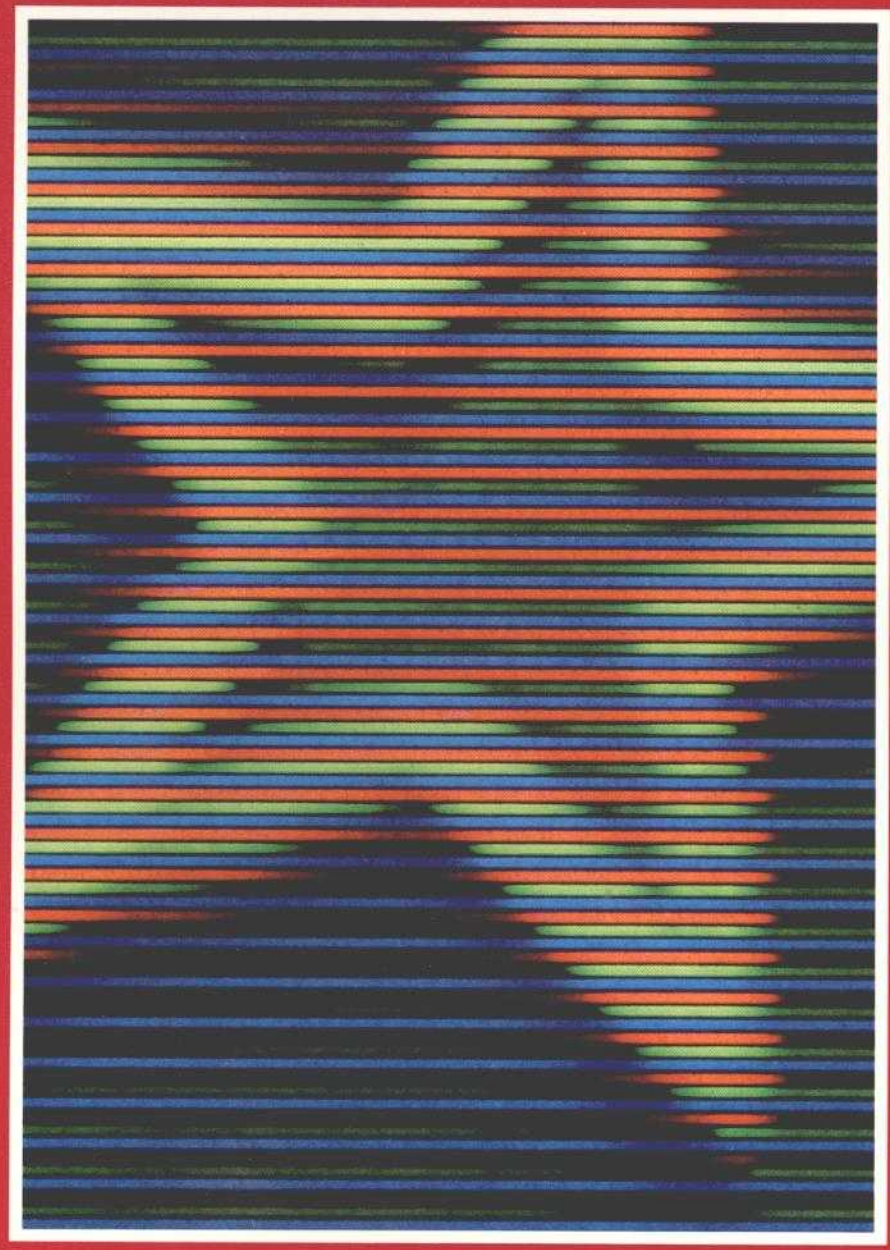
COMSAT®

COMMUNICATIONS SATELLITE CORPORATION MAGAZINE

1981



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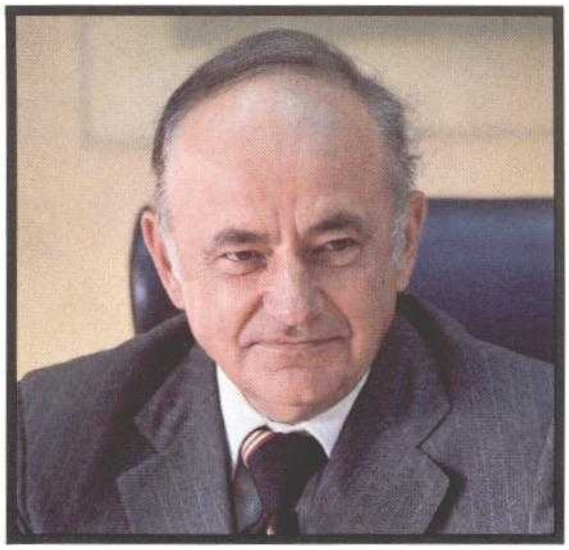
VIEWPOINT



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

It takes only a passing familiarity with the satellite communications, broadcasting and entertainment industries to realize that what Comsat, through our Satellite Television Corporation subsidiary, is proposing is a large and very challenging undertaking. In brief that proposal calls for the provision of three channels of television from a single transmission center via satellite to the homes of subscribers in scattered areas. To accomplish this, satellites that in several substantive ways are different than the type of satellites that thus far have been proven for commercial service must be designed, manufactured, successfully tested and launched. A new ground-control system must be established. Small receiving antennas, receivers and other equipment for home installation must be developed and manufactured in large quantity under economically attractive conditions. New and exciting programming must be developed, and a significant segment of the American public must be convinced of the desirability of subscribing to such a service.

Clearly, in terms of technological and marketing requirements and the investment necessary to meet these requirements, the challenge ahead is a very large one.

Still we have every confidence that it can be met, and we stand ready to make the investment to develop this new and exciting business. Throughout its history, Comsat has met very large challenges, and our record shows that we have met them extremely well. The Intelsat system of global satellite-based communications, the Marisat system of satellites serving the maritime communications needs of the U.S. Navy and commercial ships and offshore rigs and systems for domestic and business communications such as that being offered by Satellite Business Systems—these are examples of the challenges met by Comsat of which we are justifiably proud.

At the present time, the Federal Communications Commission is reviewing Satellite Television Corporation's filing asking permission to begin the first phase of the three-channel, satellite-to-home television service. It cannot be emphasized enough how important timely approval is for STC so that it can begin the long-lead-time tasks I have alluded to previously and which are described in much greater detail in the feature section of this issue of Comsat Magazine.

Satellite Television Corporation stands ready to begin the big job of bringing a new service into being and continuing Comsat's commitment of bringing the benefits of space technology to the using public.

COMSAT

No. 5 1981

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Articles in Comsat Magazine reflect the authors' opinions, which may not necessarily be those 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: Video enhanced art is one of the art world's new crazes. We've used the technique here and on pages 13, 19 and 20 and 21 in treating Satellite Television Corporation (STC) and its direct broadcast satellite (DBS) proposal. The star symbolizes the rising star of DBS and STC (including its "Superstar" Channel A) in this country. Video enhanced art photography by Tom Vack.

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From the Editor

In this issue we provide a large amount of information on Satellite Television Corporation and its pioneering proposal, information we trust the reader will find useful. In preparing this issue we have received the help of a lot of people at STC. The help of some of these people is acknowledged through the use of their bylines on the articles that begin on page 13. But others should be cited for special thanks, others like Keith Fagan and Cheryl Stein of the STC legal staff, and Daniel N. Crampton, a member of the Comsat Corporate Affairs staff on assignment to STC.

Other feature articles in this, the fifth issue of Comsat Magazine describe the tracking, telemetry, command and control (TTC&M) operations of the Earth Station in Andover, Maine, as seen by the manager of those operations, and a far-reaching proposal for encouraging private industry to become more involved in the funding of and actual management of in-space activities like earth sensing and manufacturing. Still another article provides a look at Intelsat, the organization that manages the hugely successful global satellite-based communications system.

We would be remiss if we also failed to thank Congressman Timothy E. Wirth, Chairman of the Subcommittee on Telecommunications, Consumer Protection and Finance of the House Energy and Commerce Committee for his timely thoughts on the extremely challenging task of rewriting the Communications Act.

Stephen A. Saft

N O T E S

Shareholders elect 12 directors

Comsat shareholders on May 15 held their 1981 Annual Meeting and re-elected 11 directors and elected one new director, Elliott M. (Pete) Estes, former President and Chief Operating Officer of General Motors Corporation.

At an organizational meeting of the Board of Directors following the Annual Meeting, John D. Harper was reelected Chairman of the Board and Joseph V. Charyk was reelected President and Chief Executive Officer. (Excerpts of Mr. Harper's and Dr. Charyk's speeches at the Annual Meeting can be found on page 37ff.)

Mr. Estes replaces John A. Johnson, who retired from the Board. Mr. Johnson had been a director since 1976 and served as Chairman and Chief Executive Officer of Comsat General Corporation, a **Comsat** subsidiary, from May 1977 to August 1980. Mr. Johnson most recently was Chairman of Satellite Television Corporation, another **Comsat** subsidiary.

Elliott M. (Pete) Estes, former President and Chief Operating Officer of General Motors Corporation, has been elected a director of Comsat.

The 11 directors reelected at the Annual Meeting were Joseph V. Charyk, Frederick B. Dent, Lewis W. Foy, William W. Hagerty, John D. Harper, Melvin R. Laird, Howard J. Morgens, Ellmore C. Patterson, Charles J. Pilliod, Jr., Bruce G. Sundlun and William L. Zimmer, III.

The 12 elected directors and three Presidentially appointed directors form the Comsat Board of Directors. The Presidentially appointed directors are Joan F. Tobin and Jesse Hill, Jr. The third Presidentially appointed director's position is vacant.

Shareholders appointed the firm of Deloitte Haskins & Sells to serve as **Comsat**'s independent public accountants for 1981 and rejected a shareholder's proposal.

Second Intelsat V in orbit

The second of the Intelsat V series of communications satellites was successfully launched on May 23 and is presently in use providing some of the communications connections in Intelsat's Atlantic Ocean region. Designated the Atlantic Ocean primary satellite, the Intelsat V is located at 335.5 degrees East longitude.

Transfer of communications traffic from the present 6,000-circuit Intelsat IV-A Atlantic primary satellite to the 12,000-circuit Intelsat V Atlantic primary began in July and is not expected to be completed until January 1982.

First commercial use of the Intelsat V primary satellite was for some 400 telephone circuits between the United States and West Germany using the 14/11 gigahertz frequencies.

The first satellite in the Intelsat V series was launched in December 1980 and has been designated the Atlantic Ocean spare. In all, a total of nine Intelsat V satellites and three higher-capacity Intelsat V-As will be launched.

Labs Director testifies on 30/20 GHz R&D

On July 9, Dr. John V. Harrington testified before the Subcommittee on Space Science and Applications of the House Committee on Science and Technology on the subject of continued funding of the National Aeronautics and Space Administration's research and development program on the 30/20 gigahertz frequencies for communications satellite applications. Dr. Harrington is Senior Vice President, Research and Development, and Director, **Comsat Laboratories**, and in addition serves as head of the NASA Advisory Council Space Terrestrial Applications Committee.

We quote the concluding remarks of Dr. Harrington's testimony:

"We believe that NASA's 30/20 GHz R&D program, which exemplifies an optimum working relationship between the Federal Government and the private sector, deserves strong support. The targeted areas of research and development in higher spectrum utilization are vital for advancing commercial communications satellite technology. In these times of fiscal restraint it is important to ensure that short term economic goals do not jeopardize those activities of the Federal Government which serve to maintain U.S. leadership in space communications and benefit our balance of payments."

N O T E S

President of Satellite Television Corp. named

Irving Goldstein has been named to succeed John A. Johnson, who is retiring, as head of Satellite Television Corporation, a Comsat subsidiary. Mr. Goldstein assumes the day-to-day responsibilities of **STC** in the newly created position of President. His previous position was Senior Vice President of International Communications Services for Comsat World Systems Division. (Mr. Goldstein's picture appears on page 17. Coverage of **STC** begins on page 13.)

Mr. Goldstein, 43, has represented **Comsat** on the Board of Governors of **Intelsat**, the International Telecommunications Satellite Organization, since 1974. He served as Chairman during the 1980-81 term of the Board of Governors, the decision-making body of **Intelsat**.

Mr. Goldstein is a native of Catskill, New York. He joined **Comsat** in the Office of General Counsel in 1966 following three years with the Federal Communications Commission. In 1972 he was named Director of **Comsat**'s European Office. Later he was named Director of International Affairs, and in 1979 he became Vice President and General Manager of International Communications for **Comsat**. He assumed his previous position in 1980.

Mr. Johnson, 65, has served as Chairman of **STC** and previously as Chairman and Chief Executive Officer of Comsat General Corporation. Dr. Joseph V. Charyk, Comsat President and Chief Executive Officer, commented on Mr. Johnson's retirement. "We are fortunate that John Johnson has agreed to continue as a consultant and a member of the Board of **STC**. We are pleased that we still will have the benefit of his advice and business sense which have proved invaluable since he joined Comsat in 1963," said Dr. Charyk, who will become Chairman of the Board of **STC**.

Inmarsat Council's eighth session held in London

The Eighth Session of the **Inmarsat** Council was held at **Inmarsat** Headquarters in London from June 24 to July 1, 1981. After the recent accessions of Chile, Iraq, Liberia, and the Philippines, **Inmarsat** now has 36 members.

At this Session, Mr. Luis F. T. Perrone of Brazil, the current Vice Chairman, was elected Chairman of the Council, and Mr. Edward J. Martin of the United States was elected Vice Chairman. They will hold these positions for the next 12 months.

