competition would also afford some standard for comparing the performance of one carrier with another.

Competition in domestic satellites came next with the Domestic Satellite Decision (DOMSAT) of 1972 described in preceding pages.

4. Computer Inquiry II Decision

This decision by the FCC has been considered by many in terms of its potential impact on the structure and operations of the telephone industry as one of the most significant deregulatory actions the FCC had ever taken.

In summary, the FCC in its final decisions in Computer Inquiry II:

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[1] 29 FCC 2d 1971.

1) Defined network services as either "basic" (common carrier offering of transmission capacity for the movement of information), or "enhanced" (combining basic services with computer processing that provides additional, different, or restructured information;

2) Deregulated enhanced services, maintaining regulation only on basic services;

3) Ordered that carrier offerings of terminal equipment and related costs be unbundled from basic services and detariffed, with a deadline of March 1, 1982.

4) Eliminated existing rules requiring maximum separation of carriers' regulated and unregulated data processing services, except for carriers under direct control of AT&T and GTE. Other carriers would no longer be required to offer enhanced services through a separate subsidiary;

5) Stipulated that carriers under direct control of AT&T and GTE could provide enhanced services only through a separate corporate entity on a resale basis, and that the resale subsidiary must acquire all of its transmission capacity from a carrier under tariff;

6) Permitted AT&T and GTE to market, maintain, and service customer premises equipment (CPE) only through a separate subsidiary;

7) Interpreted the 1956 AT&T - DOJ Consent Decree as not foreclosing AT&T from providing enhanced services or CPE.

In essence, the FCC in Computer Inquiry II sought, in a single step, to deregulate major segments of the industry, to free AT&T to offer competitive services through a separate subsidiary, and in a sense to circumvent the 1956 Consent

Decree between the Bell System and the Department of Justice.

Competitive Common Carriers

On August 1, 1980, the FCC eliminated the regulations applicable to common carriers which it considered to be subject to effective competition.[1] The Commission defined "dominant" firms as any firm that could keep its price either above or below its costs, and was capable of undercutting the market. These firms possessed market power and were capable of conduct which would violate the standards of the Communications Act. Non-dominant firms, on the other hand, were defined as those who did not possess market power. If they attempted to charge prices not related to their costs, their customers could easily turn to substitute services offered by competing suppliers. Therefore, these carriers were incapable of engaging in actions which violated the Communications Act and their rates could be considered to be lawful.

In its ruling the FCC:

i) Removed the requirement that non-dominant carriers file economic data to support each new rate;

ii) Eliminated the requirement that non-dominant carriers seek FCC authorization for each new city served or additional capacity put into service;

iii) Reduced the filing requirements for non-dominant carriers from 70 and 90 days notice to 14 days.

The deregulation applied to some 24 firms that compete with the established telephone companies. The major firms

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[1]FCC Docket 79-252, 1980.

were MCI and Southern Pacific.

In the dominant carrier category, the FCC included AT&T and the Independent Telephone Companies, because of their monopoly control over local facilities; Western Union, because of its monopoly over telex; Domestic satellite carriers, due to the heavy demand on their services which would permit them to increase prices; and miscellaneous common carriers which delivered TV programming to cable TV systems because of a lack of easily substitutable suppliers.

It was contended by the FCC and others that deregulation of these non-dominant carriers was in the public interest.

Numerous complaints and petitions were filed with the FCC questioning aspects of its August 1980 decision. A number of non-video domestic satellite carriers objected to being placed in the "dominant" category, and questioned the FCC's conclusion that satellite carriers have cost advantages over terrestrial carriers. Satellite carriers argued that they had a much greater initial investment than their terrestrial counterparts. Therefore, they contended, even though satellite transmission were cost insensitive to a degree to distance, the necessity to recover substantial amounts of initial investment negated any presumption that satellite carrier rates set at levels similar to those of terrestrial carriers could result in "economic rents" for the satellite carriers.

5. Competition Extended to MTS and WATS

In August 1980 the FCC took, with its Competitive and Common Carrier Decision, steps to remove the last remaining barrier to entry into the interstate telecommunications markets, providing that anyone who wishes could compete with the established telephone companies in the home or business long distance market.[1]

This FCC decision traces its history to the early 1970's. In 1974, MCI, a company representing an affiliation of specialized common carriers offering private line service, filed a tariff for Execunet, a class of metered-use service which permitted a subscriber to access any telephone in a distant city served by MCI via MCI's network. AT&T complained to the FCC that MCI was offering interstate long distance message toll service (MTS) under the guise of Execunet and this competed with AT&T's interstate monopoly. The FCC agreed that MCI had not been authorized to offer any service that was equivalent to MTS or WATS and forbade MCI to offer Execunet. The U. S. Circuit Court of Appeals, however, reversed the FCC decision in 1977, allowing Execunet to continue, on the grounds that the FCC's previous decisions (i.e Specialized Common Carrier Decision) did not preclude MCI or other SCC's from offering services which the FCC did not forsee at the time those carriers had been authorized to construct facilities. The Court, however, said that the FCC could restrict future service offerings if it was found that such restrictions were in the public interest, but that such a finding was not contained in the SCC decision.

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[1] FCC, Docket 78-72, 1980.

In response, the FCC launched in 1978 a far-reaching market structure proceeding (Docket 78-22) to determine whether the public interest required that MTS and/or WATS should be provided on a monopoly basis. In its report in August 1980 the FCC concluded that the public interest would be served by allowing all interstate telecommunications services -- including message toll service (MTS) and wide area telephone service (WATS), and their functional equivalents -- to be provided competitively. New entrants would not be required to demonstrate that such competition would not result in detrimental effects.

