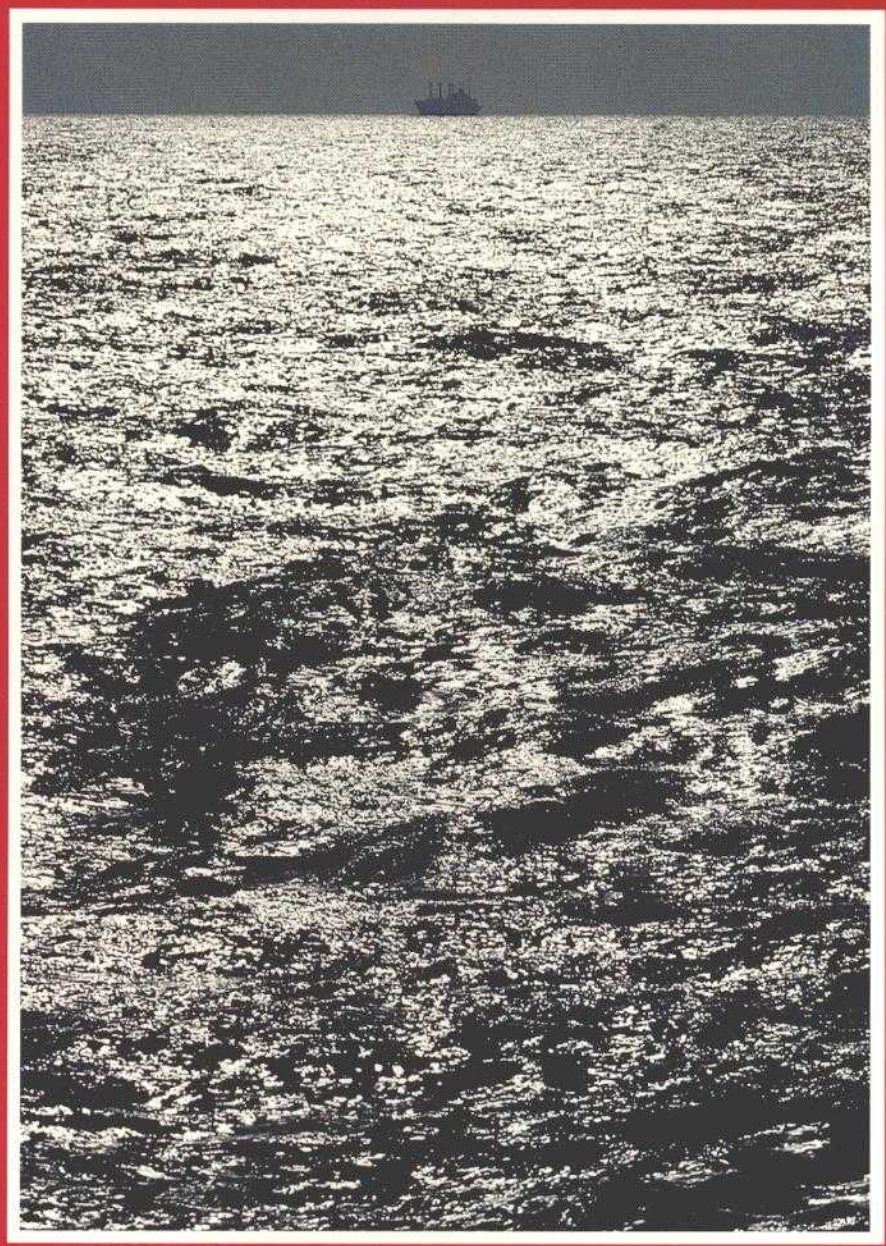
COMSAT®

COMMUNICATIONS SATELLITE CORPORATION MAGAZINE

1981



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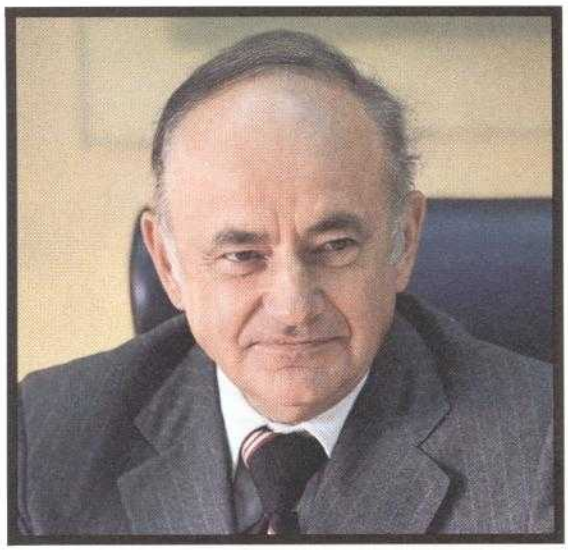

by Dr. Joseph V. Charyk
President and Chief Executive Officer
Communications Satellite Corporation

At this time when communications via satellite on the high seas is about to enter a new era, namely the Inmarsat era, it is well to remember the achievements of the Marisat system, which our subsidiary, Comsat General Corporation, first made operational in 1976. On February 1 of next year, we cease offering commercial service via the three Marisat satellites under an arrangement with the International Maritime Satellite Organization in which the commercial capacity of Marisat will be utilized for the first phase of Inmarsat's service offering.

Marisat is significant in the history of satellite communications for three principal reasons. First, this system created for use by both the U.S. Navy and commercial maritime interests has provided ample demonstration of what we have long known about satellite communications technology, that it is not just for fixed land-based communications, but for mobile applications as well.

Indeed, Marisat dramatized the fact that communications satellite systems are ideally suited for mobile applications. The development of a stabilization system to keep a microwave antenna constantly oriented to the satellite as the vessel carrying the antenna constantly changed location made high-quality communications services to ships at sea a reality for the first time.

From the perspective of the marine community which became the beneficiary of communications satellite technology, Marisat was unquestionably a milestone. No longer was the voyager on the high seas limited to the not-always-reliable electronic communications offered through medium and high-frequency radio. Marisat proved to the mariner far out on the high seas that voice communications could be crystal clear no matter what the ship's location and time of day. Telex communications also could be virtually 100 percent reliable, again regardless of location and time of day. The excellent communications afforded by Marisat meant and continues to mean safer operation for ships and drilling rigs on the high seas and also significant economies in their operations.