Some of the most important decisions taken and items discussed during this Session were:

Space Segment Matters
The Council decided to accept the offer made by **Comsat General**, on behalf of the Marisat Joint Venture, to lease the commercial capacity in the MARISAT satellites in the Atlantic and Indian Ocean Regions for nine-month and one-year periods, respectively. Capacity in the Pacific Ocean Region Marisat satellite was leased from **Comsat General** earlier this year.

This decision ensures that the transition from Marisat to Inmarsat will take place as of February 1, 1982. Extensive efforts are being made to ensure a smooth transition with no interruption in the continuity of service.

Ship Earth Station Standards and Procedures of Type Approval and Commissioning
The Council adopted final standards for ship earth stations that would have access to the Inmarsat system, and procedures for type approval and commissioning of ship earth stations. These standards and procedures will establish a firm basis for the transfer of crucial system management functions from **Comsat General** to the Inmarsat Directorate.

High-Speed Data Services
The Council agreed on arrangements to provide 56 kbps high-speed data service from the outset of operations.

Advisory Committees
The Council reviewed the work of its two advisory committees to determine whether any structural revisions would be appropriate. It decided that the Advisory Committee on Technical

and Operational Matters should be continued with essentially the same terms of reference. The Council further decided that the Advisory Committee on Finance and Market Planning had completed the tasks it was set up to undertake and that it be discontinued. In its place, a new Finance Committee was created to review for the Council the proposed annual budget and the five-year financial plan, as well as audit Inmarsat accounts. This Committee will be chaired by the Council's Vice Chairman, Mr. Edward J. Martin of the United States.

Network Coordination Services

The Council requested the Director General to examine the feasibility and cost of providing an alarm at each NCS station for distress alerts. This could provide assurance that any distress alert alarms would reach the proper rescue coordination point. The next Session of the Inmarsat Council will be hosted by the Singapore Signatory in October 1981.

Pedro Castelo Branco is Chairman of the Intelsat Board of Governors.

New officers elected by Intelsat Board

Irving Goldstein, President, Satellite Television Corporation, and former Senior Vice President, Comsat World Systems Division, completed a one year term of office as Chairman of the **Intelsat** Board of Governors at the conclusion of the Board's latest meeting, which was held June 3-10 in Tokyo, Japan. Mr. Pedro Castelo Branco, Governor for Brazil/Portugal, who had served during the last year as Vice Chairman, was elected to succeed Mr. Goldstein as Chairman. Mr. Pierre Godiniaux, Governor for France/Monaco, was elected Vice Chairman.

New officers were also elected for the Board's advisory committees. The Committees' current Vice Chairmen were appointed as Chairmen; they are Mr. Georges Payet, of France, the new Chairman of the Technical Advisory Committee, and Mr. Francesco Bartone, of Italy, the new chairman of the Planning Committee. Two **Comsat** World Systems staff members, Ahmad Ghais and Ellen Hoff, were elected as Vice Chairmen of the Advisory Committees. Dr. Ghais, who is Director, Satellite Communications Systems, will serve as Vice Chairman of the Advisory Committee on Technical Matters; Ms. Hoff, Director of **Intelsat** Affairs, will serve as Vice Chairman of the Advisory Committee on Planning.

Earth sensing restructuring called for by Dr. Charyk

A bold restructuring of the system of civil earth sensing satellites in the United States has been proposed by Dr. Joseph V. Charyk, President and Chief Executive Officer of **Comsat**. Appearing before a joint hearing of the House Space Science and Senate Science, Technology and Space Subcommittees on July 23, Dr. Charyk outlined **Comsat**'s proposal for a unification of the management of non-experimental earth sensing satellites in the private sector.

Currently, the Federal Government, through the National Oceanographic and Atmospheric Administration (NOAA) and the National Aeronautics and Space Administration (NASA), operates two independent systems of satellites that perform such sensing functions as weather and crop forecasting. Under the Comsat proposal, the management of these satellite systems would be unified, thus eliminating the need for duplicate facilities. "Combining the land and meteorological satellite programs," commented Dr. Charyk, "would enable the operator to eliminate unnecessary facilities and reduce administrative support, thereby reducing the overall cost of operating an integrated system.

In concluding, Dr. Charyk pointed to the qualifications of **Comsat** to operate a unified earth sensing satellite system. "**Comsat**," according to Dr. Charyk, "is a unique private corporation which has for nearly 20 years successfully met public needs and furthered national objectives through the development, operation, and use of communications satellite systems... without financial assistance or subsidy from Government."

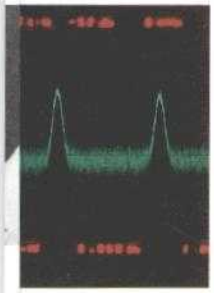
TTC&M

SATELLITE HEALTH IS THEIR BUSINESS

by ***Charles O. Lepage,***
Manager, TTC&M Services,
Andover, Me., Earth Station,
Comsat World Systems Division.
Photography by ***William J. Megna.***

TTC&M

Below, the two telemetry beacons on communications satellite in space as seen on a spectrum analyzer CRT in TTC&M Control Room at Andover, Me.. Earth Station. Facing page, the telemetry and command console in the Control Room.



The proper location of each communications satellite during the launch phase and in geosynchronous orbit, the proper position and orientation of the satellite within its location with respect to both earth and sun, and the proper functioning of each of the satellite's components—these are the concerns of the people who perform telemetry, tracking, command and monitoring (TTC&M) activities at **Comsat**. Thus, they have front line responsibility in determining the health of satellites in space and in doctoring them when necessary.

The TTC&M station located at Andover, Maine—part of the earth station there—is one of the primary facilities providing TTC&M services under contract with **Intelsat**. Andover has been involved with every Intelsat launch starting with the world's first commercial communications satellite, Early Bird, which was launched in April 1965. Since then, many changes have occurred at Andover, including the addition of two large communications antennas. In 1979 the old original TTC&M Casshorn antenna was supplemented with a 16-meter parabolic dish. The Casshorn, nicknamed "Sugar Scoop" because of its peculiar shape, now provides TTC&M services with satellites in geostationary orbit only and is utilized as a standby during satellite launch support. The Andover TTC&M staff consists of 12 TTC&M technicians and the TTC&M Manager. Administrative support and additional technical support, when needed, is provided by the staff of Comsat World Systems Division at **Comsat** headquarters in Washington, D.C.

Although the complexity, sophistication and magnitude of TTC&M operations have increased dramaticlly over the past 16 years, the basic purpose remains unchanged. That purpose is to assist **Intelsat** in placing satellites in geostationary orbit and to maintain these satellites in the proper attitude, location and configuration to ensure uninterrupted international communications service.

The routine daily requirements of the TTC&M facility are widely varied, and station technicians must attain a broad spectrum of technical knowledge and skills to operate and maintain the complex system.

Telemetry data, received from each of the satellites' two telemetry transmitters, is processed and retransmitted via full period data circuits to the Intelsat Satellite Control Center (ISCC) in Washington, D.C., on a continuous basis. Precise antenna pointing angles and range (straight line distance) to the satellite relative to the TTC&M station are measured and recorded by site computers and transmitted daily to the ISCC via the data circuits. The data is utilized to determine the attitude, drift, inclination, position and general condition of each satellite. In addition, the data is used to provide antenna pointing predictions required by all earth stations to locate and track the satellite.

Under the coordination and direction of the ISCC, TTC&M station technicians transmit commands which control satellite velocity, attitude, orbital inclination, on-board communications configurations and on-board power systems.

The Communications System Monitor (CSM) equipment located at each TTC&M facility is utilized to perform measurements on all the carriers assigned to each satellite. Measurements of carrier power, deviation, center frequency, isolation and many other parameters are available.

Approximately 15 days prior to a scheduled launch, the TTC&M daily routine must encompass an addtional task—that of preparing the station for supporting the scheduled launch. Tracking a satellite in transfer orbit is much more demanding than tracking a satellite in geostationary orbit. All of the TTC&M subsystems must be

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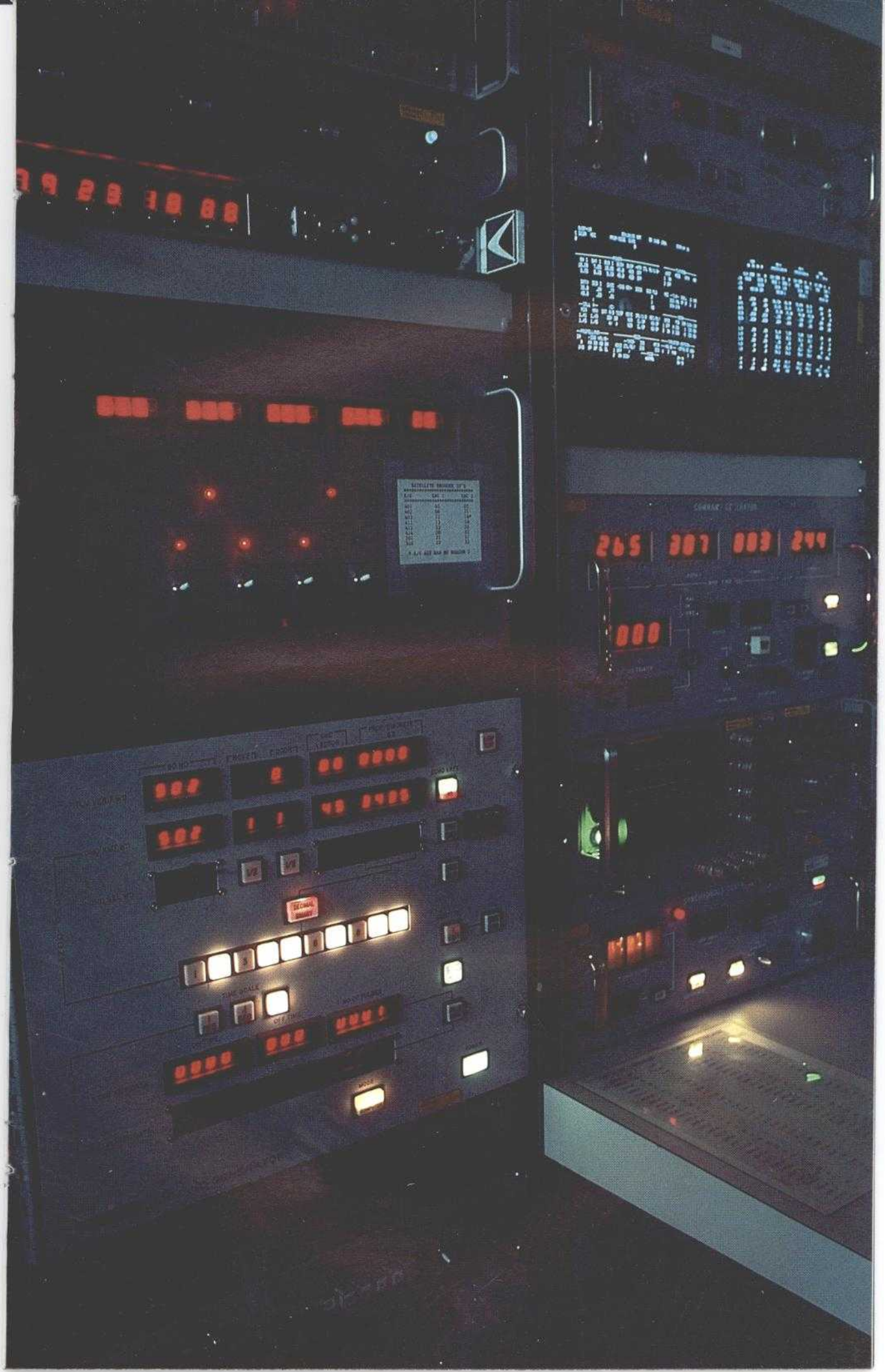


The 16-meter parabolic tracking antenna used by the TTC&M staff at the Andover, Me., Earth Station.

capable of performing to their maximum design specifications. Antenna acceleration, velocity and tracking rates during transfer orbit are thousands of times greater than those experienced in geostationary orbit. Command and ranging transmitters normally utilizing 50 to 100 watts of power for satellites in geostationary orbit require one hundred times more power during critical phases of the transfer orbit.

Up converters, down converters, modulators, demodulators, telemetry receivers, tracking receivers, servo drive systems, command encoding systems, computer systems—the multitude of equipment needed to support a launch is all thoroughly tested, aligned and documented. During the 10 to 12 days spent in performing the station prelaunch tests, technicians are extremely busy. A successful launch requires that the launch crew personnel be on site two to three hours prior to expected acquisition—usually 2:00 to 3:00 a.m. Pre-acquisition checklists are completed and TTC&M personnel prepare for the first glimpse of telemetry data from the newly launched satellite.

During the tracking phases associated with each transfer orbit, Comsat's Launch Control Center (LCC) and the ISCC coordinate the command and data acquistion activity with each TTC&M station assigned to the spacecraft. This coordination is provided via full period voice/data circuits to each facility. Technicians at the TTC&M station operate the command data, acquisition and processing systems, assuring that the vital link with the orbiting satellite is maintained at all times. Critical maneuvers are performed which will position the spacecraft correctly for firing of the apogee motor. During each command sequence, the LCC relays the command parameters via the voice circuits. Earth station technicians set up the command system parameters and, on cue from LCC, transmit the commands to the satellite. Only after the telemetered

The author with six of the members of the TTC&M staff: from left, Bruce H. Nelson (seated), Donald C. Bachelder, Alan T. Gerace, Gary W. Philbrick, Jr., Lauris W. Davidson, and Clifford L. Wooten.

contents of the spacecraft decoder are verified by the LCC and the TTC&M station is the command executed. In this way, the probability of executing a wrong command is minimized.

