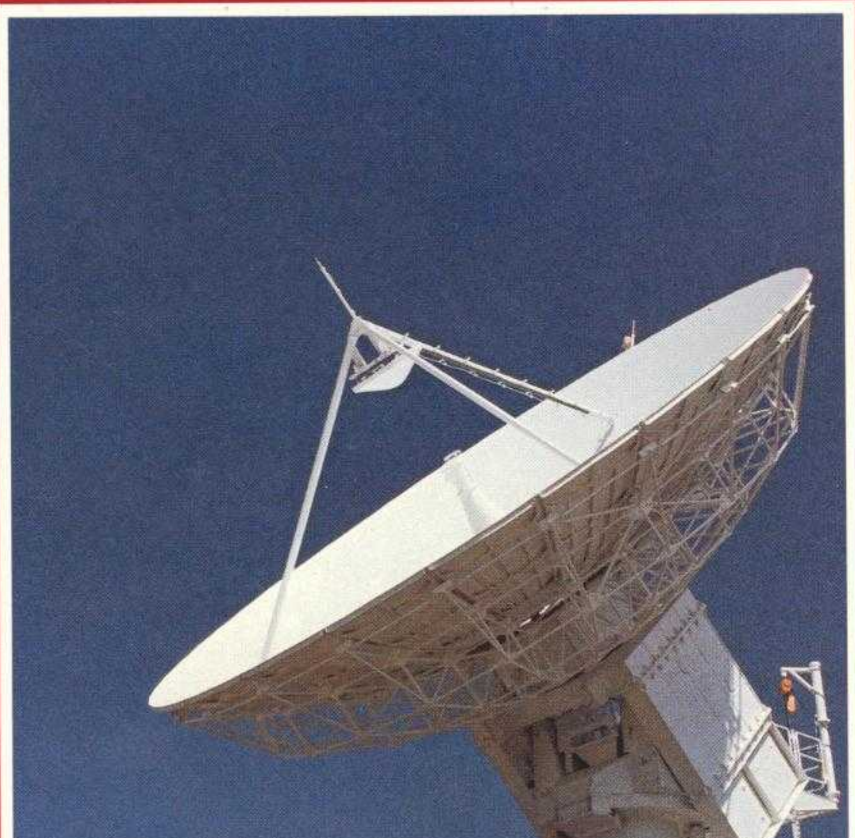
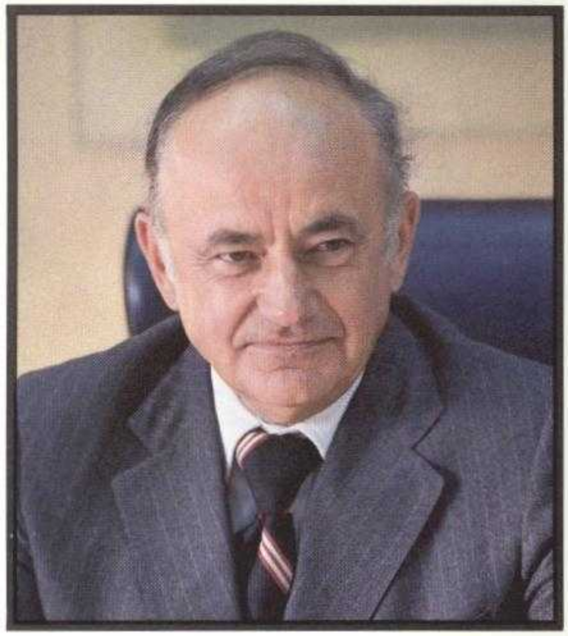
COMSAT®

COMMUNICATIONS SATELLITE CORPORATION MAGAZINE



NUMBER 1

VIEWPOINT



by Dr. Joseph V. Charyk
President and Chief Executive Officer
Communications Satellite Corporation

We are an information society. Our traditions, institutions and collective activities and interests are integrally linked to the effective exchange of ideas and knowledge through all forms of communication. If it is true that the progress of nations and peoples is dependent upon effective communications, then we must continually maximize our efforts to communicate; for if we succeed in these efforts we can anticipate a future based on understanding and cooperation.

The Communications Satellite Corporation, as a leader in the communications industry, recognizes the importance of the effective exchange of fact, philosophy and news within an information society, as well as the obligation to foster and participate in this exchange. Thus, we have begun what we hope will become a recognized symbol of our industry: The **Comsat Magazine**.

We hope to include articles and interviews in an exciting and colorful format, in order to engender the interest and imagination of our readers. Our topics will cover the complete range of satellite communications activities.

Comsat is at the threshold of an exciting period in its career as a leading company in the telecommunications and space industry—a period which will be characterized by efforts to produce more benefits for the public. We view **Comsat**'s charter as obligating us to pursue satellite communications-related technology in new directions to discover innovative service offerings, and to apply the technology in novel ways that can benefit the consumer. Likewise, our efforts to communicate new ideas and information through the **Comsat Magazine** are, in accordance with our obligations, designed to benefit our industry and the public as well. We view our mission to be to serve the public in many ways, and we hope the **Comsat Magazine** will serve as one example of our efforts.

COMSAT

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Articles in Comsat Magazine reflect the authors' opinions, which may not necessarily be that of Comsat. Permission to reprint articles may be obtained by writing the Editor. Correspondence should be addressed to Stephen A. Saft, Editor, Comsat Magazine, Communications Satellite Corporation, 950 L'Enfant Plaza S.W., Washington, D.C. 20024.

Cover: The antennas at Satellite Business System's tracking, telemetry and control earth station in Castle Rock, Colorado, point toward the sky. For more on SBS, see the articles beginning on page 18. Photograph by Bill Megna.

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From the Editor

Welcome to the inaugural issue of Comsat Magazine. Here are some of the subjects that you will find spotlighted as you turn the pages that follow: a program for the industrialization of space by Congressman Don Fuqua; Satellite Business Systems, an exciting new communications system for the United States; the future of international communications via satellite as seen by an officer of the new Comsat World Systems Division; a program for the future exploration of space by Senator and former astronaut Harrison Schmitt; an Administration view on trends and directions in broadcasting; a torus antenna installation in Alaska; and participation of a new member of the Comsat family, ERT, along with Comsat General in a satellite-dependent water resources monitoring program for the U.S. Geological Survey. We hope you will read and enjoy Comsat Magazine. We hope too that what you find here will stimulate your own thinking about subjects that are so important to us at Comsat—the human uses of space and the exciting present and future of domestic and international telecommunications.

Stephen A. Saft

N O T E S

Ninth Intelsat V authorized

The decision to procure the ninth in the series of high-capacity Intelsat V satellites was made by the Intelsat Board of Governors at its Forty-third meeting, held in September 1980, at Intelsat Headquarters in Washington, D.C. The Intelsat V series, being constructed under contract to Intelsat by Ford Aerospace Communications Corp., will utilize advanced techniques to allow multiple use of the same frequencies, and will operate in the 11- and 14- gigahertz bands as well as in the 4- and 6-gigahertz bands. Five in the series, including the latest procured, will include maritime communications capability, enabling capacity to be made available to the International Maritime Satellite Organization (Inmarsat). The Board also authorized procurement from NASA of an Atlas Centaur launch vehicle to launch the Intelsat V (F-9), making it the twenty-third Atlas Centaur purchased by Intelsat. The Intelsat V satellites will be launched by both Atlas Centaurs and the Ariane, a launch vehicle being developed by the European Arianespace consortium.

In action concerning use of spare Intelsat space segment for the domestic telecommunications needs of its Signatories, the Board approved in principle the request from Mexico for the lease of six hemispheric or spot-beam transponders, on a preemptible basis for five years, subject to the availability of satellite resources. Intelsat intends to meet Mexico's service requirements initially by using an Intelsat IV; service is to begin in 1981.

Comsat files for lower rates

Comsat has filed with the Federal Communications Commission an 11.8-percent reduction in its charges for international communications satellite services. The reduction reduces Comsat's rates for an international voice grade circuit from $1,275 per month to $1,125 per month.

The reduction is in response to concerns expressed by the Common Carrier Bureau of the FCC during recent months about the level of Comsat's earnings from these services. Based on similar concerns, the Commission recently initiated a formal rate proceeding against ITT Worldcom.

"This proposed reduction, based on reasonably foreseeable usage, would result in a savings to Comsat's carrier customers in 1981 of approximately $19 million," said Dr. Joseph V. Charyk, Comsat's President and Chief Executive Officer, in a letter to Charles D. Ferris, Chairman of the FCC. Dr. Charyk expressed his hope that the Commission would take appropriate steps to ensure that the savings would be passed on to the using public.

Dr. Charyk said that the rate reduction was made possible by the growth in revenues and earnings from increased Intelsat traffic.

The lower rates will apply to satellite channels leased by Comsat for voice, data and television services through the satellites of the Intelsat global system. Appropriate reductions will also be proposed for television and other services.

World Systems Division established

Comsat World Systems Division is the designation the Corporation has given to the group responsible for carrying out its global communications services through Intelsat and Inmarsat. Comsat is the U.S. representative to Intelsat and Inmarsat.

The new division comprises three elements: International Communications Services, Intelsat Technical Services and Comsat Laboratories. John L. McLucas has been named President of the new division. He was formerly Executive Vice President for International Communications and Technical Services.

Heading International Communications Services as Senior Vice President is Irving Goldstein, formerly Vice President and General Manager, International Communications. Provision of U.S. international satellite services through the Intelsat system and commercial maritime services through the

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Inmarsat system are the responsibilities of International Communications Services.

Louis Pollack heads Intelsat Technical Services as Vice President. ITS is responsible for providing a broad range of technical services to Intelsat including monitoring of the design, construction and test of Intelsat V satellites, operation of the Launch Control Center and in-orbit services related to existing satellites and design of future satellite systems.

The head of Comsat Laboratories is John V. Harrington, who as Senior Vice President, Research and Development, has responsibilities on a corporate-wide basis for all of Comsat's R&D activities.

Intelsat Board elections

Irving Goldstein, Senior Vice President, International Communications Services, Comsat World Systems Division, is the new Chairman of the Intelsat Board of Governors.

Mr. Goldstein, formerly Vice Chairman of the Board, succeeds Randolph H. Payne of Australia as the new chairman. Pedro Jorge Castelo Branco of Brazil was elected as the new Vice Chairman. Both men are serving one year terms which expire next June.

Mr. Goldstein was named Director of Comsat's European office in 1972, and director of International Affairs in 1972. He was Assistant General Manager for External Relations and Business Development from 1977 until March 1979 when he assumed his present position.

Mr. Castelo Branco is the Intelsat Board Governor for Brazil, Portugal and Paraguay, and is the chief of the Washington, D.C. office of Embratel, the Brazilian Signatory to Intelsat. He joined Embratel's International Communications Department in 1968, becoming Chief of Staff for the Brazilian Minister of Communications in 1974. He was elected to the Intelsat Board of Governors in 1978.

Mr. Goldstein expresses his views on the future for international communications on page 16.

Comsat General restructured; three main units formed

Comsat General Corporation, a wholly owned subsidiary of Comsat, has been restructured into three main operating units: Satellite Systems, Communications and Information Products, and Systems Technology Services.

Richard S. Bodman, Comsat General's President and Chief Executive Officer, said the reorganization would enhance Comsat General's competitive position and enable the Corporation to agressively pursue new business, services, and products within the telecommunications industry.

William L. Mayo, Vice President, will head Satellite Systems, which will focus on the design, ownership and operation of satellite systems on a world-wide basis. Currently, Comsat General operates two satellite systems, Comstar and Marisat. The Communications capacity of three Comstar satellites is leased to AT&T for domestic service. Marisat, also a three satellite system, provides satellite communications for the U.S. Navy and commercial maritime industries around the world.

Michael S. Alpert, Vice President, will be in charge of Communications and Information Products, which consists of two relatively new product oriented businesses, Comsat General TeleSystems, Inc. and Comsat General Integrated Systems. Comsat General TeleSystems, located in Fairfax, Virginia, is engaged in the development, design, manufacture and sale of high technology communications equipment. Comsat General Integrated Systems, in Palo Alto, California, is Comsat General's entry into the computer-assisted design and computer-assisted manufacture (CAD/CAM) market.

Systems Technology Services (STS), under Dr. Burton I. Edelson, Senior Vice President, provides a broad range of services worldwide for the development of satellite communications and information systems, including systems engineering, applications engineering and systems operation management. Among the current programs of STS is the establishment of Intelpost, an international mail delivery system via satellite.

N O T E S

Technical Review completes first decade

Comsat Technical Review's Fall, 1980, issue, soon to come off the press, marks the close of its first decade of existence. Approximately 180 pages in length, the new issue includes technical articles about nickel-hydrogen battery technology; thermoelectrically cooled MESFET low-noise amplifier for earth stations; optical transmission technology in satellite communications; optical intersatellite links; 2-bit soft-decision weighted erasure decoding for binary block codes; and ship-to-shore tests of a MARISAT 56-kbit/s data service.

Published twice a year, Comsat Technical Review can be obtained for $5 a single copy, or subscribed to for one year for $7, two years for $12, or three years for $15. Checks should be made payable to Comsat and addressed to Treasurer's Office, Communications Satellite Corporation, 950 L'Enfant Plaza, S. W., Washington, D. C. 20024, U. S. A.

Inmarsat has new logo

The International Maritime Satellite Organization (Inmarsat) recently adopted a logo to symbolize its maritime communications mission. The logo is in the form of a highly stylized circle depicting the earth with a satellite in orbit around it. It was submitted as an entry in a logo design competition held by Inmarsat for its international membership.

