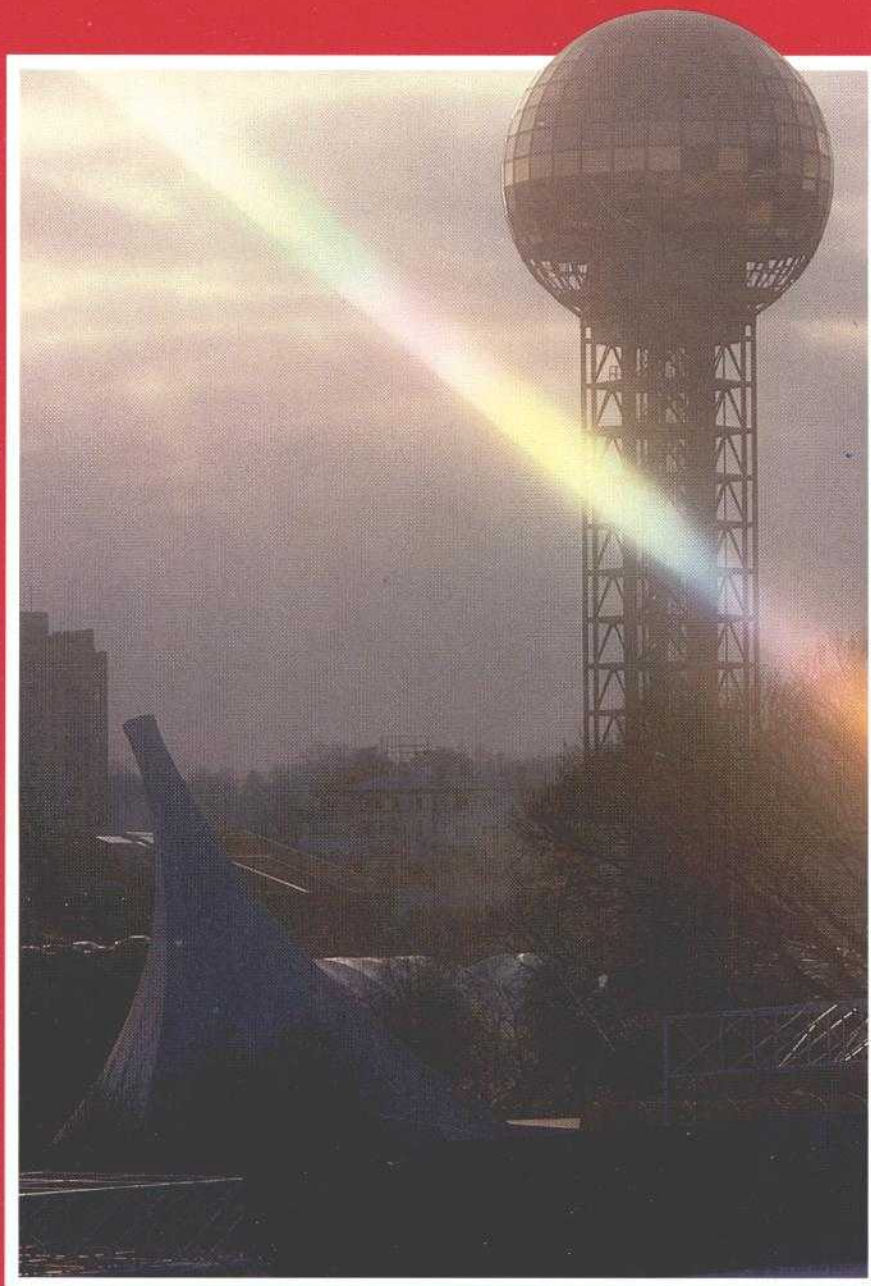


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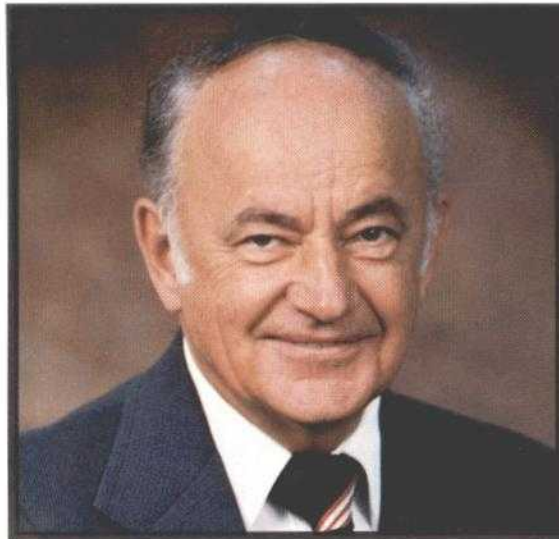
COMMUNICATIONS SATELLITE CORPORATION MAGAZINE

1982



NUMBER 8

VIEWPOINT



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

We hear the word in television and radio advertising. We see it in print. "Productivity" has become the watchword of U.S. business and industry. We at Comsat believe that satellite communications together with the entire information sector can contribute to making business, all business, more efficient and, hence, more productive.

The productivity-enhancing benefits of satellite communications are many. High quality, economical voice communications and telex instantly possible with almost any spot on the globe, main-frame computers thousands of miles from each other transferring data from one to the other at the rate of millions of bits per second, mail transmitted and received electronically, marketing and sales people or engineers in widely scattered locations working as teams to get jobs done through the medium of video teleconferencing—these are the most salient benefits, benefits that will inevitably alter the way organizations are structured and managed and result in significant productivity improvements for the user.

Some of these benefits have long been known by U.S. companies doing business internationally, for they have been taking advantage of the Intelsat system of communications satellites, through services provided by Comsat. Indeed, the benefits of satellite communications for commercial international communications first became evident 17 years ago with the successful launch and

operation under Comsat's supervision of Early Bird or Intelsat I. Beginning in 1976, companies operating fleets of ships or offshore rigs began realizing the productivity enhancements and safety benefits of maritime satellite communications, for it was in 1976 that the Marisat system first started commercial operation under Comsat General Corporation. Today, several U.S. businesses are beginning to experience the benefits of satellite communications for their domestic operations. These companies are private-network customers of Satellite Business Systems (SBS), a company that we jointly own with Aetna Life & Casualty and IBM.

The record of satellite communications in helping to bring about productivity improvements for companies is already extremely impressive, but we are convinced that the best is yet to come. Indeed, we believe that satellite communications in conjunction with the whole information sector may well play the crucial role in leading the country to a new era of business growth.

At the 1982 World's Fair in Knoxville, Tennessee, Comsat will be demonstrating some of the many ways in which satellite communications technology can help business become more productive as well as the many ways that the technology results in greater communications services for the individual citizen. We invite as many of you as possible to visit our exhibit.

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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: Knoxville World's Fair site with its prominent Sunsphere on a cold winter morning three months before opening of the event. Comsat will have a major exhibit at the fair. Photo by William J. Megna.

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CONTENTS

From the Editor

Comsat Magazine has received notification of three awards in recent times, and we are pleased to bring these to the attention of our readers. In the prestigious international Gold Quill competition, held annually by the International Association of Business Communicators (IABC), Comsat Magazine will receive the Award of Excellence in the category "four-color magazines: business—services."

The two other awards are in recognition of the magazine's design. The first six issues, grouped together as one entry, were among 150 entries selected as worthy of distinction out of a field of about 13,000 in the annual international Type Directors Club of New York competition. And Comsat Magazine No. 3 has received a Certificate of Distinction in the annual Creativity competition of *Art Direction Magazine*.

In the current issue, our eighth, we focus on two interrelated themes: how the services that Comsat companies provide improve the productivity of companies availing themselves of those services and Comsat's participation in the Knoxville World's Fair, which has the theme "Energy Turns The World." Two

of our three guest authors this issue are distinguished representatives of the Federal Government—Howard H. Baker, Jr., Majority Leader of the U.S. Senate, and Malcolm Baldrige, Secretary of Commerce. Our third guest author is Javier Castillo, Manager, Special Projects and Fish Resourcing of Ralston Purina Company, Van Camp Sea Food Division.

In addition to Senator Baker, Secretary Baldrige and Mr. Castillo, we have many people and organizations to thank for much of the content of the current issue. Patrick V. Belen of the Marine Electric Division of Marco Marine San Diego, Inc., for example, was of great assistance to us in arranging the photography for the article on the tuna industry that appears beginning on page 18. For permitting us to photograph its Technical Operations Center (TOC) to illustrate Mr. Alper's article (p. 14 ff.), our thanks go to Citibank and the staff of its TOC in New York City. And our thanks to Adam Grow, General Manager, Southern Satellite Systems, Douglasville, Georgia, for permitting us to photograph Southern's Torus antenna and its control room.

Stephen A. Saft



Public Affairs, of Inco Limited and was based in Toronto, Canada.

Retirements: Sidney Metzger, Comsat's Vice President and Chief Scientist, has retired, closing an 18-year tenure during which he was instrumental in forming and evaluating the Corporation's technical and engineering policies. Mr. Metzger plans to remain active in the field of satellite communications working as a consultant in Washington, and he is also studying biology at the National Institutes of Health. See additional item about Mr. Metzger under "honors."

Promotions: Chief Financial Officer has been added to the title of Carl J. Reber, Senior Vice President.

Bruce L. Crockett, formerly Vice President, Finance, of Comsat General Corporation, has been elected to the new position of Vice President, Finance, and Treasurer, of Comsat.

Robert W. Kinzie, until recently Vice President, Finance and Administration, of Comsat World Systems Division, has been named to the new position of Vice President, Satellite Systems and Technology, of Comsat General Corporation.

[Editor's Note: In our previous issue of **Comsat Magazine**, an article by Mr. Kinzie appeared pertaining to the planned Third East Coast Earth Station in Pennsylvania (p.19ff). Mr. Kinzie's new position with **Comsat General** was used in the article. We wish to make clear that at the time he wrote the article and it was processed for publication, Mr. Kinzie was an officer in the Comsat World Systems Division.]

Edmund Bartlett III has been elected Vice President, Finance and Administration, of Comsat General Corporation. He previously held the position of Division Director of Finance.

Don R. Owen is Vice President, Earth Station Programs, of Comsat General Corporation. Mr. Owen previously held the position of Vice President, Programs and Services, Comsat General TeleSystems.

Stanley L. Shubilla is Vice President, Finance and Administration, of Comsat World Systems Division. He was formerly Treasurer of **Comsat**.

A. William Perigard has been elected President of Comsat General TeleSystems, Inc. Mr. Perigard, formerly Executive Vice President and General Manager, is one of three people who established **TeleSystems** in 1979.

Honors: Dr. John L. McLucas, President, Comsat World Systems Division, will receive the 1982 American Institute of Aeronautics and Astronautics (AIAA) Reed Aeronautics Award, one of the two top awards presented each year by the AIAA. Dr. McLucas is being honored for his outstanding contributions and achievements in the development and management of aeronautical systems and for his leadership in major U.S. aviation programs and will be presented the award at their 1982 Annual Meeting.

Sidney Metzger, former Vice President and Chief Scientist, has been elected a Fellow of the American Institute of Aeronautics and Astronautics (AIAA) for his pioneering efforts and significant contributions to satellite communications.

Comsat General completes acquisition of Amplica

Comsat General Corporation has completed the acquisition of Amplica, Inc., a California-based manufacturer of advanced microwave amplifiers. As a Comsat General subsidiary, **Amplica** strengthens the company's growing businesses, which include two other wholly owned subsidiaries: **CGIS** (Comsat General Integrated Systems), a producer of advanced computer programs and related systems used in computer-aided design, manufacturing, and testing (CAD/CAM/CAT), and Comsat General TeleSystems, a manufacturer of sophisticated digital telecommunications equipment. (See picture story on pages 32-33.)

With revenue of \$14.2 million in 1981, **Amplica** is a rapidly growing manufacturer of a wide range of microwave amplifiers and related subsystems for defense electronics systems and commercial satellite communications equipment. **Amplica** offers over 600 standard low noise, medium power and general purpose amplifiers.

Commenting on the acquisition, Comsat General President and Chief Executive Officer Richard Bodman noted, "We are committed to a strategy of growth that is designed to expand and integrate our involvement in the satellite communications industry. **Amplica**, a leading producer of key microwave sub-

JOHN D. HARPER

In January, we had an opportunity to conduct a tape-recorded interview with John D. Harper, Chairman of the Board of the Communications Satellite Corporation. The theme of this special issue of **Comsat Magazine**—U.S. business and industrial productivity—inspired many of the questions we asked him.

The business career of John D. Harper spans almost 50 years. After graduation from the University of Tennessee, he joined ALCOA, the leading U.S. aluminum company, as an electrical engineer. By 1962 he had become ALCOA's Vice President in charge of production, and a year later, he was elected President. In 1975 he retired as the company's Chairman and Chief Executive Officer. Mr. Harper has served on **Comsat's** Board of Directors for nine years and as Chairman since 1979. What follows is an abridged version of Mr. Harper's answers to our questions.

In addition to the Nation's productivity crisis, the answers pertain to the general state of the U.S. economy and, of course, to **Comsat**.

Editor's Note.

Q: Do you feel that any part of the current recession is the result of a productivity crisis in this country? Is that an element in this, do you think?

HARPER: I don't think there is any question about it. We did pretty well for a while, but we have been drifting down to where our increases in productivity have been very low, much lower than heretofore. Look at the automotive industry, for example. Their productivity is not up to where it should be. All American industry is suffering, and for a variety of reasons.

I think most American industry has too much overhead. Part of that is brought about by what I consider excessive government interference in business, excessive regulations, over-regulation, too many requirements for paperwork generally relating to government. This is resulting in a tremendous increase in overhead which works against productivity.

Q: Are some industries more prone to this productivity problem than others, or is it more a uniform problem throughout American business?

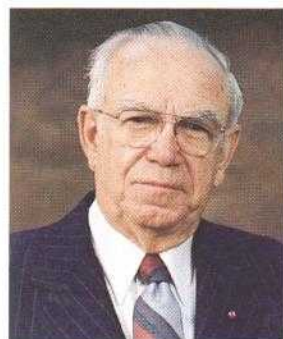
HARPER: I don't think it is uniform, but I do think it can be found throughout American business. Its effect depends a lot on an industry's competitive situation. An industry that has a strong competitive situation has real troubles: the steel and the automotive industries, for examples.

Q: What needs to happen, do you think, to make these industries that have been in a state of crisis more productive again?

HARPER: I see evidence that some of those things are happening now. The automotive industry is negotiating with the union right now for productivity increases. Everybody is really looking at overhead, looking for ways to cut costs. The present Administration has at least made a start at reducing government controls, regulatory agencies. They've pulled back on some of the paperwork.

*Q: Do you think that **Comsat**, with its expertise in satellite communications, has a role to play in helping American industry out of its present productivity crisis?*

HARPER: The potential is tremendous for us. One of the brightest opportunities right now for increasing productivity is video teleconferencing. Those of us in business and industry have to have meetings. I am reconciled to that, but one of the big detriments to productivity is the rounds of meetings in scattered locations that demand our time. It isn't just the expense of moving people to particular meeting places that's the problem for us. It's the loss resulting because people are taken away from their regular jobs. If you could keep the employee in the office and just take an hour of his or her time instead of three days for an out-of-town meeting, you would get a tremendous increase in productivity. Just as important, satellite communications means the ability to communicate faster, to move information faster. Bringing these capabilities to all business and industry is one of the keys to turning American business around.



John D. Harper is Chairman of the Board of Communications Satellite Corporation

Q: Are you optimistic generally about the future for the businesses that Comsat is engaged in?