Firing of the apogee motor, which will place the satellite in the synchronous orbit, is the most critical command. Telemetry beacon Doppler frequency shift and spacecraft accelerometer data are carefully monitored at the earth station and transmitted via data lines to the LCC. These data are the primary real-time information used in measuring the quality and quantity of the thrust imparted by the apogee motor. A successful firing is followed by a sigh of relief from the staff at all sites. Hundreds of critical commands follow, including velocity maneuvers to circularize the orbit, attitude and inclination maneuvers, deployment of solar panels and antennas and a complete satellite systems test, all of which depend on the reliability and capability of the TTC&M station.

The combined effort of all the TTC&M facilities under the direction of the ISCC and the LCC have been an integral part in the success of the global communications network. The effort, dedication and skills of the TTC&M staff are among the primary reasons for this success. In effect we are the eyes, ears, voice and hands extending from the control centers in Washington, D.C., to a satellite 22,240 miles in space.

Communications Act Challenge

giving users their due

by the ***Honorable Timothy E. Wirth,*** *Chairman, Subcommittee on Telecommunications, Consumer Protection and Finance, House Energy and Commerce Committee*

The telecommunications revolution has brought with it a set of increasingly complex challenges and questions that go to the very core of how we see ourselves as a society. And the economic and sociological implications are staggering.

We moved, in 150 years, from a society based on agriculture to one based on manufacturing and industry, and finally, our economy is now based on services and information. In the 1980s, more than half our gross national product derives from the development, storage, transfer and use of information, and this trend shows no sign of slowing down. Telecommunications is a growth industry, and in the competitive world markets of the future, it's an economic winner, clearly one of our most promising assets.

But while this change is going on around us, there are relatively few people who have been able to clearly see the excitement and challenge of what lies ahead. We are faced with the paradox of needing a workforce that is increasingly sophisticated in manipulating ideas and numbers in a period when, as most national indicators point out, our young men and women are, for the first time in our history, less literate than their parents. We cannot shrug this trend off, for our nation cannot remain strong if future generations are not prepared to master the demands of a new age.

It is imperative that, as a nation, we respond to the demands of the information revolution, both through public policy initiatives and strengthening the partnership between the public and private sectors that has served our country so well in the past. As we develop new directions in budgetary and tax policy, these imperatives take on great significance:

We should be increasing our natural advantages in space research—especially after the success of the space shuttle—not starving NASA.

We should be retooling our university laboratory network, not allowing it to erode as it will under the present budget for the National Science Foundation.

We should be training more computer scientists, physicists, engineers, mathematicians, chemists and biologists, not severely cutting support for graduate students.

We should be developing a tax program designed to encourage our economic winners. We should develop incentives for research and development through savings and rewards for stock ownership, which will help industries of the future; not a tax program bent on short-term political returns, with incentives based on assumptions about American industry that are no longer true.

That tax program should encourage the telecommunications industry. As we rely more and more heavily on this burgeoning resource, we must seek the ways to make it more widely available, enabling it to fulfill its potential for increasing innovation, more competitive pricing, and providing wider opportunities for the technicians and skilled managers that will allow it to grow and flourish.

The House Subcommittee on Telecommunications, Consumer Protection and Finance is exploring the steps that must be taken to assure the future well-being of the telecommunications marketplace. We are now in the process of holding hearings prior to introducing major telecommunications legislation in the fall that will truly meet the realities of our future.

And new legislation is needed, for existing laws and regulations are archaic. The Federal Communications Commission regulates on the basis of the Communications Act of 1934, a law passed before the advent of television, cable, computers—or satellites. It is a law that assumes scarcity, a law that gives the FCC far too little direction. Its sole mandate is to regulate "in the public interest, convenience and necessity."

It is a law developed to regulate a network of country roads—radio and operator-assisted long distance telephone. But the network of country roads is now a diverse, high-speed, multi-laned thruway, and policy is lagging far, far behind.

We have learned, as lawmakers, that in communications, as in many other fields, there are significant limitations on the ability of the government to "do good," and decisions that can be left to the marketplace should not be made by the government. The government can try to keep prices low, and require minimum levels of service. It can correct egregious violations of the public's rights. It can establish structural ground rules and operating principles. However, it cannot innovate or create diversity; it cannot mandate excellence, whether that be in video programming or software. The government cannot predict well, and therefore should not bless or restrict technological choices.

The enormous change, variety and competition we now see probably came as much in spite of the government as because of it. These events have been driven by technology and thousands of disparate decisions by private persons. It is this diversity of decisions that guarantees progress. In the marketplace, bad or ill-timed ideas die quickly, but only the government can float a bad idea and keep it floating for years.

We must reinforce the principle that those who would limit competition and consumer choices must bear the burden of proving that there is a public interest in exclusion. Unfortunately, this principle runs contrary to the instincts of many regulated industries, and among many of them there is a sense of private entitlement to public rights or resources which fits neatly with economic self-interest.

Historically, legislators and regulators have found themselves in the role of referees among the competing groups in the telecommunications industry. Because the issues are so complex, we have tended to look for solutions that will calm the most visible groups that come before us. It is far easier to pick one of two or three defined options—or to seek a middle ground among them—than it is to do one's own research. Looking for the solution that will best serve the public at large is not as simple and often not as rewarding. For although the public is increasingly affected by the decisions we make about telecommunications policy, it is often not wise to the ways of the Washington wars, and, more importantly, it is often unaware of communications issues and their implications.

When they receive no other input, lawmakers also tend to think that there is only one set of ideas. A proper balance, therefore, can only be achieved if broader segments of the public realize that they, too, have a major stake in communications policy. For public interest is a prerequisite for the creation of the kind of coalitions that are needed if we are to create rational and progressive policy that is truly in the national interest.

Because of these imperatives, our Subcommittee, in developing national telecommunications policy, has sought to reach out beyond traditional telecommunications interests. We have recently completed hearings to determine the needs of users of telecommunications systems—corporations, government agencies, and individuals whose future economic survival will increasingly depend on ready access to a wide range of services and equipment. It is the first time during the lengthy debate on the development of new policy that there is a clear recognition that users are the purpose of the policy. And it has become apparent from those hearings, and others we have held, that if our legislation is to be truly responsive, we must continue to hear from more than just the suppliers of telecommunications.

The crucial questions can no longer revolve around how big a slice of the telecommunications pie each industry group can carve out for itself. The debate must center on how to ensure that the benefits of the electronic revolution are made available to the public, and that its positive impact on the future economic well-being of our country can be felt. It is a debate that demands involvement from every one of us.

COMMENTARY

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

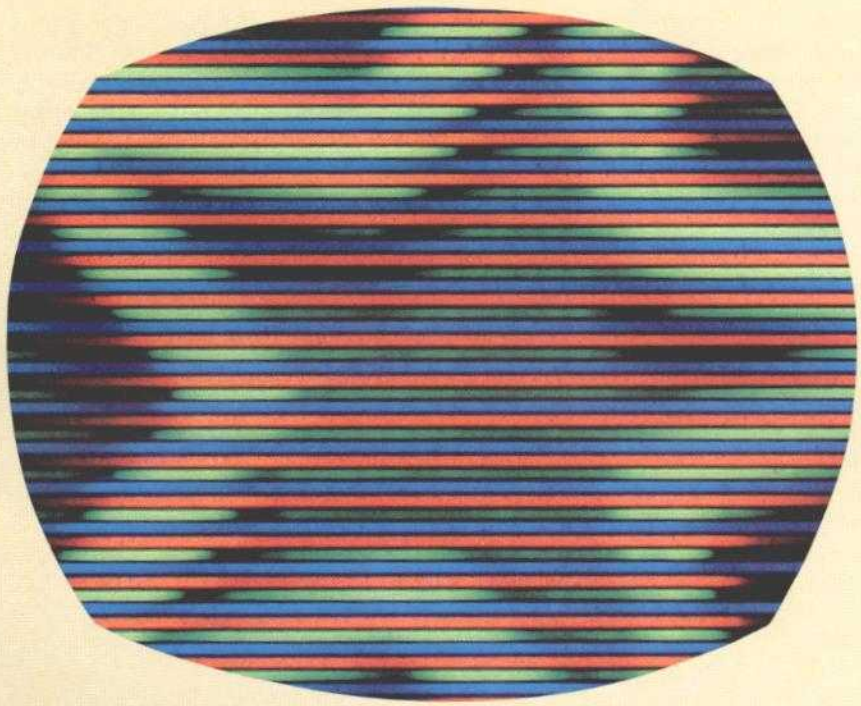
In June 1983, Region 2 Administrative Radio Conference 1983 (RARC-83) will convene in Geneva, Switzerland, to draw up a frequency allotment (assignment) and orbital plan for the 12 GHz Broadcasting-Satellite Service (BSS) in the Western Hemisphere. In preparation for RARC-83, each Western Hemisphere nation has been directed to submit its BSS requirements not later than one year before the start of the Conference, and United States preparations are underway.

It has been argued that Federal Communications Commission authorization of STC's proposed DBS system prior to RARC-83, even on an experimental basis, will restrict the United States' negotiating flexibility at RARC-83 and will effectively predetermine the issues RARC-83 has been convened to resolve. To date the FCC has rejected these arguments, correctly concluding that the experimental approach to DBS authorizations will assist in formulating realistic, detailed U.S. plans for RARC-83 and will not compromise the United States' negotiating flexibility at the Conference. In fact, the U.S. National Telecommunications and Information Administration, which contributes materially to the formulation of U.S. positions for international telecommunications conferences, not only agrees with the FCC, but NTIA further concludes that the authorization of experimental DBS systems will substantially *improve* the posture of the U.S. negotiators at RARC-83 by providing credible support for U.S. claims concerning the nature and extent of its BSS requirements.

At RARC-83, each country's allotment of orbital and frequency resources will be based entirely on its demonstrated "requirements" for direct satellite-to-home broadcasting ("individual reception") systems. To the extent that the United States can point to needs that are real and pressing—rather than hypothetical and remote—the United States' negotiating position will be substantially enhanced. The most effective means of demonstrating credible U.S. requirements would be to point to authorization of specific commercial proposals. A credible showing of the real and pressing needs of authorized DBS proposals may also enhance the willingness of other Western Hemisphere nations to accommodate U.S. spectrum requirements. Such a showing will be of particular importance if, as anticipated, the U.S. presses for the allotment of resources that are far in excess of those to be allotted to some of the smaller and less developed nations in the Hemisphere.

Authorization prior to RARC-83 of commercial DBS proposals would not lock United States negotiators at the Conference into any particular set of DBS technical characteristics. With respect to a number of technical issues to be decided at RARC-83, DBS applications like STC's can build in design and schedule flexibility so that the resulting DBS system (which requires from three to four years to construct) would be able to accommodate any reasonable outcome of the Conference.

Concerns about the flexibility of the United States' negotiating position, therefore, are easily allayed. The prompt authorization of interim DBS systems should not have an "inhibiting" effect on U.S. negotiators, but the Commission has effectively minimized even the slightest possibility of such an effect by proposing to subject all interim authorizations to the blanket condition that all licensees will be required to conform to any final RARC-83 requirements. STC's Application, which is fully consistent with World Administrative Radio Conference 1979 (WARC-79) criteria, specifically states that STC's system can accommodate any reasonable outcome of RARC-83, and STC is willing to accept an FCC construction permit so conditioned. Accordingly, there is no reason for the FCC to delay authorization of interim DBS systems because of unwarranted concerns about United States' negotiating flexibility at RARC-83. Rather, the FCC should take the opportunity to use previously authorized systems to enhance the United States' negotiating position.



STC

Television System for the Nation

In Comsat Magazine No. 2, we carried our first detailed reports on the pioneering proposal of Satellite Television Corporation to establish a direct broadcast satellite (DBS) system. Since publication of those reports, the concept of DBS has won considerable support from the highest levels of government as well as from hosts of prospective customers for the service. The following articles provide a comprehensive look by the officers of Satellite Television Corporation at the past, present and anticipated future for this precedent-setting advancement in communications satellite and broadcasting technologies. Editor's Note.

Continued on page 14

*by **John A. Johnson**, former Chairman and presently member of the Board and consultant, Satellite Television Corporation.*

Satellite Television Corporation (**STC**), a wholly owned subsidiary of **Comsat**, was incorporated in 1980 for the purpose of establishing and operating a direct broadcast satellite (DBS) system. **STC**'s proposed system would provide service to all of the continental United States and parts of Alaska and Hawaii from four satellites spaced 20° apart in geosynchronous orbit. There would be two backup satellites in orbit as well.

On December 17, 1980, **STC** filed an application with the Federal Communications Commission (FCC) seeking permission to inaugurate, on an experimental basis, the first phase of its system. This involves the construction and launch of two satellites—one operational and one in-orbit spare—to provide service to an area approximating the Eastern Time Zone of the United States.

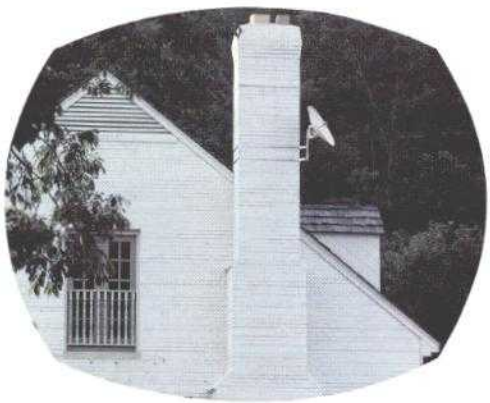
STC proposes to provide three channels of premium pay television programming over its system. Subscribers would pay $14-$18 (1981 dollars) a month for the basic program service. They would be required to buy the small dish-shaped receiving antenna (about 2½ feet or .75 meter in diameter) for approximately $100, including installation. The additional equipment which would be required—basically consisting of an outdoor down converter and an indoor descrambler/channel selector—could be leased or bought, at the subscriber's option. If leased from **STC**, the expected cost would be $8-$10 a month. If purchased, the price is expected to be several hundred dollars.