Michael Martell, of the engineering department of Canada's Teleglobe, designed the winning logo. He flew to Inmarsat's London headquarters from Montreal to accept an award from Olof Lundberg, Inmarsat's Director General.

Inmarsat was created last year to establish a global satellite system to carry maritime telephone communications between ships, offshore facilities, and land-based users. Comsat has been designated as the U.S. participant.

FCC Staff Reports on DBS

In an important step in the development of direct satellite broadcasting (DBS), on October 2 the Federal Communications Commission (FCC) voted to issue a Notice of Inquiry soliciting public comment on two FCC staff reports addressed to DBS.

Comsat is the only company that has said it is planning a direct satellite broadcasting service. Satellite Television Corporation (STC), a wholly owned subsidiary of Comsat, has been formed to pursue development of plans for a subscription television service. The direct-to-home service would offer multiple channels of high-quality programming without commercials. Subscribers would use small rooftop antennas to receive the satellite-to-home broadcasts.

One of the staff reports released by the FCC addresses the question of what regulatory framework would be appropriate for direct broadcast satellites. The report concludes that satellite-to-home subscription television would operate in a highly competitive environment and that marketplace forces would operate vigorously to protect the public interest.

The second FCC staff report describes the technical aspects of a direct broadcasting satellite system.

The Commission has requested public comments on the FCC staff reports by December 5.

John A. Johnson, Chairman of Satellite Television Corporation (STC), said the company was "encouraged that the FCC plans to move ahead with deliberations with respect to direct broadcast satellites.

"We are convinced that our planned satellite-to-home subscription service will deliver significant public benefits, and we are equally certain it would be in the public interest for government to promote direct broadcast satellite technology," Mr. Johnson said.

Comsat's torus antenna to begin operation in Alaska.

Multi-Visions, Ltd., an Anchorage, Alaska, cable television company, is making the first commercial use of Comsat's new 10-meter multiple beam torus antenna.

Scheduled to begin operation by early 1981, the torus for Multi-Visions will initially receive three television broadcasts from three satellites simultaneously. The antenna is capable of receiving up to 72 different broadcasts from U.S. domestic satellites.

The torus is a revolutionary antenna design developed by Comsat Laboratories in Clarksburg, Maryland. With a torus, a user can receive signals from as many as seven satellites at the same time. By comparison, a conventional parabolic antenna can access only one satellite at a time.

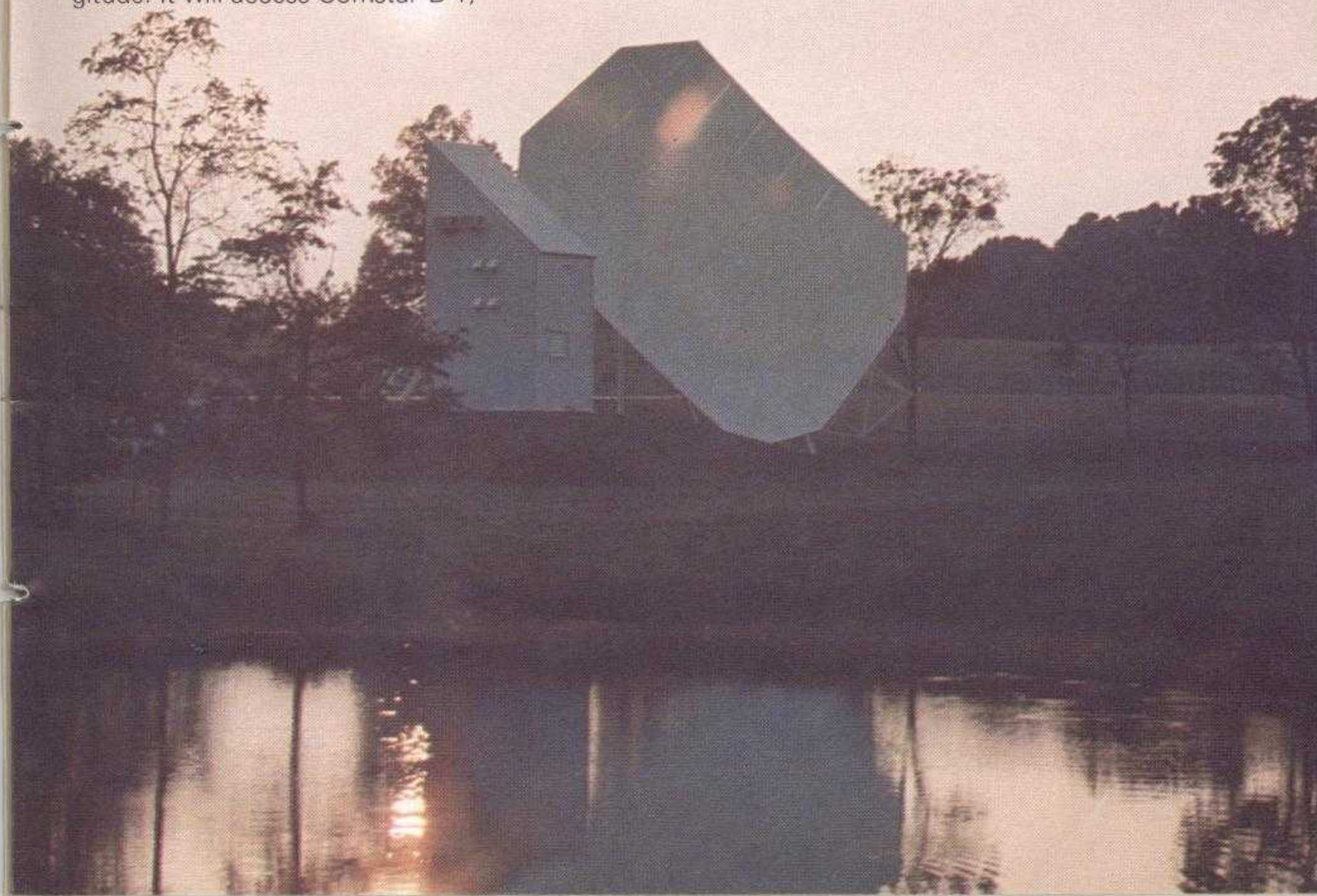
Because it is able to access multiple satellites, the torus offers major cost advantages. Besides reducing the amount of land necessary for several parabolic antennas, the torus can operate with less signal interference in congested frequency areas such as Anchorage.

In Anchorage, the torus will be aimed at the orbital arc between 116 degrees and 136 degrees West Longitude. It will access Comstar D-1, Westar 2, and Satcoms 1 and 2. Multi-Visions plans to install an optical fiber link between the torus and its head end.

"With the torus we will be able to provide our viewers with more television programs much more reasonably than the cost of three separate conventional dishes," said Robert Uechitel, Chairman of the Board of Multi-Visions. "In addition, we can easily 'tune in' future satellites by installing relatively inexpensive feeds when needed. We've always tried to be synonymous with the state-of-the-art product in the state-of-the-art state—Alaska."

"We look forward to increasing the diversity of programming offered by Multi-Visions and bringing another benefit of satellite communications to the people of Anchorage," said John L. McLucas, President of Comsat's World Systems Division. "We believe the torus has a number of economical applications for domestic cable TV operators and other communications users around the world."

Comsat has filed with the FCC for permission to locate torus antennas at Comsat-operated earth stations at Etam, West Virginia; Andover, Maine; and Jamesburg, California.



The torus antenna installation at Comsat Laboratories in Clarksburg, Maryland.

Environmental Research and Technology

A Member of the Comsat Family

ERT's headquarters is located in Concord, Massachusetts.

Environmental Research and Technology, Inc. (ERT), a leader in the field of environmental protection and monitoring, was acquired by Comsat in May 1979. ERT is headquartered in Concord, Massachusetts, and has offices across the United States. ERT's President is Norman E. Gaut.

This member of the Comsat family offers a complete range of environmental consulting, planning and monitoring services, and is experienced in conducting varied environmental impact assessments. Principal ERT services include: air and water quality monitoring, regulatory tracking, environmental engineering, site evaluation, identification of permit requirements and implementation of baseline survey and measurement programs.

In addition, ERT offers services in conservation and land-use planning, reclamation, solid and hazardous waste management, remote sensing, environmental chemistry, data management, emissions sampling and control, meteorological forecasting, noise measurement, and ecological field sampling and analysis.

ERT's clients include the mining, iron and steel, chemical and paper industries, electric utilities, refineries, transportation agencies and many other segments of industry and government.

Comsat General Corporation and ERT have begun work under a $2.2 million contract to provide information services on water resources to the U.S. Geological Survey of the Department of the Interior.

Recently, two five-meter antennas were installed at Environmental Research and Technology headquarters. The antennas will receive water height information from remote sites around the country via satellite.

According to Comsat General Program Manager Don Kutch and Ross Yeiter, Vice President and Director, ERT Information Systems Group, the project currently includes data collection platforms at 12 sites. By January 1981, 105 remote platforms will be operational in New England, Arizona, Colorado, Pennsylvania and Texas.

Hydrological data from the initial 12 sites (later from all 105 sites) is processed by computer at the ERT Data Information Center and transmitted in a unique format to USGS headquarters in Reston, Virginia.

The 18-month program should validate the feasibility of remote collection of water data while enabling the USGS to define the costs and requirements for real-time data collection.

The Comsat General and ERT system could be expanded in the future to include collection of data on rainfall, water and air quality, soil moisture, snow height and solar intensity.

Radome Being Given New Look

Radome at the Andover, Maine earth station gets a fresh coat of paint

Every once in a while, we in the space technology and satellite communications business are reminded that ours is still a very "down to earth" business after all. For along with the advanced technology, antennas, satellites, the astrodynamics and electrical engineering, we find that the seemingly common jobs can make an important contribution.

The painting of the giant radome at the **Comsat**-operated earth station in Andover, Maine, is a good example of this.

The "bubble" covers a huge 380-ton "horn" antenna which is used in satellite communications. It is 210 feet in diameter, 160 feet high, and has a surface area larger than one and one-half football fields. Six painters—dangling from climbing ropes suspended from the top of the bubble—are spraying 1200 gallons of paint on the radome. The final color will be white, but initially an undercoat of blue paint will be applied. In this way, any areas not fully covered by the final white spray will be immediately visible.

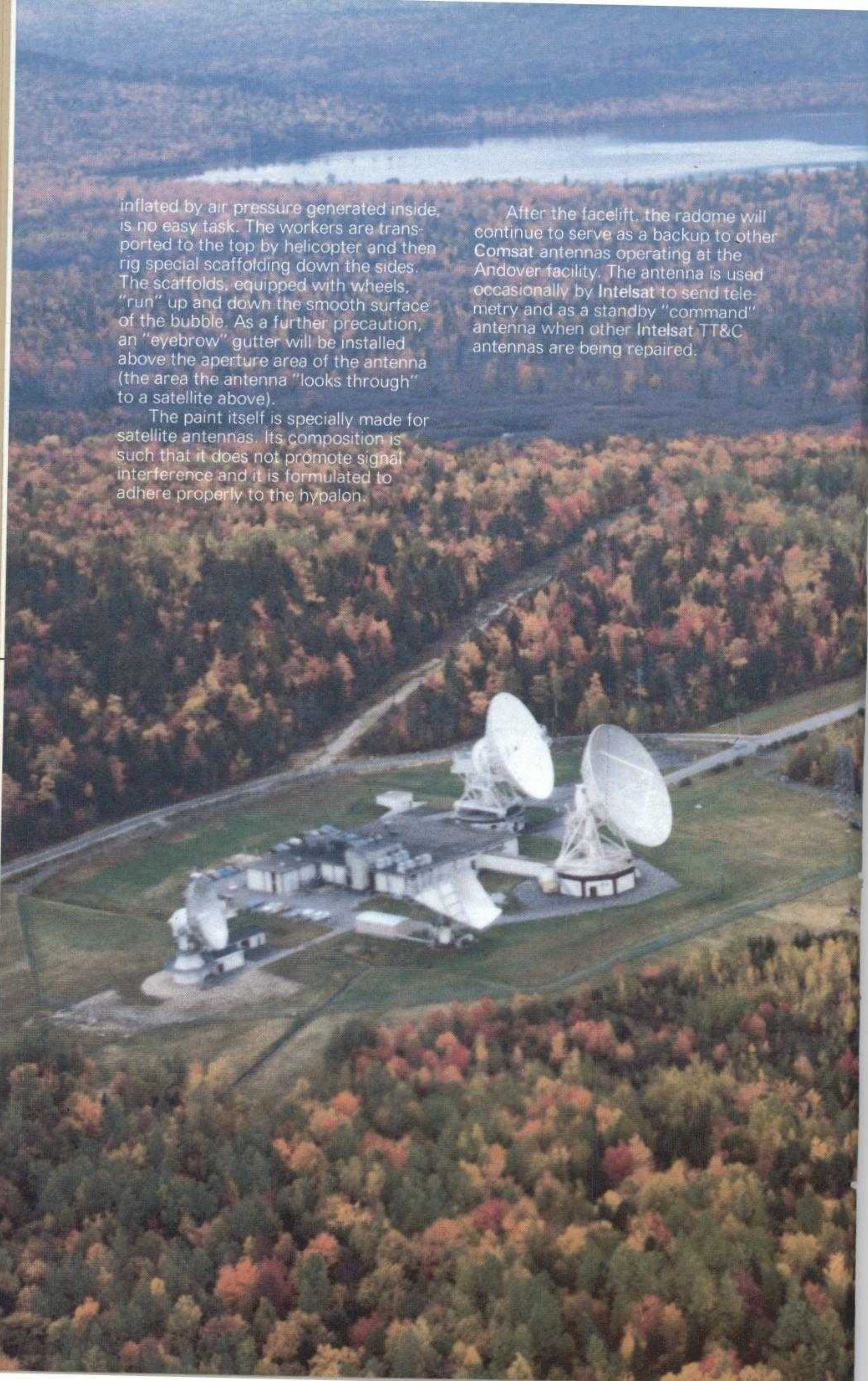
The importance of this monumental paint job far surpasses the aesthetic value. Over the years, the special fabric—called hypalon—has a tendency to retain moisture, causing signal attenuation. After a heavy rainstorm the wet covering can disturb signals going to and from the huge antenna inside.