Numerous submissions were filed with the FCC, including formal comments and statements, from a variety of carriers, consumers, and other organizations. Many of the arguments of the telephone industry were restatements of earlier positions opposing competition in transmission services, including the argument that interstate revenues provide subsidies for local exchange users and users in sparcely populated areas, and these would be eroded through competition. Some comments asserted that the introduction of competition in the MTS-WATS market was undesirable because it would lead to a change in the existing separations procedures. Many of the arguments were similar to those found in earlier inquiries (i.e. FCC Docket 20003) regarding the effects of competition in the MTS-WATS market. Most of the telephone industry participants submitted that they believed that competition would produce some detrimental effects, but did not make any systematic effort to demonstrate that such effects would occur.

The FCC determined that neither the record of the pro-

ceedings nor its experience in regulation of the telecommunications industry led to the conclusion that competition would harm the development of optimal facilities, impair the viability of the Independent telephone companies, or have any detrimental effects on the rates for any intrastate or interstate service. The FCC pointed out that in the six years since the first MTS-WATS equivalent services were introduced (by MCI), there could be observed no inpairment to the ability of AT&T to provide service, no meaningful diminution of its profits, and no apparent retardation in the substantial rate of growth for MTS-WATS services.

While the Commission conceded that there was no clear evidence of tangible benefits for most MTS-WATS customers, it expected such benefits to be realized as new entrants achieved increased penetration in these markets. The Commission took the position that, given its policy of permitting increased competition over the past few years, it would be "completely incongruous for the Commission to now attempt to turn back the clock and carve out a separate MTS-WATS enclave which alone would be the preserve of 'monopoly carriers'."[1]

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[1] FCC, Docket 78-72, 1980.

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GLOSSARY

GLOSSARY OF SOME SATELLITE-UNIQUE AND FREQUENTLY USED TERMS AND ABBREVIATIONS

Bandwidth	The useful frequency range of a device such as a transponder.
Cable TV (CATV)	A system by which television signals are collected at a central point and distributed to subscribers by wire (cable) for a fee.
Carriage	Conveyance or retransmission of programs or communications.
Channel	A frequency assignment within which a station operates (is dependent upon the frequency band and the geographic location).
Circuit	A complete (two-way) telecommunications loop.
Common Carrier	A company, organization, or individual providing wire or electronic communications service for hire (telephone, telegraph, satellite).
Comsat	Communications Satellite Corp. is a private corporation established by the Communications Act of 1962 for ownership and operation of the U.S. portion of the global satellite system.
DBS	Direct Broadcast Satellite service is a radiocommunication service in which signals from earth are transmitted by high-power, geostationary satellites for direct reception by small, inexpensive earth terminals.
Downlink	The space-to-earth path.
Earth station	A fixed station used in communications satellite service for transmitting or receiving information from satellites.

Fixed Satellite Service	The earth stations are non-mobile. This service provides general telecommunications services.
FDM	Frequency Division Multiplex. A multiplex system in which the available transmission frequency range is divided into a number of narrower frequency bands, each available for a separate signal.
Frequency	The number of complete vacillations per second of an electromagnetic wave, measured in hertz. One hertz equals one cycle per second.
Frequency Assignment	The assignment of a specific frequency band to a particular station.
Geostationary (Geosynchronous) Satellite	A satellite whose orbit is synchronized with the rotation of the earth over the equator and remains stationary over the same spot on the earth's surface.
Gigahertz (GHz)	A unit of frequency equal to 1 billion cycles per second.
Hertz (Hz)	A unit of frequency equal to 1 cycle per second.
HDTV	High Definition Television which is a higher than normal definition TV.
Landsat	Land remote-sensing satellites.
LPTV	Low Power Television Service is a low watt station between existing stations serving small communities with localized programming.
MDS	Multipoint Distribution Service is a microwave signal transmitted to microwave receive antennas.
Megahertz (MHz)	A unit of frequency equal to 1 million cycles per second.
Microwave	The portion of a radio spectrum above approximately 1000 MHz.
MTS	Message Toll Service. Long distance telephone service, rates a function of distance and time.

Orbit Spacing	The angular separation (measured in degrees of longitude) between satellites using the same frequency and covering overlapping areas.
Private Line Service	Telephone communications link between two or more designated points set aside for exclusive use of a particular consumer during stated periods of time.
RARC	Radio Administrative Radio Conference.
Satellite Communications	Radio and TV communication involving the use of satellite stations in space.
Satellite Relay (Repeater)	A relay or repeater station aboard a satellite in space. Relay or repeat means to retransmit a signal received at a given point.
Satellite system	A space system using one or more artificial earth satellites in conjunction with two or more ground stations.
SCPC	Single Channel Per Carrier. A system employed where traffic routes are not very heavy and circuits are provided by satellite, especially to small dish stations.
SMATV	Satellite Master Antenna Television is a mini-cable system providing multiple channels of programming to multi-unit housing developments such as apartment complexes.
STV	Subscription television services (also called pay TV) are scrambled signals broadcast by a conventional UHF television station.
Tariffs	List or scale of common carrier prices, charges, etc. and rules.
TDRSS	Tracking and Data Relay Satellite System is a communications system to be used for the relay of data direct from Landsat to a single U.S. ground station at White Sands, N.M.
Transponder	A combination of one or more receivers, filter, frequency converters and transmitters to form a signal repeater.
Uplink	Earth-to-space path.

WATS	Wide Area Telephone Service. A system by which a telephone user is allowed unrestricted number of calls in specific areas for one overall rate.
Wide band	A wider-than-average radio channel used to transmit large amounts of information in a short time.

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