In addition, the design of the overall system demonstrated certain important technical refinements in the state of communications satellite technology at the time of its birth in 1976. Marisat was the first system to use different frequencies to separate different users of the system and the first to make it possible to allocate power among those users as desired.

In the annals of communications satellite technology, clearly Marisat will always enjoy a very important place. We at Comsat are proud of the role we have played in bringing this outstanding system into being.

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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: A lone ship on a vast sea, as photographed in the Gulf of Alaska by William J. Megna. No photograph could better portray the need for and value of satellite communications, that is, Marisat, on the high seas. Marisat does indeed mean greater security for the traveler on the vast, dangerous, awe-inspiring sea.

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From the Editor

To put together this issue, devoted to a considerable extent to the subject of satellite communications and the sea, we have been fortunate to have had the assistance of many people in the Maritime Services group of the Comsat World Systems Division, some of whom are authors of articles. These others, who might not otherwise receive the recognition they deserve, also provided much needed help: Robert D. Bourne, Senior Director, External Affairs; James H. Kilcoyne, Jr., Assistant Director, Market Communications; and David W. Lipke, Special Assistant for Program Development.

In arranging the marine photography for much of the issue, specifically the work of Chief Photographer William J. Megna, we received considerable help from Edward G. Dooley, Manager of Maritime Marketing for Comsat General TeleSystems, Inc., who is based in New York City. In arranging photography in Houston, Texas, we were aided by Edward P. Moser, President of Satellite Services, Inc., of Houston. Both deserve our thanks.

Finally, our deepest thanks to Atlantic Richfield Company and the crew of the Arco Alaska and to the Holland America Cruises and the crew of the S.S. Rotterdam for permitting Mr. Megna to voyage and take photographs aboard their ships.

We are pleased to have as our guest author this issue The Honorable Walter B. Jones, Chairman of the House Merchant Marine and Fisheries Committee. Our readers will find Mr. Jones' article both highly informative and thought-provoking.