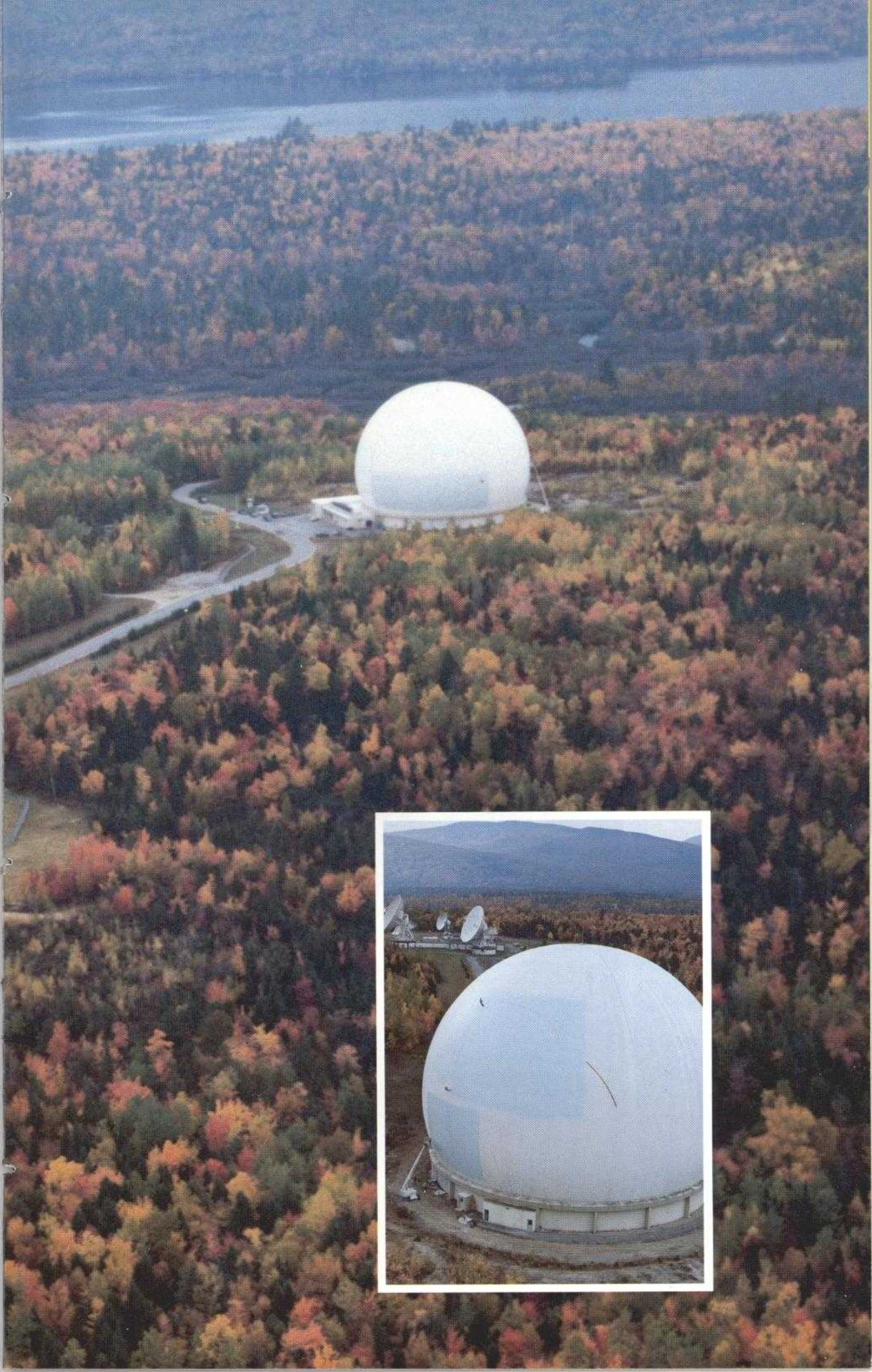
Painting this bubble, which is kept

inflated by air pressure generated inside, is no easy task. The workers are transported to the top by helicopter and then rig special scaffolding down the sides. The scaffolds, equipped with wheels, "run" up and down the smooth surface of the bubble. As a further precaution, an "eyebrow" gutter will be installed above the aperture area of the antenna (the area the antenna "looks through" to a satellite above).

The paint itself is specially made for satellite antennas. Its composition is such that it does not promote signal interference and it is formulated to adhere properly to the hypalon.

After the facelift, the radome will continue to serve as a backup to other **Comsat** antennas operating at the Andover facility. The antenna is used occasionally by **Intelsat** to send telemetry and as a standby "command" antenna when other **Intelsat** TT&C antennas are being repaired.





A new frontier for commerce?

by Congressman Don Fuqua, Chairman, Committee on Science and Technology

The Space Act passed by the Congress in 1958 declared that all space activities of the National Aeronautics and Space Administration should be devoted to peaceful purposes for the benefit of all mankind. With that direction America has landed men on the moon, sent unmanned spacecraft to the far-reaches of our solar system to explore the planets, demonstrated the application of space technology to the solution of mankind's needs here on earth, and is about to complete the space shuttle program which should make possible routine and less costly access to space.

The introduction of the new space transportation system with its recoverable orbiter and space laboratory will further expand the role of business by permitting a more economical accomplishment of present space activities and enabling industry to perform work in space not previously possible because of restrictions imposed by today's expendable launch vehicles.

The reusability and weight lifting capabilities of the space transportation system, the interaction of man and machine in space, and the unique attributes of the space environment (such as near zero gravity, hard vaccum, and freely available energy) will all lead to new space activities with greater commercial opportunities.

The nation's first commercial venture in space began in 1963 with the formation of the **Comsat** Corporation and the founding of the international consortium, **Intelsat**, with more than a hundred participating member countries. **Comsat** was formed as a privately owned corporation to carry out a unique and challenging mandate embodied in the Communications Satellite Act. This mandate gave **Comsat** the responsibility for establishing, in conjunction and cooperation with organizations of other countries, a global commercial communications satellite system. In commenting on the establishment of **Comsat**, President John F. Kennedy stated, "The ultimate result will be to encourage and facilitate world trade, education, entertainment, and many kinds of professional, political and personal discourses which are essential to healthy human relationships and international understanding."

In fulfilling its mandate, **Comsat** established a global communications system which has drastically reduced rates for transoceanic telephone services, e.g., the charge for a New York to London phone call which was $12.00 before Earlybird is now $5.00 or less. Additionally, other U.S. companies have successfully entered the communications satellite business for domestic use, providing video distribution, data, and telephone services.

Earth resources data information services will likely be the next area for commercial exploitation of space technology. Earth observation satellites have provided a wealth of data useful for agriculture, forestry, water resource management, and the detection of new mineral deposits. Although commercial exploitation of these data is still only beginning, a number of activities are underway including a joint program between the St. Regis Paper Company and NASA calling for the space monitoring of 1.7 million acres of timber and the formation of the GEOSAT committee by more than 100 major oil, gas, mineral, and engineering companies.

In November 1979 the President announced the designation of the Commerce Department's National Oceanic and Atmospheric Administration to manage all operational civil remote sensing activities from space. NOAA, in coordination with other appropriate agencies, was further charged with the development of a transition plan for moving to a fully integrated satellite-based land remote-sensing program. A very significant aspect of the White House announcement was a directive that the Commerce Department seek ways to further private sector opportunities in civil land remote-sensing activities through joint government/industry ventures, a quasi-government corporation, leasing arrangements, etc., with the goal of eventual operation of these activities by the private sector.

I am encouraged with the recognition by the Executive Branch of the need for continued efforts to stimulate broader participation by the private sector in the operation of civil remote-sensing systems. Industry and government share the responsibility to assure that appropriate mechanisms are established to provide a larger role for the private sector.

Materials processing in space is another area which undoubtedly will lead to commercial opportunities for the production of high-value space products in such areas as health, electronics, and optics. The concept of space manufacturing is quite new with the first experiment conducted on Skylab. Experiments on Skylab and Apollo manned space missions have demonstrated new materials and materials processing capabilities not available on Earth which hold great promise for use in making products with new and unique characteristics. Further experimentation has been accomplished by the Soviet Union during their extensive manned-spaceflight activities and significant effort is also underway by European countries.

Recently, the General Accounting Office released a report which stated that the United States must spend more to maintain its lead in this technological arena. The report further stated, "Space manufacturing offers the possibility of exploiting the unique environment of space to produce materials superior to those produced on Earth or believed impossible to produce on Earth. Whether space manufacturing becomes a reality depends on the results of future materials research and the propensity of government and industry, both here and abroad, to invest. Success will require eliminating some difficult institutional barriers and creating incentives. Despite high expectations among U.S. scientists, only limited success can be expected in the next 20 years due to funding constraints and limited backing by the Administration and the Congress. This could allow foreign competitors to rapidly overcome any technological lead in materials science in space now enjoyed by the United States."

Within the foreseeable future the cost of research, development and operations in space will remain relatively high. NASA responsibilities will continue in government-sponsored programs such as materials research and technology as well as in developing necessary operational capabilities. However, the prospects for uses of space for manufacturing goods and providing services will provide a new and greater role for the private sector. Therefore, the private sector must be involved early and should fully participate in establishing appropriate institutional, financial, and legal frameworks.

American industries will be competing in a world marketplace where governmental policies and relationships with industry can vary substantially. During hearings with the House Subcommittee on Space Science and Applications, Dr. Sherwood Fawcett, President of Battelle Memorial Institute, noted, "...in most advanced technical countries, industry and government are so closely related that it is sometimes difficult to distinguish between them."

In the past, the American system of free enterprise has provided unparalleled national growth; however, in looking toward private industrial participation in space, we cannot ignore the realities of present world and national economies. Within the American tradition of free enterprise, characterized by minimum governmental interference, new approaches to high technology stimulation need to be thoroughly explored and evaluated.

One bold and innovative approach to addressing the needs of the private sector in advancing national capabilities in space is embodied in the proposed legislation, H.R. 2337, which I have introduced in the House of Representatives. The objective of this bill is to establish a mechanism to provide investment capital and the necessary business conditions for attracting industries which can use the space environment to manufacture products and provide services. Target industries include not only those which provide aerospace equipment and systems for governmental purposes but those which supply goods and services for private sector purposes.

The approach employed in H.R. 2337 is to provide a sufficient degree of flexibility to balance the interests of the government with those of private enterprise in promoting aggressive and worthwhile space ventures. National interests would be served by ensuring the pursuit of worthwhile projects which advance the technology base of the nation and also provide useful goods and services for domestic and world markets. Private sector interests and objectives would be served by providing a source of investment capital which would be committed to high-technology projects having significant prospects for commercial success but which otherwise might exceed acceptable risk to private shareholder investments. Although earth orbit is shorter in distance than Washington, D.C. is from New York City, the private sector may well view this as an impenetrable abyss in the process from conceptualization to commercialization.

The mechanism of federal support envisioned in this legislation seems particularly appropriate to space industrialization which has been nurtured from programs essentially the exclusive domain of government. The legislation would establish a corporation to provide capital through direct equity investments, loans, and loan guarantees. A trust fund would be established and initially funded through federal appropriations. The Space Industrialization Corporation would administer the fund and provide the institutional connection between the trust fund and private enterprise. The Space Industrialization Corporation would conduct its operations in a manner familiar to the private sector and, accordingly, enter into arrangements on a sound business basis. The provisions of the bill recognize differences in business arrangements when private enterprise undertakes research and development for the competitive market as opposed to producing goods and services for government agencies. The typical contractor relationship with a government customer can often involve conditions which inhibit private enterprise innovation. In such cases, the Government establishes needs and specifies requirements, controls the funding and termination provisions, and owns the property rights ensuing from the contract. On the other hand, in dealing with the private sector, the Space Industrialization Corporation would recognize commercial practices and make financial arrangements consistent with these needs while still protecting the interests of the taxpayer.

The Space Industrialization Corporation is essentially an investment bank having equity interests in space ventures. The Corporation would be subject to the Government Corporation Control Act, 21, USC856, which brings its activities under annual congressional scrutiny while providing operational flexibility to conduct a business function as opposed to a government function. Several provisions of the bill are directed toward establishing a businesslike relationship which would provide a high degree of assurance that a private entity could depend upon the continuity of obligated funds, the commitment to management and financial plans, security in handling competitive information, private ownership of patent and proprietary data, and the ultimate sharing in the benefits of the business venture.

The extent to which Congress should accommodate the needs of private enterprise in promoting entry into space industrialization will require further consideration. Specifically, the Budget and Impoundment Act, 21 USC 1301, exemptions on spending authority limitation would apply to the Corporation. The Freedom of Information Act, 5 USC 552, exemption for protection of commercial and proprietary information would be delineated as it applies to management and financial agreements. In addition, agreements entered into by the Space Industrialization Corporation would provide for full private ownership of intellectual property rights and subject all parties to performing the contracted obligations.

Profitability would be an important consideration in measuring the success of the Space Industrialization Corporation investments. Commercially successful projects would provide the cash flow necessary to reimburse the trust fund and to form the basis for viable ongoing operations. The goals are to eventually return federal appropriations through tax revenue to the U.S. Treasury and to sustain a stockholder-owned, venture capital enterprise to provide the source of private funds for infusion into space industrialization activities. Commercially unsuccessful projects, although failures in a finanical sense, could provide invaluable technical information for future projects.