All of **STC**'s programming will be presented without advertising. In addition to movies, general entertainment and sports programming, **STC** plans to offer a broad range of cultural, informational, educational, public affairs, children's and minority-oriented programming. By programming all three channels, **STC** will be able to present different types of programs over its system at the same time. This ability to "counterprogram" allows **STC** simultaneously to serve different audience segments having distinct interests.

Another unique aspect of the DBS service is the ability to "narrowcast," to offer programming targeted to relatively small segments of the national audience. Thus, **STC** will be able to offer lectures, adult education classes or special cultural events that lack wide audience appeal. Some of these programs might be offered on a pay-per-view or pay-per-series basis.

STC's innovative programming will be supplemented by a variety of special service enhancements, such as teletext, stereo sound, closed captioning and a second language track. **STC** will also incorporate into its satellites a versatile capacity for high definition television; the objective is to test a variety of HDTV techniques and to advance the development of this technology.

Beyond the value of the program service itself, which will help meet growing consumer demand for greater video choice, **STC**'s proposed system promises to yield numerous public interest benefits. First, DBS development will help maintain U.S. preeminence in the satellite communications field in the face of vigorous competition from abroad. Second, because of its ability to reach anywhere that a receiving dish is located, DBS can serve rural and remote areas that are underserved by conventional television and that may never be reached by cable. Third, **STC**'s proposed system will provide a competitive stimulus to the subscription television, program packaging and program production industries. DBS will further stimulate the economy by creating and supporting jobs in the manufacturing, marketing, distribution, installation and maintenance areas. Finally, the entry of a new communications medium will



Facing page: 2½-foot diameter STC antenna mounted on chimney. Above: Same antenna mounted on stand on roof in inner city.

enhance First Amendment values by adding to the diversity of voices available to the American public.

STC's application is pending at the FCC, which is now engaged in a comprehensive evaluation of DBS in four separate administrative proceedings. Significantly, the Commission recently reached a preliminary judgment that the authorization of domestic DBS systems in the 12 GHz band would serve the public interest. Direct broadcast satellites promise to offer valuable services by providing several additional channels of video programming throughout the country.

There has been support forthcoming from other government sources as well. Secretary of Commerce Baldrige has urged the Commission "to resolve DBS questions as soon as possible" so as not to "place unnecessary obstacles in the path of those who wish to invest in new areas of our economy." The National Telecommunications and Information Administration (NTIA), which operates under the aegis of the Department of Commerce, also has endorsed the prompt approval of DBS services. The Justice Department, citing the pro-competitive benefits of DBS is advocating its prompt implementation. And President Reagan recently urged "a free market approach to provide Direct Broadcast Satellite services in the United States."

DBS benefits could be lost if FCC authorization is not forthcoming in the near future. It will take 39 months for the construction and launch of STC's system. STC is hoping for approval of its application by the end of this year.

There has been some determined opposition to STC's proposal, especially from conventional broadcasters who suggest that DBS will damage or destroy the current system of advertiser-supported local broadcasting. All existing evidence shows that this conclusion is unfounded. STC expects to offer a service that will supplement commercial advertiser-supported television. The projected market penetration by the end of the decade for a nationwide DBS pay service like the one STC is proposing is only four to seven million subscribers, a very small percentage of total U.S. television households.

STC commissioned a study by the firm of Arthur D. Little which was included as part of its application. It concludes that the impact of STC's service will be well below the level that the FCC has in the past found to pose a danger to the economic well-being of established broadcasters. This basic conclusion has been echoed in a study by Kalba-Bowen Associates that was commissioned by the National Association of Broadcasters and in a report by the television Station Representatives Association. Both NTIA and the FCC have expressed the opinion that the impact of such DBS systems on conventional, advertiser-supported television will be "negligible." There are thus no grounds to fear for the health of commercial television because of the advent of STC's service.

STC's system promises to offer innovative programming and advanced technology in one exciting package. It will expand viewer choices, provide competitive stimulation to the economy, serve remote, underserved areas and enhance U.S leadership in satellite communications without harming the system of local, over-the-air broadcasting. This new service deserves the chance to test its appeal in the marketplace and to succeed or fail on its own merits.

Satellite-To-Home Pay Television

by Satellite Television Corporation

Overview: Three channels of subscription television without commercials directly from satellites to small antennas at homes of individual subscribers.

Coverage: Initial phase, area approximating Eastern time zone. Subsequently, expand to cover all 50 states with each time zone covered by separate satellite. (Hawaii and Alaska served by satellite serving Pacific mainland time zone.)

Programming: Three channels, without commercials:

Channel A "Superstar"	Channel B "Spectrum"	Channel C "Viewer's Choice"
-Major motion pictures	-Children's programs	-Sports
-Popular concerts	-Film classics	-Adult education
-Theatre specials	-Public affairs	-Experimental theatre
-Family entertainment	-Performing arts and cultural attractions	-Lecture hall

- Special programs offered on pay-per-program, pay-per-series basis.
- Experiments with high definition television pictures.
- Optional service: stereo sound; simultaneous second language; closed captioning for the hearing-impaired; teletext.

Reception: Home equipment bought or leased from competing sources:

- Outdoor: Dish antenna (2½ feet in diameter) with unobstructed line-of-sight to satellite; related electronics; antenna mount hardware.
- Indoor: Cable connection to small set-top unit to descramble signals and to select STC channel fed into vacant channel on subscriber's standard television set.
- Quality comparable to general cable reception.

Subscriber cost: About $25 per month (1981 dollars) for basic three-channel service and equipment leased from STC. Installation of receiving equipment would cost about $100, including purchase of antenna. Basic programming service alone would cost $14 to $18 per month. Other home equipment available from competing sources so purchase cost will vary, to lease from STC $8-$10 per month.

Distribution: Programming service and equipment sales, installation and service available through local agents.

Satellites:

- First phase covering Eastern service area, one operating and one backup;
- Full national service would use four operating and two backup satellites;
- Type—PAM-D class satellites;
- High-powered—Minimum of 1,700 watts; traveling wave tubes with minimum of 185 watts;
- Uplink: 17-GHz band; Downlink: 12-GHz band;
- Proposed orbital location, 115° W longitude for Eastern service area satellite.
- Full nationwide service satellites 20° apart in geostationary arc (115° W, 135° W, 155° W and 175° W longitude).

Ground Facilities:

- Broadcast center and satellite control facility near Las Vegas, Nevada;
- Backup transmission and control facilities at Santa Paula, California (to provide backup control);
- Engineering support facilities at Washington, D.C.

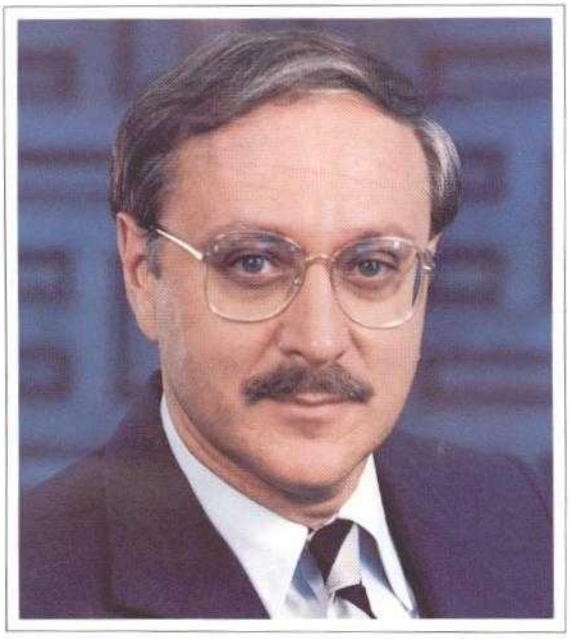
Television via DBS

New Avenue for U.S. Leadership

by **Irving Goldstein**, *President Satellite Television Corporation.*

The coming of direct broadcast satellite (DBS) systems has enormous significance for the United States. DBS has the potentional to become big business worldwide. Japan, Canada, France and Germany already are in the process of developing DBS systems, and many other nations around the world have DBS plans under consideration. The prompt introduction of DBS in this country could prove very important to maintaining U.S. preeminence in commercial satellite communications.

The stakes are very high indeed. Technological stature translates into economic strength. Nations in the vanguard will have a great deal to gain. International competition will be keen for leadership in the development of



DBS. Fortunately, the U.S. is in an excellent position to spearhead the worldwide growth of this technology. DBS proposals like the one advanced by STC give the United States the opportunity to seize the initiative. At stake is access to vast international markets, vast export opportunities and large numbers of newly created jobs.

DBS technology will break new ground. A system like the one STC has proposed will mark a major leap forward in domestic satellite communications.

The exceptionally high power of the STC satellites will be one of the system's principal technical innovations. Each satellite will carry three operating high-powered traveling wave tube amplifiers, each with a power of 185 watts. This contrasts with the per-channel output of today's satellites, which generally have more amplifiers onboard but have tubes operating at five to ten watt levels.

Another advanced feature of the STC satellites will be the shaped-beam antennas they will deploy. This antenna system will be more complex than any used on present domestic satellites. The shaped beams are needed to guarantee that a sufficiently intense concentration of signal power is spread throughout the satellite coverage area.

Because of their high power and antenna system, each of STC's spacecraft will be able to beam to a large area—roughly equivalent to an entire time zone—while disseminating a signal strong enough to be picked up by home antennas as small as 2½ feet in diameter.

The satellites will have a seven-year design life and will broadcast in the 12.2 to 12.7 gigahertz band. They will make highly efficient use of the frequency spectrum and orbital arc, allowing ample room for the DBS satellites of other potential systems.

The home reception portion of STC's system will also have its share of innovative features. The small size of the dish antenna will make it easy to install and maintain. And the indoor descrambler unit will have "individual addressability" so that STC can target messages and programs to subscribers as required. For example, each descrambler will be assigned a unique code. Using this "address," STC will be able to send a coded signal by satellite that will permit a subscriber's descrambler unit to be activated. The same process will permit STC to disconnect service in an individual household.

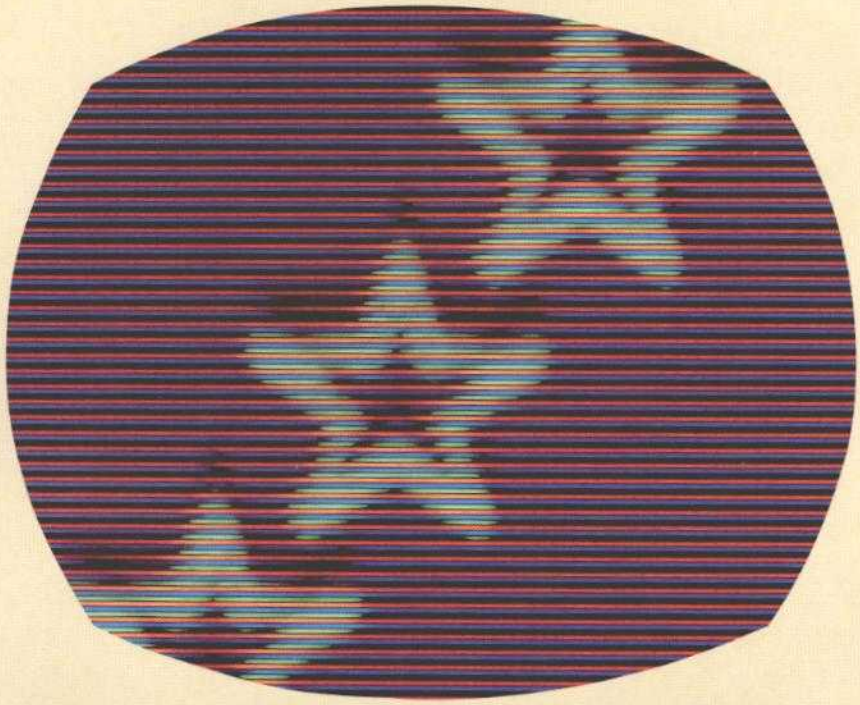
Taking the lead in developing a broad-based DBS capability will have wide-ranging implications for the United States. Government officials and economists agree that restoring America's economic strength necessitates clearing away obstacles to technological progress and providing incentives for investment in high-technology businesses. DBS presents a prime opportunity to assert American interests.

DBS systems like STC's will stimulate U.S. economic activity. In fact, the STC system alone will entail an investment greater than one billion dollars through its service life and will support between 15,000 and 23,200 jobs in its full implementation, according to U.S. Department of Labor projections.

The deployment of other domestic DBS systems will contribute additionally to U.S. economic productivity and growth. Moreover, it is projected that DBS markets and export opportunities will be worth in excess of ten billion dollars by the end of this decade. Foreign industry, particularly in Japan and in Europe, is moving ahead with the systematic support and subsidization of their governments to dominate this important sector of economic activity. The rapid development of DBS may prove decisive to American industry's ability to compete against foreign suppliers.

Significantly, President Reagan recently stressed the promise that DBS holds to stimulate new investment and employment opportunities for all Americans: "[DBS] presents us with a new era of tremendous creativity and makes possible the expansion of delivery systems for new programming and increased employment."