HARPER: International communications continues to grow each year at a rapid rate. You can say, 'Well, it's going to level off some day,' but is it? Improvements in international telecommunications have a proliferating effect because, as you get better international communications, people want better domestic communications. The communications system of European countries and other countries are much better than they used to be, largely as a result of improved international communications.

If you look at our involvement in business communications with **SBS**, you can't help but get very excited. **SBS** is going to radically change the way we manage and operate major companies. I am absolutely convinced of that.

If you look at what we're doing in satellite television, there are grounds for equal optimism. We will be increasing the options for television entertainment in the nation, and we also will be able to start thinking about providing full interactive video communications for people in their homes. The home computer could be tied into a variety of national networks, for example. As it is now, most people are buying home computers, like buying Atari, to play games with them.

We have opened up an entirely new era of maritime communications via satellite. This will continue to grow rapidly. **ERT** gave us an opportunity to take part in the very important environmental area and holds hopes of moving into new fields.

The new ventures for us, like **Amplifica**, **TeleSystems** and **CGIS**, are important because they help create the electronics foundation upon which advances in telecommunications must be built. I am very bullish. I really am.

Q: I want to pursue one point that you were addressing before. It is a very interesting one, and that is the subject of the ways in which satellite communications will help to make managers more productive in the future. You specifically mentioned video teleconferencing. Is there anything more that you would like to say about that?

HARPER: One of the problems in managing a multi-operational company is the flow of information. How do you handle the paperwork back and forth? How do

you make sure that you are not reinventing the wheel in four or five different plants, for example? We try to do this in various ways. We write reports. We write memos. We send a lot of paper from one place to another. We send people from one place to another too. By improved communications, the ability to move tremendous volumes of digital data very quickly to overcome inherent limitations in computer use, we free ourselves from dependency on conventional mail. We have access to very high-volume communications of all sorts: written, voice, and teleconferencing. I think this will lead to the ability to do a much better planning job and to reduce overhead. I am quite excited about it.

Q: Are you optimistic that the Nation can get itself out of this recession we're in? Some government economists say, 'Oh well, recovery is just around the corner. We're going to see an upturn.' Some other economists I notice are speaking rather gloomily about this economy.

HARPER: I guess I am always an optimist. I know no reason why we won't come out of it. This isn't the first time we've had an economic slowdown. If you go back you find that each time it happened in the past, you had one group of economists saying that we're going to keep heading down, down, down, and another group saying, recovery is just around the corner. The facts are that neither are usually right. I think we'll get out of it. We are already doing some positive things that will enable us to get out of it.

Without any question we have much more government than we either want or need or can afford. I think we're shrinking some of that as a result of actions of this Administration. You can be critical of some of the individual ways they've done things. Generally, I certainly agree with their objectives, their efforts to pull government activity back within reason, to a level we can live with and can afford. If we can hold on, that is, if Congress doesn't do something foolish—which they can do very easily in an effort to fix things—I think we'll come out of the current slowdown in good shape. As I said earlier, I'm an optimist.

FIGHTING INFLATION

THE BATTLE MUST CONTINUE



While this is a difficult time for most portions of the American economy, the advanced electronics and communications industries represented by Communications Satellite Corporation are entering an era of unprecedented promise, growth, and productivity. The next decade will witness a communications revolution in this country which will be historically rivaled only by Alexander Graham Bell's patenting of the telephone in 1876.

Perhaps the only other element of our business and industrial community which can anticipate the growth rate of communications is our nation's energy industry. In that regard, I would like to take this opportunity to commend and express my gratitude to Comsat for the foresight you have shown in sponsoring a major pavilion at the energy-themed 1982 World's Fair in my native state of Tennessee.

The biggest legislative battle this country has seen since Franklin Roosevelt, certainly since World War II, is being fought in Congress. The greatest immediate danger in the United States

*by the Honorable Howard H. Baker, Jr.,
Majority Leader, United States Senate.*

today is whether or not we can put a halter on inflation, whether we can re-energize our economic system, whether we can create new wealth, then new employment, at a rate that will enhance the quality of life in this country.

We have been able to create new wealth and new employment in the past, and we're going to do it as well in the future. But right now we're engaged in a pitched battle to try to get inflation under control and interest rates down, and I believe the President will succeed.

The gamble is whether or not the country has the courage to stay the distance. That is the big question in the country right now. If you check with almost everybody, almost everybody will agree that we cannot go on the way we are, not with 15 percent inflation or 10 percent inflation or 23 percent interest rates.

Most people will agree that this country cannot keep going the way we have been going in a free enterprise economy. We will lose our freedom, and we will lose the energy of the economic system. Almost everyone agrees with that, but now the great gamble is whether the American people will hold tight to do the things that most everyone agrees must be done in order to get our economy under control. You don't do that in a day, or a month, or a year, and you don't do it without sacrifice and without difficulty. It is a riverboat gamble, and it is a big gamble whether, having started this economic battle, the country will go the distance and stay with the President until the job is done.

We have established the productivity that is the result of the efforts and initiatives of free men and women who have an opportunity to work in a free society. Even under the most optimistic aspects, with the expenditure reductions

that have been put in place in the tax policy that has now been adopted, I predict to you that still further reductions in the level of federal programs will be necessary.

The President is embarking on the second phase of his Economic Recovery Program through a New Federalism. I believe that the program outlined by President Reagan in his State of the Union address is a brave, courageous statement that will have impact not only on the budget, but the basic structure of government. It will lead the nation in the right direction in terms of federal responsibilities in the years to come.

I have watched the evolution and development of the President's proposal on federalism for some time. This new federalism is the next logical step in the program that the President has already begun and is consistent with the concept that I have urged during my Senate career—General Revenue Sharing.

The President is proposing a program that will be materially helpful to the quality of government at the state and local levels. It is a method whereby we can put services closest to the people who require them by putting those services closest to the unit of government that will dispense them. The Federal Government will use its resources to raise money and to disburse that money to states, to cities, and counties in a way that will give them the maximum flexibility to decide how to apply those funds which are available for the purposes that are most needed in that community.

I would not suggest to you that the enactment of President Reagan's program will be a simple or painless matter. To the contrary, it will be difficult for us all to wean ourselves from the Federal bureaucracy. However, I am convinced that these difficult and painful decisions are absolutely unavoidable if we are to indeed restore the status of the United States economy as the most innovative and productive in the history of man.

PRODUCTIVITY

STRATEGY FOR GROWTH

One of the Nation's most serious and least understood economic problems of the past decade has been the declining rate of productivity growth. Everyone talks about the problem, but since productivity growth does not depend on any one stimulus, the solutions appear difficult.

Here's the problem: After increasing at an average annual rate of more than 3 percent from 1947 to 1965, growth in output-per-worker-hour slowed to 2.2 percent a year between 1965 and 1975 and 1.0 percent from 1973 to 1978. For 1980, labor productivity actually declined 0.3 percent.

The slowdown in productivity growth is reflected in lower living standards, reduced international competitiveness and diminished prospects for economic growth. It affects the economy because the rate of growth in productivity determines the extent to which wages can be increased without contributing to inflation.

The news is not all gloomy, though. In spite of the downward trend in the rate of productivity growth in the United States, the Congressional Budget Office estimates that the actual level is still 10 percent above that of most European countries and possibly 30 percent over the Japanese level, even though that is not the common perception. Our concern is the steady erosion of the United States' competitive edge.

Among the causes of the slowdown are the aging of existing equipment; money diverted from investment in plant and equipment to meet government regulations; changing demographics (the number of less-skilled workers has been growing); and a decline in the amount of corporate and government investment in research and development. The result has been fewer innovative technological breakthroughs, which produce large productivity gains, such as the more widespread use of robotics.

The oil shock also contributed to the slowdown. Firms had to substitute labor

for energy and adopt energy-saving technologies, again, diverting investment money away from new plant and equipment. Inflation has also been a serious problem. High and increasing levels of inflation make long-term planning more uncertain. Rather than take a high-risk investment, companies spend their money on less-risky, short-term havens. Total national output has increased only slightly since 1975 because of small increases in domestic income and shrinking foreign markets, resulting in less efficient use of workers and capital goods.

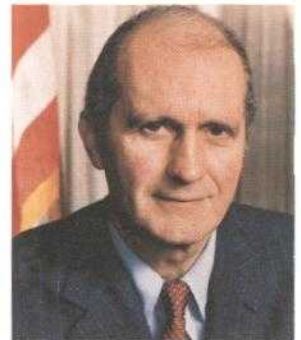
Solutions to the productivity puzzle must come from the three sectors involved—labor, management and government.

Government's main responsibility is to establish an economic climate for private sector efforts to improve productivity by designing and implementing policies and programs that are stabilizing. The Administration is striving to reduce public policy uncertainties and improve the decision-making and risk-taking environment for business and consumers. Government must cut back unnecessary regulations, and this Administration is doing that.

We are working on regulatory reform and trying to get the contradictions out of Federal and monetary policymaking. The Department of Commerce has a new Office of Productivity, Technology and Innovation to develop productivity policy, to provide business with information, to promote the understanding and use of productivity measurement techniques and to develop better strategies for getting government-owned know-how into industry's hands.

The President's Economic Recovery Program is aimed at providing the necessary foundation for increasing U.S. productivity and competitiveness. For example, the new tax code provides for accelerated depreciation allowances, cou-

by the Honorable Malcolm Baldrige,
Secretary of Commerce,
United States of America.



pled with retention of the investment tax credit. These provide a powerful stimulus for American industry to expand investment in modern plant and equipment and increase the proportion of our Gross National Product that is invested.

The law now permits three-year depreciation of equipment, and more than 80 percent of costs can be recovered in two years. Firms can also receive a 25 percent credit for increases in research and development (R&D) expenses over the amounts spent during a base period. These are strong incentives and should result in sharp R&D increases.

For labor, the time has come to discard outmoded work rules and wage demands. From 1948 to 1965, real output per worker-hour in the private sector rose by a solid 3.2 percent per year. That was a number that got enshrined in many contract settlements, supplemented in recent years' negotiations by inflation-induced cost of living demands that pushed the inflationary spiral higher. The fact is that there is no room for 3.2 percent increases when productivity growth per man-hour is only 0.8 percent, as it was from 1973 to 1978, and actually negative, as it was in 1979 and 1980. Labor must realistically return to wage rates linked to productivity increases.

American management faces the biggest challenge. Management must re-evaluate all the basic principles governing past business practices. It must recognize that it made many mistakes in the past 20 to 30 years when U.S. managers adopted an attitude that everything was going well, the quarterly reports were good, therefore, why change anything? Management's preoccupation with immediate earnings has dimmed the focus on long-term carefully engineered investments, which is the mode of operation of many of our foreign competitors.

Business and labor must work together and look at their traditional rela-

tionship in a new context—the current economy. These past struggles may have made sense against the backdrop of a domestically-oriented market structure, but today's global competitive realities are different.

For management, this means a new awareness of—and respect for—the cooperation of its workers. Labor cannot be treated as a cost alone, it must be counted as a resource. And, for the worker, this means a new sense of responsibility for the production process and the final product.

Labor, management and government must face the challenge of technology and innovation. Our share of world trade in manufactured goods declined from 25 percent in 1960 to 18 percent in 1980. We lost our lead in this area to Germany, and we may soon drop to third place behind Japan. We can expect increasing trade deficits in 1981 and 1982.

If the increases in the numbers of patents granted to foreigners since the early sixties is any indication, our market share may continue to erode in the years ahead.

Now that government has taken steps to remove some of the productivity roadblocks it created in the past and has created a favorable climate for growth, the responsibility falls to American industry and labor to do their share in meeting this national challenge. Unless the private sector grasps the critical nature of its role and returns to the creativity, innovation and competitive drive that has marked its history, our future in today's world markets is bleak.

The Administration has confidence that the private sector is up to the challenge. The telecommunications industry, for instance, was one of the few bright spots in the national productivity picture during the 1970s. The telecommunications industry has made the technological breakthroughs and stayed ahead of its world competition with forward-looking philosophies.

It is with this kind of approach that I know we can meet and beat the productivity challenge.

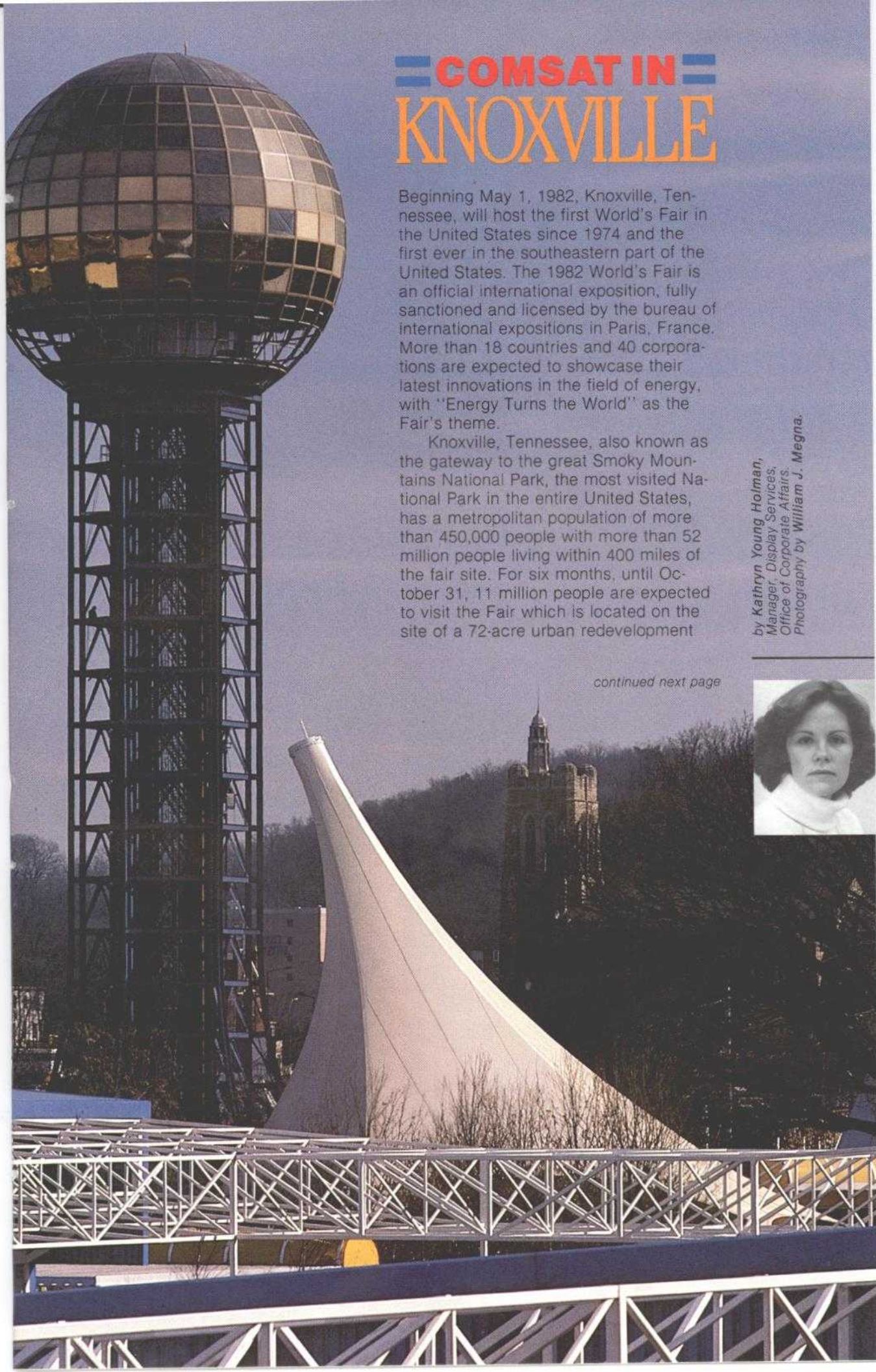
COMSAT IN KNOXVILLE

Beginning May 1, 1982, Knoxville, Tennessee, will host the first World's Fair in the United States since 1974 and the first ever in the southeastern part of the United States. The 1982 World's Fair is an official international exposition, fully sanctioned and licensed by the bureau of international expositions in Paris, France. More than 18 countries and 40 corporations are expected to showcase their latest innovations in the field of energy, with "Energy Turns the World" as the Fair's theme.