What is important now is to keep in mind that technology and current research and development programs are not restricted to uses that can be forecast today, but are only limited by the farthest reaches of creativity and imagination. Only the creative minds of mankind can ultimately determine how soon outer space will become an avenue of commerce. The challenge before us will be met through the expertise of our scientists and engineers and the creative pursuit by both government and private industry.

MEDIA DIVERSITY

POLICY AND PROSPECTS FOR THE 1980s.

by Richard M. Neustadt, Associate Director; Domestic Policy Staff, The White House

As the barriers to competition come down, the media side of the communications business is rushing toward diversity. There are 8,508 radio and 988 TV stations on the air, double the number in 1960. UHF TV and pay TV are finally booming; there are 233 pending applications to put UHF stations on the air. Cable TV reaches one household in five and is growing at 20 percent a year. Most new cable systems have over 30 channels, and the competition for franchises is so fierce that some applicants are proposing systems with over 100 channels. In addition to the three major TV networks, stations across the country are served by the public network, a religious network, a Hispanic network, three sports networks, and 21 regional services. For households with cable TV, there are over 30 more providing movies, news, children's shows, black-oriented programming and even live coverage of the House of Representatives.

This explosion of choice is providing the economic base for "narrowcasting," programming aimed at particular groups of viewers instead of the lowest common denominator. This abundance is not utopia. Quality programs require talent and lots of money no matter how many channels are available. But it is giving people services they want, as demonstrated by the explosive growth of cable and pay TV. (This competition seems not to be jeopardizing basic broadcasting; the typical TV station showed a 26 percent profit in 1979.)

Seven programs are underway to continue this expansion and take advantage of the multiplying channels to deliver public services:

Spectrum: The recent World Administrative Radio Conference accepted a U.S. proposal that will expand the AM radio band by 10 percent. The U.S. has also proposed that the Western Hemisphere narrow the spacing between stations from 10 kHz to 9 kHz; the Eastern Hemisphere already has this narrower spacing. And the FCC has limited the coverage of the "clear channel" radio stations. These steps should produce slots for almost 1,000 new AM radio stations.

The FCC has also proposed four new VHF TV stations and ordered TV manufacturers to improve UHF reception. It is now considering more VHF "drop-ins" and NTIA proposals to provide more FM stations.

There will be many applicants for all these new stations. We believe top priority should go to minority groups, public radio, radio stations restricted to daytime operations, and rural areas.

Deregulation: The FCC has taken dramatic steps. It dropped most of its once harsh restrictions on cable TV, accelerating the cable boom. (This action leaves to Congress the dispute about the adequacy of cable's payment for the programs it picks up from over-the-air TV.) The Commission has also deregulated receive-only earth stations; dropped some of its requirements for engineers' licenses; relaxed its restrictions on pay TV; and slashed the paperwork required for broadcast license renewals. Because radio is highly competitive and the new spectrum actions are making it more so, the FCC is now considering substantial radio deregulation.

Minority ownership: In 1977, minorities held fewer than 1 percent of the broadcast licenses. The President launched a program that has already doubled this number. The program includes FCC incentives to encourage sales to minorities, loans by SBA and other agencies, and training for potential owners. Progress will accelerate soon when the new station slots become available and private loan funds come on stream. In addition, the FCC has stepped up enforcement of its equal employment rules.

Public broadcasting: Among the multitude of media voices, we need strong, independent public TV and radio systems. The President's first communications initiative led to the 1978 Public Telecommunications Financing Act, which provided increased Federal support, especially for program production; the system's first long-term plan; and increased community involvement through citizens' boards and sunshine for meetings and records.

Another major goal was to extend coverage. All Americans pay for public broadcasting, so all should be able to receive it. Public TV reaches 90 percent of households, but the increasingly vital Public Radio system reaches only 65 percent—and even fewer at night. Under the new program, grants already have been awarded to extend public radio to 10 million people and public TV to 3½ million. NTIA has developed a plan to reach 95 percent of the country by about 1985.

Rural communications: Diversity is doing well in the cities, but many rural Americans still get very limited service. The expansion of public broadcasting and the new radio and TV stations will help. In addition, we launched a rural telecommunications program to help rural telephone and cable TV companies provide broadband service. So far, joint REA-FHA loans totalling $8.5 million have been provided; up to $90 million will be available over the next three years. To complement this effort, we asked the FCC to lift, for rural areas, the rule restricting joint ownership of telephone and cable.

These steps will give rural residents access to more TV channels, and the cables can help deliver public services. For example, a hospital can diagnose patients in a small town clinic by two-way cable TV, sparing patients and doctors long trips; a rural school can use cable to plug into a city school's foreign language classes.

Captioning for the deaf: New communications technology also can help the deaf. In 1977, President Carter asked the networks to help establish closed captioning for television. This system uses a blank portion of the TV signal to transmit captions so the deaf can understand programs. A decoder makes the otherwise invisible captions appear at the bottom of the picture. A captioning institute has been created; affordable decoders are on the market; and 20 hours a week of captioned programs are being broadcast throughout the country.

Satellites: In the early 1970s NASA experimented with public service communications satellites. Now that commercial satellites are available, the President's space policy shifted the mission to NTIA. NTIA has just announced grants to four "wholesalers" who will obtain commercial circuits for a variety of public services users. The first project is already on the air; the Appalachian Community Service Network is distributing education programs by satellite to cable TV systems.

These policy areas will need work throughout the 1980s, but the directions are fairly clear. Meanwhile, technological change creates new opportunities and problems.

The communications industry is booming in spite of the recession. Media diversity will keep growing, and videodisks and cassettes will soon offer a new dimension if they are sold and used like records. The most dramatic impact, however, will come from data processing and storage. If the price of automobiles had fallen the way the price of computers has during the last 30 years, a Rolls Royce would cost a quarter. That trend will continue for the foreseeable future. We will see computer chips used in factories, cars, home appliances and games. They will be spread throughout communications systems, creating "telecomputing" networks. Much of this needs no government action, but we do foresee a new and challenging policy agenda.

Among the many policy areas which will receive attention are those concerning spectrum allocation and assignment, government systems and various international issues. However, three areas of particular relevance to media diversity are information property rights, the advent of home information systems and public information institutions.

Property rights: Information is an unusual commodity; you can transfer it and still have it. As communications channels multiply, there is more demand to share information, at a minimum price. There is also more demand for new information, requiring incentives to produce it—a high price. This conflict has popped up in the arguments about royalties from use of paper copiers and videotape recorders; in the fight over cable TV operators' payments for broadcast programs; and in the debate over technology transfer abroad. In the next few years we will have to re-examine the balance struck in the patent and copyright laws.

Home Information Systems: The British, French, and others have launched systems that transmit data from computers to people's homes, usually displayed on TV sets. The information can include news, theater listings, airplane schedules, ads, etc. There are three varieties of transmission: Viewdata uses telephone lines; cable TV uses coaxial cables; and Teletext uses a blank portion of the over-the-air TV channel. Some futurists say these systems will become our main information source, supplanting newspapers, magazines, and broadcast news.

Viewdata and cable can also operate two-way, turning TVs into computer terminals. By the end of the decade we may be using phone lines or cable to shop and bank from home, send mail, turn on appliances, play computerized games, and so on.

This technology poses tricky policy questions. CBS wants the FCC to set a technical standard for Teletext; others think that would be premature. Cable operators are interested in the data business but fear it could expose them to regulation as common carriers.

AT&T wants to computerize the Yellow Pages and other information services (using Viewdata); newspaper publishers want to limit Bell to hardware while they and others provide the information and sell the ads. Computer records of people's habits in shopping, banking and movie-watching also raise privacy concerns; companies that offer two-way systems should adopt the Fair Information Practices discussed earlier.

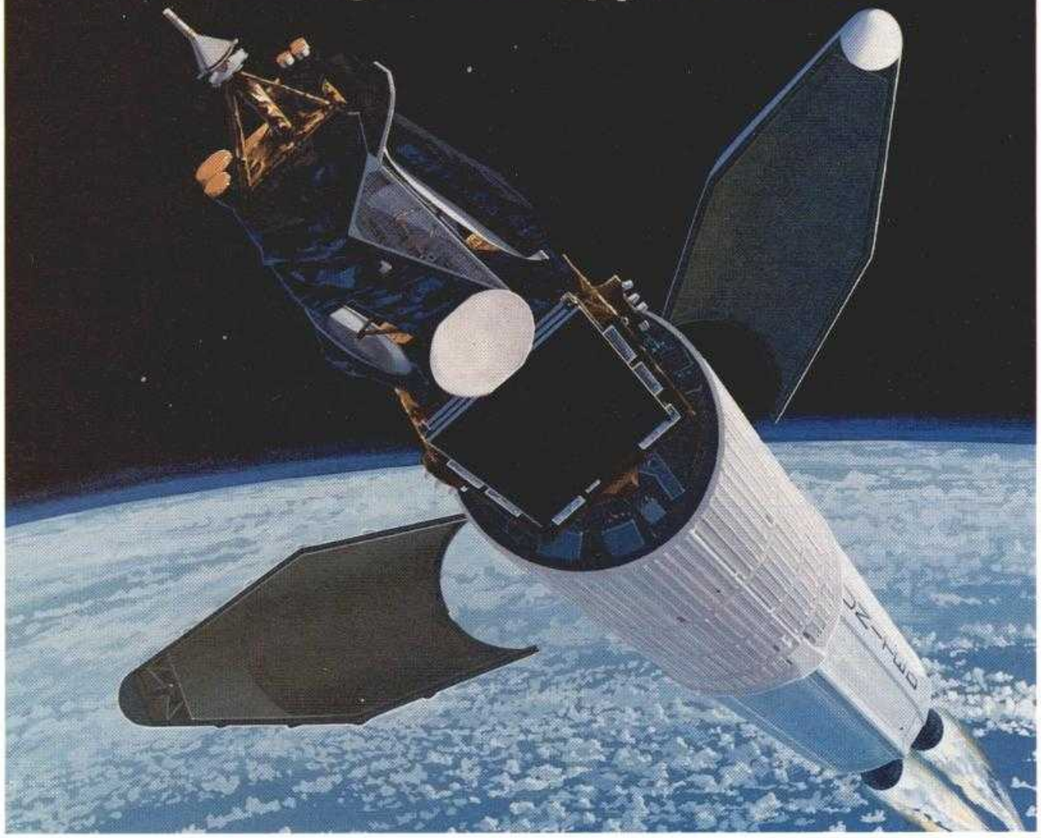
These systems can handle a lot of information; for two-way data retrieval the capacity is infinite. We should therefore stick to our First Amendment principles and avoid the kinds of content regulations now applied to broadcasters. The problem is that these systems can put control of the information in too few hands. For Viewdata, the Administration has suggested an answer: the common carrier bill should let AT&T's computers relay news produced by others but not let Bell originate its own editorial material. The question remains open for cable, because its operators control both distribution channels and content, and for Teletext, because it is an over-the-air service that may be classed as "broadcasting."

Electronic information systems are booming in the workplace (e.g., electronic mailboxes and legal research computers), but no one knows how many people will pay to bring them home. With no government monopoly to push them, these systems' growth will depend on demand, as it should. The rules must be clarified, however, so the test is fair.

Information Institutions: The explosion of technology, the policy of competition, and the limits on government spending together pose challenges for the public institutions that handle information. Old fashioned mail will be around for a long time, but the Postal Service must plan for inexorable increases in its costs, while the declining cost of electronic messages pulls customers away from the mails. The public broadcasting system's needs are rising, but Federal funding has leveled off and the proliferation of commercial TV networks raises questions about PBS's role. When Congress next considers public broadcasting legislation in 1981-82, it will debate the competing claims of national and local programs and the idea that the public system must diversify into commercial ventures to remain healthy. Libraries' costs are also surging, and their tradition of free access for all is baffled by information stored in data bases that charge by the hour. A recent White House Conference struggled with the libraries' future in an electronic age.

There are many more items on the communications agenda. The work of the past few years has put into place a policy direction and a government structure to deal with these challenges. But the pace and the issues of the next decade will make the last one look easy.

The Global Communications Future, Challenges and Opportunities



Irving Goldstein, Senior Vice President, International Communications Services

Congress declared in 1962 the United States policy of creating a global commercial communications satellite system, and authorized the creation of **Comsat** to develop and participate for the U.S. in this system. The unique cooperative venture which was developed, the International Telecommunications Satellite Organization (INTELSAT), today owns and operates the global commercial system. **Comsat** as the U.S. member of **Intelsat** provides satellite connections to communications companies for service from U.S. earth stations to other countries. A substantial amount of the Corporation's net operating income now derives from its participation in **Intelsat**. Following the successful establishment of **Intelsat**, **Comsat** was designated in 1978 as the U.S. participant in the International Maritime Satellite Organization, **Inmarsat**, whose global system is expected to be operational in 1982.

These two key functions have recently been placed in **Comsat**'s new World Systems Division (see the article in Notes, page 2). As part of this reorganization Irving Goldstein, who has been responsible since 1978 for management of our **Intelsat** business, has been named Senior Vice President for International Communications Services, which includes responsibility for the **Inmarsat** as well as the **Intelsat** services.

Comsat Magazine, in the first of several interviews with officers of **Comsat** World Systems Division, recently discussed with Goldstein the challenges facing our **Intelsat** business in the next decade. That interview forms the basis of the rest of this article.

For Goldstein, the oft-predicted future communications explosion is in fact underway today, and demand for international service will continue to grow through the 1980s.