Stephen A. Saft

N O T E S

Dr. Delbert D. Smith resigns

Dr. Delbert D. Smith has resigned as Senior Vice President, Corporate Affairs, in order to pursue other business opportunities. Assuming responsibility for the Office of Corporate Affairs on an acting basis is Robert E. Bernier. Mr. Bernier previously was Division Director, Corporate Promotion.

Second Quarter results are made known

Comsat has reported consolidated Net Income of $6,144,000, or 77 cents per share, for the second quarter of 1981. This was a decrease of $2,985,000 or 37 cents per share (32.7 percent) from the second quarter of 1980.

The major factor in the decrease was the anticipated increase in costs related to Satellite Business Systems (SBS). SBS is a partnership of Comsat General Corporation, IBM and Aetna Life and Casualty established to provide advanced communications satellite services for a variety of users.

The Corporation's share of losses and amortization of certain costs relating to SBS offset by related investment tax credits are included in Other Income (Expense)—Net. These SBS-related items reduced Net Income for the second quarter of 1981 by $6,243,000. The reduction attributable to SBS for the second quarter of 1980 was $2,733,000.

The Comsat Board of Directors today declared a quarterly dividend at 57.5 cents per share, payable on September 14, 1981 to shareholders of record on August 14, 1981.

Operating Revenues for the second quarter of 1981 totaled $81,597,000, an increase of $9,395,000 from the second quarter of 1980. Operating Expenses including income taxes for the second quarter of 1981 totaled $71,272,000, up $9,040,000 from the second quarter of 1980. Net Operating Income for the second quarter of 1981 increased slightly from a year ago despite an 11.8 percent rate reduction which Comsat put into effect on January 1 for Intelsat services Comsat provides.

For the first six months of 1981, consolidated Net Income was $26,253,000, including the increase from a non-recurring item of $11,769,000 or an increase of $1.47 per share in the first quarter of 1981 resulting from the change to the flow-through method of accounting for investment tax credits. Consolidated Net Income increased by $7,235,000 over the first six months of 1980. Without the aforementioned accounting change, Net Income for the first half of 1981 would have declined, primarily because of the anticipated increase in costs related to SBS.

Operating Revenues for the first half of 1981 were $159,531,000 as compared to $142,232,000 for the first half of 1980. Operating Expenses for the first half of 1981 were $138,612,000 compared to $121,765,000 for the first six months of 1980. Net Operating Income for the first half of 1981 increased slightly from the same period in 1980 despite the January rate reduction for Intelsat services.

Torus demonstrated at Denver Conference

A new design concept that enables a single antenna to simultaneously operate with signals from a number of different satellites was demonstrated at the Third Annual Satellite Communications Users Conference in Denver August 19-21. The demonstration, sponsored by Comsat and SatCom Technologies Inc., a subsidiary of Radiation Systems Inc. (RSi), featured Comsat's revolutionary multiple beam satellite antenna, Torus, which is engineered and manufactured by RSi.

A first-ever feature of this demonstration was the simultaneous reception of 4 GHz and 12 GHz television signals from different satellites by the same antenna. Through the use of the multiple beam Torus, Comsat and RSi supported a variety of satellite communications applications, including a

video conference with participants from New York City and Washington, D.C., and a simultaneous multiple satellite feed on 4 GHz and 12 GHz frequency bands.

In addition, the Torus antenna received a live intercontinental video feed from Hong Kong. This feed, a double hop, was transmitted through the Pacific Intelsat satellite from Hong Kong to the West Coast, and via a domestic satellite, to the Regency Hotel in Denver, site of the demonstration.

Torus antennas differ from conventional parabolic satellite antennas in that, unlike parabolic antennas which can "look" at only one satellite at a time, they may simultaneously operate with multiple communications satellites in geostationary orbit. The advanced antenna was developed by **Comsat Laboratories** and manufacturing rights were recently licensed to Radiation Systems. The Comsat marketing agent for Torus is **Comsat**'s Maintenance and Supply Center, located in Clarksburg, Maryland.