Knoxville, Tennessee, also known as the gateway to the great Smoky Mountains National Park, the most visited National Park in the entire United States, has a metropolitan population of more than 450,000 people with more than 52 million people living within 400 miles of the fair site. For six months, until October 31, 11 million people are expected to visit the Fair which is located on the site of a 72-acre urban redevelopment

by Kathryn Young Holman,
Manager, Display Services,
Office of Corporate Affairs.
Photography by William J. Megna.

continued next page



Below left, Sunsphere, dominant feature of Knoxville World's Fair, up close. Below right, The fairgrounds seen against downtown Knoxville skyline. Tall building is United American Bank. All photographs of the site were taken about three months before the fair's opening.



project. Knoxville is the home of the Tennessee Valley Authority, the world's largest public utility, and the University of Tennessee where extensive energy-related research is conducted. Within one hour's drive is the Oak Ridge National Laboratories, a leading nuclear research facility. These facts, together with Knoxville's location at the crossroads of three major interstates, make the city an ideal location for an international energy exposition.

The Fair has received support from President Reagan and many major nations of the world which are currently planning exhibits including: France, Mexico, Japan, Saudi Arabia, the Federal Republic of Germany, Italy, the United Kingdom, Korea, Australia, Canada, the European Community and the People's Republic of China. These nations will feature, in their respective pavilions, everything from advances in solar energy to film presentations on their foreign cultures.

On May 1, **Comsat** also will be in Knoxville, along with many other corporations, nations and states to help celebrate the 1982 World's Fair. The Comsat exhibit, located in the Lifestyle and Technology Pavilion, will illustrate

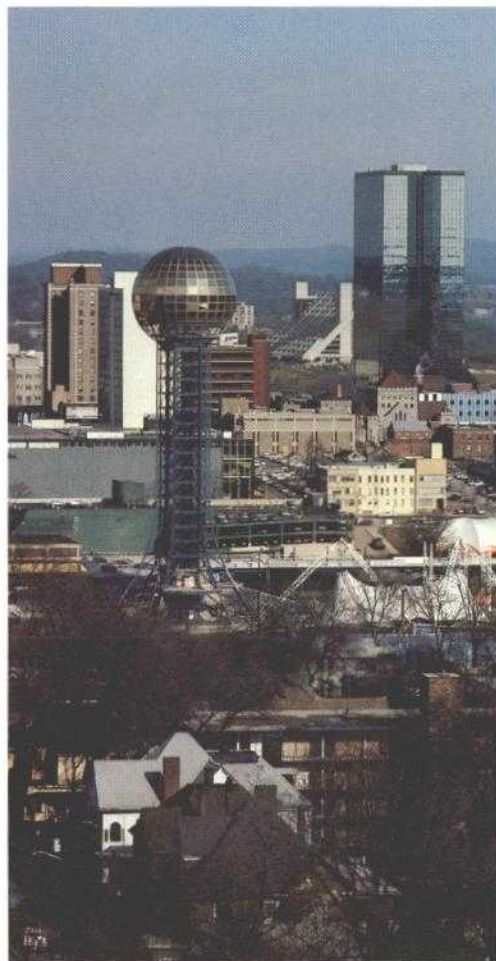
the Corporation's leadership role in providing satellite communications products and services to meet the needs of business and consumer markets. Creation of the Comsat exhibit, and the Corporation's participation once the fair begins, is under the direction of the Comsat Office of Corporate Affairs.

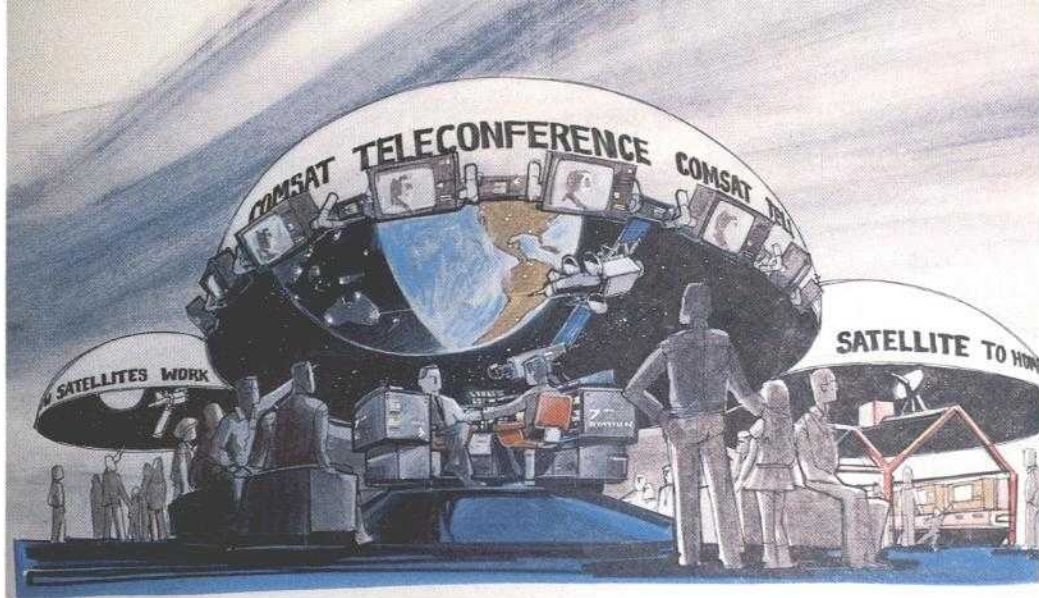
Addressing directly the subject of Comsat's participation in an exposition with an energy theme, Dr. Joseph V. Charyk, Comsat President and Chief Executive Officer, has stated, "We at **Comsat** are excited about the Knoxville International Energy Exposition and our participation in it. Through the application of advanced technologies to communications and other needs, we have contributed, and will continue to contribute, greatly to mankind's need to increase productivity and thus save energy. We are proud to be part of the Fair's theme: Energy Turns the World."

The 1,500-square-foot exhibit with its futuristic design will dramatize **Comsat's** advances in the use of satellite technology for the benefit of large corporations as well as single-family dwellings. Three domes appearing to float overhead will focus attention on video teleconferencing, direct-to-home television broadcast satellites and our Comsat World Systems Division operations.

Visitors will be drawn into the video teleconferencing area enticed by the chance to actually participate in the business environment of the future. People from far-flung areas of the world can be brought together through these advances in satellite technology. Tremendous medical and educational possibilities abound, as well as business applications in teleconferencing. Friends and relatives will be able to share the experience of a business meeting just as if they were situated in foreign locations and will be able to see and hear others instantaneously.

As the roar of rocket engines resounds in the center of the exhibit, visitors will be drawn to a mysterious pool sunken in the floor where an exciting multimedia show will illustrate **Comsat's** core business areas. The world of global communications will be explored, highlighting the Intelsat and





Inmarsat systems, including the integral role **Comsat Laboratories** plays in the development of new technology. Meanwhile satellites positioned in the dome overhead are central to a demonstration of how vital communications links are created among cities, continents and ships at sea.

A tremendous amount of interest is expected in the direct-to-home television satellite system display. As you walk into our "typical home" with its 2½-foot dish antenna perched on top, the Satellite Television Corporation story unfolds on a wall filled with video images (TV monitors). Stereophonic sound from the dome overhead will tell about television of the future—which is actually not that far away.

While not actively engaged in one of the major areas of the exhibit, visitors can stroll through the Comsat exhibit at their leisure. Graphic panels displayed throughout will provide detailed descriptions of our various divisions and subsidiary businesses.

In addition to this dynamic exhibit inside the Lifestyle and Technology building, located outside the Sculpture Court -2 will be **Comsat's** Multiple-Beam Torus Antenna. This exhibit will demonstrate the Torus's ability to send and receive multiple satellite signals, which will then be projected onto video monitors inside the exhibit.

The 1982 World's Fair is probably the largest exposition **Comsat** has ever attended. The exhibit, in tones of red, white and blue, subtly suggests U.S. technolog-

ical leadership at this international forum, amidst our neighbors: Ford Motor Company, U.S. Steel and Control Data Corporation. The Fair provides **Comsat** an excellent opportunity to inform, educate and entertain the public while demonstrating how **Comsat** and satellite technology affects their everyday lives.

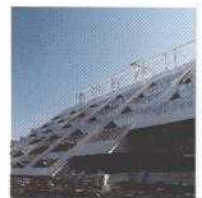
The World's Fair will also feature continuous live entertainment with headliners including Bob Hope, Bill Cosby, Johnny Cash, Debbie Boone, Patricia Neal and Japan's Grand Kabuki Theatre. In addition to celebrity performers, there will be international displays of song and dance, instrumental groups, marching bands, local and national bluegrass and country bands, the Up With People Musical Troop, jugglers, clowns, magicians, and daily parades and firework displays.

Located on an adjacent seven-acre site will be the Family FunFare, an amusement area complete with a roller coaster which is capable of speeds up to 69 m.p.h., a double-decked carousel, swinging pirate ship, the largest ferris wheel in North America and many popular rides from around the world.

So plan your vacation now to include the trip to Knoxville, Tennessee. Stop by the Comsat exhibit to learn more about the world of satellite communications and how **Comsat** is playing a vital role in your future.

"The 1982 World's Fair—You've Got To Be There." That's the advertising theme line for the Fair. We agree with it.

Above, Artist's rendering of the Comsat exhibit.
Below, Closeup of exterior of the U.S. Pavilion.



Surrealistic view of modern Technical Operations Center of Citibank in New York City created by photographing reflection of multiplexers in front of Remote Access Switching and Patching (RASP) system. From this center, Citibank's international data and voice communications are controlled.



Growth

A major concern in the United States in recent years has been the steady decline in productivity experienced throughout the economy. On both an individual and industry level, numerous experts have commented that business is not as productive as it once was. One area which has not declined, however, is the information-based sector, including telecommunications. Telecommunications and information systems have undergone tremendous changes in the same period, expanding and branching out into new areas. Innovative technologies are being developed and marketed every day, providing more effective and efficient means for businesses to use and communicate information. These new technologies help the telecommunications industry itself grow, and, more importantly, they provide the tools needed by the rest of the economy to grow and become more productive.

It was just twenty years ago that Congress enacted the Communications Satellite Act which led to the establishment of **Comsat**, and, a few years later, the creation of **Intelsat**—the International Telecommunications Satellite Organization. And it is **Intelsat** which, by establishing a global system of communications satellites serving a worldwide network of earth stations, has provided reliable international telecommunications throughout the world, opening the way for economic and business growth in the United States and over a hundred other countries.

Intelsat's business of providing telecommunications services has played a significant role in helping to keep businesses moving and growing.

Comsat's World Systems Division is in the business of bringing that productivity to the United States through its role as the U.S. Signatory to **Intelsat**, including its operation of a network of U.S. earth stations from Maine to American Samoa. Through these earth stations and the **Intelsat** satellites, **Comsat** provides the services which connect users to markets, home offices to overseas branches, investors to investments, even sports teams to their fans and sponsors. These

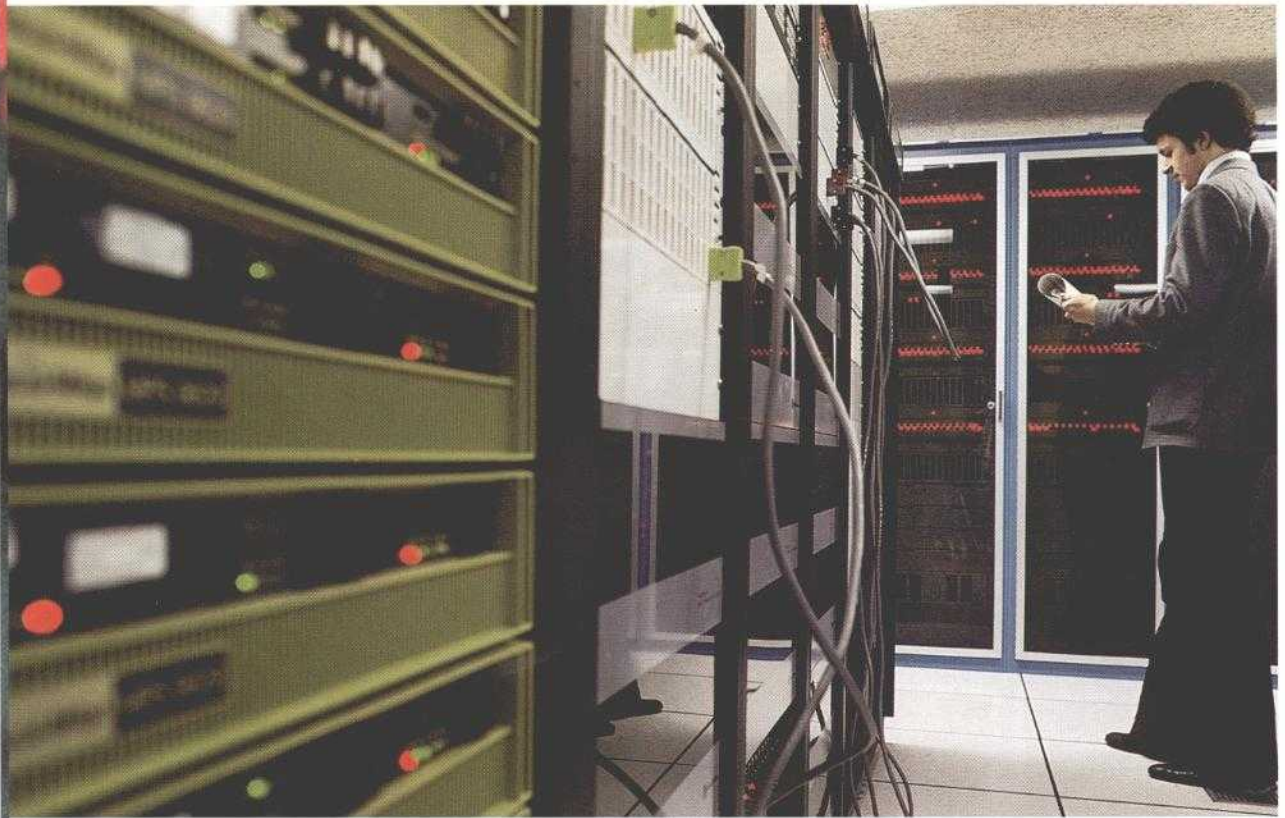
satellite links move information rapidly, saving time and money, enabling prompt, fully informed decision-making which is central to productive enterprise.

Comsat, in its position as the U.S. Signatory to **Intelsat**, has played a leadership role in encouraging **Intelsat** to respond to the communication needs of business. Much of the traffic carried by **Intelsat** is, in fact, serving the communication needs of American businesses, helping them do their business better. The growth of satellite traffic across the Atlantic, the heaviest route in the **Intelsat** system, testifies to this. Not only has U.S. international traffic in this region grown from 2,036 half-circuits in 1970 to 9,816 half-circuits in 1980, but alternate-voice-data leased channels, used almost exclusively by business, have increased from 91 to 586 in the same period in this region. In fact, the Etam, West Virginia earth station, operated by **Comsat** Communications Services, has led the way in meeting the challenges of this growth, by consistently handling the most traffic of any earth station in the **Intelsat** system, carrying some 5,834 half-circuits in 1981 alone, to 77 other end-user countries and territories.