"It is striking to recollect that, in 1965, satellite service was available only between North America and Western Europe—one satellite path," Goldstein says. "However, by the end of 1970, only five years later, there were 131 paths linking 30 nations over five satellites. And by August 1980 there were 807 satellite paths in use throughout the **Intelsat** system, between 292 earth stations in 113 countries over satellites stationed above the Atlantic, Pacific and Indian Oceans.

"This expansion has been paced by technological change," Goldstein adds. "We have gone from the 240-circuit Intelsat I, Early Bird, through the Intelsat IV-As with their 6,000-circuit capacity, and shortly will begin launching satellites of the Intelsat V series, each with a circuit capacity of 12,000."

The Intelsat V generation of satellites, nine of which are on order, will be able to accommodate communications in different roles well into the 80s but will have insufficient capacity to carry Atlantic or Indian Region Primary satellite traffic beyond the mid-80s, according to Goldstein. This insufficiency will not result from the loss of satellite life but because capacity will be exceeded by demand.

"So, it is critically important," says Goldstein, "for both Intelsat and Comsat to be responsive to and to anticipate demand. We now have underway, in both organizations, very extensive planning for the satellites and the techniques we will need to utilize, starting as early as the mid-80s. This means that hardware and systems need to be designed and procured within the next years and that this early planning is absolutely critical in order to keep us in the forefront of the telecommunications industry in the second half of this decade."

In addition to the growth factor to be considered in the "decade of challenge," there is also the element of change: change in the technology and change in the operating environment. The competing cable technology has made great strides and is also on the threshold of significant change, the use of the submarine fiber optic cable. This will help reduce the cost of cable circuits, which in turn will benefit the U.S. user. Thus, it is necessary that there be continued breakthroughs in satellite technology to maintain the competitive edge of satellite coverage.

Goldstein predicts increased development of satellite capability, including inter-satellite links. "Inter-satellite links, which, literally, will enable two satellites to function as a single satellite, offer very important opportunities for future use. For example, one prospect has two large satellites linked in a manner that, as far as the users are concerned, makes them appear as if they are one gigantic satellite. Yet this capability, although costly, will be achievable at a fraction of the cost that would be required to design, build and launch a single satellite of comparable capacity, especially since launch costs are a major component of the cost of any satellite system." In addition to keeping down costs, according to Goldstein, inter-satellite links will permit more areas of the world to access each other directly.

Many of the innovations Goldstein sees contributing to the technological advancement of satellite communications have been either developed at, or improved by, Comsat Laboratories, which is also part of the new Comsat World Systems Division. Among Comsat-developed breakthroughs is TDMA/DSI (Time Division Multiple Access/Digital Speech Interpolation), an extremely promising modulation access technique which will allow much greater benefits from the bandwidth available for satellite communications. It is expected that such technologies will come into use during the Intelsat V era and mature in the Intelsat VI era through the rest of the 1980s. Another significant development evolving before the end of the decade will be the utilization of new frequency bands which were allocated to satellite service by the 1979 World Administrative Radio Conference (WARC).

Goldstein sees the telecommunications industry continuing to move from analog to digital with all forms of communications, including voice and video, becoming digitalized. Comsat presently offers its digital service which has the equivalent transmission capability of 70,000 words per minute, permitting the full page of a newspaper to be transmitted digitally in a matter of seconds, a full photo negative of the same page in five minutes, and computer-to-computer information, which previously took eight hours by conventional links, in 30 minutes.

"I see enormous growth in the next decade at no lessening of pace over the previous one," Goldstein concludes. "If we continue to expand our expertise in the telecommunications industry, if we stay alert and adaptable to technological change and if we continue to apply concepts that improve the performance and cost of satellite communications, Comsat can look forward to a continuation of its vital role in the field of worldwide communications."

Seen against the nighttime Chicago skyline, the SBS antenna installation atop IBM's 52-story Chicago building.

SBS

New Communications System for the United States

by Gunnar Hughes, Assistant Editor

The story of Satellite Business Systems tells of a bold new corporate world of rooftop antenna dishes dotting city skylines and rural countrysides, of a new information age in which meeting rooms thousands of miles apart are linked through private network television, of the ability to send a volume of business data the size of Tolstoy's *War and Peace* anywhere in the country in one second.

Its prologue is the formation of **SBS** in 1975 by a partnership among subsidiaries of **Comsat General** Corp., IBM Corp. and Aetna Life and Casualty. The idea of forming a commercial satellite system had been under consideration at **Comsat** since the early 1970s. After reorganizing to separate current international satellite communications interests from future domestic services, **Comsat**, with Lockheed and MCI, formed

Photo Tom Vack

the CML Satellite Corporation in 1972. Three years later, SBS was born when Comsat purchased the interests of MCI and Lockheed and arranged for IBM to become a partner. Aetna stepped in to fulfill the FCC requirement for a third party.

Above all, the SBS story marks the creation of an integrated, all-digital satellite communications system to carry voice, data, image and electronic mail communications for business and government organizations. And it underlines a statement made some 15 years ago in *Fortune* magazine after the launch of the first Early Bird satellite: "Nothing can stop this technological revolution, any more than the Mississippi River can be stopped."

Looking to the Heavens

Early next year SBS will introduce a new dimension of intracompany satellite communications. In this realm, plants and offices beam messages to each other through the SBS satellite. On top of each company installation or in its parking lot, a five-meter antenna (or seven-meter in some areas) looks to the sky, external evidence of the futuristic communications occurring within.

Multiple leased lines no longer crisscross the company's dispersed buildings, carrying different transmissions to their distant ends. Instead, a master switching device—the "satellite communications controller" (SCC)—is the gatekeeper for all company traffic. Inside this machine, electronic sleight of hand converts the various digital and analog (wave) signals into millions of digital bits each second. The homogenous digital stream is then fired in bursts to the satellite for broadcast to company earth stations.

The SBS system measures telephone lines in yards—from the SBS earth station to the company switchboard. At the earth station the lines stop as the SCC digitizes the caller's voice for its trip through space. At the end of their triangular journey, the digital pulses—perfect mathematical representations of speech—are reconverted into waves and routed through the facility's internal phone system. (Neither speaker nor listener is aware this process has taken place.) In similar fashion, with appropriate interconnections, all the company's communications—data, facsimile, teleconferencing—are prepared for transmission via satellite.

What SBS has created is a flexible, high capacity transmission system capable of handling a number of separate intraorganizational networks, with the satellite acting as a celestial microwave tower. The system will operate in the 12 to 14 gigahertz frequency bands, higher frequencies than the 4 to 6 gigahertz bands over which most microwave transmissions currently flow. This is an important feature: it means that small earth stations can be placed in metropolitan areas without experiencing interference from other signals.

A Short Queue

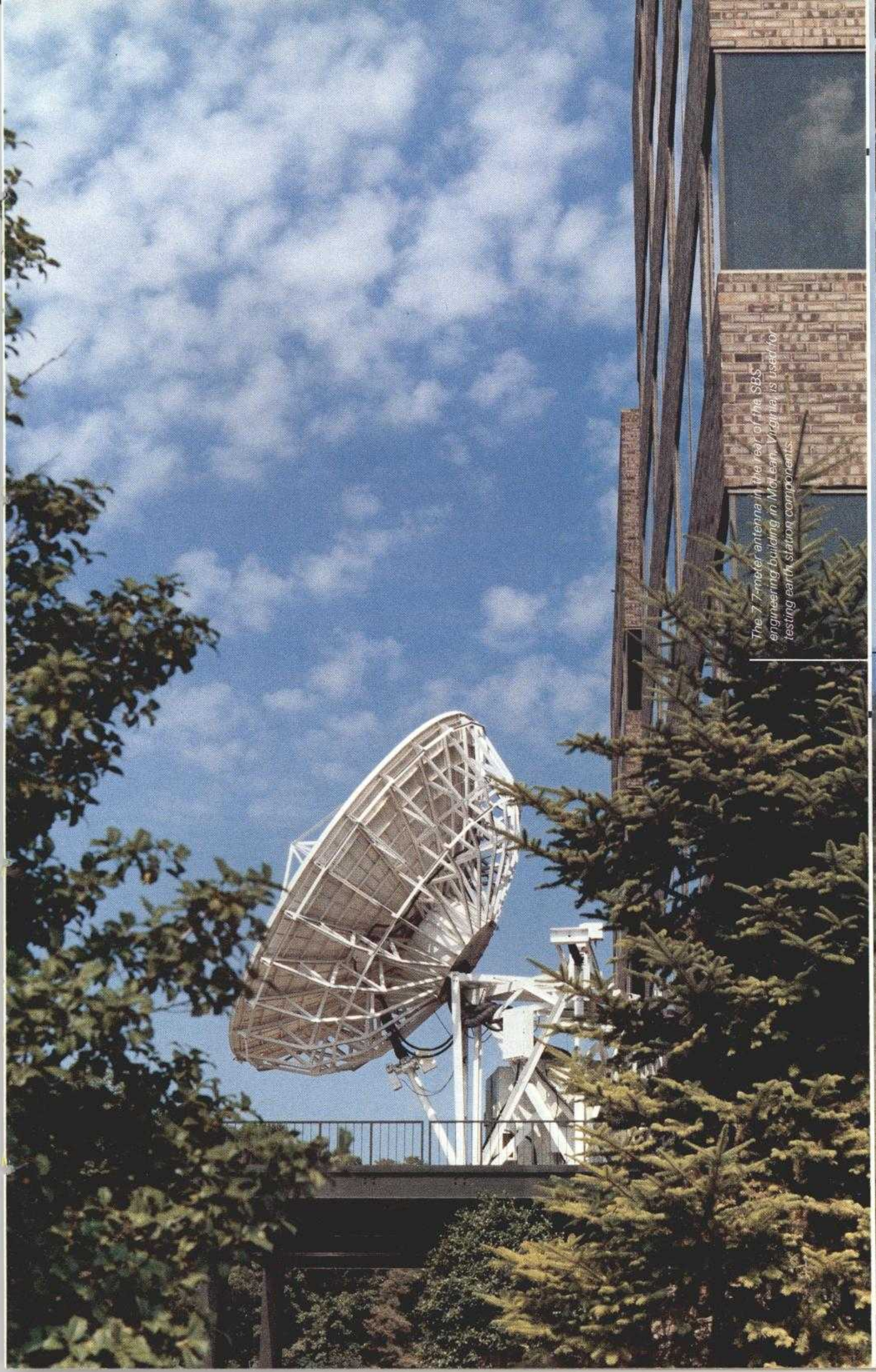
SBS customers will send traffic throughout their networks on a "demand assignment" basis, that is, they will share the satellite transmission capacity as needed. But the sharing mechanism will be automatic and invisible to each user. This is accomplished through a technique called time-division multiple access (TDMA). Here, each second is divided into slots measured in milliseconds and each user receives an exclusive slice of time to send traffic. The system, monitored at the SBS Network Control Center near SBS headquarters in McLean, Virginia, will sweep from one earth station to another in response to customer usage.

One virtue of this arrangement is that the system dynamically moves capacity to where it is needed among networks and within networks. For example, if Company A's earth station in Boston has relatively little traffic to send during a particular slot, that time can be reallocated to another earth station that needs it. There is no waste of transponder capacity and the system automatically adjusts to a customer's changing transmission routes, traffic density and types of messages. Best of all, the satellite's capacity is so large that users will be able to send information between operations hundreds of times faster than is now possible. Timely data on inventories, sales, accounts receivable, etc., can be transmitted quickly among dispersed locations, permitting tighter management control and improved decision-making procedures.

Special Carriers

Satellite Business Systems is one of several specialized communications common carriers that serve various segments of the communications market. SBS has targeted intracompany business communications as its principal market, a $7 billion market that SBS says has not kept technological pace with information requirements.

Continued on page 22.



The 7.7-meter antenna in the rear of the SBS engineering building in McLean, Virginia, is used for testing earth station components.

In five years **SBS** has put together its innovative system in a capital-intensive $375 million start-up. Its work towards system operation will culminate when the first of two **SBS** satellites is launched from Cape Canaveral. (See related story on the **SBS** facilities which monitor and control the satellite in space.) Meanwhile, at **SBS**'s System Test Facility and at field trial sites, final hardware and software tests are underway. Satellite transmission testing is being conducted using Canada's ANIK B satellite and a WESTAR satellite. In the Network Control Center, where overall system management will occur, controllers, monitors and information systems are undergoing carefully programmed testing. Successful field tests using **SBS** earth stations at IBM sites in Poughkeepsie, New York, Research Triangle Park, North Carolina, and Los Gatos, California, are about to be concluded.

Robert C. Hall, President
Satellite Business Systems

Doing Business with SBS

An important byword for **SBS** is "all-digital." To companies currently relying on the telephone system to carry their messages, the implications of this term are difficult to overestimate. General Motors, for instance, has 20 distinct networks, each performing a different task. At Ford, six data networks stretch from one building. Like other large communicators—**SBS** studied seven companies whose average communications costs are $85 million annually—these companies rent full-time private lines to link their operations. In doing so they pay for 24-hour channel capacity for a system that, by and large, works the same hours the employees do. This, along with the capital investment necessary to sustain a host of redundant networks, and a certain amount of built-in subsidization of residential tolls by business users, turns up in the "cost per message sent."

To the **SBS** customer, the voice communications cost equation looks quite different. To begin with, the maintenance of a group of leased lines and special networks like WATS, MTS, CCSA, etc., is factored out. All of the company's traffic follows an invisible route to the satellite for beaming to any number of intracompany earth stations.

The distance of a call becomes irrelevant with the **SBS** system—the satellite sends the same stream of digital bursts to all earth stations simultaneously. Conversations remain private, however, because the satellite communications controller at each station filters out all but the traffic "addressed" to that station.