Contract signed with Indonesian Agency

Comsat General Corporation has signed a $1.6 million technical consulting contract with Perusahaan Umum Telekomunikasi (Perumtel) of Bandung, Indonesia, to assist Perumtel in the management of Indonesia's satellite system. The 34-month contract provides that **Comsat General** will support Perumtel in the operation of the existing Indonesian system as well as in the implementation of the second generation of communications satellites, Palapa-B, expected to become operational in 1983.

The services to be provided by **Comsat General** include improvements in the efficiency of the management, maintenance, and operations of the Palapa System. These assessments will cover both the extensive Indonesian satellite communications network and the satellite control system. In addition, the Comsat subsidiary will provide a variety of services for the new generation of Indonesia satellites, which are currently being manufactured in El Segundo, California. These services include: technical monitoring of spacecraft construction; spacecraft, U.S. Space Shuttle, and Payload Assist Module (PAM) integration; spacecraft launch preparation; and spacecraft in-orbit testing.

The Comsat General contract with Perumtel of Indonesia is one of many technical consulting agreements that the Washington-based firm has entered into, both domestically and internationally.

Three more V-A satellites are ordered

Three more Intelsat V-A spacecraft were ordered by the Intelsat Board of Governors at its meeting in September, bringing to six the total number of such spacecraft procured by **Intelsat** from Ford Aerospace and Communications Corporation, and to fifteen the total number of satellites of the Intelsat V series. The Intelsat V-A can carry up to 15,000 two-way voice conversations, an increase of 3,000 circuits over the Intelsat V which are already providing service over the Atlantic Ocean. To be launched beginning in 1984, the Intelsat V-A will be used to meet **Intelsat**'s growing traffic needs, and will initially be deployed over the Atlantic and Indian Oceans.

On the Intelsat VI program, the Board was informed that two bidders, Ford Aerospace and Communications Corporation, and Hughes Aircraft Company, had responded to the March 1981 Request for Proposals; evaluations are proceeding toward contract approval by not later than March, 1982. **Intelsat** has awarded grants to the two bidders for immediate development of new antenna system technology, a step which is expected to assist the timely development and production of the spacecraft. The Board also approved a Technical Assistance Contract between **Intelsat** and **Comsat** for monitoring and

continued next page

evaluation of the Intelsat VI program.

Also at this meeting, the Board approved a one year extension of Mr. Santiago Astrain's term of office as Director General, through December 1983, and recommended that the Assembly of Parties confirm this action.

Intelsat RFP released for TDMA equipment

In another step toward the introduction of digitally derived services, the Intelsat Board of Governors recently authorized the release to industry of the RFP for the Reference and Monitor Station Equipment for Time-Division Multiple-Access/Digital Speech Interpolation (TDMA/DSI). TDMA/DSI, a digital transmission method, offers dramatic increases in satellite voice channel capacity, greater accuracy over traditional analog techniques, and greater adaptation to new services. The reference stations will monitor and coordinate the traffic of all earth stations using TDMA/DSI. TDMA/DSI is to be introduced in the Intelsat system in 1984.

During its last two meetings, the Board of Governors has discussed the provision of other digital satellite services on an international level, and has asked the Director General to continue studies of the means by which **Intelsat** would provide business services. Also of increasing interest are video teleconferencing possibilities, and **Intelsat** is taking action to further develop the service on an international scale. **Intelsat** has established a one year demonstration period for tests and demonstrations of new video teleconferencing techniques such as digital transmission and data compression, and plans to hold an international conference on video teleconferencing in early 1983.

TeleSystems receives large order for echo cancellers

Comsat General TeleSystems has received an order in excess of $1 million from MCI Telecommunications Corp. (MCI) for 2,500 echo cancellers.

MCI provides a variety of intercity long-distance telecommunications services to both business and residential customers throughout the continental United States. In the past, MCI has not made extensive use of communications satellite circuits in its nationwide network; however, after detailed testing, MCI concluded that satellite circuits equipped with echo cancellers could offer essentially the same quality of service as terrestrial circuits. According to Tom Leming, Senior Vice President of Transmission Systems, "The availability of the **TeleSystems**' echo canceller was a key factor in deciding to employ satellite circuits in our network."

The EC-4000 echo cancellers will be installed on circuits between Miami, Houston, San Francisco, Chicago and New York. Delivery of the cancellers will be completed by mid-November 1981.