In addition to rapid growth in services to other industrialized countries, **Intelsat** and **Comsat** provide voice, data and video services which enable U.S. firms to expand into new geographical areas of operation, areas which might have been underserved in the past due to the lack of the telecommunications facilities. From 1970 to 1980, for example, the number of antennas accessing the **Intelsat** system grew from 51 in 30 countries to 327 in 134 countries. During this same period, U.S. traffic on **Intelsat** grew from 2,036 to 9,816 half-circuits, representing almost 500-percent growth, including more than a fivefold increase in telephone traffic (from 1,650 to 8,745 half-circuits). There were similar increases in alternate and simultaneous voice-data leased channels (from 166 to 590), and in medium and high-speed data, which

by J. R. Alper, Vice President,
Communications Services,
Comsat World Systems Division
Photography by William J. Megna.





were not provided in 1970, but by 1980 accounted for 165 half-circuits.

The impact of international satellite communications in opening the way for the expansion of U.S. business abroad was vividly demonstrated when Intelsat service to South America was implemented in late 1968 with the inauguration of the Longovilo, Chile earth station. At that time there were two submarine cables serving the area, one landing at Panama and one at Venezuela, carrying a total of 208 voice circuits. Businesses were required to carry out most communications via telex and airmail. In the first two years of Intelsat service, U.S. - South America telecommunications traffic more than doubled, and the dramatic increase in communications continued through the 1970s, providing the means for increased U.S. business in the region.

The U.S. banking industry is a major user of international telecommunications to South America. The industry's productivity has been increased in recent years through the use of sophisticated new telematic services such as electronic funds transfers, services which depend on the availability of reliable telecommunications facilities. The experience of major banking institutions such as Citibank and BankAmerica has shown that the present efficiency and scope of their activities in South America would have been virtually impossible without

the advent of the Intelsat system. Satellites have provided the capacity and reliability needed to keep up with these banks' and other businesses' demand for high-speed data, and, of course, telephone service.

Satellite communications, with its large bandwidth and multi-point transmission capabilities, is a medium well-suited to businesses for which rapid information dissemination is vital to success. This is shown by the experience of Time, Inc., which, for the past year and one-half, has been transmitting its overseas editions in facsimile form via Intelsat Atlantic and Pacific Ocean Region satellites for location printing in Amsterdam, Hong Kong and Melbourne. Prior to that time, master printing plates had to be flown to the individual printing sites, a time-consuming and not always reliable process.

Comsat and **Intelsat** have worked continually to provide improved services to meet user needs. A major benefactor of these improvements is the business community which is the largest system user. The results of these improvements have been reflected in regular rate reductions which have substantially improved the economics of doing business overseas. [See related article on page 25.] In addition, in a major effort to ensure full productivity within the telecommunications industry itself, Intelsat satellites have regularly provided capac-

ity to restore cable circuits which have been lost due to cable interruption. In 1981 alone, some 3,129 half-circuits days of cable restoration services were provided worldwide, ensuring the integrity and reliability of all international telecommunications.

In order to further improve productivity, **Intelsat** is now exploring the provision of satellite communications services expressly designed to fill the growing needs of international business users. One such service is video-teleconferencing. While this service has been offered via **Intelsat** for more than a decade utilizing standard television transmission capacity, only in recent months has it been receiving great popular attention as an economical and energy-saving alternative to business travel and an efficient means of increasing manpower productivity. Many large corporations are actively pursuing international as well as domestic teleconferencing as a practical management tool, which enables business meetings to be held promptly and frequently without wasting travel time. **Comsat** and **Intelsat** are keeping pace with the demand for such services, and, in fact, began experimenting with teleconferencing techniques years ago.

An intriguing hybrid video-conference experiment was carried out by **Comsat** in 1978 when it joined with NASA, the U.N. and ENTEL of Argentina to use the 14/12 GHz capacity of the experimental Communications Technology Satellite to beam voice and video signals from a U.N. conference in Buenos Aires to New York where speeches were translated simultaneously and beamed back to the convention delegates. Documents were similarly transmitted, translated and returned by high-speed facsimile. Use of such services on a commercial basis, via **Intelsat**, can enable more efficient international business meetings and conferences.

Intelsat is also actively investigating new ways to provide the "office of the future" with the means to maximize productivity through automation and improved business communications. New digital technologies expressly designed for business communications will increase **Intelsat's** ability to interconnect all office technologies to facilitate transmission, storage and retrieval of information in voice, data, text and image forms. **Comsat** will continue to work with **Intelsat** to respond to the new service needs of the global business community. In pursuing that goal, **Comsat** will cosponsor with **Intelsat** the Sixth Inter-

national Conference on Digital Satellite Communications in Phoenix, Arizona in September 1983. This conference will provide a forum for presentation of new technologies, applications and services including business-related services and specialized digital business networks.

Finally, in addition to providing improved access to overseas markets and faster, more efficient corporate communications, the proliferation of the global satellite communications system has itself become a market for U.S. skills and technological know-how. It is estimated that, as of September 1980, U.S. firms were awarded contracts worth in excess of \$250 million for the construction of **Intelsat** earth stations around the globe. The potential worldwide market for all satellite communications earth station and ancillary equipment for the next ten years has been estimated at \$20 billion. In addition, there are extensive markets for consulting services and terrestrial communications systems, both of which have expanded as a result of increased international telecommunications.

International satellite communications truly produce productivity. **Comsat** World Systems, through the earth stations operated by Communications Services and the satellites operated by **Intelsat**, is working to bring this productivity home to American business and to the U.S. economy.



Facing Page, Citibank's Technical Operations Center (TOC), multiplexers in left foreground. Remote Access Switching and Patching (RASP) system in rear. Below, Closeup of Citibank multiplexers.

Tuna & Productivity

The object of the tuna industry's quest for ever more sophisticated technology: the tuna.

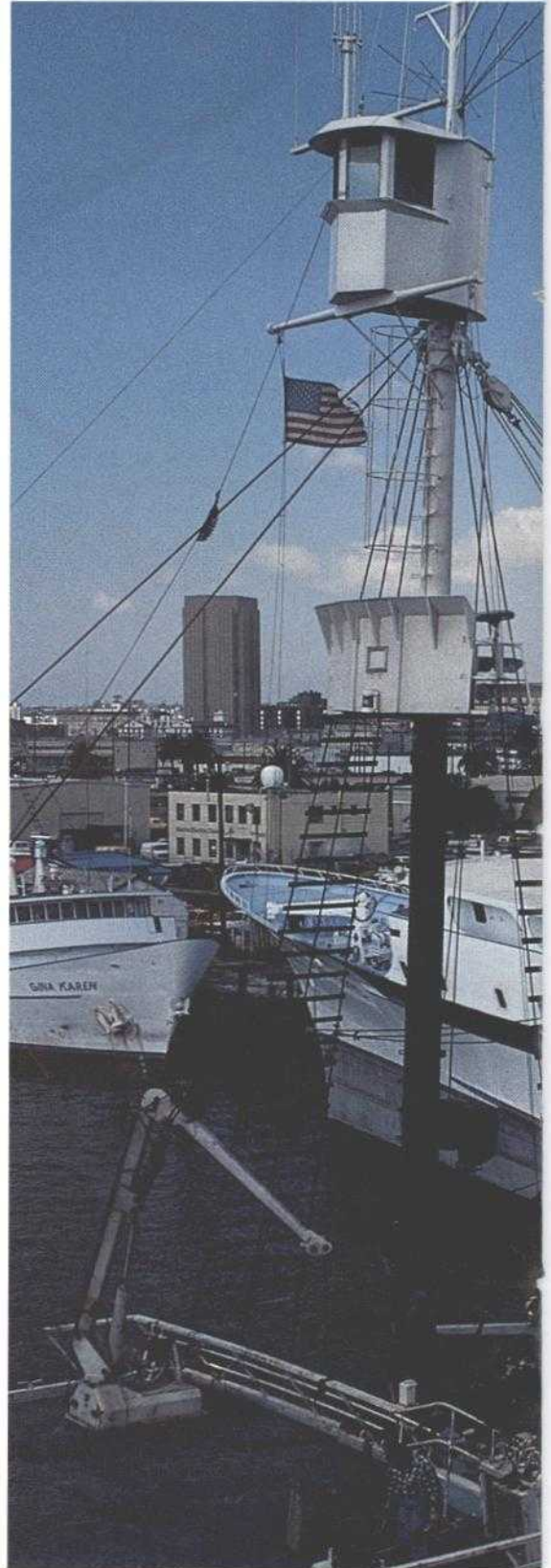


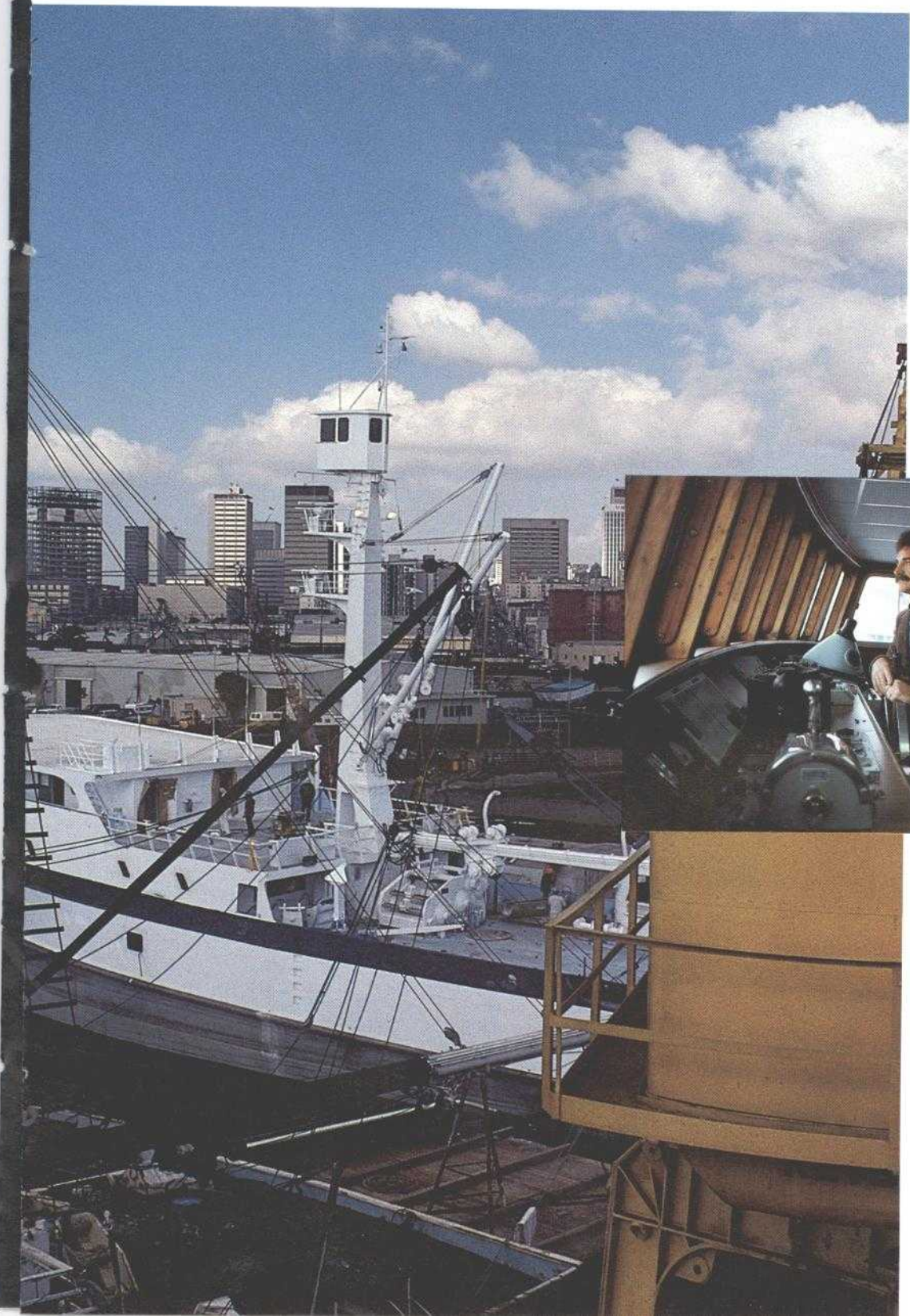
San Diego-based U.S. tuna industry, engaged in the most modern form of hunting in history, will benefit from the widespread use of maritime satellite communications.

San Diego, the southernmost city on the coast of California, is the main U.S. port for the thriving U.S. tuna industry. From this warm and beautiful city, population over 800,000, fishing vessels so complex that it might be better to call them fishing machines, head forth on voyages ranging from three to four months in duration across much of the wide Pacific Ocean.

In some cases more than 300 feet in length, these fishing machines carry processing equipment on board capable of quick freezing and freezer storing hundreds of tons of tuna fish, and they carry a whole lot more—fleets of speedboats that are used in corralling tuna schools (and in shooing away schools of porpoise under whom tuna often like to school) and a heavier seine boat that drags the leading end of the seine or net off the back of the mother vessel and then brings it back once the school has been encircled. In addition, they often carry helicopters. The helicopters are used for tuna spotting. Hence these vessels we are calling fish machines must also be considered aircraft carriers.

Despite its obvious sophistication, the industry has only recently made an investment in terminals and antennas for maritime satellite communications. It is clear, however, that several members of the industry are strong advocates of the use of satellite communications both for





Left, City of San Diego as seen from Campbell Industries shipyard. Marco Marine building, where bows of two vessels meet, contains Inmarsat dome for experimental system Marco uses for customer demonstrations. Both Marco Marine and Campbell are owned by Peter Schmidt. Right, Ferrin Ferrara, one of the top 10 tuna seiner skippers fishing out of San Diego.



by Javier Castillo, Manager,
Special Projects and Fish Resourcing,
Ralston Purina Company, Van Camp Sea Food Division.
Photography by William J. Megna.



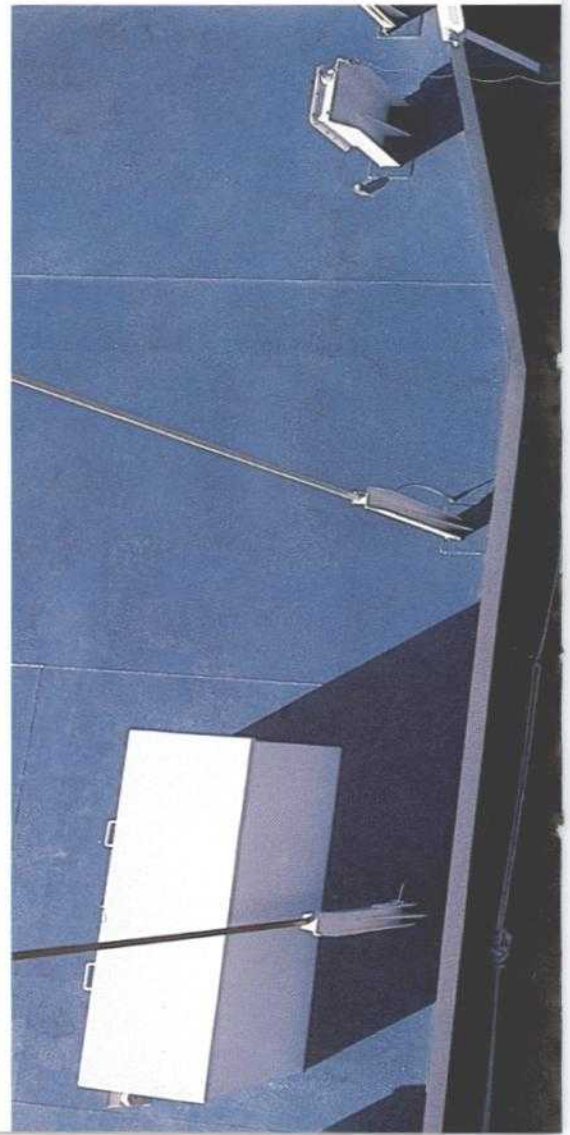
its inherent benefits for tuna fleet owners and crew and as an essential adjunct for use of still another example of the human uses of space—remote sensing. Some members of the tuna industry have come to see that by providing real-time weather information to their ships, their operations and that of their helicopters can be made safer. At the same time, they have come to see that by providing information on such sea conditions as near-surface turbidity, salinity, chlorophyll content and sea surface temperature, again on a real-time basis, they may be able to help make their fleet skippers, already legendary for their fish-catching ability, even more productive.