Services Match Needs

Currently, 90 percent of corporate telecommunications is voice traffic. **SBS** addresses this market with its Communications Network Service. CNS service comprises two separate offerings: CNS-A and CNS-B. CNS-A users will be large organizations with high-volume communications between dispersed facilities. They will use SBS-provided equipment—earth stations and associated interconnections—dedicated exclusively to their requirements for voice, data, and image communications. A major appeal of the **SBS** system is the ease with which the different applications can be handled. But, on voice service alone, **SBS** is competitive with existing telephone services. In fact, **SBS** estimates that certain large users will see a 10 percent savings in voice costs alone with CNS-A.

Once customers have a CNS-A network for voice communication, they'll find it easy and relatively inexpensive to migrate to the other services. Some CNS-A customers are following this voice-plus path. Others, however, are starting first with data and will migrate to voice and other applications.

CNS-B is for customers whose smaller volume of traffic does not justify dedicated facilities. Here, the same **SBS** facilities are provided, but they may be shared by two or more users. Although there is some limitation on maximum network size because of the shared use, CNS-B customers can still expect savings on voice communication costs.

In both services, "off-net" calls (calls made to or from stations not in the **SBS** system) can be made via common carrier services extending from the earth stations.

SBS is also planning an Exchange Services network to compete with long distance offerings like Southern Pacific's Sprint, MCI's Execunet and the Bell System's WATS. Beginning in late 1981, 20 **SBS** Exchange Service earth stations plus telephone lines leased from other carriers will provide a low-cost message service among 75 metropolitan areas. By 1983 another 75 metropolitan areas will be added. A "Type 1" ES customer would receive dedicated access lines to an appropriate earth station, while "Type 2" users would make the same connection over public phone lines.

For Fortune 500 corporations with major communications requirements, the CNS service will be appealing for a number of reasons. Insofar as it may be compared to existing services, CNS is competitively priced. On top of that, the customer automatically receives the opportunity for an integrated network, and the cost of adding other applications is low. For example, the user simply interconnects high speed communicating copiers to his network to send these otherwise slow moving messages with **SBS** speed. Computer data, of course, is already in digital form, and, with the appropriate interfaces, is handled at vastly greater speed by the **SBS** network.

Sending Data

The last decade has seen tremendous advancement in computer technology. The machines are faster, smarter and less expensive. But while the speed with which computers can produce data increases, the rate the information can be sent over prevailing phone lines remains startlingly slow: typically 9,600 bits per second. The result is obvious: computers being used by corporations to track important data—inventory levels, sales or earnings—are generating information hundreds of times faster than it can be transmitted. To compensate, the data must be stored in intermediate buffers or the computer must be throttled down, an expensive compromise.

The **SBS** system changes all this. Because it speaks the computer's tongue, data can be sent from computer to computer at a variety of rates up to 1.5 million bits per second initially. Speeds of 3.1 million and 6.3 million bits per second will be made available when demand for them develops. To put this in perspective, suppose a company wants to send a 1-billion bit reel of data. Even if the sender uses what is generally the fastest speed available today, 56 kilobits per second, it will take 5½ hours to send the data. The same file can be sent in 12 minutes at 1.5 million bits per second.

This opens up a host of heretofore impractical data processing strategies for the customer. For instance, huge files can be copied quickly and inexpensively and sent to multiple locations, a safeguard against loss. A central computer can send tasks over the satellite system to an underutilized machine in the company's computer system. In a like manner, minicomputers in the field could send data to a headquarters CPU for processing. All of these methods are handled adroitly by the **SBS** network.

"The application of new technology and innovations to communications will make the 80's an exciting decade for us all. For SBS, it will be the decade that we were launched and grew to be one of the more significant businesses in one of the fastest growing industries in America. Who could ask for a greater or more satisfying challenge?"

Robert C. Hall, President
Satellite Business Systems, before the New York Society of Security Analysts, April 10, 1980

Facts About Fax

Facsimile machines used by businesses today are slow, expensive to operate and often deliver poor quality copies. At four to six minutes per page, these transceivers, operating via conventional carrier lines, are relatively expensive to operate and make sense only for high-priority, time-sensitive documents.

By contrast, an **SBS** user can send 70 high quality pages per minute with "electronic document distribution." Using new high-speed communicating copiers, a customer can send letters, contracts or drawings point-to-point or to multiple destinations. A prototype of the new communicating copiers to be used by **SBS** customers has been developed by AM International and is being demonstrated at the **SBS** Demonstration/Test Center in Reston, Virginia.

Best of all, the electronic mail system works a 24-hour day. At night, when the doors are locked and the employees at home, the company's communicating copiers will resurrect batches of stored messages and send them to distant offices with 100 percent overnight delivery.

Taking this a step further, some observers say that future electronic mail could also emanate from communicating typewriters interconnected into such a satellite network. Using something similar to a visual display terminal (VDT), a secretary could type a letter, attach the appropriate electronic "address" and send the copy directly to another terminal at a distant facility.

Instant Meetings

The major reasons why teleconferencing is not widely employed as a business tool today is cost. Conventional transmission facilities do not offer the necessary bandwidth for video transmission. Thus, where teleconferencing is used, its function is severely restricted and expensive.

The SBS system takes care of exisiting shortcomings; the video signal becomes just another digital message sent to the satellite. The SBS customer can easily and economically add this application to his network.

Meeting participants can gather in distant meetingrooms and see each other through a video window: perhaps a four-foot-square screen mounted on the wall. They can hand documents or charts back and forth using a document scanner built into the meeting table, itself specially shaped to avoid image distortion of any of the participants. No studio-like lighting is necessary and the audio system permits any participant to speak and be heard at any time, just as in a face-to-face encounter.

With teleconferencing, executives will find that productive meetings can be scheduled with greater frequency. The participants do not arrive worn out from the usual long distance traveling that precedes most meetings. SBS also believes that the application has great potential as a teaching tool. Seminars for sales people, for example, often require group travel to one location, an expensive way to pass information. With the SBS teleconferencing system, multiple field marketing offices can get together via satellite.

Ten on Line

Ten corporations have contracted for the Communications Network Service so far. Two of them are partners in SBS: IBM and Aetna. Five others who have announced their service contracts are Allstate; Boeing Computer Services Co., a subsidiary of Boeing Corp.; ISACOMM, a communications subsidiary of Insurance Systems of America; The Traveler's Corp., and Westinghouse Corp.

Boeing is SBS's first data customer and will use the system initially to broadcast computer data between earth stations in Vienna, Virginia, and Kent, Washington, a Seattle suburb.

IBM plans voice service initially among six major locations with data and teleconferencing applications in the future.

ISACOMM's network will initially include two stations in Wassau, Wisconsin, and St. Louis for the transfer of data files between computer centers.

Westinghouse initially will send computer applications between its Pittsburgh headquarters and facilities in Dallas, Los Angeles and Baltimore.

Aetna will transmit voice and teleconferencing between two earth stations, and Traveler's will have high-speed data capability (1.5 Mbps) between two stations.

A New Concept

SBS has offered these companies more than communications. It has offered them a single but powerful concept: that productivity rides the crest of information. In a society where one-half of the labor force produces information rather than physical goods, intracompany communications have grown in volume and importance. The growth has many sources. Diversifications and mergers mean heightened communication between formerly separate facilities. Rising fuel and transportation costs spell future construction of manufacturing plants near resource deposits and marketing regions, often apart from headquarters locations. Circumscribing all this is a competitive atmosphere where corporate "reaction time" in both workplace and marketplace must be all but instantaneous.

The SBS system marks the beginning of a new era. The way we work—and live—is about to be changed; the two-lane communications "roads" over which we've traveled for so long are being replaced by celestial "superhighways."

Comsat is proud to be a partner in the establishment of Satellite Business Systems and the innovative SBS system—a system which will bring increased productivity to business customers—via satellite.

One of the antennas of the Castle Rock, Colorado, TT&C station points skyward to the SBS satellite.

...Guiding the SBS satellites

When the first **SBS** satellite is launched into space, the precise orbital positioning of the spacecraft—a complex mix of time (two months), distance (22,300 miles), astrodynamics, physics, and some luck—will begin.

This all-important assignment will be handled by **SBS**'s new tracking, telemetry and control (TT&C) network, which comprises twin control stations in Clarksburg, Maryland, and Castle Rock, Colorado (25 miles south of Denver). Initially, **Comsat**'s Satellite Launch Control Center, located at **Comsat** headquarters, will play a central role in the process, but its work will be over soon after the apogee motor on the satellite is fired.

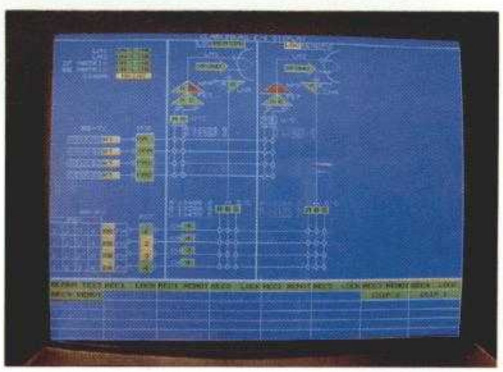
When the vigil begins, antennas at the two TT&C outposts, one in cool, green Eastern countryside, the other in cracker-dry, prairie dog territory, will be pulling in microwave whispers from a cylinder-shaped vessel floating in space. Inside each station, a maze of components will stand listening as oscilloscopes flash, meters wave and computers whirr. Hard copy printers will offer reams of data on the satellite while television monitors gleam with wiring schemes, circuit diagrams and computer formulas.

Nor will direct satellite signals be the only source of information reaching the TT&C network. Far-flung **Intelsat** system earth stations at Andover, Maine; Paumalu, Hawaii, Fucino, Italy; and Carnarvon, Australia, will track the satellite during its preliminary "transfer" orbit—an elliptical course which will take the satellite out of the "sight" of the two **SBS** TT&C stations. Around the first of the year, when the satellite finally reaches the apogee (farthest point) of the transfer orbit, an onboard apogee motor will be fired on command from one of the **Intelsat** stations. The craft will then be propelled into its final "circular" route: a geosynchronous orbit over the Equator at 105 degrees West Longitude. With the satellite back in sight, the **SBS** TT&C network will assume the tracking and monitoring chores.

The Clarksburg station, 28 miles from the **SBS** Spacecraft Engineering staff at **SBS** headquarters in McLean, Virginia, will act as the principal center for receiving and processing telemetry (messages) sent by the satellite. Engineers at Clarksburg will be continuously checking the satellite's power supplies, its orbital path, and the workings of its thousands of parts. Early next year, when the satellite is expected to beam communications to customers' earth stations, a radio frequency monitor at Clarksburg will scan the satellite's transponders, looking for signs of frequency drift, translation error or signal interference.

Complementing this role as a clearinghouse for satellite telemetry, the East Coast segment also houses the Satellite Control Facility (SCF)—the main center for all TT&C activity involving the satellite. Commands to the spacecraft—to correct its position or to engage back-up components, for example—originate at the SCF.

These messages, however, reach the satellite from the Castle Rock station, having first reached the Colorado-based partner via the stations' computer link. The Castle Rock side is issuing the commands because its location is inside the area from which the satellite is programmed to look for signals of that nature.



Video displays in color help technicians at the SBS tracking, telemetry and control (TT&C) station in Clarksburg, Maryland, "see" how well the satellites are functioning.

Engineers at Castle Rock, able to "talk" with the satellite, will conduct preoperational testing of the craft's communication circuits, and, using a fully-steerable 12-meter antenna, will track the satellite's drift in space. Perhaps most important, the Colorado station is the "beacon" station; the satellite will track a radio frequency beacon sent by one of the station's antennas.

The role of these two stations, 2,000 miles and three time zones apart, is much like that of the steering wheel

The antennas of SBS's Clarksburg, Maryland, TT&C station.

of a car—without which, the seemingly more important parts (the motor or transmission) lose their value. Working in concert, forming a triangle with the satellite, the stations will track and steer the satellite, keeping it within a small "box" in space.

The satellite will tend to drift from its box because its orbit, although synchronous, will never be perfectly circular—an effect produced by the slightly ellipsoidal (rather than spherical) shape of the earth. To counter the satellite's propensity for leaving its desired station, computers at Clarksburg will produce a schedule for the firing of control jets on board the satellite.

The satellite becomes useless if its antennas are not pointed at just the prescribed angles to the earth below. To put this positioning task of the Castle Rock station in perspective, imagine shining a beam of light at a target 22,300 miles away. Should your aim be a degree off, you might not notice it at the light's origin. But over that long journey, the deviation magnifies; the light arrives miles wide of the target.

Similarly, the satellite's antennas will beam signals to their targets: the 48 contiguous states. If the antennas are aimed a fraction of a degree wide, then the beams, which are shaped to fit specific regions below, will miss their designated areas of coverage.

SBS's satellite will keep its antennas aligned in a simple, yet fascinating way: it will "recognize" and track Castle Rock's beacon in much the same manner that a plane follows a landing signal to an airport runway.

Holding onto a satellite with an RF beacon is one of many advantageous features which Anthony van Hover, Manager of Satellite Control Engineering for **SBS**, spent three years designing into the TT&C network. His design for Clarksburg, for example, combines the Satellite Control Facility with an earth station to permit monitoring of both satellite telemetry and radio spectra from the same location. Only two of the three Clarksburg antennas are involved in the TT&C functions; the third is a prototype of the kind to be used at customer locations. Each station also has two back-up power sources: a self-contained battery subsystem and a 400-kilowatt generator.