Senior management changes announced for CGIS

Wayne D. Brown, formerly President of Comsat General Integrated Systems (**CGIS**), has been elected to the post of Chairman of the Board, and Stephen A. Szygenda, formerly Senior Vice President of **CGIS**, has been elected President.

As Chairman of the Board, Mr. Brown, who conceived the CGIS concept, "will be responsible for interaction with top corporate and government officials in order to create an awareness of **CGIS**'s capabilities and future plans," according to Michael S. Alpert, Vice President, Communications & Information Products, Comsat General Corporation. "He will also work with the various elements of the **Comsat** family so that maximum benefits will be derived from the internal use of CGIS products," Mr. Alpert said.

Dr. Szygenda became Senior Vice President of **CGIS** when **Comsat General** acquired, earlier this year, Comprehensive Computing Systems, a company he founded. He will assume responsibility for the day-to-day operations and long-term profitability of CGIS.

Another senior position was filled

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WORLD SYSTEMS

COMSAT'S LINK TO INMARSAT

by **Dr. John L. McLucas**, *President, Comsat World Systems Division*

We wish the new International Maritime Satellite Organization (**Inmarsat**) well as it undertakes the large responsibility of managing a worldwide system for high seas communications via satellite, beginning in February of next year, and we are proud that the system **Inmarsat** is building upon is the pioneering Marisat system created by **Comsat** through its Comsat General subsidiary.

The use of the Marisat system as the basis of the new Inmarsat system means that for manufacturers of antennas and terminals used with the Marisat system and for users of the system continuity will prevail. Users of the system, for example, should notice little practical change in the service on that day when management of Marisat's commercial capacity is taken over by **Inmarsat**.

At **Comsat** it is the responsibility of our World Systems Division to work with **Inmarsat** to ensure the smoothest conceivable transition from one system to the other, and indeed many hours of work by many people have already gone into the task. Once **Inmarsat** is a fully operational system, World Systems will have responsibility for providing all the services **Comsat** offers through **Inmarsat**, as it is it's responsibility to handle all of the Corporation's statutorily-mandated services. The Corporation's services through the Intelsat system are the other major responsibility of World Systems.

The group specifically assigned the task of working with **Inmarsat** is Maritime Services. It is headed by Mr. Edward J. Martin, Vice President.

Essentially three types of tasks are handled by the Maritime Services group—representation of **Comsat** in the Inmarsat organization, which has its headquarters in London, operation of the U.S. Network Control and Coast Earth Stations, and marketing; that is, making known the benefits of maritime communications via satellite to the widest possible audience.

Over the past several months, Maritime Services has been holding a series of seminars for both manufacturers of marine communications equipment and for users of marine communications at various cities throughout the country to explain the steps being taken to accomplish the Marisat to Inmarsat transition and how the system will operate under the management of **Inmarsat**. The attendance at these meetings has exceeded our expectations and shows us that interest in maritime communications via satellite is continuing to rise. Maritime Services has already held seminars for users of maritime communications in Los Angeles and New Orleans and will hold the next meeting of this type in New York City at the Whitehall Club on December 1.

At all of these meetings our basic message is a simple one. The formation of **Inmarsat** and the commitment of 36 countries to that organization, including all the major seafaring nations of the world, should give strong encouragement to prospective users and manufacturers alike that maritime communications via satellite is now accepted fact and is, thus, the most worthwhile of investments.

SAFETY AT SEA

satellites' role on the high seas

by the **Honorable Walter B. Jones**, *Chairman, House Merchant Marine & Fisheries Committee*

In April and June of this year, I chaired the House Merchant Marine and Fisheries Committee hearing on the disappearance of the U.S. cargo vessel, the S.S. Poet. Marine safety is a special concern of mine, and the S.S. Poet tragedy poignantly brought to our attention the need for global satellite communications. Perhaps a maritime satellite communications system could have saved the lives of the men on the S.S. Poet.

Sometime after she left port in Philadelphia and cleared Cape Henlopen last October 24, 1980, the S.S. Poet and her 34 man crew disappeared. The vessel, carrying corn, was bound for Port Said, Egypt. She vanished without anyone receiving a distress call. An intensive search has turned up no clues to her fate. The S.S. Poet disappeared, it is safe to say, engulfed in mystery.