One of the staunch advocates of bringing the benefits of space technology to the tuna industry is Javier Castillo, Manager, Special Projects and Fish Resourcing at the Ralston Purina Company, Van Camp Sea Food Division. Mr. Castillo's company is a producer of a wide variety of well-known food products and markets its tuna under the Chicken of the Sea label. Recently, **Comsat Magazine's** chief photographer, William J. Megna, on assignment to photograph the tuna industry in San Diego, had an opportunity to conduct a tape recorded interview with Javier Castillo. The comments that follow are those of Mr. Castillo as extracted from the taped interview. **Editor's Note.**

Traditionally, fishermen fishing far from shore have had to lead an isolated existence. The isolation has really not diminished that much even with the advent of high-frequency and single-sideband radio. Both HF and SSB radio are affected by atmospheric perturbation, and even on a clear day, due to solar activity, your ability to communicate with your boats can be severely curtailed if not impossible.

When a company owns a fleet of boats, each of which costs \$8 million to \$9 million, even though these vessels are fishing in widely scattered locations, management should be able to exercise some real-time administration. These boats should be considered branches of the company wandering the oceans, and they should be administered in that way. Fishermen should have the same abilities to communicate with the same speed, flexibility and quality as do executives on land.

In addition to speed, flexibility and quality, maritime satellite communications is appealing to us because of its



privacy. It's confidential. It's a fact of life in the fishing business that fishermen try to find where the fish are by listening in on each other's radio communications. Even when a boat is using a scrambler or a special crystal to keep its communications private, you can locate it by using a relatively primitive radio direction finder. Then you can set your course for the signal and you will soon be fishing in the same waters as the other boat.

With the widespread use of satellite communications, we will be able to forget about the use of coded language, scramblers and crystals to keep our communications private, and we won't have to worry about our boats being spotted by competitive boats through the use of basic radio direction finding techniques. We will be able to break through to our boats in any weather conditions and in any time zone.

The efficient administration of a fleet of tuna boats fishing in widely scattered locations means making sure that the fish you are catching are not too expensive, too expensive in terms of how much money it is costing you to catch

them. To achieve this, we must keep the boats fishing all the time. We must avoid delays in port. We must make sure that everything the boats need in the way of supplies and repairs is ready when they arrive. Skippers with helicopters on board will frequently require special servicing help when they come into port, and that special help should be planned for in advance. If we are going to be changing crews in a port, the new crew needs to be informed in advance where to be and when to be there.

Maritime satellite communications is not just a vital administrative aid in the operation of our fleets, but it will help us with our entire operation as well. For example, with sufficient advance warning about how much tuna a boat is bringing in and when it will arrive, you can gear up your cannery operation accordingly. You will make sure that the plant has sufficient cans, labels and other essential supplies. There will be no surprises. The way it is now, trying to plan cannery operations is extremely difficult. Because they do not want other skippers to find

continued next page



Facing page, Crow's nest of the Patrician, modern seiner that fishes for Ralston Purina. Below left, View of chase or speedboats aboard the Patrician.

Another view of Campbell Industries shipyard where much construction, repair and maintenance of San Diego's tuna fleet takes place. Note Inmarsat dome being removed for maintenance, rear. Below, Inmarsat terminal equipment used by Marco Marine for customer demonstrations.



out where they caught their fish, our skippers will not radio ahead that they are on their way home until they are within two days of port.

Another benefit of satellite communications is in the transshipping of fish. Sometimes, rather than process the fish ourselves, we sell it to another processor in another port, say in a foreign country. In cases like this, we may wish to notify a boat well in advance to land its fish in another port rather than bring it back to its home port.

Then there is the benefit that with a fleet linked by maritime satellite communications you can begin to think in terms of supplying your boats with weather information and with information that will aid in the task of catching fish—information remotely sensed from space and provided instantly to your skippers. Such real-time weather information should make the operation of our boats safer, should help us to be able to navigate around storms or at least should give us plenty of advance warning when there's nothing we can do to get out of the way. It should help in our helicopter operation. As a result, in terms of operating costs, we should begin to see a

decline in our high insurance costs for both boats and helicopters.

The information we receive on ocean conditions should help us more easily find water where tuna are likely to be. By correlating all that we now know about tuna with the kinds of information we can obtain by remote sensing activities, I think we can be of great help to our skippers.

I should emphasize that I am not talking about a system that will replace the skilled tuna skipper. No amount of equipment and sophisticated technology will ever do that. We are never going to be able to fish from our desks. What I am talking about is a system that helps the skilled skipper do an even better job than he's doing now, a system that will result in the skipper being able to catch as much tuna as he is bringing in today, but on shorter—hence less expensive—fishing trips.

Today's tuna fisherman is taking part in an activity that is the most modern, the most sophisticated form of hunting in history. The widespread use of maritime satellite communications for its own inherent benefits and as a means of communicating weather and other satellite-sensed information will keep the industry at the forefront of technology.

Productivity and R&D the role of COMSAT Laboratories

Comsat Laboratories is the research and development center of the Communications Satellite Corporation and its subsidiaries. It provides scientific and technological expertise and laboratory support to the Corporation in its role as a major member of **Intelsat** and **Inmarsat** and as a member and manager of the Earth Station Owner's Consortium (ESOC) and to its wholly owned subsidiaries, **Comsat General Corporation** and **Satellite Television Corporation**.

A major role of **Comsat Laboratories** is to conduct research, development, and engineering support activities to provide a strong, creative, farsighted technological base in support of the Corporation's current and future business activities, and, further, to stimulate and enhance the Corporation's efforts to bring the benefits of satellite telecommunications to a broad spectrum of users. The technology developed at **Comsat Laboratories** must be able to keep the Lines of Business productive and competitive.

The Laboratories' various technical programs are responsive to both near-term and long-term goals and objectives of individual Comsat lines of business. About two-thirds of the work done is "customer-directed," sensitive to specific initiatives, problems, or projects as defined by "customers." The remaining one-third is long range research and

development designed to bring the scientific and engineering skills at the Laboratories to bear on exploration and advancement of satellite telecommunications. This R&D program is long-range and goal-oriented and is the wellspring of **Comsat's** future technology-driven business initiatives.

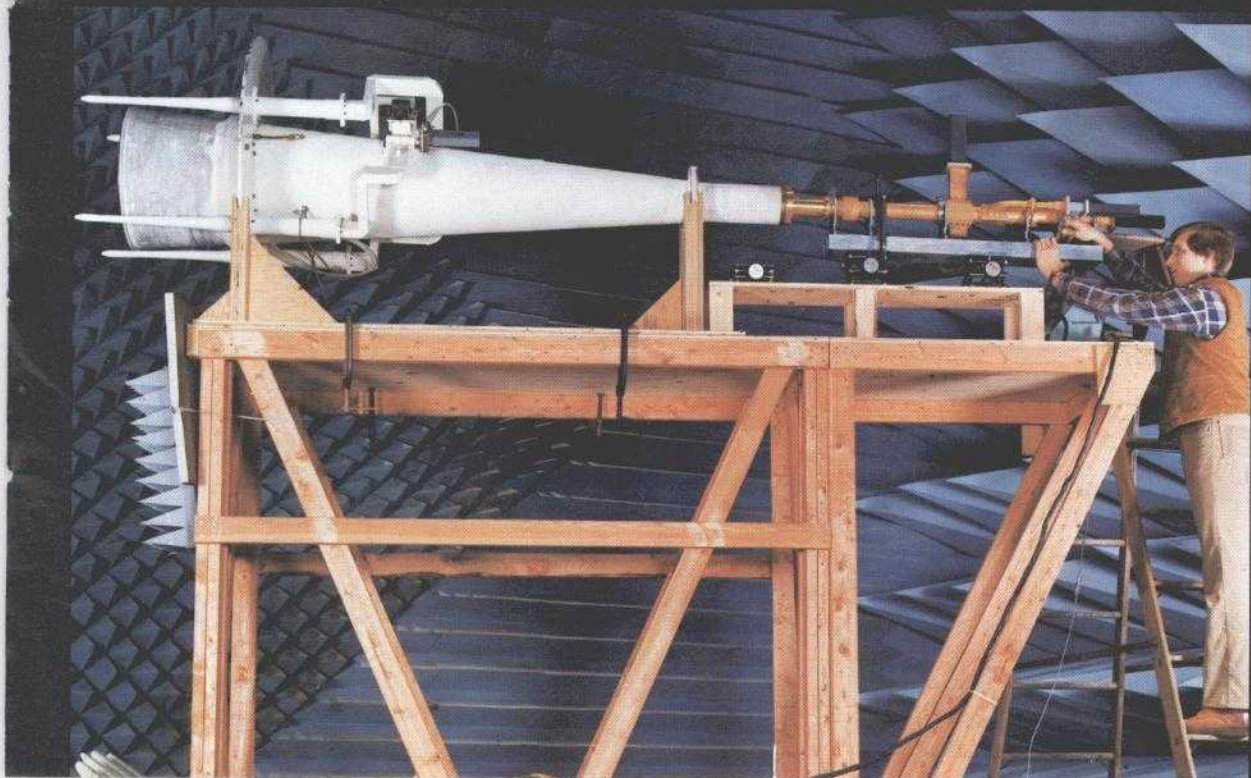
This is how Dr. Joseph V. Charyk, **Comsat's** President and Chief Executive Officer, has described the importance of the Labs to **Comsat**: "**Comsat Laboratories'** research and development program is the foundation upon which are built all of the achievements of our Corporation, . . . the **Intelsat** global satellite system, the **Marisat** system of maritime communications satellite, the **Comstar** domestic system, and the **Satellite Business Systems** space segment."

The Laboratories' programs are managed mindful of the need to carefully distinguish between effort undertaken in behalf of the regulated business and effort in support of **Comsat's** family of competitive businesses. Thus, the considerable benefits of the Laboratories technology are made available, on an evenhanded and accountable basis, in accordance with the sources of Laboratories funding.

It was the research and development effort at **Comsat Laboratories** that made possible such features of the Satel-

continued next page

by **Allan Galfund**, Manager,
Information Activities,
Comsat Laboratories.
Photography by **Carroll R. Haugh, Jr.**



Previous Page, Acceptance testing of dual polarized feed system for Brewster, Washington, Earth Station under the project direction of Earth Station Antenna Department, Comsat Laboratories. Below, Radio Frequency System Monitor (RFSM), developed at Comsat Laboratories, is installed at SBS earth station in Clarksburg, Maryland.



lite Business Systems (SBS) effort as Time-Division Multiple-Access (TDMA) techniques and operating in frequency bands which permit transmitting and receiving stations to be located at customer premises. The Laboratories also developed the Radio Frequency System Monitor (RFSM) now installed at the SBS earth station in Clarksburg, Maryland. This system monitors the status and conditions of the satellite and of the TDMA-transmitting earth stations. The RFSM development has great potential for increasing productivity in the SBS system by immediately identifying problems that may occur at ground stations in the networks, thus saving valuable time spent in pinpointing malfunctions.

In the past few years, the Corporation has undertaken new business activities and expanded old business activities in both regulated and non-regulated areas. Increasing customer demand for international communications services through Intelsat has required the World Systems Division to plan and build new earth stations and add new facilities to upgrade existing earth stations to support this regulated business. The introduction of new modulation and access techniques (Time-Division Multiple-Access—TDMA), and of source coding technology (Digital Speech

Interpolation—DSI) will sharply increase the effective capacity and enhance the operational efficiency of Intelsat. These techniques were conceived and developed by Comsat Laboratories over the years and newer technology is constantly

being developed to further improve the capabilities of the Intelsat System.

With the designation of Comsat as the U.S. Signatory for Inmarsat, emphasis on the development of technology for maritime communications has been renewed. Research, development, and engineering support in behalf of the maritime system is regulated in much the same way as is Comsat's participation in Intelsat.

Comsat's most recent competitive business ventures have placed new demands on Comsat Laboratories. These demands have initially been focused on near-term technology needed to support start-up activities. However, longer range needs are evolving, and these will challenge the Laboratories to produce the high technology required to fill those

needs to keep these new businesses vigorous and competitive.

The Laboratories has developed for Comsat's subsidiary, Satellite Television Corporation (STC), a novel receiver for the Direct Broadcast Satellite which yields greater economies in fabrication and packaging. Comsat Laboratories has designed, built, and demonstrated circuits for scrambling and descrambling the direct-satellite-to-home television and audio signals that will be used in STC's direct television broadcast service.

Recent trends in both terrestrial and satellite telecommunications have been to seek new, innovative services at lower cost—to make the most efficient utilization of existing and future ground and space elements of communications systems. In response to these trends, the Corporation has committed itself to the investment of new facilities and resources at Comsat Laboratories to produce the advanced technology required. Buildings now under construction at Comsat Laboratories will house the most modern equipment and resources and permit the consolidation of other resources. A facility for the design of Large Scale Integrated (LSI) circuits will be brought on line to support engineers and scientists in an effort to fulfill the Corporation's business needs for high performance and low cost technology. The Laboratories' capacity to produce Gallium Arsenide and its compounds will be expanded, as will the capability to design and fabricate microwave integrated circuitry, including monolithic devices. Sophisticated computer-aided design and computer-aided manufacturing equipment will be installed to ensure that the Laboratories maintains current state-of-the-art proficiency, including the resourcefulness to retain essential progress in new technologies.

Comsat Laboratories' principal role is the support of the Corporation's technological needs—to ensure that all lines of business, regulated and non-regulated, are productive and will remain so in the future. The measure of the Laboratories' success in satisfying this role is the productivity of the lines of business it supports.

As Dr. John V. Harrington, Senior Vice President, Research and Development, and Director, Comsat Laboratories, has said, "The frontiers of satellite communications are quite remote with many new services and systems still conceivable. It is the important and exciting objective of the Laboratories to ensure that those new applications and business possibilities are technically achievable."

The average American worker knows only too well about the ravaging effects of the inflationary forces that have been loose in the American economy in recent years. It sometimes seems that, with each trip to the store, we discover still more items whose prices have gone up. A partial explanation for high, persistent inflation is that American productivity gains have been woefully inadequate in offsetting intense cost pressures. As a result, rising costs are only slightly checked by productivity gains, and therefore prices continue to spiral upward as increasing costs are passed through to the consumer.

The pattern of the Comsat World Systems Division's lease charges to U.S. carriers for international communications services is dramatically different, how-

Decline of the Lease Charge

ever. While the U.S. consumer price index (CPI) is 2.99 times as high as it was in 1965, Comsat's lease charge for a half-circuit is only 0.27 of its initial level when service began in April 1965. In other words, while consumer prices in general nearly tripled over the 17-year period 1965 through 1981, Comsat's charge has declined 73 percent, from \$4,200 per month in 1965 to the present rate of \$1,125 per month for a voice channel between an earth station and a satellite.