Congress and the White House have identified the preservation of the United States' leadership position in space technology as a high priority national objective. The rapid implementation of DBS will promote U.S. advancements in the art of satellite communications, and the technical innovations associated with DBS will be useful for future satellite communications services.



STC & Rural America

The following article is an excerpt of John A. Johnson's testimony before the Subcommittee on Communications of the Committee on Commerce, Science & Transportation, United States Senate. Mr. Johnson testified before the Senate subcommittee on June 22, 1981. Editor's Note.

Continued on page 22.

COMSAT®
COMMUNICATIONS SATELLITE CORPORATION MAGAZINE

Starting with one primary satellite and one spare serving an area approximating the Eastern time zone, the system will be enlarged to cover all 50 states with each time zone covered by a separate satellite. Hawaii and Alaska will be served by the satellite broadcasting to the Pacific mainland time zone.


THE VIEWING ZONES,
SATELLITE TELEVISION CORPORATION

STC & Rural America

With STC's proposed system and service in mind, let us consider the distinctive communications needs of our rural populace.

Since the inception of broadcasting in this country, policy makers have grappled with the chronic problem of bringing an adequate level and a richer variety of telecommunications services to rural communities, small towns and remote locations. Congress has long been committed to the objective of extending the availability of telecommunications to all Americans. This objective is embedded in the Communications Act, and improved rural communications is an integral part of the public interest standard which the FCC administers. Yet, today, in spite of all efforts, a map sketching nonserved and underserved areas would cover large stretches of the country, encompassing millions of people. It seems that the problem of rural communications has defied solutions. However, new communications technologies are now emerging and these advances offer hope that meaningful progress is on the horizon.

In this context, the FCC's preliminary finding this April, that it is in the public interest to allow direct satellite-to-home service, is of particular relevance to rural Americans. Whereas population diffusion and distance have previously created economic obstacles that have prevented new communications services from becoming available to all Americans, approval of direct broadcast satellites would help to equalize the television service options of urban and rural Americans. Even Americans who live in the most remote areas of the country could expect to have access to the same satellite service as urban Americans because our DBS transmissions will have nationwide coverage and will be beamed directly to viewers' homes.

STC's direct broadcast satellite system will provide a first television service to many rural households. Our system will also enlarge consumer choice and offer a diverse mix of programming in rural areas now inadequately served by existing media. For instance, based on NTIA studies, there are approximately 1.2 million households in rural America that receive no television and over 4 million households that receive only one or two channels. According to these studies, 80 percent of rural households receive three or fewer channels of television service. Thus, there are millions of rural residents who either lack television altogether or who must content themselves with poor television reception or a very limited choice of programming. Moreover, tens of millions of rural residents lack access to pay television, which viewers value very highly.

Against this backdrop, the potential public benefits of DBS can be clearly seen. Direct broadcast satellites can ensure that rural America shares the advantages of modern technological improvements along with the rest of the nation. A DBS system such as the one proposed by Satellite Television Corporation will represent an effective means of extending television service to those parts of the country which are currently not served or are underserved by conventional broadcasters and cable operators.

John A. Johnson testifying on STC & Rural America before Subcommittee on Communications of the Committee on Commerce, Science & Transportation, U.S. Senate.

Relevant Trends

Contemporary rural America defies stereotypes. Any discussion of how a direct broadcast satellite system might

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STC and Small Business

by George H. Billings,
Vice President
Business Development
Satellite Television Corporation

Small business in the United States is big business. And small business enterpreneurs could well play a key role in the success of satellite-to-home television.

The Bureau of Labor Statistics at the U.S. Department of Labor has estimated that a nationwide satellite service such as the one proposed by Satellite Television Corporation would, directly or indirectly, support approximately 23,000 jobs at the peak of activity in the mid-to-late 1980s, leveling off to 15,500 jobs on a continuing basis.

A substantial number of these jobs could go to small enterprises. The marketplace promises to be highly competitive and attractive to many smaller firms. In the areas of home equipment sales, service, installation and maintenance, the expertise and geographic spread of local companies will help to give subscribers a readily available sales and service network.

Programming, too, presents opportunities for small business since ***STC*** *intends to devote considerable resources to encourage program production from new and innovative sources.*

STC *will be responsible for programming all three of its channels. It will also specify the technical standards for the home receiving units, the satellites and related equipment. However, a host of other businesses will be given an opportunity to supply a wide variety of hardware and programming products and to furnish a broad array of services.*

The competitive marketplace will determine the cost of the home equipment. The objective is to have numerous retailers throughout the country vie among themselves to serve the home equipment needs of subscribers.

STC *plans to establish a network of authorized agents to lease, install and maintain the receiving equipment. These agents would obtain the home equipment components from* ***STC*** *or directly from manufacturers and would receive training in proper installation and maintenance. In addition, it is expected that independent companies will enter the sales, installation and maintenance business, further ensuring a competitive market.*

Beyond the retail sales and installation opportunities inherent in ***STC****'s proposed service, a venture of this size inevitably requires other services and products from small business. There is a sizeable potential for small entrepreneurs to act as subcontractors to manufacturers of the satellites,* ***STC****'s own ground control facilities and the home equipment. Printing, publishing, construction, transportation, real estate, lodging and similar peripheral services could provide additional favorable impact on small business.*

Overall, satellite-to-home television will not only have an impact on the economy as a whole but will also provide significant opportunities to small business. In turn, small business will have the opportunity to provide many of the essential services needed by ***STC****'s subscribers.*

Facing page: *STC antenna being installed on the chimney of a log house in country.*

Above: Ground-level installation of STC antenna on stand for a mobile home.

serve these areas must necessarily take account of the domestic and international forces which have been working to profoundly alter the character of rural America.

During the decade of the 1970s, the movement of people from rural to urban America was reversed in almost all regions of the country. Now non-metropolitan areas are gaining population faster than metropolitan areas. More Americans are leaving cities than opting to settle in them. Most urban newcomers to rural America are employed outside of farming—in the professions, in the wholesale or retail trade and manufacturing. The decision to migrate to the countryside, however, in no way diminishes people's expectations for television service. Rural residents—whether they are newcomers or lifelong residents—are just as eager as urbanites to receive diverse television fare. Cable industry statistics show that the proportion of rural residents electing to subscribe to cable when it becomes available in their community exceeds the proportion of subscribers in urban areas.

The population growth in non-metropolitan America is associated not only with the shift in manufacturing sites and the search for alternative lifestyles, but also it is occurring because of an influx of retirees. Rural elderly as a group suffer from a lack of mobility. Nearly half of them lack access to either their own or public means of transportation. As such, large numbers of rural elderly are isolated in remote communities. Under these circumstances, the importance of television as a primary source of information and entertainment for this group cannot be underestimated.

Development of the recreation industry also has influenced recent settlement patterns in rural areas. Michigan, New Hampshire, Vermont, Missouri, Arkansas, California, Oregon, Utah, Colorado—all are states where the rural population growth during the last decade was induced to a significant extent by a booming recreation industry. Inevitably, this industry growth has yielded a demand for expanded services, which rural communities often find difficult, if not impossible, to provide. Because much of the recent recreation industry development has occurred in mountainous areas where television reception is frequently poor, the delivery of improved television services to many rural areas has presented a difficult problem. But direct broadcast satellites can overcome such terrestrial barriers. Thus, virtually any community in the United States—whether it is situated in the mountains or on the plains—can potentially receive premium television services.

Another noteworthy trend is that the number of farmers who combine farm and non-farm pursuits has grown substantially. The wage contribution of these non-agricultural jobs spells the difference in some cases between a marginal income and a tolerable income for many farm families. The ability of a farm family member to garner extra income from non-agricultural employment clearly is influenced by that person's skills. The continuing education programs of junior colleges prepare many adults for new careers. But rural residents must travel farther than their urban counterparts to gain access to continuing education. The long travel distances, compounded by the high travel costs, combine to severely handicap the rural resident interested in improving his or her employment

skills through continuing education.

While farm employment has declined dramatically in some non-metropolitan regions of the United States, there are places where employment in agriculture continues to dominate. Agriculture remains the primary source of income for many families in the hundreds of counties in the Great Plains and Corn Belt. But the statistic that arouses concern here is that the average age of the small family farmer has now risen to 53 years. A major thrust of this country's rural development program has consistently been to inhibit further thinning of small family farms by enhancing the quality of life in rural America. Underlying this policy is the belief that young persons could be more easily persuaded to follow in their parents' footsteps if managing a small family farm did not automatically exclude them and their families from many of the amenities, such as television service, that have come to be considered basic to the average non-rural American's living standard.

Rural America's Contributions

The significance of our agricultural resources was highlighted during the 1970s when agricultural exports helped to offset large foreign trade imbalances

continued next page

STC and MESBICs

by Judith S. Elnicki
Vice President, Public Affairs
Satellite Television Coporation

*To ensure that minority firms are able to participate in the economic benefits of satellite-to-home TV service, **STC** will create a $1 million Minority Enterprise Small Business Investment Company (MESBIC).*

MESBICs are venture capital firms devoted to the funding of minority businesses. They are licensed and regulated by the Small Business Administration (SBA). MESBICs also receive matching funds from the SBA.

*Most MESBICs are joint ventures of a number of private corporations. Others are owned by individuals, non-profit organizations, or state and local government. Only a small number of major corporations have their own MESBICs: General Motors, Ford, General Foods, Control Data, Equitable Life, Sears, Sun Oil, Standard Oil of Indiana and MCA. Since all of these are multi-million dollar enterprises, **STC** will be by far the smallest corporation to have its own MESBIC. **STC** also will be the first to establish a MESBIC as an integral component of a start-up venture.*

*To set up its MESBIC, **STC** will be required to obtain a license from the SBA. The company will apply for such a license after it receives its construction permit from the FCC. At that time, it will incorporate the MESBIC, make a formal commitment of funds and file a detailed operating plan. Once SBA approval is obtained, **STC** will capitalize the MESBIC which will begin to invest its assets in minority businesses.*

*The $1 million initial private capitalization proposed by **STC** for its MESBIC is twice the amount required by the SBA, and is equal to the median private capitalization of the MESBICs established by the corporations listed previously. The impact of that $1 million can be increased in three different ways. First, the MESBIC can obtain up to four dollars in matching funds from the SBA for every one dollar of private capital. Second, the minority businesses themselves can obtain unsubordinated debt financing from local bankers as a result of the equity invested in them by the MESBIC. Third, syndications with other MESBICs (or with other sources of financing) can be arranged. Within two years of the formation of the MESBIC, **STC**'s $1 million investment could lead to the generation of more than $4 million for investment in minority businesses through the use of these three types of leverage.*

mainly attributable to oil imports. Now, as the world's major supplier of foodstuffs, Americans have been compelled to recognize that food production is of fundamental importance to the future of this nation. And with international and domestic demand for American foodstuffs projected to increase during the 1980s, American farmers will have to devote still more agriculture and non-agriculture resources to the production of food in the years ahead in order to satisfy the anticipated growth in demand. Farm owners and managers can be greatly assisted in this endeavor by having access to timely weather and agricultural information. Advanced video-based information services can be made available for this purpose, thereby helping ensure the most efficient and productive use of this country's agricultural resources.

In reviewing some of these trends of change in rural America, it is important to keep in mind what virtually all observers concede—that the needs of rural residents are not being adequately met by existing television delivery systems. Conventional broadcasting and coaxial cable together provide many urban residents with a growing variety of television fare, but they fall far short of providing the same level of service to rural Americans. Owing to the development of direct broadcast satellites, however, the technology is now available which can surmount the economic problems that have deterred other television delivery systems from penetrating rural areas. It is essential to encourage the application of a new technology, such as direct broadcast satellites, that would have special value and utility in rural America, in addition to its nationwide benefits.

How STC will serve rural America

Development of direct broadcast satellites will serve the interests of rural Americans by enhancing rural life in several important ways.

DBS Can Reduce the Inequities Between Rural and Urban Areas

DBS will offer a wide selection of entertainment and information programming to rural residents who are presently not served or who are underserved by existing television media. In this manner, STC's direct broadcast satellite system will help redress the inequities that now characterize the nation's television system. With direct broadcast satellites, rural residents, no matter how geographically isolated they may be, will have access to premium programming typically becoming available now only in urban areas.

Improvement of communications services in rural areas will support the national objectives of revitalizing and developing rural areas as a means of achieving balanced national growth. Due to the important contribution to America's future being made by persons employed in agriculture and the energy extracting industries in non-metropolitan areas, Congress assigned the "highest priority" to this national objective in the Agriculture Act of 1970 and in the Rural Development Act of 1972. The significance of direct broadcast satellite technology, thus, is that it represents a dramatic step forward in providing the same quality television service to rural residents that populations in industrial areas have come to consider an essential amenity.

Below: Antenna installation on the chimney of a farmhouse.

STC and HDTV

by Leo M. Keane
Vice President, Engineering
Satellite Television Corporation

***STC** will incorporate hardware in its satellites to permit experimentation with a wide variety of high definition television (HDTV) signals during unprogrammed periods on two of the normal TV transmission channels. **STC** will provide access to that capability by qualified parties interested in testing and demonstrating HDTV technology with the goal of promoting and advancing to the earliest practical date commercial introduction of HDTV in the United States.*

Home reception of HDTV satellite transmissions would permit large-screen projection of TV images with a perceived quality approaching that of film. The graininess in currently available large-screen video displays using conventional U.S. transmission standards is apparent to most observers.

There are, however, significant evolutionary problems in introducing HDTV into the present U.S. environment. Because of expected differences in aspect ratio, luminance bandwidth, the method of handling luminance and chrominance information, line rates, etc., there is substantial expert opinion that HDTV standards cannot be synthesized which would permit compatible and economic reception by conventional TV receivers. Unless this can be overcome, HDTV transmissions would only be receivable on specially designed television sets, different from those required for normal over-the-air VHF/UHF broadcast. This basic incompatibility can be expected to have a significant retarding effect on the broad domestic introduction of HDTV for home use.