Though the Poet normally reported in by radio every 48 hours, no alarm was given by the ship's owner until November 3, when he informed the Coast Guard the ship had been out of radio contact for 10 days. The Coast Guard began a fruitless search for the vessel on November 8th, approximately 15 days after it cleared Cape Henlopen and five days after it was due in Port Said.

The estimated loss for the ship and its cargo was $4,250,000. The shipowner collected $1 million from Lloyds of London; the cargo was insured by the Agency for International Development (AID); and the relatives of the lost seamen are presently seeking damages in court.

As Chairman of the House Merchant Marine and Fisheries Committee, I felt it imperative to investigate the disappearance of the S.S. Poet. While U.S.-flag vessels are occasionally lost at sea, the Poet mystery represents the first time in 18 years that a U.S.-flag ship has disappeared without anyone receiving a distress call or without someone subsequently finding some trace of the vessel. Our Committee's inquiry has raised numerous questions, including: the adequacy of ship inspections; the responsibility of a shipowner to report a missing vessel; the timeliness of Coast Guard search and rescue operations; the feasibility of a mandatory reporting system between a ship and the Coast Guard; the state of today's technology in radio communications; and the usefulness of satellite systems to vessels on the high seas.

Our Committee's hearings, along with an investigation and report done by the National Transportation Safety Board, may result in the introduction of legislation requiring regular communications between ship and shore and compelling shipowners to notify the Coast Guard when a vessel has not been heard from in a given period of time. But a big question remains unanswered: What can be done to improve radio communications on the high seas? Even if the law requires vessels to report to a communications station every two days, how can a ship's captain or owner be held accountable when a radio communication does not reach shore, a fairly common occurrence?

Testimony at our hearings indicated that it is not uncommon for a vessel to be out of radio contact with land facilities because of atmospheric interference. As one witness testified: "... Unreliable radio communications are a fact of life." A ship's radio equipment may operate well, but ionospheric interference frequently blocks the communication.

It is natural to ask, "Why cannot the U.S., with all of its sophisticated technology, improve radio communications on vessels? Why is the air traffic control system superior to maritime radio systems?" Basically, as one witness testified at the S.S. Poet hearing, the state of radio communications remains as Marconi left it some 60 or 70 years