Comsat's cost performance is even more impressive when viewed in "real" terms, that is, after adjusting for inflation by using constant dollars. Comsat's original lease charge is 1116 percent higher than the current charge when viewed in 1981 dollars. Thus, while the general U.S. price pattern has been one of high inflation, Comsat's record is one of steady, significant deflation in terms of both actual and constant dollars.

Although Comsat's lease charge for satellite circuits makes up only a portion of the total cost of an overseas telephone call, the sharp decline in Comsat's rates has gone a long way towards enabling these significant reductions in charges to international ratepayers:

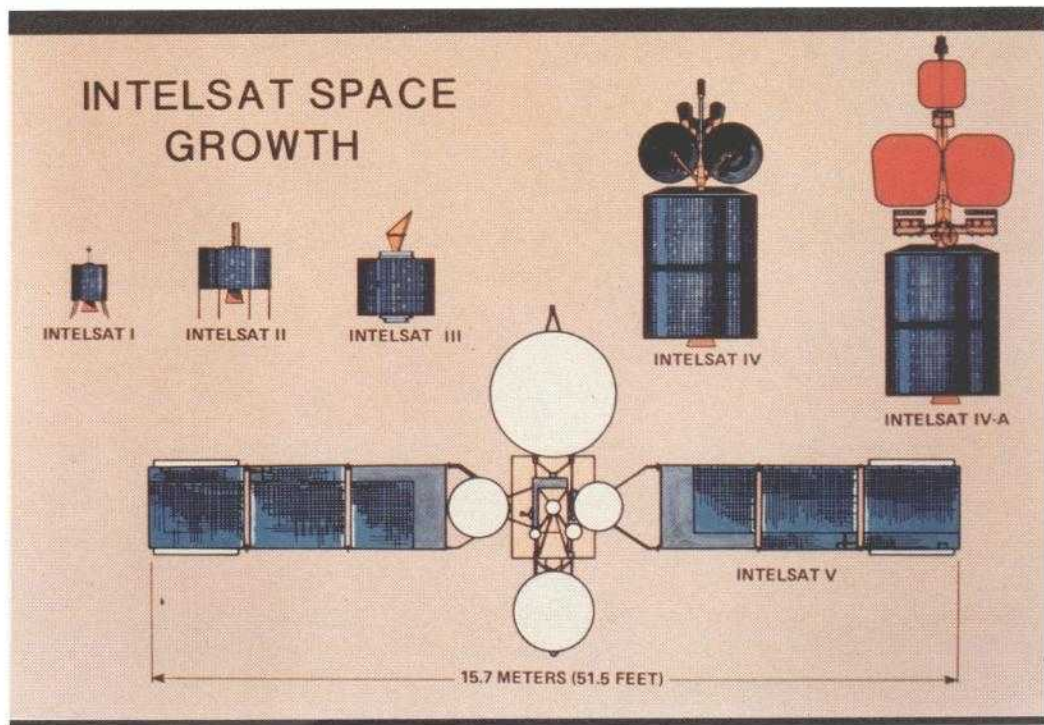
Initial 3-minute (Day) Dial Rates

	1965	1982	% Reduction
London	\$12.00	\$3.00	75%
Caracas	12.00	3.60	70
Paris	12.00	4.05	66
Rome	12.00	4.05	66
Tokyo	9.00	4.95	45

Perhaps the most meaningful way in which to view these reductions in message telephone charges is in terms of "real prices," or how long a person must work in order to pay for the call. In 1965, the average American worker had to work four hours and 53 minutes to pay for a three minute call to Great Britain,

by **Thomas M. Barr**, Assistant Director,
Market Planning & Traffic Analysis,
Comsat World Systems Division.
Photography by **William J. Megna**.





whereas today the same call would require only 25 minutes of his or her labor.

In contrast to the overall CPI of 2.99 and the Comsat price index of 0.27, the average price index for telephone calls to the five overseas points indicated above is 0.36. Thus, Comsat's sharp reductions in lease charges have helped produce the nearly parallel decreases to international ratepayers that have been effected by AT&T Long Lines.

The substantial cumulative reduction in Comsat's lease charge is largely attributable to technological progress and economies of scale. It is difficult to disentangle these twin factors because they are interdependent. For example, technological gains will often reduce capital costs and improve the quality of service—both of which will stimulate the demand for satellite circuits. This expansion in demand will in turn increase efficiency further by spreading R&D and other fixed costs over more units of traffic. And making it economically feasible and desirable to introduce further techno-

logical developments requiring high capacity utilization will in turn drive capital costs per unit down further.

It is this environment of dynamic technological progress, together with steadily expanding demand, that fosters the enormous cost efficiencies and productivity gains that have characterized successive generations of Intelsat satellites. (The table on this page summarizes certain key aspects of the various generations of Intelsat satellites.)

The enormous cumulative productivity improvement over time is shown in the next to last column of the table,

Satellite	Initial Launch	Circuit Capacity	Design Lifetime
INTELSAT I	1965	240	1.5 yrs.
INTELSAT II	1967	240	3
INTELSAT III	1968	1,200	5
INTELSAT IV	1971	4,000	7
INTELSAT IV-A	1976	6,000	7
INTELSAT V	1981	12,000	7

1/ Circuit-years per spacecraft refers to spacecraft design life times circuit capacity. This product expresses the effective capacity of a satellite in the given series.

2/ In 1965 dollars.

"Capital Cost per Circuit-Year in Constant Dollars." Productivity can be viewed in terms of how much of a resource is required to produce a unit of the end-product. For our purposes, how much does it cost in constant dollars to provide the space segment for one circuit-year of capacity? This cost for Intelsat I was \$32,500. Seventeen years later—and netting out inflation so as to compare "apple with apples"—that cost has declined to \$300. Thus, in productivity terms, while \$32,500 provided the space segment for one circuit-year originally in 1965, that same sum (in constant dollars) provides 108 circuit-years in 1982! This translates to an annual productivity improvement factor of 32 percent for the Intelsat space segment. And, of course, it is largely this rather dazzling productivity achievement that has enabled the significant reductions in **Comsat's** lease charge.

This remarkable record of 32 percent annual productivity growth stands in marked contrast to the U.S. economy's typical average of 2 to 3 percent, and less in recent years. (**Comsat's** rate reductions and space segment productivity growth are perhaps more remarkable when it is considered that the regulatory environment in which it operates does not foster technological or managerial progress and innovation.) This tremen-

dous productivity performance is largely attributable to **Comsat's** success in developing, advocating, and implementing new capital cost-saving technology in successive generations of Intelsat satellites and earth station facilities.

Further technological progress—which promises improved efficiency and productivity—is on the horizon. **Comsat** is today playing a leading role in speeding the introduction of the TDMA transmission technique which will increase the capacity and flexibility of the global system. **Comsat Laboratories** is developing on-board batteries that are expected to stretch the lifetimes of satellites. Work is also proceeding on the development of digital TV equipment which could permit a number of TV channels to be placed on the same bandwidth now required for one TV channel.

With respect to earth segment cost-saving efficiencies, **Comsat** will introduce the first dual band feed in the Intelsat system at its new east coast earth station. This feed will permit a single antenna to access a spacecraft at both 6/4 gigahertz and 14/11 gigahertz frequencies whereas at present, two antennas are necessary.

In a world of stubbornly high inflation, **Comsat** has established a remarkable record of substantial reductions in its charge. **Comsat's** enviable performance has resulted largely from the enormous productivity improvements that have been incorporated in communications satellite and related technologies.

Now, if only other goods and services had deflated at the same rate as **Comsat's** leased circuits . . . new cars for \$700 . . . a quart of milk for 7 cents . . . a gallon of gasoline for 9 cents . . . new homes for \$8,000 . . .

Ckt-Yrs. per Spacecraft 1/	Capital Cost per Ckt-Year	Capital Cost per Ckt-Yr. in Constant \$ 2/	Notes on Technology
360	\$32,500	\$32,500	World's first commercial satellite
720	11,400	10,700	Introduced multi-point capability
6,000	2,000	1,800	Simultaneous forms of communication (e.g., telephone, TV, Telex)
28,000	1,200	900	Introduced spot beam concept
42,000	1,100	600	Multiple use of same frequency bands
84,000	850	300	Use of new frequency bands plus reuse of frequencies

Technician at world's busiest earth station, the Intelsat earth station in Etam, West Virginia, monitors the quality of transmissions.



Two of the antennas at Southern Satellite Systems, Douglasville, Georgia, including Torus, foreground. People are Adam Grow, General Manager, and Sheila Bink, Executive Assistant. Above, wave form monitor in Southern Satellite Systems control room.



the more productive antenna

TORUS



The new Torus antenna, described by Comsat President and Chief Executive Officer Dr. Joseph V. Charyk as "the shape of things to come in the field of telecommunications," is already eliciting praise from users although less than a few are now operational. The Torus antenna, manufactured by Radiation Systems, Inc. (RSI), under an exclusive licensing agreement with **Comsat**, epitomizes a corollary of the modern age: Productivity improvements spring from technological innovation.

One of the first companies to purchase a Torus was Atlanta's Southern Satellite Systems, a common carrier uplink serving the cable television industry. Productivity—both human and mechanical—has been on an upward curve ever since.

"I like the way it looks and I like the way it performs," says Adam Grow, general manager of Southern Satellite Systems' Douglasville, Georgia, Uplink Facility. "Scanning the next four years and the services we anticipate providing, I see the Torus antenna substantially reducing installation costs and increasing operating efficiencies," he continues. Right now Southern's Torus is aimed at Satcoms F1 and F3R. Grow says his company plans to activate additional feed horns within the next three months.

That's the beauty of the Torus antenna. Developed and tested by **Comsat Laboratories** nearly 10 years ago, a Torus antenna can focus on several satellite transmissions simultaneously, pushing the conventional dedicated parabolic "dish" antenna, and its one-to-one operational constraints, closer and closer to obsolescence. Torus—once described as "a solution in search of a problem"—represents a significant increase over the productivity of these conventional reception systems and is destined to become as familiar. At **Comsat's** M&S Center, the Marketing Group has the task

by **Scott Chase**, Specialist, Public Relations,
Office of Corporate Affairs.
Photography by **William J. Megna**.



continued next page

Chrome vector scope at Southern Satellite Systems indicating color saturation of Torus transmission.



of developing demand for the new product.

"The main virtue of the Torus is that you can put up one antenna and look at several satellites, all at the same time," explains Jack Ehrmann, a senior staff engineer at the M&S Center.

Aimed primarily at the cable television market, the current production model Multiple-Beam Torus Antenna (MBTA) receives satellite television transmissions over a 50° orbital arc. The curved, rectangular-shaped Torus made industry history less than a year ago during the Third Annual Satellite Users Conference in Denver, Colorado.

At a demonstration jointly sponsored by the M&S Center and SatCom Technologies, Inc., an RSi subsidiary, the Torus received simultaneous television signals in the 4-gigahertz frequency range from Westars I and III and Comstar D-2, and in the 12-gigahertz range from Satellite Business Systems' SBS-1, for the first time publicly.

"We stole the show," exclaimed Richard E. Thomas, Chairman and President of Radiation Systems, Inc. A Sterling, Virginia, manufacturer of antenna products, RSi designs, builds and markets Torus antennas ranging in size from 3 to 8.5 meters under an exclusive contract with Comsat and has non-exclusive rights in other sizes.

The Torus is a fixed reflector-type antenna with a movable feed system. It is capable of forming up to 17 independent beams, each of which can be directed towards a satellite in geostationary orbit. This allows a single Torus to act as a terminal for transmission links to many satellites simultaneously. A 50° Torus measures 15 feet high and 36 feet long and generates a reception area equivalent to a 4.5-meter parabolic "dish" for each feed.

"The big appeal of Torus is its ability to operate with separate satellites simultaneously," said Clifford Allison, Jr., Director of Programs at RSi, during a visit he hosted at the firm's manufacturing plant.

The Torus has important implications for cable TV operators, TV broadcast stations and the national TV networks. In terms of productivity, the impact of Torus is dramatic.

Because Torus can access multiple satellite transmissions at the same time, the dimensions of earth station locations can be greatly reduced, easing the burden of real estate costs. Torus installations on the tops of large office buildings are entirely conceivable. Its commercial

introduction signals extinction for most comparable parabolic "dish" antenna farms and makes possible the use of Torus systems in otherwise prohibitively expensive or congested areas. In the rapidly-changing world of satellite communications, these increased use options translate easily into new markets, new services, and new horizons.

MultiVisions, Ltd., an Anchorage, Alaska, cable television company, was the first firm to purchase a Torus antenna, although legal complications have prevented its installation. The company plans to have its 10-meter Torus operational in mid-March. Expectations are running high.

"The Torus will give our programmers more flexibility and the ability to select and present more and varied programming," comments Seth Davis, MultiVisions Vice President for Engineering and Operations. "Also, we're located in a business park facility that was reluctant to give up space for multiple earth stations. The Torus cuts down on space requirements dramatically."

Saving real estate costs is a common theme among users and potential buyers of Torus antennas. Another note of optimism from Torus users concerns signal reception. The Torus outperforms "dish" antennas.

"We noticed initially that we actually pulled about 1.5 decibels better carrier-to-noise signal off the Torus than we did off our 5-meter dish," remembers Southern's Grow. Davis, at MultiVisions, says their Torus "will improve our signals in our congested microwave environment."

RSi is currently completing two production model 50° Torus antennas. After they're field-tested on the RSi range, one will travel to Knoxville for the 1982 World's Fair as a star of the Comsat exhibition there. It will be shown using at least three separate satellites. Bud Kennedy, Manager of Material and Technical Support Services at the M&S Center, expects large turnouts for the Torus demonstrations.

"We'll get a lot of exposure in Knoxville," Kennedy prophesied. "The interest so far has been overwhelming." Kennedy says the M&S Center gets about a dozen phone calls daily concerning the availability of Torus antennas. "It's pretty obvious that a lot of people are studying them," he says.

"The Torus is really a Cadillac-class product," Kennedy continues. "As the Ku-band satellites are launched, the Torus will become even more cost-effective. And it's a market that hasn't even been touched yet."

Productivity and Electronics

CGIS does the job

The need for productivity improvements on the part of American industry is well documented and fully accepted as critical. The encouraging aspect of this otherwise grim reality is that American industry has always risen to the challenges of the times.

In the electronics industry, Comsat companies are rising to the challenge by providing world leadership in communications and in computer-aided design, computer-aided manufacturing and computer-aided testing (CAD/CAM/CAT).

At Comsat General Integrated Systems (CGIS), for example, we are attacking the productivity problem from at least two points. We are developing the CAD/CAM/CAT tools necessary for the electronics industry to produce more, produce better and to stay competitive. On the second level, we are concerned with applying these tools in our everyday work within our own company.

Within every part of CGIS, productivity is a most serious matter. While many companies speak of the need to computerize, we go a few steps further. Every employee in our Palo Alto facility, from Board Chairman on down, is equipped with a computer terminal. The same will soon be true in our Austin facility. In addition, we have developed a computer communication language, called NOEL—the CGIS Network Operating Environment and Language—that allows the many terminal users with various terminal types to communicate with four different computers at that site. All this is done without the need to make connections, disconnections or adjustments to any device.

This capability will soon be expanded to include communication links between other CGIS sites so we can all access the full range of computer resources without regard to the physical location of the resources or their specific type.

More importantly for the American electronics industry and the many related fields that incorporate electronics into their end-products, we design and produce a vast array of tools with which others may increase their own productivity. These are the CAD/CAM/CAT tools that effectively let design engineers cope with the complexities of this high-technology age. In the major areas of elec-

tronic design, complexity levels have reached beyond the grasp of the unaided human mind. Without CAD/CAM/CAT the designer is reduced to an unproductive level, he cannot survive.