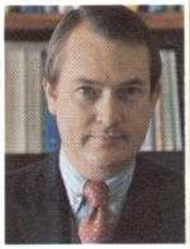
Van Hover's design employs many "one-of-a-kind" processing and monitoring components, and **Comsat**, under contract to **SBS**, supported the TT&C projects by manufacturing and installing important hardware. **Comsat Labs**, also at Clarksburg, designed and built the TDMA monitoring equipment for the Clarksburg station and Castle Rock's in-orbit test equipment. Processing equipment for both stations was designed and built by **Comsat**'s Monitoring and Control Engineering Division in Rockville, Maryland. Celestial mechanics surrounding the **SBS** satellite are being formulated by **Comsat**'s Orbital Mechanics and Data Processing Division at the Washington, D.C., headquarters.

Together, these components and the 12-man staffs at each station are the solitary link to a satellite orbiting thousands of miles above. Each day, every second, they watch, listen, and send directions from their end of a microwave bridge. Without them, it is safe to say, the whole innovative system could not function.

An engineer makes final test of control equipment at the TT&C station in Clarksburg, Maryland.

COMMENTARY

by Dr. Delbert D. Smith
Senior Vice President, Corporate Affairs,
Communications Satellite Corporation



Space policy development in the 1980s will have a profound impact on the direction and expansion of the satellite communications industry. Too often satellite communications is thought of only in the context of telecommunications policy with a de-emphasis on its integral relationship with policies impacting space applications.

This nation is in the midst of change with regard to civilian space policy which is driven by the prospects of the National Aeronautics and Space Administration's Space Transportation System as well as the progressive realization of the vast potential for beneficial space applications systems. Evidence of this dynamic state of policy can be seen in the efforts and initiatives made within Congress during the past several years.

Foremost in the development of any policy is the identification of desirable objectives, and several civilian space policy goals have already been articulated during space policy discussions. The goal of the preservation of United States technological leadership has been a fundamental and continuing goal. A second goal is the support of private sector initiatives in the provisions of space systems and services. Maximum provision of services and the timely implementation of systems are additional goals. Finally, minimization of federal government expenditures is an extremely desirable objective. While there are many more specific civilian space policy goals, the generally desirable and progressive nature of the five articulated above indicate the important roles for both public and private entities in the achievement of such goals.

Private industry can and should be instrumental in the achievement of national space policy goals, and this can be accomplished if two space policy axioms are adopted. The first is that private industry must take the initiative in the development of major space systems necessary to achieve national goals. The second is that productive public/private relationships must be developed in support of national space policy goals.

There are several ways in which the federal government can encourage private sector development of major space systems for public benefit. The government can encourage system development by offering to become a primary user of private space segments. For example, the U.S. Navy's commitment for utilization of commercially developed maritime satellite services made possible the development of a commercial market for such services which may otherwise have been either delayed or not created.

There are also a number of incentives which government could adopt to encourage development of commercial offerings of applications which have proven feasible. For example, government should discontinue providing particular areas of service once the private sector becomes involved in such service provisions. Additionally, government could offer assurances that it will not establish a system that competes with those operated by the private sector. Government can also give international support for the private sector owner and operator of a space system. Other possible incentives include government furnished equipment, sponsored research, reduced rates for launches, shared satellite buses or platforms, jointly developed equipment, and regulatory and tax incentives.

Finally, the federal government could review its present and planned space systems with the specific goal of seeking ways to obtain such space services from the private sector rather than from government-owned systems.

The ultimate beneficiary of an enlightened space policy which strives for achievement of these national goals is the user community. Both the private sector and the federal government should recognize their roles that seek the best ways to make the benefits of space available to the public by the development of new space systems and services in the public interest.

AME

by U.S. Senator Harrison Schmitt;
Republican-New Mexico

The Soviet Union shocked the world in 1957 when it launched the first artificial satellite of the Earth. I was an exchange student in Norway at the time and observed firsthand the profound impact this event had on the international student community then in residence in Oslo. There was wonder at this first step by mankind into the new ocean of space; there was fear that an oppressive civilization like that of the Soviets would dominate man's activities and man itself through its new technological prowess.

Sputnik I and reactions to it convinced me that the course of human history would be determined by which civilization dominated space: the civilization of oppression championed by the Soviet Union or the civilization of freedom championed by the United States. I remain convinced of this today as the Soviets steadily extend their reach and capabilities in space while U.S. leadership languishes in the deceptively calm backwaters of indecision.

On January 24, 1979, I introduced the National Space and Aeronautics Policy Act (S.212) in the United States Senate. The proposed legislation establishes guidelines for a long-term approach to a national space and aeronautics policy. It defines broad policy goals for the Nation and establishes specific scientific and technological program objectives critical to the timely achievement of these goals.

Prior to introducing this bill, I sought comment and input from leaders in industry, labor, academe, government and other vital sectors in our national economy. The responses were most encouraging and helpful, and S.212 reflects the thoughtful views and suggestions received from the many individuals who responded to my requests for comments.

As the Soviets steadily move their civilization into space, we merely talk of gradually building worldwide satellite systems in communications, weather forecasting and Earth-resource sensing. These are fine but limited objectives which are already in our grasp.

As the rest of the industrialized world runs technological and marketing circles around us, and the dollar steadily weakens, we further close our principal modern faucet of innovation in technology and productivity; namely, new activity in space.

As the extreme danger of our dependence on external sources of fossil fuels increases, we stagnate in the development of alternative conservation, production and conversion energy technologies, most of which have their roots in aerospace research and development.

As the decline in our productivity and markets fuels inflation, we forget that well-conceived expenditures on new technology are inherently deflationary in their creation of new techniques, products, and services.

This country and its people need to flex their muscles and their motivation against all the frontiers of human endeavor. They must face the risks and grasp the benefits of those frontiers.

If we were to imagine a space policy that would continue to carry this country and elements of our civilization into space and into the 21st century, upon what factors should such a policy rest?

Let me suggest the following essential criteria:

First, the policy must present a sense of direction and continuity for all present and future generations which must implement the policy.

RICA

Second, the policy must have flexibility that can take advantage of new science and technology as well as adapt to rapidly changing goals which events may dictate.

Third, the policy must have clearly identifiable significance to the direct or indirect solutions of the major terrestrial problems of hunger, disease, unemployment, and ignorance.

The policy must integrate budgetary requirements between the various elements of the policy, and between the governmental and private sectors, so that the demands on the taxpayer are both reasonable and consistent from year to year.

Finally, space policy must match the real world of science and engineering with the perspective of the younger generations which will give it life.

The decade of the 1980s, a world information decade, should have programs aimed at permanent, eventually self-financing, services for world-wide communications, weather and ocean forecasting, Earth resources discovery or monitoring, education and public assistance, and prediction of natural events of disastrous human consequences or broad scale economic impact.

The collection and distribution of information on a worldwide basis via satellite has provided a distinct change in the course of human history. The most graphic demonstration of this change came when on Christmas Eve, 1968, hundreds of millions of human beings throughout the world simultaneously had a new thought about a familiar object in the night sky—the Moon. The men of Apollo 8 were there, and the Moon would never be the same for anyone. Now, we realize that the world will never be the same; that there are solutions to the age-old problems of the human condition on Earth—hunger, disease, poverty and ignorance.

A world information decade is both aggressive and far reaching. Of particular interest is the capability such a decade will provide in our assistance to those developing countries of the world that wish to move with us, as free nations, into the technological 21st century. The benefits of the high technology of space will be available to them without the need to invest alone in its creation.

The decade of the 1990s, an orbital enterprise decade, should emphasize the progressive creation of permanent facilities in near-Earth space. Such facilities will utilize and augment this unique research, service and manufacturing environment. The weightlessness, the vacuum, the unique view of Earth, Sun and stars provide unparalleled opportunities for research, education, space power production, manufacturing, health care, Earth power production and for direct public participation.

Permanent facilities in orbit will provide capabilities that relate directly to current and growing problems facing this Nation. For example, creating new export commodities and inexhaustible energy supplies are needs that cannot be ignored by this generation, nor denied to future generations. In addition, the now-real possibility of research, education, health care, and recreation in space has caught the imagination of millions of young Americans. Let us not disappoint them, nor the future.

As with a World Information System, the management of the development of an Orbital Enterprise System should be rapidly assumed by largely nongovernmental groups. In most cases, the facilities will be economically self-sustaining, except for continual Federal involvement in high-risk improvements in technology.

Continued next page

In the first decade of the 21st century, a space policy for our civilization should reach a major culmination of excitement with the initiation of a solar system exploration decade. This is the decade about which most of the very young have their dreams: bases and settlements on the Moon and missions of exploration to Mars and Venus.

A research and test base on the Moon would provide the opportunity to develop and test the systems necessary to sustain a permanent mining, agricultural and research capability. Equipment required for long duration mobile exploration of Mars also can be developed and tested in this environment. It may be that the Mars and Venus missions themselves would be most economically staged from the Moon.

Whatever may turn out to be appropriate, now is the time to create the options so that the next generation may proceed when they are ready.

In order to sustain the technological and scientific requirements for these three decades of space activity, a significant level of basic research must be maintained, and development programs must be phased in to support the major programmatic efforts.

Of particular significance is the continued development of basic transportation systems, units and structures for space facilities, large capacity boosters, deep space boosters and new power and communication systems; particularly those utilizing laser and other advanced technologies.

The Space Shuttle concept for economical and convenient access to the near-Earth environment and its resources must be continued through additional phases and maximized to the fullest extent practicable. The chances are that both the development of an orbital enterprise system and the extended exploration of the solar system will demonstrate the need for expanded shuttle concepts. Also, a Moon shuttle capability will obviously be required in the 1990's to establish a Moon base and then conduct two-way physical transport between Moon and Earth.

New power and booster concepts must be developed to accomplish the civilization and exploration goals economically. New engineering concepts for space construction, and maintenance of large weightless planetary structures, also must mature in parallel with the mission demands.

These efforts in space science and technology will be the well from which will come new products and technologies for direct terrestrial applications. The systems components and materials developed, as well as the ideas, will, as always, produce unanticipated benefits of value far beyond their costs. This will continue to be true in space as it has always been for basic research and exploration on Earth.

The estimated annual costs of the development, research and mission programs, when properly phased, suggest that a sustained level at about one-half of one percent of our GNP would eventually be required to establish the basis for Earth-supported space facilities. The buildup to this level would be from about \$5 billion in 1980, to about \$10 billion in 1990, to about \$15 billion in 1995. These figures represent a projected GNP of about \$2 trillion in 1990 based on a GNP growth rate of approximately two to three percent in constant 1972 dollars. This final level would include an estimated Federal work force of about 75,000 and a directly supported industrial force of about ten times that figure.

The economic and employment impact on commercial and other non-governmental activities during this period has not yet been estimated. However, a major design philosophy behind this policy is to undertake largely those activities in the world information and orbital enterprise decades which would eventually sustain themselves without Federal support. It is also assumed that the long-term activities on the Moon will be in part, if not largely, supported by commercial interests and will be self-sufficient after a decade or less.

These last comments represent the practical side of the future. Space activities, however, will be sustained by emotions: the emotions of young Americans, young Europeans and Asians, young people the world over, indeed, young Soviets who look to space as the Earth's frontier. As with our ancestors their freedom lies across a new ocean, the new ocean of space.

AT PRESS TIME

First SBS satellite launched

The day was thickly overcast, but the 300 people who were present in a reviewing stand about three miles away were, though more than a little nervous, filled with hope. And after the Delta 3910 rocket vehicle with satellite cargo on top rose trailing a powerful orange flame and first reports were positive, the hope turned to joy.

The time was exactly 5:49 p.m. on Saturday, November 15, location the National Aeronautics and Space Administration (NASA) launch complex at Cape Canaveral, Florida. Present were senior representatives from **Comsat General** Corporation, Satellite Business Systems, IBM Corporation, Aetna Life and Casualty, Hughes Aircraft Company, McDonnell Douglas Corporation and several other major U.S. corporations as well as government officials.

What was happening was the launch of the first satellite of Satellite Business Systems into geosynchronous orbit, an absolutely essential first step before the innovative new **SBS** communications system described on page 18 and following could become a reality.

Two minutes later the satellite was in orbit and separated from the Delta launch vehicle, a product of McDonnell Douglas. At 6:10 p.m., the satellite's payload assist module (PAM) fired, thrusting the spacecraft into an elliptical transfer orbit that eventually reached 19,363 nautical miles from earth at its apogee and 126 nautical miles from earth at its perigee and inclined from the equator by almost 27 degrees. The satellite, manufactured by Hughes Aircraft Company, is the first satellite launched with a payload assist module incorporated in lieu of a conventional third stage in the launch vehicle.

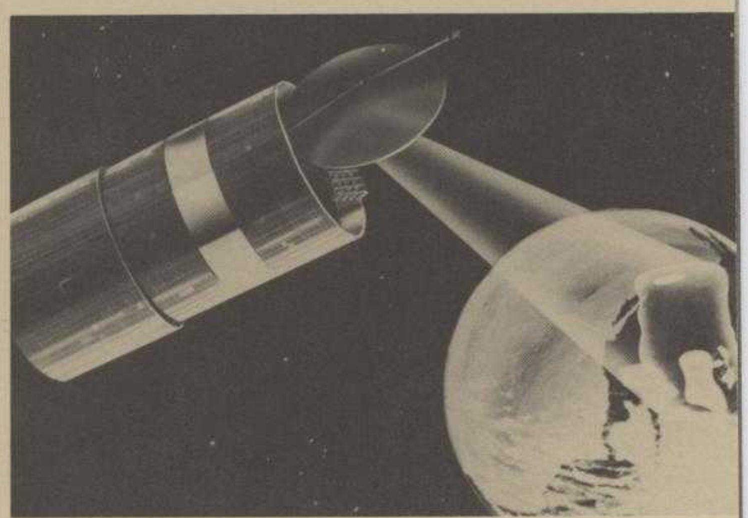
Now control of the launch switched from NASA technicians at Cape Canaveral to **Comsat** technicians at the Launch Control Center at **Comsat** headquarters in Washington, D.C. Once the spacecraft reached its apogee for the fifth time—at 5:35 p.m., Monday, November 17—Launch Control Center controllers gave the signal that told the craft to fire its apogee motor. For almost 53 seconds the apogee motor fired thrusting the satellite into a circular, nearly geosynchronous orbit about 22,350 miles in space. Next the communications section was to be deployed and despun and the solar section expanded to its full length.