Reduction in the bandwidth currently required to broadcast HDTV signals via satellite will undoubtedly also be necessary. If transmitted using conventional analog methods, HDTV channels might require five or six times the bandwidth of a conventional television signal. There is hope, however, that, with further research and development, digital processing and transmission of the TV signals will reduce and make affordable the necessary bandwidths.

*It may be possible to initiate commercial service of this sort in a second generation of DBS satellites sometime in the 1990s. It is hoped that the versatile experimental capability planned in **STC**'s DBS will stimulate resolution of these fundamental issues and the development of suitable national HDTV standards.*

DBS Can Provide Farmers Up-To-Date Weather and Agricultural Information

STC's direct broadcast satellites will enable farmers to receive the latest commodity and livestock prices, weather forecasts, pest management information and a variety of other data services. This capability can be offered by means of a video-based information system, called "teletext," which will broadcast text and graphic material on the home television screen.

Information transmitted via teletext will draw on fresh data sources and will be updated several times daily. The attractive aspect of this service for farmers and other rural residents is that it will enable them to base their day-to-day operating decisions on the most current information. Possession of the latest information will, in turn, serve to enhance their productivity. Receipt of prompt weather information, to take one example, is apt to help the farmer reduce pesticide bills and improve irrigation efficiencies.

The National Weather Service and the USDA Extension Services recently conducted a relevant experiment which confirms the potential utility of STC's proposed teletext offering. In this

Above: STC antenna photographed at nightfall.

experiment, computer-based weather information was transmitted via telephone lines to farmers in rural Kentucky. The farmers who had access to this experimental information delivery system, known as "Project Green Thumb," responded very favorably to the service.

DBS Can Deliver Adult Education and Instruction

The capacity of direct broadcast satellites to aggregate audience segments from various parts of the country for special-interest programs makes the technology particularly suitable for education.

Rural youth is one group that stands to benefit from satellite-delivered education. They have few employment options. Often they lack the education or training which would allow them to compete for new jobs becoming available in the rural labor markets. Yet these same young people are potentially the most trainable and adaptable group in the rural population. Whether rural youth are able to take advantage of new employment opportunities in their communities will be determined in large measure by their access to education.

Women constitute another important group in the rural population whose educational needs are not being satisfied. Women who live in sparsely settled areas generally find few opportunities to continue their education or acquire new skills. Family responsibilities tend to confine them to the home. And community colleges often are not situated within a manageable commuting distance.

Similarly, continuing education opportunities for the elderly in rural America are sorely wanting. Retirees who once had access to rich community college continuing education programs in metropolitan areas are often frustrated to find a dearth of such programs in rural communities. Many small towns simply lack the resources to develop educational institutions for adults.

DBS can help meet these needs. STC's programming schedule will devote significant air time each week to educational and instructional programming and thus will make a meaningful contribution to the quality of rural life. To illustrate, STC expects to devote approximately 15 percent of the air time on one of its channels to courses addressing the continuing education requirements of various professions. About 33 percent of the air time of a channel will be devoted to a second type of educational program that will focus on adult education at both the high school and college levels. Our objective will be to present a variety of courses enabling persons to initiate work on, or possibly complete, high school and college degrees. Moreover, STC will present instructional programming targeted to the needs of rural America. In addition, we plan to establish a Citizens Advisory Council which will have rural representation, to help us meet evolving rural programming interests.

DBS Can Bring Direct Economic Benefits to Rural America

Development of direct broadcast satellite technology will create important economic benefits for America as a whole. Rural America will share in these benefits. The establishment and operation of STC's DBS system will entail, over its construction phase and seven-

year operating lifetime, an investment in excess of one billion dollars. Importantly, this investment will be made in a high growth, high technology sector of the economy. According to U.S. Department of Labor forecasts, STC's project alone will support approximately 23,000 jobs at its peak of activity. We expect substantial new employment opportunities to open up in rural areas and small towns, especially in connection with sales of the service and installation of home equipment in these marketplaces.

STC plans to rely on local sales and service dealers and local distributors to market our subscription service and to provide and maintain the home equipment that STC subscribers will require. This activity is expected to offer attractive business possibilities to local enterprises and entrepreneurs, and should be of special interest to those organizations which have traditionally been concerned with ensuring that basic services are extended to all rural residents—namely the telephone cooperatives and the electric power cooperatives.

Summary

In summary, the STC direct broadcasting satellite system promises to become a valuable communications resource in the service of rural Americans. We believe that DBS holds the potential to:

- reduce the inequities in television service that now exist between rural and urban America;
- introduce diversified home video service to areas deficient in video choices;
- provide farmers with vital up-to-date weather and agricultural information upon which to base day-to-day operating decisions;
- deliver adult education and instruction tailored to the interests and needs of different groups in the rural population;
- create new business and job opportunities for rural residents who will sell, install, and service the home equipment used by STC subscribers.

STC and Spectrum Allocation

by Warren Y. Zeger
Vice President and General Counsel
Satellite Television Corporation

DBS will operate in a band of frequencies specifically allocated for satellite broadcasting by international agreement. The national policy of the United States has for over a decade been to seek a reservation of spectrum sufficient to enable the development of DBS. Clearly, the impetus behind this policy has been the intent to encourage American advances in a high technology field, itself an objective based on the recognition that a nation's technological stature translates into economic strength. Indeed, as early as 1973, the FCC stated that it was "deeply committed to retaining a viable allocation" for DBS.

Prior to 1979, DBS shared an allocation in the 11.7-12.2 GHz band with the Fixed Satellite Service (FSS) —e.g., the existing domestic satellites. In order to provide for the important long term requirements of both services, it was determined to place each service in a separate band. Thus, the United States became a leading advocate for the allocation of the 12.2-12.7 GHz band to DBS at the 1979 World Administrative Radio Conference. Significantly, the U.S. position at this international treaty was based on a thorough domestic evaluation of alternative uses for the spectrum, involving years of preparation and inter-agency coordination. The requirements of other radio services, including the FSS, community reception public services and fixed microwave services (FS), were taken into account during this process, and provision was made for their existing and long term needs in numerous other frequency bands.

Community reception DBS services have spectrum allocated to them at 2500-2690 MHz. This band segment

continued next page

has not been used since its allocation, and the FCC now has a proceeding under way in an effort to encourage the development of community reception systems in this choice portion of the spectrum.

Although claims have been made that the Fixed Satellite Service will be given part or all of the 12.2-12.7 GHz band, these claims rely on dated FSS capacity estimates which yield grossly misleading results. NASA, which commissioned the underlying studies to gain support for its program to lay a technology base for Fixed Satellite Service systems operating in the 30/20 GHz band, has concluded that currently used FSS allocations will be adequate at least through the early 1990s and possibly through the end of the century. It is expected that NASA will demonstrate the commercial usefulness of the 30/20 GHz band and that a prototype commercial satellite system will be deployed before the end of this decade. This band will supply an enormous amount of new FSS capacity.

The situation involving the fixed microwave service (FS) users is somewhat more complex. As a number of FS systems will cause destructive interference to the reception of DBS transmissions in certain major metropolitan areas (rural areas are not affected), implementation of DBS systems will require frequency changes by some FS users. Many of these which will have to adjust their operations to allow the introduction of DBS could be accommodated within the same band. Costs for such adjustments will be nominal. While it is likely that the relocation of some Fixed Service systems to higher frequencies will become necessary, certain classes of FS users could readily move to the 18/22 GHz band, which provides substitute spectrum already allocated for FS use.

As previously noted, the United States in 1979 selected the 12.2-12.7 GHz band as the appropriate band in which to accommodate DBS development. This decision was made with full awareness of its potential effects on Fixed Service systems. Private microwave operators actively participated in the domestic proceedings and their protests were evaluated and overruled. The government's decision was accompanied by a series of explicit notices alerting Fixed Service users that they might be required to adjust or relocate their operations in order to permit the introduction of direct satellite broadcasting. Further, all Fixed Service licenses granted or renewed since 1979 have been conditioned with that express understanding.

While adjustments by Fixed Service operators are essential if DBS is to become a reality in this country, those adjustments can be made in a spectrally efficient and economical manner. Moreover, it is important to note that it will be at least 1985 before any Fixed Service systems are required to make adjustments. In that period, normal depreciation of existing equipment will lessen significantly the impact of equipment replacement.

*Nevertheless, **STC** has been mindful that approximately 37 percent of all Fixed Service operators are non-profit public service organizations. To ensure that none within this group is asked to bear a financial hardship, **STC** has notified the FCC that if operational changes are required by any such organization in order to avoid interference with DBS reception, **STC** will absorb its fair share of the attendant costs. Specifically, **STC** has proposed that non-profit public service organizations be reimbursed on a shared basis by all DBS applicants who are authorized to construct DBS systems by the FCC.*

In summary, the 12.2-12.7 GHz band is a portion of the spectrum which has been specifically intended and set aside for DBS use. Practically speaking, it is the only band available for DBS development in this decade. While DBS opponents are pressing the claims of other services for access to the DBS band, all of these services have ample allocations in other portions of the spectrum to satisfy their long term growth requirements. For DBS, unlike the other services, access to the 12.2-12.7 GHz band is a question of survival. Recent FCC proposals to allow DBS the use of this band recognize this fundamental consideration, and the FCC's proposed action amounts to nothing more than the domestic implementation of an international agreement which the United States sponsored.

INDUSTRY IN SPACE

A Plan for Increased Participation

The article that follows is an abbreviated version of a paper presented at the 19th Goddard Memorial Symposium of the American Astronautical Society, held this past spring in Pentagon City, Virginia. Editor's Note.

It does not take a special visionary to see commercial potential on the horizon for such space technologies as large space platforms, space manufacturing, high frequency communications, and solar satellites. Remote sensing technology has been ripe for commercial development for several years. Yet how do we, as a nation, expect to reap the benefits of the development of these technologies when we do not have a mechanism for the commercial application of our achievements and when it appears that the United States Government is prepared to significantly reduce the funding for such activities?

Several steps must be taken now to revitalize our civilian space program and to foster the commercial development and application of space technology. We must look to private investment to provide some of the funds to support new civilian space projects. We need to redefine the relationship between government and industry in the conduct of civilian space projects and to give industry and other investors incentives to provide the needed funds. Finally, industry must seek new sources of financing by forming ventures which are attractive to investors with new venture capital.

by ***Dr. Paul M. Maughan,*** *Director, Earth Resources Sensing Systems, left, and* ***Dennis J. Burnett,*** *General Attorney, International and Legislation, Comsat General Corporation*

Reduced Funding of Civilian Projects

The size and expense of the federal bureaucracy have prompted the Reagan Administration to question the role of the Federal Government in a variety of programs vis-a-vis state and local government and private industry and individuals. The President and his new administration are examining and recasting the fundamental relationships which have been established with and within the Federal Government. The focus of this examination was set forth by the President in his address to the Joint Session of Congress on February 18:

"Spending by government must be limited to those functions which are the proper province of government. We can no longer afford things simply because we think of them."

It is apparent, given the present budget and

the pressures to further reduce Government spending, that NASA will not have the resources at its disposal in the near future for major new missions. Confronting the reductions in NASA's budget, one might question what the proper province of government might be within the sphere of NASA versus civilian space activities questions.

The role of the government in civil space programs is set forth in the National Aeronautics and Space Act of 1958. NASA is charged with the responsibility of (1) conducting research into the solution of problems of flight, and (2) the development, construction, testing, and operating for research purposes of aeronautical and space vehicles.

Simply said, NASA's charter is to conduct research for the advancement of knowledge and the maintenance of a national technology base. We see no evidence that the new Administration questions this mission as a proper role of government. The NASA budget reductions would therefore appear to be fiscal rather than prompted by a fundamental shift in policy.

INDUSTRY IN SPACE

The vast majority of Americans concerned about the commercial use of space will probably agree that the continued development of the civilian U.S. space program is in the national interest of the United States and that the nation cannot afford in the long run to forego development of new civilian space missions. How then, if NASA will no longer be able to fund such missions, will funds be made available to support such new missions?

Will private industry step in to fill the gap? We believe that the answer to that question is "no;" that is, if one asks the question while assuming that private industry will merely replace the U.S. Treasury as the source of funds for NASA R&D missions. However, private investment may be available to fund new space projects if the right conditions are created; that is, if the proper framework is built to encompass cooperation between government and industry in which their respective interests are accommodated. It is our belief that private investment may be used to achieve our national space goals.

Charter for Cooperation

The role of private industry in space is fundamentally different than that of the government. While industry does conduct research and development activities, these activities are generally in pursuit of their primary business goals. Industrial research and development, in contrast with NASA's R&D, is product- or service-oriented. Furthermore, an acceptable percentage of industrial R&D activities must result in profitable business applications.

While the fundamental roles of industry and government are distinct, they are not incompatible. There is a common ground on which a new relationship can be established. A new Charter for Cooperation between government and industry needs to be drafted to exploit the commercial potential of civil space technology.

We propose that such a new Charter for Cooperation incorporate these principles:

1 Government and industry should cooperate in the commercial development of current operational programs by transferring such programs to the private sector and terminating programs (and initiating no new programs) whenever it is possible to procure the same or similar services from the private sector.

2 Cooperative programs, joint ventures, and joint endeavors involving governmental and commercial activities should be encouraged whenever possible.

3 Research and development activities should be formulated with a view toward commercial application of the resulting technology and should encourage the participation of private capital and commercial utilization of the resulting technology.