Good examples of our problem solutions can be seen in our Systems Division products. In this area of CGIS, we incorporate the many CGIS software products (the computer program instructions) with hardware (the actual computer machinery) to produce "systems" that perform the complex tasks more productively than could be attained by use of hardware and software that have been designed separately for general-purpose application.

One of the keys to our systems concept is found in our company name: The key is the word "INTEGRATED." We integrate software and hardware to produce synergistic systems that can be used by our customers for substantial productivity increases—at levels that can make their end products competitive, viable, and timely.

Within this framework, CGIS is constantly improving and integrating our existing software programs so as to achieve the highest possible compatibility from program to program. For example, our TEGAS program is used in the design, verification and testing of digital circuits. A second CGIS program, LOGIX, is used in the development of logic diagrams—the blueprints of the circuit. These two programs work together so that data captured for one is applicable to the other. As a result, we can reduce errors in data capture and at the same time reduce the time required in bringing new products from concept to completion.

Other products of CGIS are designed for productivity increases in the area of analog electronics.

In a major aerospace firm, CGIS products and services are integrated to provide productivity enhancements for virtually all employees, doing engineering and non-engineering work, in a 250-person electronics design department. In this application, our capabilities go beyond the limits of traditional engineering CAD/CAM/CAT and into the general-use area where productivity benefits can be shared and multiplied.

In total, CGIS offers solutions that are targeted at the whole problem of productivity: single software programs, programs that are integrated with others for more extensive computer assistance, and integrated systems of hardware and software that bring CAD/CAM/CAT to its fullest level of maturity.

by Randy L. Prakken,
Vice President, Systems Division
Comsat General Integrated Systems



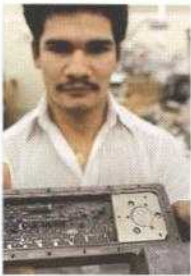
A M P

Amplica joins the family

On January 15, Amplica, Inc., a Newbury Park, California, manufacturer of a wide range of microwave amplifiers and related subsystems, joined the Comsat family. Located about 50 miles north of Los Angeles, the rapidly growing company produces and sells over 600 standard low-noise, medium-power and general-purpose amplifiers and employs about 200 people.

Organized into two operating divisions—Telecommunications Products and Defense Electronics—Amplica has shown strength in both defense and commercial markets. Last year it had revenues of \$14.2 million.

Below Right, Charles Abronson, President of Amplica, Inc., with an array of products manufactured by Telecommunications Products and Defense Electronics Divisions. Below Left, Amplica assembler holds low-noise amplifier sub-assembly. Photos by William J. Megna.



Productivity & The Environment

ERT Strikes the Balance

by Barbara Kelly,
Promotion/Technical Writer,
Environmental Research & Technology, Inc.



ERT provides the environmental consulting, measurement, and engineering services that make it possible for government and industrial managers to seek workable balances between natural resource preservation and resource use. Striking an optimum balance between industrial growth and resource preservation will benefit everyone. In the United States, ERT uses innovative approaches and multidisciplinary experience to help industrial clients find the best ways to comply with environmental regulations, to become more productive in the management of large projects and thus to save time, money, and labor. In developing countries, such as Saudi Arabia, ERT skills assist the government with environmental management to accompany industrial development.

ERT's work is highly diversified, but its efforts aimed at helping make its clients more productive are exemplified by the projects described in this article. A project in Colorado is intended to result in more efficient use of limited water resources; a project in Texas is the first in a series to save clients needing air permits substantial amounts of money and time. ERT is the primary environmental consultant to a large synthetic fuels facility proposed in Tennessee; the facility would synthesize gasoline from the large coal reserves immediately available in that part of the country. For the Kingdom of Saudi Arabia, undergoing a concerted effort to industrialize its nation and to protect its natural environment, ERT is providing technology and training.

Colorado Water Project

ERT and Comsat, its parent company, have applied high technology—computers and satellites—to help western states protect, conserve, and allocate a precious resource—water. The Arkansas River in southeastern Colorado, for example, must supply the needs of farmers and ranchers, of towns and cities, and of industries. Water demand, however, frequently exceeds supply. In addition, the water supply varies, not only from season to season, but as often as from one

part of a day to the next. The farmers, municipalities, and industrial facilities that need the water, however, must be able to count on a consistent supply. Farmers, who might have as much as \$300,000 tied up in a single planting season, must plan ahead for crops and acreage. The cities of Pueblo and Colorado Springs, undergoing explosive population growth, must have water for municipal needs. Industrial facilities, such as steel mills, must have a dependable water supply for processes and production. The survival and the productivity of the entire area and of similar areas in the semi-arid western states depend on keeping track of the water supply.

A Comsat/ERT system of automated water sensors, satellite communications, and computers gathers, tracks, and stores information on water height and flow in the Arkansas River, enabling the state engineer responsible for water allocation to determine virtually immediately, how much water is available for its users. Water sensors at key points in the river and adjacent canals are connected to data collection platforms at each site, which periodically transmit height and flow information via satellite to the ERT computer. System users have access to the information via their computer terminals. The continuous availability of these data enable water allocators to make better decisions based on near real-time information. The river flow is dynamic and ever-changing; information about the flow needs to be immediate and continuous. The exciting new technology of satellite communications makes it possible.

Texas Air Project

Rules stemming from the Clean Air Act and the Environmental Protection Agency require industries planning major expansion or new facilities to gather air quality data for one year to include in permit applications. Complying with these rules can cost a company running an air monitoring (measurement) network well over \$200,000 and a year of construction delay and concomitant costs. A unique ERT air

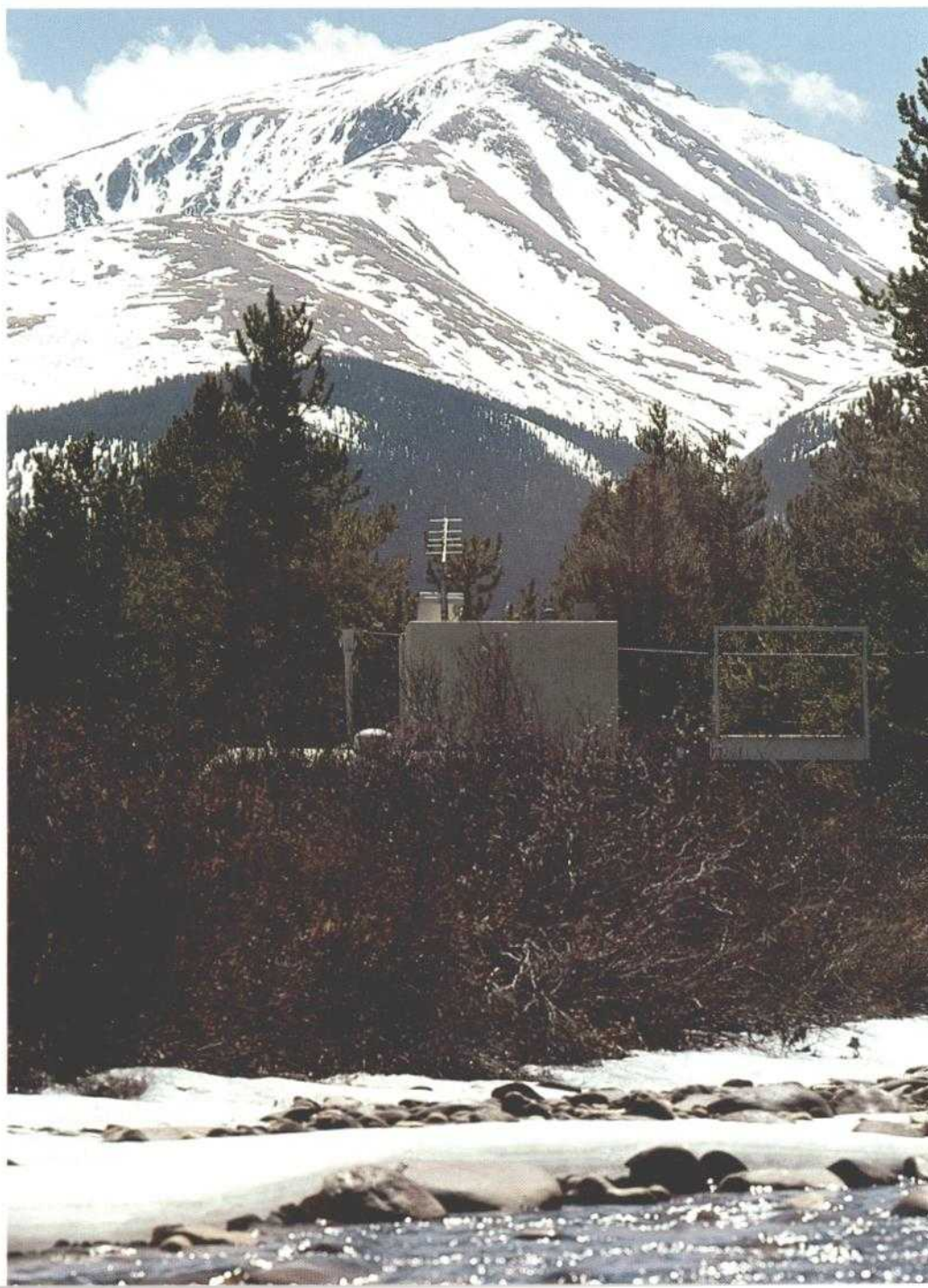
quality monitoring system now enables large industrial facilities, in proximity and in key geographic areas, to save 60 to 80 percent of the costs ordinarily incurred for an air monitoring system.

ERT is running a subscription air monitoring service in the Beaumont/Port Arthur/Orange area in Texas that is saving substantial sums for its five industrial subscribers. They share the costs of network operation and data management. ERT owns the equipment and operates the system, assumes all administrative responsibility, and offers the subscribers access to their data as well as to the advice of a senior air quality consultant. Industrial members are also assured that their data are kept confidential until they are used in an air permit application.

The time saved for subscribers can be a year or more. Before construction begins, permit information must be gathered on potentially significant pollutants, such as sulfur dioxide and nitrogen oxides, along with basic meteorological data. For network subscribers, these data are collected continuously over three years and are available for an air permit application as soon as industrial managers decide to go ahead with an expansion or a new capital project.

Synthetic Fuels

Tennessee Synfuels Associates (TSA) proposed to construct a coal-to-gasoline synthetic fuels facility in Oak Ridge, Tennessee. This innovative project would be a first step toward revitalizing the national coal



Malta water height monitoring site on the Arkansas River, highest (in elevation) water height monitoring site in the United States. Mountain is Mount Elbert, highest peak in Colorado (14,433 feet above sea level). Photo by William J. Megna.

Subscribers to ERT air monitoring service make use of data gathered at such sites as that pictured. Site includes tower with weather instruments, rain gauge (foreground) and shelter housing instruments.



industry to provide the raw materials for production of domestic gasoline. The plant would convert bituminous coal from Tennessee and Kentucky to synthetic gas and then to gasoline. ERT is the principal environmental consultant to the project. Final decision on the project depends on loan guarantees from the U.S. Synthetic Fuels Corporation.

The scope of the project required ERT to perform detailed studies of the proposed site for the facility and of the local terrestrial and aquatic ecology, air and water quality, hydrology, and socio-economics. Health and safety and environmental engineering studies were also carried out. ERT has successfully assisted TSA in the acquisition of the necessary pre-construction air permit and to prepare the required Environmental Impact Report.

The Koppers Synfuel Corporation (one of the partners of TSA) and Babcock & Wilcox developed the KBW gasification process that would be used at the Oak Ridge facility. The KBW process operates at temperatures above 3000° F, and the high temperatures decompose all tars, oils, and phenols in the synthesis gas. This high-temperature process is cleaner from an environmental and health standpoint than other synthetic fuels production processes, such as

low-temperature gasification or direct coal liquefaction.

Benefits from the TSA project would accrue not only to the economic well-being of the Oak Ridge area and Tennessee but also to the domestic fuel needs of the United States. In addition, plant operations would provide a "laboratory" for the nearby National Energy Research Park, whose objectives include the study of technological activities on ecosystems and whose work at the TSA site would complement the studies undertaken by Oak Ridge National Laboratories.

Saudi Arabia

As the Kingdom of Saudi Arabia proceeds toward rapid industrialization,

ERT is providing environmental consulting, computer software, monitoring equipment, and training. On its eastern coast, the Kingdom is concerned with environmental protection and management as a village and its environs are transformed into a major complex of industrial, air-

port, community and regional park areas. ERT is providing environmental consulting and monitoring of air quality and meteorology in support of the development.

For the Saudi Arabian National Meteorological and Environmental Center (NMEC) in Jeddah, ERT has trained nearly 40 Saudi nationals as environmental forecasters and observers, systems engineers, and data analysts. ERT has also written the scientific software programs needed to operate the computerized data center. The Kingdom plans to provide sophisticated weather forecasting for its internal needs and to automate meteorological information transfer between the Arabian peninsula and the worldwide meteorological Global Telecommunications System.

Among the special requirements for accurate and reliable air monitoring in Saudi Arabia is the need for instruments to operate under extremes of heat, dust, and humidity. ERT technicians developed and delivered six air quality shelters that include in their equipment a special calibration system to ensure accuracy and a unique intake manifold to eliminate sand, dust particles, and water vapor from the sampling mainstream. Data from the sensors are collected and transmitted automatically via satellite to the NMEC for environmental forecasting, study and archiving.

Through continued training, experience with new equipment, and use of the growing body of environmental data, the Kingdom will increasingly benefit from the transfer of ERT environmental skills and experience.

ERT is often in the forefront of scientific and technological services to clients. Some recent projects include optimum ocean routing for the shipping industry, studies of microfossils for the oil drilling industry, and studies of the effects of ice on offshore drilling sites. Another innovative project, for the pulp and paper industry, has included environmental studies for a mill proposing to burn dried sludge, bark, wood waste, and coal for fuel, recovering what would otherwise be byproducts and waste products. ERT's consulting, engineering, and environmental measurement services are intended to help clients achieve that desired balance between preservation and use of resources.

continued from page 4

systems used in defense and in satellite communications systems, fits very well into our plans for careful and steady growth. We are delighted to have the talented management team led by Mr. Abronson join the Comsat General organization and we look forward to working closely together in the future."

Charles Abronson, President of Amplica, added, "We have experienced rapid growth over the past years, both in our defense and commercial sales. With the joining of Comsat General and Amplica, we expect that growth to continue and to accelerate."

Dr. Joseph V. Charyk, President and Chief Executive Officer of Comsat, the parent company of Comsat General, stated, "We are very pleased with the addition of Amplica to the family of Comsat companies. This acquisition continues our movement into markets for communications and information products where our technological experience and capabilities can be fully utilized."

Comsat General and Amplica had announced their intention to merge last October. Comsat General has acquired all of Amplica's outstanding stock for a total of approximately \$57 million. In order to finance the acquisition, Comsat General has borrowed \$55 million under a \$60 million credit agreement from a group of banks led by American Security Bank, N.A. of Washington, D.C.

Applied Silicon Technology acquired by CGIS

Comsat General Integrated Systems (CGIS), a wholly owned subsidiary of Comsat General Corporation, has acquired Applied Silicon Technology (AST). Located in Austin, Texas, AST custom designs integrated circuits for microprocessors and other advanced electronic devices. As a result of the acquisition, AST now becomes an operating part of CGIS.

With this acquisition, CGIS expands its range of computer-aided design, manufacturing and test (CAD/CAM/CAT) capabilities to include integrated circuit mask design, the last major step before the actual manufacture of an integrated circuit.