The spacecraft is expected to reach its station at 106 degrees west longitude, on the equator due south of El Paso, Texas, shortly. It is then that it will begin homing in on the beacon signal from the **SBS** control station in Castle Rock, Colorado.

By press time, three more customers for **SBS**'s Communications Network Service (CNS) had been announced. (See page 24 for a description of some of the other customers for CNS.) The three new customers are General Motors Corporation, U.S. Telephone Communications, Inc. and Wells Fargo & Company.

General Motors will use its network for the transmission of data at 1.5 megabits per second and for voice communications. The earth stations in the network will be located in Detroit, Atlanta and Dayton.

U.S. Telephone Communications, Inc., an independent long distance telephone company based in Dallas, plans a 13-earth station network to be installed beginning December, 1981 in 4 phases. Wells Fargo will use its network for voice and data communications among earth stations in a number of cities including San Francisco and El Monte, California.



FOR THE RECORD

Dr. Charyk speaks at Ferris Washington Showcase and Boston Society of Security Analysts meetings.

Dr. Joseph V. Charyk, President and Chief Executive Officer of **Comsat**, was a guest speaker at the annual Ferris Washington Showcase on September 22. The Ferris Company is a Washington, D.C., investment banker and brokerage firm.

On October 6, Dr. Charyk traveled to Massachusetts to appear before the Boston Society of Security Analysts. Excerpted below are his observations on the nature of **Comsat** and the regulatory environment surrounding **Comsat**'s domestic and foreign satellite communications services.

About Comsat

....**Comsat** is a private corporation and not a governmental or quasi-governmental organization. It is a misconception, held even by many knowledgeable individuals, that **Comsat** is part of the government or that it receives part of its revenues through government grants or subsidies. It has, however, certain unique attributes and mandates.

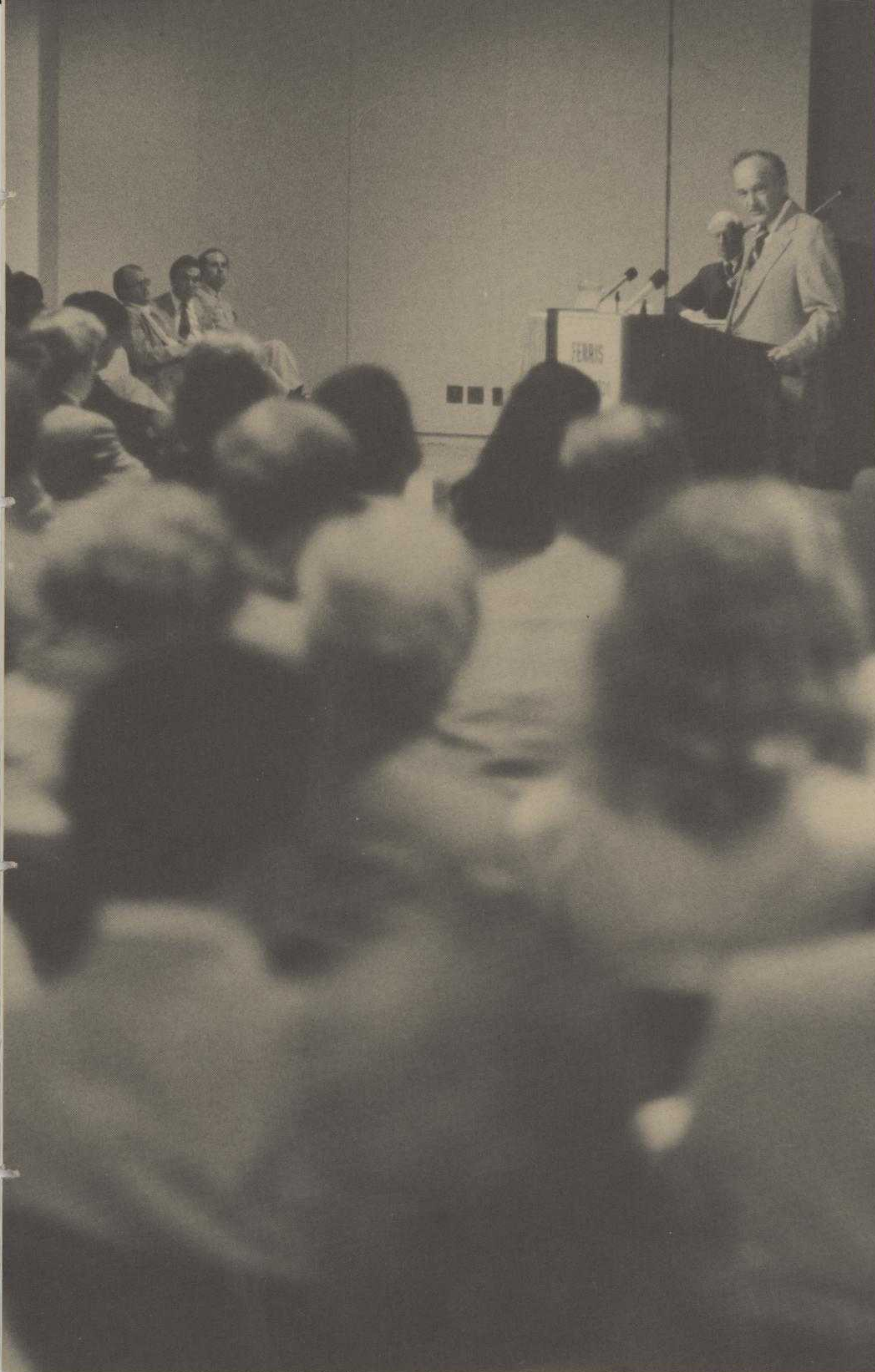
Comsat was created by Congress through the Communications Satellite Act 1962 and given the mandate to seek to bring the potential benefits of satellite communications to the public through the development and operation of an international satellite communications system. Congress stipulated that three of the 15 directors of the Corporation would be appointed by the President of the United States, subject to Senate confirmation, and that there would be certain relationships between the Corporation and appropriate elements of the government with regulatory oversight of the Corporation by the Federal Communications Commission.

However, the United State Government is not and has never been a shareholder of the Corporation, nor has it made any financial contribution to the company. Direct service to the U.S. Government provided less than five precent of our operating revenues during the first six months of this year.

About Regulatory Matters

We are pleased that the regulatory climate is increasingly favorable to the introduction of innovative and competitive services in the telecommunications industry. As noted earlier, in its recent study of **Comsat**, the FCC confirmed our belief that **Comsat** may engage in any activities that do not hinder the carrying out of our statutory obligations. We are also pleased with recent FCC decisions and pronouncements that presage a more flexible, overall regulatory framework.

Although we are pleased by these major trends toward less burdensome regulations, we continue to have some major concerns about the way our core international communications business is regulated. The application of classical rate-making theory, as employed by the FCC, is not well suited to the satellite business. In our business, innovation tends to produce economies that reduce the rate base and thus the company's earning capacity. Obviously, some sophisticated and more appropriate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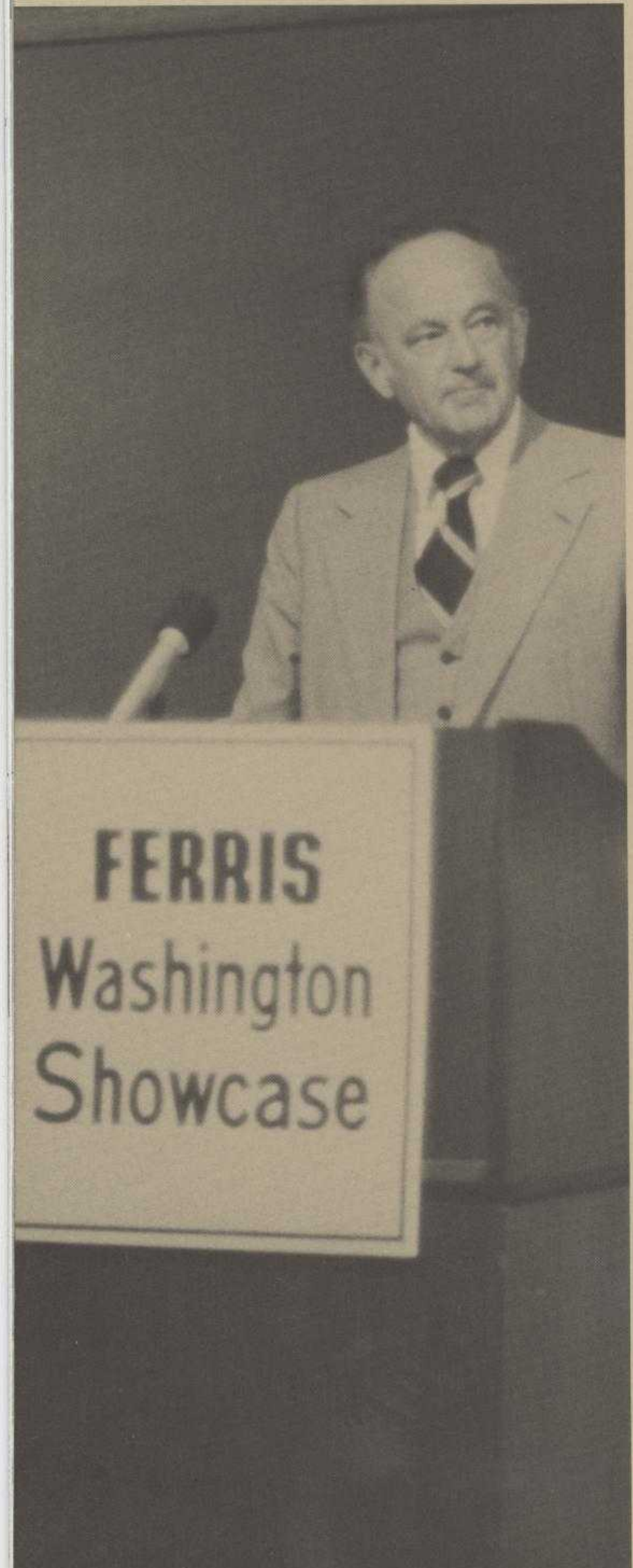

methods of regulation are needed in our business. Just as the ratepayer receives the benefits of lower rates, the investor too should be rewarded for the efficiencies and public benefits that come from improved technology.

Within the last three years alone, we have reduced our rates three times. In 1978, there was an across-the-board reduction of 48 percent, resulting from the settlement of a long-standing FCC rate case. In 1979, we reduced our rates again by 15 percent, and in February of this year we made a further reduction of 5 percent. The combined annualized savings to **Comsat**'s customers from these rate reductions amount to more than $275 million.

Of course, we are pleased that our technological advances are resulting in steadily declining rates for communications services, especially at a time when the price of virtually everything else is rising dramatically. It is important, however, that the benefits of greater efficiency and technology improvements be shared in a fair manner between the ratepayer and the shareholder and that the zealousness of regulation, and the methodology applied, do not do violence to this vital principle.

About the Future

We see **Comsat**'s charter as obligating us to pursue satellite communications related technology in new directions, to discover potential new service offerings, and to apply the technology in novel ways that can benefit the consumer and of course our shareholders. **Comsat** is in an excellent position to accomplish these things. We are an established presence in the burgeoning telecommunications industry. We have ambitious new projects and programs underway, and we have the will and the means to carry them out.

We, along with other companies in our industry, are a potential beneficiary, over the long-term, of a trend toward substituting marketplace forces for regulatory fiat. If government regulation continues to become more flexible and more responsive and if innovation continues to be encouraged, **Comsat** will truly be able to extend the benefits of satellite communications while contributing to the expansion of competition, not only among the companies in our industry, but among the technologies that will be the basis for the products and services of the future.

Corporate Locations

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Earth Stations

Andover, Maine
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Etam, West Virginia
Jamesburg, California
Paumalu, Hawaii
Pulantat, Guam
Pago Pago, America Samoa
Saipan, Northern Mariana Islands

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Telephone: 617.369.8910

Earth Stations

Santa Paula, California
Southbury, Connecticut
Fucino, Italy (MARISAT TTC&M)

Communications Satellite Corporation

5
First commercial use of Comsat's 10-meter multiple beam torus antenna is taking place in Alaska.

6
Two five-meter antennas have been installed at ERT as part of its participation with Comsat General in a water resources monitoring program for the U.S. Geological Survey.

10
U.S. Congressman Don Fuqua, Chairman of the Committee on Science and Technology, discusses his bill aimed at promoting the commercial uses of space.

13
Broadcasting, Administration policy and trends, is the topic of Richard M. Neustadt, White House staff member.

16
An officer of the new Comsat World Systems Division probes international communications in the Intelsat V era and beyond.

18
Lower-cost voice communications and extremely fast data and electronic mail services and readily-accessible video teleconferencing are being made a reality by SBS.

30
U.S. Senator and former astronaut Harrison Schmitt argues for a bill that defines broad policy goals and specific objectives for the human uses of space.

COMSAT