Cooperative programs and joint ventures between government and industry should be used to foster the development of new technology and to share the total costs of civilian space activities. For example, an experimental NASA payload and a commercial payload could be carried on the same spacecraft, thus reducing the launch and spacecraft costs to both parties.

There may also be industrial payloads or missions in which the government may have a legitimate interest, and vice-versa. In such cases, a joint venture involving a closer relationship may be required rather than a simple launch and spacecraft sharing arrangement. We envision joint research and development activities involving both government funding and private capital. Such arrangements would have two obvious benefits. First, there would be a more-immediate commercial utilization of the resulting technology. Second, the infusion of private capital into such projects would allow NASA to spread its funds over a greater number of missions or programs.

Are there precedents for what we are proposing? The answer is "yes." For example, the Federal Government and the U.S. automakers have a joint research project for a fuel efficient vehicle, and the Federal Government and U.S. oil companies have a joint venture to develop deep sea drilling technology.

More directly pertinent to this topic, NASA has established guidelines regarding joint endeavors with U.S. domestic concerns in materials processing in space. The first implementation of this policy was in a joint endeavor agreement between NASA and McDonnell Douglas to develop and demonstrate the technology of continuous flow electrophoresis (C-F-E) in the low gravity environment of space and to ascertain the applicability of this technology to the production of pharmaceutical products.

We believe that the joint endeavor guidelines and the joint endeavor agreement with McDonnell Douglas show remarkable flexibility on the part of NASA and hold great promise not only for materials processing in space but other civilian space activities.

Investment in Space

Joint endeavors or joint ventures between government and industry will not work unless industry is willing to invest the necessary funds and make the investments at risk. Generally speaking, large corporations are reluctant to invest their shareholders' money in risky ventures. As an article on this topic in the March 22, 1981 edition of the *New York Times* pointed out, most companies accept a "second-to-market" role. "They'll not spend money up front, but will try to cash in once something is proved."

It is probably unrealistic to assume that many companies will change this attitude. However, we believe that there are ways for companies to participate in ventures with the more venturesome investors to develop new space technology.

There is a large amount of venture capital in this country which is invested in very risky business propositions. The sort of ventures which attract this venture capital usually have two features: (1) some form of immediate tax benefit to the investor, and (2) the potential of handsome return on the investment.

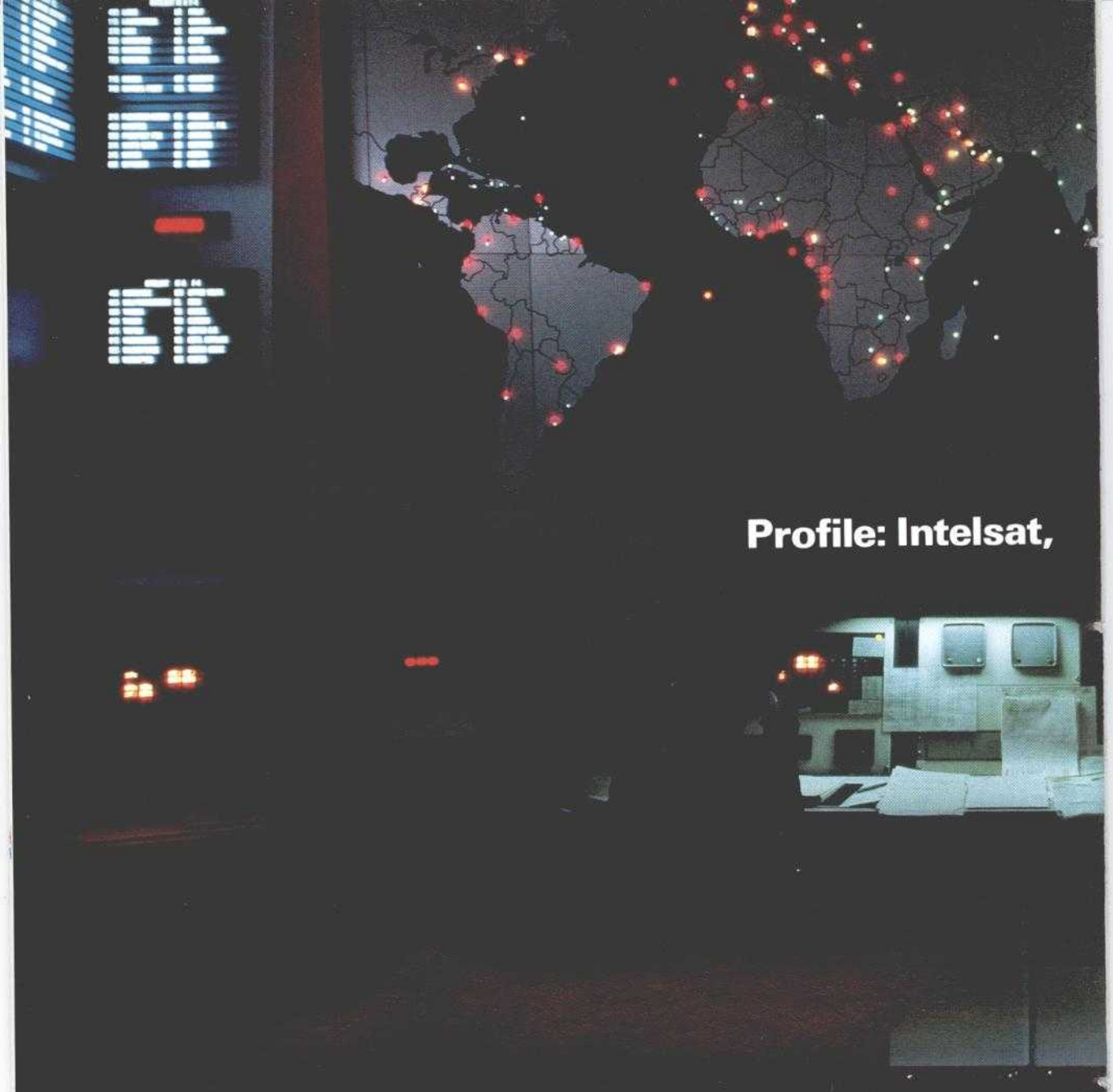
The government could also foster the development of joint ventures by providing further tax incentives and relaxing the SEC controls on the formation of joint ventures involving a large number of investors. We believe such measures would be in furtherance of the President's preference for incentives but not subsidies for business development.

There are probably many innovative ways to attract investment in space technology development. Industry needs to learn to tap these sources of venture capital in combination with its managerial and technical expertise to bring about the formation of innovative joint endeavor projects with NASA.

Conclusion

The revitalization of our civilian space program requires the fostering of a new relationship between government and industry in the conduct of space missions. Cooperative programs, joint endeavors, and other similar ventures involving both government funding and private capital must be applied to research and development activities formulated with a view towards commercial application of the resulting technology.

Several established joint government and industry research and development projects provide the framework to implement larger research and development space missions. This framework coupled with the availability of venture capital should provide the impetus for a new era of civilian space activity.



Profile: Intelsat,

From a newly-completed facility on the first floor of the **Comsat** Building in Washington, D.C., visitors can virtually peer over the shoulders of the engineers at work in the Intelsat Operations Center. They can watch as the controllers monitor and coordinate the smooth flow of international telecommunications traffic among almost 250 earth stations in 135 countries, using more than 800 pathways via the 12 operational satellites in the Intelsat system.

Because of its geographic location, the visitor could be forgiven for thinking that the center was a **Comsat** operation and, following on from that, that **Intelsat** was one of those growing number of **Comsat** subsidiaries...After all, **Comsat** is in the satellite communications business, isn't it? The visitor would be wrong. While the history and destinies of **Intelsat** and **Comsat** are closely entwined, they are separate organizations. **Intelsat**, which leases the space in the **Comsat** building for its Operations and Satellite Control Centers, is an international organization of 106 member countries, dedicated to the provision, maintenance and operations of a system of satellites for global international telecommunications services. It is recognized as probably the world's most successful cooperative business enterprise, and it is of staggering global importance.

Through its satellites, positioned 22,300 miles above the earth's equator in geostationary orbit, pass about two-thirds of the world's international transoceanic telecommunications—

the organization

Engineers at work in Intelsat's Operations Center on the first floor of the Comsat headquarters building in Washington, D.C.

everything from telegrams and telephone calls to the high-speed conversation of computers and, of course, satellite television. Capacity on some of the satellites is also leased to a growing number, now about 20, of individual countries for their own domestic communications networks.

Intelsat's operations have resulted in a reduction, in some cases down to one-fifteenth of their original level, in the real costs of international communications, and its system has provided many smaller and developing countries with their first opportunity for access to high quality international and domestic communications. The governments of Intelsat member countries each nominate an organization to act as their representative in their administrative and operational dealings with **Intelsat**. Each of these Signatory organizations also holds a capital investment share in **Intelsat**, according to its country's use of the Intelsat system.

Comsat is the organization nominated by the United States Government to be its Signatory. With a current investment of about 23 percent, **Comsat** is the largest Intelsat shareholder. But this does not portray **Comsat**'s real significance to **Intelsat**.

In a recent article, **Intelsat**'s Deputy Director General, Operations and Development, Bill Wood, summarized the level of this significance by saying, "If it had not been for **Comsat**, **Intelsat** in its present form would not exist." The first moves towards the organization which would eventually become **Intelsat**

by **Gavin Trevitt**, *Public Information Officer, International Telecommunications Satellite Organization*

grew out of **Comsat**'s original brief from the U.S. Congress to establish a global commercial communications satellite system. **Comsat** found 10 other countries willing to share the risks involved in this experimental space technology and, in 1964, they signed agreements to form what would be known as the International Telecommunications Satellite Consortium. As well as being instigator and U.S. member of the Consortium, **Comsat** was also appointed manager.

Santiago Astrain is Director General of Intelsat.

Soon after, Intelsat I, or Early Bird, was launched, stunning the world with its ability to carry trans-Atlantic television. During this period, the first Intelsat operations center, located where it is today, was indeed a **Comsat** owned and staffed operation.

As the 1960s became the 1970s, and with the experience of three generations of satellites under **Intelsat**'s belt, a series of meetings was held, hosted by the U.S. Government, which resulted by 1972 in plans for the reorganization of **Intelsat** into its present structure. Recognizing that such a change could not take place overnight, **Comsat** was nominated to maintain its leading role, this time as management services contractor, for a transition period.

The transition was gradual, with the steadily-growing staff of the Intelsat executive organ slowly exerting more and more influence on all the activities of **Intelsat**, including the Operations Center. The transition was completed by early 1979. Soon after, **Intelsat**'s staff had climbed to about 400 people—including those in the Operations Center—covering about 40 different nationalities. This was a period of growth for **Intelsat**, with demand for its services doubling every three or four years.

During the 1970s two new satellite generations, the Intelsat IV and IV-A series, were launched to cope with the exploding traffic requirements. These satellites still form the backbone of the Intelsat system. But, late last year, the first of a new generation of satellites—Intelsat V—was launched. In May, the second Intelsat V was placed in geosynchronous orbit.

Capable of carrying about 12,000 simultaneous telephone calls, plus a couple of color television programs, Intelsat V has about double the capacity of its predecessor, Intelsat IV-A. In all, **Intelsat** will be launching a total of nine Intelsat V satellites, four of which will also have maritime communications capacity for use by the recently formed International Maritime Satellite Organization (**Inmarsat**).

Intelsat also plans to launch three Intelsat V-A satellites—improved versions of the V with a capacity of about 15,000 circuits—during the 1984-6 time frame. And **Intelsat** is already seeking proposals from prospective manufacturers for Intelsat VI, a series of satellites each with a massive 40,000 circuit capacity that will carry the continuously burgeoning world demand for telecommunications well into the 1990s.

For the period beyond, many different concepts are being considered. The idea of multifunctional space platforms—huge structures built in space, containing control and power sources and supporting numerous space applications packages—is being given serious consideration by Intelsat planners. Also being investigated is the concept of interconnecting groups of satellites utilizing microwave or laser transmissions for inter-satellite links.

Another huge boost in capacity will be provided by the gradual transfer of the Intelsat system to digital operation, rather than the analog mode of operation presently in use. **Intelsat** has already taken a decision to begin some digital operations, in the form of Time Division Multiple Access (TDMA) techniques, Digital Speech Interpolation (DSI) and, later, on-board satellite switching (SS).

Through all of this period, **Comsat** has and will continue to play an active role in Intelsat affairs, both as senior shareholder and as a contractor.

Within the next few years, **Intelsat** plans to move its headquarters from L'Enfant Plaza, adjacent to **Comsat**, to a new building in Northwest Washington, D.C. With the move will go such installations as the Operations Center. Many people see this move as the final severing of the apron strings which have bound the two organizations for so long. That may be so, but it is certain that **Intelsat** will reflect the heritage of its **Comsat** upbringing for many, many years to come.

FOR THE RECORD

Excerpts of Mr. Harper's and Dr. Charyk's Remarks at the 1981 Annual Meeting of Shareholders, Washington, D.C., May 15, 1981

Remarks of John D. Harper, Chairman of the Board of Directors, Communications Satellite Corporation.

For most of our history, we have operated in a closely regulated common carrier environment and our role has been narrowly focused. While we continue to place primary emphasis on our basic, statutorily-mandated Intelsat and Inmarsat businesses, our goal is to diversify and strengthen our presence in non-regulated segments of the communications satellite business. We are fortunate to have sufficient depth of talented managerial and technical personnel to help achieve this significant goal.