Dr. Stephen A. Szygenda, CGIS President, commenting on the move, explained,

"Our goal is to provide a truly integrated set of design, manufacturing, and test tools that assist electronics designers at every stage—from concept to finished product. The AST acquisition brings us closer to that goal."

Teamed with the software programs marketed by CGIS, AST's capabilities permit CGIS to offer CAD/CAM/CAT services through the development of the circuit mask itself, which specifies the actual makeup of the finished chip.

Documents made available

The Comsat World Systems Division is compiling a list of the names of individuals and organizations interested in receiving copies of the available working documents of the International Telecommunications Satellite Organization (Intelsat) and the International Maritime Satellite Organization (Inmarsat). Individuals and organizations interested in receiving free periodic listings of the Inmarsat and Intelsat documents, which can be ordered on a cost-reimbursable basis from Comsat, the United States Signatory to these organizations, should send a written request to:

Inmarsat/Intelsat Documents List,
Room 6233, World Systems Division,
Communications Satellite Corporation,
950 L'Enfant Plaza, S.W., Washington,
D.C., 20024.

Five satellite builders asked for direct broadcast bids

Satellite Television Corporation has invited five U.S. satellite manufacturers to bid on construction of high-powered direct broadcast satellites (DBS), operating in the 12- and 17-gigahertz bands, for STC's satellite-to-home pay television service.

The Request for Proposals solicits bids for construction of two satellites (one operating and one spare) which STC would use to initiate service in the Eastern United States as well as options on additional satellites to extend the service nationwide.

Each satellite is expected to provide at least 1,700 watts of prime power and to employ a shaped beam antenna to

provide coverage to an area roughly covering a U.S. time zone. The spacecraft will have three operating transponders with a radio frequency output power of approximately 200 watts each. This level is 20 to 40 times higher than that of conventional communications satellites now serving the United States. The high power will permit television reception by small receiving antennas, generally 2½ feet in diameter.

Intelsat opts to negotiate with Hughes on Intelsat VI

Intelsat has decided to negotiate with Hughes Aircraft Company for the supply of Intelsat VI series communications satellites. While the initial contract will be for five satellites, the total value of the Intelsat VI series could amount to more than \$1 billion.

The Intelsat VI series satellites, which are expected to go into operation in 1986, will be capable of relaying the equivalent of more than 30,000 telephone calls simultaneously as well as several television programs. This compares with the 12,000-telephone-call, plus television, capacity of Intelsat V—currently the world's largest commercial communications satellite.

Intelsat called for proposals for Intelsat VI early in 1981 and in July 1981 began assessment of the two proposals received—one from Hughes and the other from Ford Aerospace and Communications Corporation.

The original request for proposals called for a series of between five and sixteen spacecraft. Each spacecraft is expected to cost in excess of \$100 million, exclusive of launch charges. Intelsat VI will be capable of launch aboard the NASA Shuttle or European Ariane 4 launcher.

Intelsat's Director General, Mr. Santiago Astrain, said that the choice of Hughes was the result of a balanced assessment of the total submissions from the bidders—including financial, contractual and technical proposals for the satellite. Negotiations will now commence with Hughes with a view to reach-

ing mutually agreed contractual arrangements. If, however, this proves impossible, negotiations will be opened with Ford. Both Hughes and Ford have built satellites for Intelsat previously. Ford is currently manufacturing the Intelsat V and V-A series satellites, of which a total of 15 are scheduled to be launched by 1985.

The current Hughes version of Intelsat VI is a spin-stabilized satellite weighing over 7,700 pounds (3,500 kilograms) measuring 11.8 feet (3.6 meters) in diameter and standing 38.7 feet (11.8 meters) high when fully deployed in orbit. It would utilize both the 6/4-gigahertz and 11/14-gigahertz frequency bands and, with extensive use of SS/TDMA (Satellite Switched/Time-Division Multiple-Access) techniques, will be capable of deriving a total of more than 30,000 two-way telephone circuits and four television channels.

Date for fourth annual natural resources event set by ERT

ERT will hold its fourth annual International Seminar on Natural Resources and Environmental Management June 7-18 in Concord, Massachusetts. The two-week seminar is an intensive series of case studies, site visits, and presentations made by some of the world's leading experts in natural resources and environmental management, with visiting faculty from the United Nations Environment Program and the World Bank.

The seminar is open to any interested person and is designed for high-level policy makers and administrators in the public and private sectors concerned with natural resources and environmental management. The course strengthens skills in strategy formation and implementation and provides an up-to-date understanding of the scientific and technological tools and methods available to implement such strategies with success. The course includes specific sessions on Education and Training and Technology Transfer.

The three previous seminars have involved over 100 participants from more than 30 countries and six international organizations.

FOR THE RECORD

Excerpts of what officers of Comsat and subsidiaries said at recent speaking engagements

"Planning for the Use of the Orbit/Spectrum Resource," by Dr. Joseph V. Charyk, President and Chief Executive Officer, Communications Satellite Corporation at Leeds Castle, Kent, England, March 1982.

... Generally, there are a number of reasons why *a priori* planning is disadvantageous to both developing and developed nations. Under such plans, orbital slots could be denied to users who could use them now, in order to reserve them for other parties who may not use the slots for many years, if ever. By thus forcing a large part of the orbit/spectrum resource to remain unused, an artificial scarcity of orbital positions for nations and organizations actually using the orbit is established. This inefficient use of the resource is economically wasteful and may result in increased prices and decreased services which would most adversely affect the very nations who advocate such planning.

Furthermore, *a priori* plans are based on a particular set of requirement estimates that become obsolete long before most of the allotments in the plan can be utilized. Because of our inability to predict the future, particularly in technology, these plans do not take into consideration technological trends that may allow the orbit/spectrum resource to be used more intensively. Consequently, they may freeze technological development and hasten the congestion they are designed to prevent.

The results of the 1977 Broadcast Satellite Service Conference reveal some of the specific problems encountered in detailed long-term *a priori* planning. At that conference, a complex, interlocking plan was approved for use by all nations, except those in North and South America. As part of the plan, each of the Arab countries was assigned specific channels at specific orbital positions. The Arabsat system, which had been organized to provide both television and telephony service to 22 Arab countries, was based on a system design using a single orbit location and therefore could not utilize the channels assigned in 1977,

since the countries to be served had been assigned a number of different orbital positions.

Another type of problem arose in the case of the Peoples' Republic of China, which had been assigned three orbital slots, and 35 beams totaling 55 channels. By late 1978 the Chinese decided that their needs would best be met by two hybrid satellites, each operating simultaneously at 4/6 GHz for telephony and 12/14 GHz for television broadcasting. They believed that their best design approach at 12 GHz was to illuminate the country with only two beams, one east and one west, and use only one television channel in each beam. This concept was at odds with the 35 beam and 55 channel assignment resulting from the '77 Conference. Furthermore, of the two orbital positions assigned to them for the 12/14 GHz band, one was one degree from an Indian satellite operating at 4/6 GHz, while the other was one degree from a Soviet satellite operating in the 4/6 GHz band, thus constraining the Chinese in the use of the 4/6 GHz and 12/14 GHz frequencies simultaneously in one satellite. A solution to this problem has not yet been found.

These are illustrations of one of the main shortcomings of *a priori* plans, the lack of flexibility to meet diverse needs. The 1977 plan also highlights the dangers of "freezing" technology which results from a detailed, long-term plan. For example, with the laudable objective of minimizing the costs of ground receiving installations in the broadcast service, the conference specified comparatively insensitive receivers and antennas with relatively modest sidelobe performance. However, today's technology allows for mass production of receivers with greater sensitivity and significantly better antenna sidelobe performance at lower cost than was envisioned by the conference. Had the planners anticipated these developments, more channels and more orbit locations would have been available for assignment or could have been held in reserve to accommodate future growth and changes in requirements.

The prospects for broadcast satellite planning for North and South America,

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



fortunately, seem somewhat brighter. A middle ground between the detailed long-term *a priori* planning used in 1977 and the preexisting IRFB registration/coordination process seems to be emerging and will be decided at the forthcoming 1983 Regional Administrative Radio Conference. This approach, known as "Block Allotment," ensures developing country access while preserving the flexibility required by changing technology. Under this approach a block of frequencies and orbital positions are assigned to a large country or group of small countries. Specific arrangements for channelization, satellite power, sharing with terrestrial services, etc., can then be made at national or subregional levels.

It is to be hoped such a reasoned approach will be adopted by the World Administrative Radio Conference for Space Services in 1985/87. It is particularly important that flexible and sound approaches be adopted for the latter conference. The fixed satellite service must accommodate a greater variety of requirements than the broadcast satellite service. Different, often overlapping service areas, varying power levels, earth station sizes and spacecraft designs must be considered in the planning process. In order to gauge future requirements, traffic patterns and forecasts for the next 20 years must be considered. All established services (telephone, telex, data transmission, television relay) and emerging services (teleconferencing, high-speed data, high-speed facsimile) must be included. In addition to Intelsat needs, the requirements of a growing number of nationally owned systems and of a number of regional systems, must also be taken into account . . .

The current procedures have been considered by developing countries to be "first come-first served", placing a newcomer in a weak bargaining position vis-a-vis established users. Recognizing these concerns, it appears that the adoption of a "next come-next served" accommodation approach in which the latest entrant's access claims are cooperatively incorporated in the current phase of the ongoing planning process

might present a solution acceptable to a *priori* advocates while protecting current interests.

For many nations, leased space capacity from Intelsat provides an economical alternative to individual domestic satellite systems since such capacity can be tailored to individual needs. Thus, insofar as Intelsat services can relieve pressure on the orbital arc, the common interest of many countries may be well served by accommodating Intelsat requirements for orbital positions and space segment appropriate for provision of such service not to mention the encouragement of Intelsat provision of capabilities for new international services rather than the creation of new, hybrid systems.

One basic concept which may aid in the planning process is the formation of a new ITU activity to manage planning for utilization of all aspects of the geostationary orbit spectrum. This new activity would involve a real-time data base of orbital/spectral utilization, including information on existing satellite communications networks, their characteristics, their orbital locations and the spectrum which they utilize; information on those networks in an advanced state of planning; and those networks in a preliminary stage of planning; and forecasts by each country of satellite communications requirements for the next year. Such data would enable planning for optimal utilization of orbital/spectral resources and would permit the developing nations to realistically assess saturation of such resources not on a potential or theoretical basis, but on an actual basis.

This information/planning approach should provide some assurances, i.e. the "guarantee", to the developing nations that their domestic satellite communications needs will be met. However, for certain space services additional assurances, or access guarantees, may be required. One source of potential access assurances is in existence in the Intelsat system, already a global provider of owned as well as leased space segment capacity. Intelsat could become the repository of access potential for new entrants under a variety of access provisions of a technical, operational and financial nature. . . .

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Chairman John D. Harper talks about the U.S. productivity crisis, the general state of the U.S. economy and Comsat.

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The Nation must continue to support President Reagan's economic program, argues Senator Howard Baker.

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The Reagan Administration's strategy for encouraging productivity improvements by U.S. business and industry is described by Secretary of Commerce Malcolm Baldrige.

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Comsat will have a major exhibit at the 1982 World's Fair in Knoxville, Tennessee.

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A Comsat World Systems Vice President tells how satellite communications benefits U.S. companies' international operations.

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The U.S. tuna industry should see major benefits from the widespread use of maritime satellite communications, says a Ralston Purina official.

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Research and development is the base upon which industrial productivity is built. At Comsat, R&D is the province of Comsat Laboratories.

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The steady decline in the lease charge is excellent evidence of the productivity enhancement of international satellite communications.

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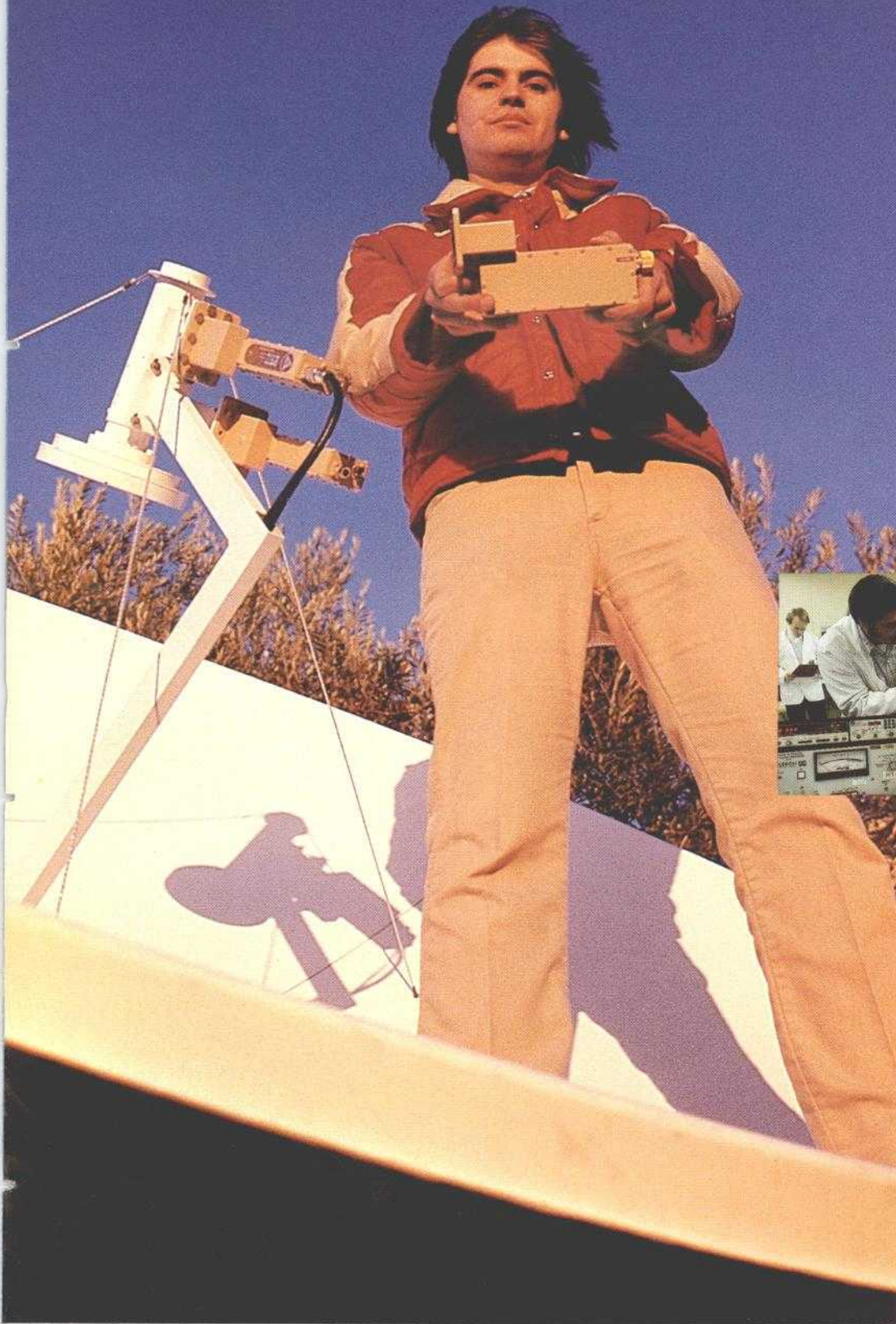
Comsat Laboratories developed Torus, made under license by RSi, is the more productive antenna.

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Industry must be made more productive, but not at the expense of environmental quality. ERT strikes the balance.

COMSAT

L I C A



Left, Amplica technician holds low-noise amplifier that will be installed and tested in company's 3.5-meter test dish. Below, Engineering technician in test lab checking Defense Electronics amplifier.