Comsat is taking steps to position itself for expansion and diversification by reconfiguring its corporate structure in a manner that will facilitate growth of our statutorily-mandated businesses as well as our new nonregulated lines of business. In this regard Comsat has already completed several important steps.

We placed our Intelsat and Inmarsat jurisdictional activities in a new element of the Corporation called Comsat World Systems Division. This division, which is distinct and separate from those elements responsible for competitive lines of business, is composed of three segments: International Communications Services, Intelsat Technical Services, and Comsat Laboratories. By making this division the sole corporate element responsibile for statutory business, we have concentrated all of our Satellite Act mandated activities in one segment of the Corporation, thereby allowing for precise identification of all relevant costs. This was done to increase our managerial effectiveness and to address some of the concerns expressed by the Federal Communications Commission in its report on Comsat last year.

Approximately one year ago the FCC completed a major study of Comsat which concluded, "As a matter of policy we believe that Comsat should not be foreclosed from applying its corporate technology and expertise to the development of new lines of business which will result in public benefit." Thus, it is the considered opinion of the agency which regulates our common carrier activities that our broadened program of activities is both beneficial and appropriate. However, the FCC also expressed concern that costs of competitive operations not be allocated to regulated business and that there not be a competitive advantage due to our Intelsat and Inmarsat roles.

In October of last year the FCC issued a Notice of Proposed Rulemaking concerning Comsat's corporate structure and operations in order to further examine those concerns. We believe that the creation of Comsat World Systems Division, and the fact that this division is structured to insure substantial separation from the rest of the Corporation, will alleviate these FCC concerns.

We have substantiated to the FCC that Comsat has carried out its statutory duties in an exemplary fashion, and that the structure and operational scheme now in effect insure that the Corporation will continue its impressive achievements. We stated that imposition of additional structural and regulatory constraints would not only be inappropriate, but would seriously disserve the public interest.

All of Comsat's non-jurisdictional business is being conducted through three major wholly-owned subsidiaries: Comsat General Corporation, Satellite Television Corporation and Environmental Research & Technology, Inc. These subsidiaries are developing and are engaged in a wide variety of systems and services providing information, entertainment and critical communications interconnections to business, government and the public...

We have moved to strengthen the organization with our long-range planning procedures and by taking care to position people to make maximum use of their talents and to ensure that they are in challenging situations. We continue to study our structure to recruit new people and will continue to attempt to make sure that our rewards are comparable to others. Our goal is a

strong, stable organization that will meet the challenges of today and the future.

Comsat was created with a broad mandate to expand the use of communication satellites for the benefit of the American public. We are dedicated to satisfying our statutory responsibilities and, in addition, to pushing out in new directions, to developing new, profitable space-related service offerings and to applying our technical expertise and business experience in ways that can benefit our shareholders. We believe the programs we have initiated will accomplish these goals.

Remarks of Joseph V. Charyk, President and Chief Executive Officer, Communications Satellite Corporation.

Although our new business directions are exciting and we believe quite significant to Comsat's future, we must not disregard the basic strength and outstanding achievements of our Intelsat-related business. I must emphasize that fifty-four percent of our Operating Revenues in 1980 were derived from our jurisdictional international satellite business.

Of primary importance is the fact that this business is characterized by growth. In February of this year Comsat leased its 10,000th circuit. To put this number in perspective, consider that it represents two-thirds of all overseas communications in and out of the United States. It is roughly equivalent to the satellite circuits of Great Britain, Canada, Japan and West Germany combined. It represents almost one-fourth of all circuits now in use in the entire Intelsat global system which serves 134 countries.

This level represents a dramatic increase over the mere sixty circuits which Comsat had when it commenced service back in 1965. In the 1½ month period between attaining the 10,000-circuit level and the close of the first quarter, Comsat had leased an additional 264 circuits. We anticipate that we will probably lease our 20,000th circuit in four to five years and our 40,000th circuit in the early 1990s.

In addition to the strong growth in demand, our Intelsat-related business is characterized by continual upgrading in terms of equipment, capacity and quality. In December of last year the first of the Intelsat V series of satellites was launched, bringing forth a new era in international satellite communications by increasing space segment capacity through various technological means including additional frequency bands, dual polarization to permit reuse of the same frequencies, and the use of zone and spot beams...

Comsat performed an important service in connection with the launch of the first Intelsat V satellite through its new Launch Control Center located on the ground floor of Comsat's headquarters building. This facility also was essential to the successful launch of the first SBS satellite, which is now in service.

Comsat is continually modifying, expanding and upgrading its earth stations so as to continue to provide high quality and reliable service to its customers. For example, we have recently installed a new antenna at our Earth Station in Etam, West Virginia, designed to operate in the 14/11-gigahertz bands in conjunction with the new Intelsat V satellites. In November 1980, Comsat dedicated the Susupe earth station on the island of Saipan which provides the Northern Mariana Islands with direct satellite communications service to and from the U.S. mainland, Hawaii, Guam and other Pacific points. For the future, Comsat is planning the construction of a third east coast earth station near Bloomsburg, Pennsylvania, which is necessary to meet the burgeoning traffic demand in the Atlantic Ocean region to provide the necessary diversity and redundancy.

We continually seek technological improvements for the global satellite system through research and development activities conducted by Comsat World Systems Division through Comsat Laboratories. Comsat Laboratories' research and development activities in

satellite communications technology have earned it an international reputation as a leader in its field...

In response to concerns expressed by the FCC about the level of our earnings in 1980, beginning January 1, 1981, we put into effect an 11.8 percent reduction in our charges for international services. Based on the projected demand for communications services, we estimated that the reduction would result in a savings to **Comsat**'s carrier customers of about $20 million for 1981. We believe that this, together with previous rate reductions, have made significant contributions to the overall growth in international satellite communications which we have witnessed.

Even though we are pleased that our technological advances are producing efficiencies that lead to declining rates for our customers, we also are mindful of the need to ensure that regulation of our jurisdictional operations does not deny our shareholders a fair return on their investment. This continues, of course, to be a key objective.

In addition to its role as the designated United States participant in **Intelsat**, **Comsat** is our country's representative in the International Maritime Satellite Organization (**Inmarsat**), with a current ownership share of about 23 percent. The first satellite system of **Inmarsat** is expected to be in operation beginning in early 1982. Contracts have been awarded to Comsat General Corporation, **Intelsat** and the European Space Agency to provide space segment capacity for the initial Inmarsat system on a lease basis.

Because of the start-up costs of the Inmarsat Organization, and the expected levels of traffic and revenues, there will be significant losses over the next several years as the space segment is put into place. However, as the maritime and offshore services that were begun with Marisat mature in Inmarsat operations, this business ultimately will contribute to **Comsat**'s earnings.

The FCC is presently considering a means of dealing with **Comsat**'s anticipated losses in the early years of providing Inmarsat services. We have proposed to the FCC that as one possible approach we be allowed to combine, for rate-making purposes, our Inmarsat revenue requirements with the revenue requirements of our Intelsat operations. We believe this to be an equitable proposal, one that is consistent with the achievement of U.S. foreign and domestic policy objectives, practices in the communications carrier business, and fair to our shareholders.

In another major area of activity, we enjoyed continued healthy earnings for 1980 from our domestic Comstar satellite program. The fourth and last Comstar satellite was successfully launched February 21, 1981, ensuring continuing revenues from this service to AT&T. Such revenues will continue at approximately the existing level up to September 1983, when the lease periods for two of the satellites will expire. Thereafter, Comstar revenues will lessen as the program draws to a close in the mid-1980s.

Dr. Charyk addressing shareholders at the 1981 Annual Meeting, Washington, D.C., May 15, 1981.

Our earnings from the Marisat global maritime communications program decreased in 1980 because of reduced satellite service to the U.S. Navy as it transferred a portion of its services to its own satellites. However, our revenues from commercial Marisat services climbed steadily during the year. Commercial Marisat satellite service now accounts for approximately one-half of our total revenues from the program and will serve as a start-up base for the Inmarsat services in 1982.

Among our newer ventures, the largest impact on earnings for 1980 and the first quarter of 1981 was caused by the costs connected with our ownership interest in Satellite Business Systems

(SBS)—a partnership of subsidiaries of Comsat General, IBM and Aetna Life & Casualty. The first SBS satellite was successfully launched in November of last year. After five months of pre-operational tests, on March 12, Boeing Computer Services became the first SBS customer to receive SBS service. SBS is providing data and video hook-ups among various Boeing facilities...

Private network service for other SBS customers will commence over the course of this year. Among these customers are several of the nation's largest corporations. At the end of 1980, there were 17 companies which had contracted for SBS service and at the end of the first quarter of 1981, there were 20...

The SBS program is capital intensive, and our investment in the program is sizable. Comsat is currently committed to fund SBS up to $175 million, of which $125 million had been provided as of the end of 1980. Our after-tax loss related to SBS was $12.4 million in 1980 and is forecast to climb higher in 1981. As SBS begins to acquire a share of the intracompany communications business, customer-related initial equipment costs will be substantial and will have an additional near-term negative effect on our earnings.

We expect SBS to begin to show a profit in the latter part of 1983 and we anticipate that its revenues could be substanial by the end of the decade. Our large financial commitment to this business reflects our confidence in the long-range earnings potential of this venture.

On April 21, the Federal Communications Commission unanimously accepted for filing the application of Comsat's wholly owned subsidiary, Satellite Television Corporation, for authority to begin building satellites for a satellite-to-home subscription television service. This is an encouraging step in the process of establishing what could be our most visible and dramatic new venture...

Our goal is to introduce this innovative service within three to four years after FCC approval...

Comsat's wholly owned subsidiary—Environmental Research & Technology, Inc. (ERT)—furnishes business and governmental clients with a complete range of environmental consulting, planning, monitoring and computer-based information services...

We have entered this high-technology growth business to position our company as a leader in selected market areas of the merging communications and information industries.

Through our Comsat General subsidiary, we are pursuing a number of promising new opportunities. We have continued our limited manufacturing operation—Comsat General Tele-Systems, Inc.—to meet a need for certain specialized communications equipment.

In addition, we have formed the Comsat General Integrated Systems, Inc. subsidiary as our entry into the rapidly developing computer-aided design, manufacturing and test (CAD/CAM/CAT) business...

Of importance is the fact that we are using the experience, expertise and talent of Comsat to reach out into areas of innovative business while at the same time maintaining the highest quality service for our expanding jurisdictional business. During a period when many companies are retrenching due to the economic climate and other factors, Comsat is fortunate to have the talent and resources to establish a foundation for important and attractive business ventures with future potential.

To build on this foundation, of course, a key ingredient is the people with the talent, energy, and dedication that are the basis for any organization's success. We are particularly going to miss John Johnson who has played a key role in Comsat almost from the beginning. He was a major architect in the development of our international satellite business. He was the first head of Comsat General and developed this key subsidiary into a significant part of Comsat's total business. More recently he has been a major factor in the evolvement of our direct broadcasting activities...

Corporate Locations

Comsat

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STC

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ERT

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Lombard, Illinois
Pittsburgh, Pennsylvania
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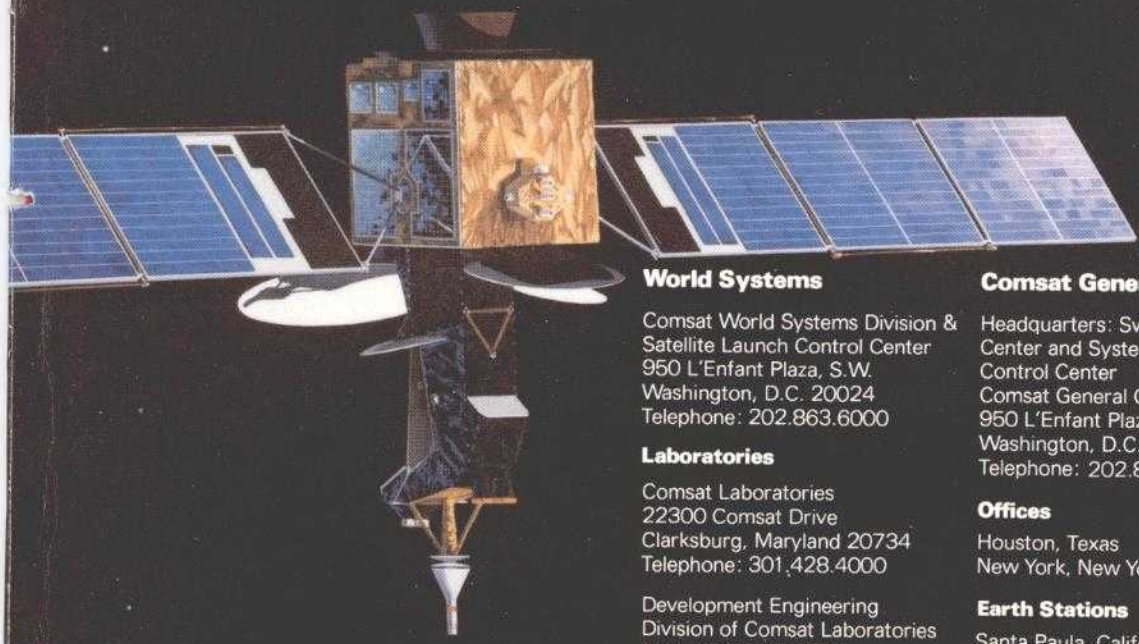

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Laboratories

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Maintenance and Supply Center
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Earth Stations

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Brewster, Washington
Etam, West Virginia
Jamesburg, California
Pago Pago, American Samoa
Paumalu, Hawaii
Pulantat, Guam
Susupe, Northern Mariana Islands

Comsat General

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Fucino, Italy (MARISAT TTC&M)
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