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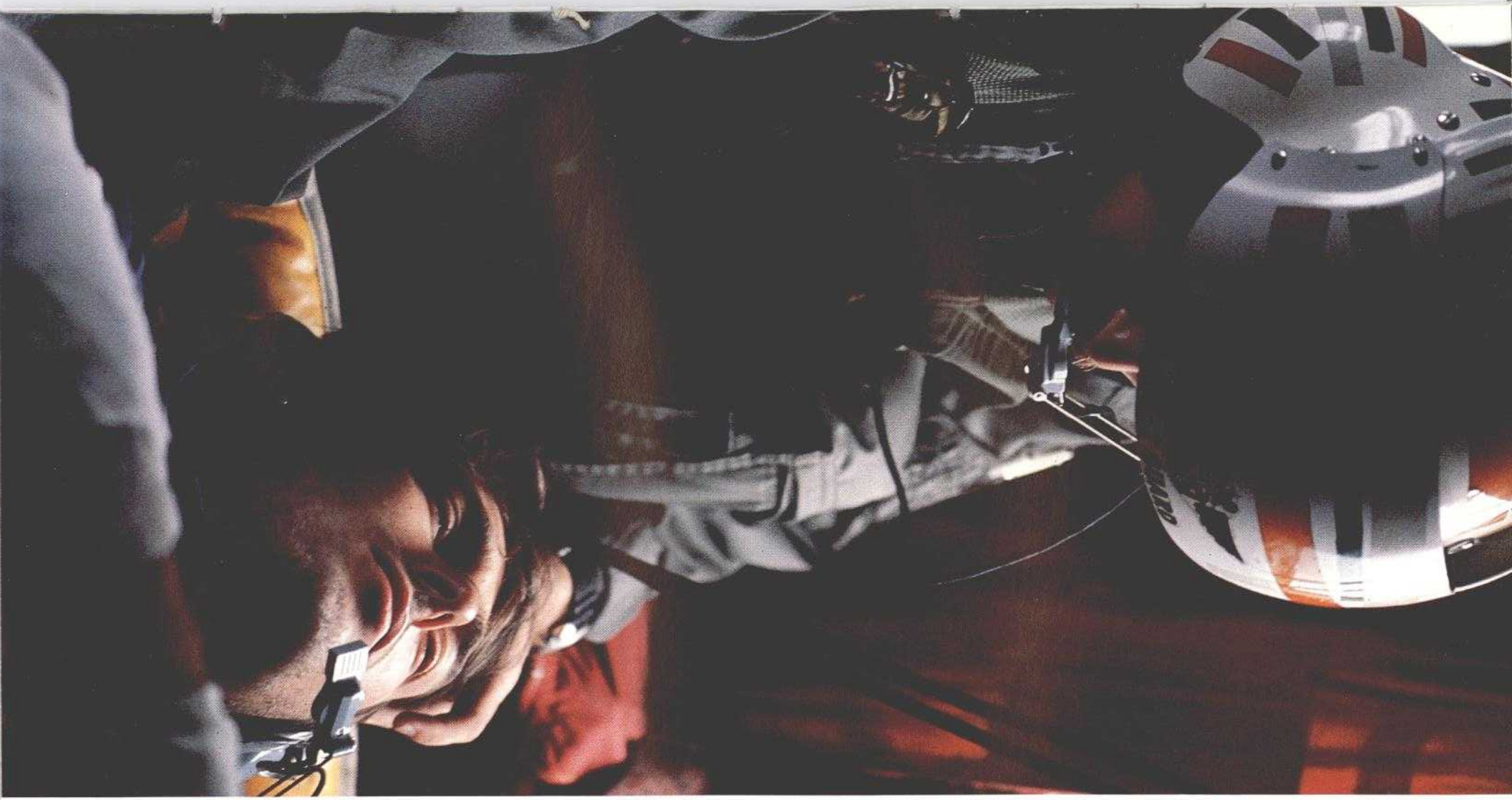


Coast Guard Emergency Medical Technician aids injured drilling rig crewman aboard helicopter. U.S. Coast Guard has the task of handling search and rescue activities off coasts of the United States. Coast Guard photograph by Brice H. Kenny.

ago. Interference with radio frequencies on the high seas occurs regularly and may leave a ship out of communication with the shore for days. The high altitude of an airplane means less terrain and atmospheric interference. But a sea-vessel is constantly subjected to oceanic and ionospheric interference.

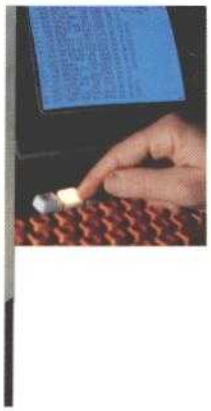
These impediments to maritime communications can have fatal consequences. The Poet's owner rationalized his delay in sounding an alarm by pointing out that he knew vessels frequently did not, or could not, transmit messages to shore. Coast Guard officials explained that for the same reasons they were not unduly worried when first notified of the situation. When a search was finally initiated, the lapse of time seriously reduced the probability that any escaping crew members were surviving in the autumn Atlantic. Thus, the inadequacies in today's technologies caused people to act in a way that contributed to the Poet's tragedy.

If improved technology is the key to better equipment, what role then does the Federal Government have in these matters? Is this not a decision for private industry? I think not. Safety at sea and military readiness are primary concerns of the United States. The U.S. has traditionally led the world in maritime safety, and our government prides itself in its military readiness. But lagging progress in communications systems at sea could hold us back in safety and military readiness. The government should have a substantive interest in improved radio technology for merchant vessels.

The U.S. Government has been involved in the regulation of marine radio communications for almost 70 years. In 1934, a comprehensive Communications Act was passed which tied together various communications laws into one package. In 1937, the United States mandated shipboard radio equipment by implementing the International Convention and Regulations for Promoting Safety of Life at Sea (SOLARS), which was signed in London on May 31, 1929. These laws did not require high frequency (HF) radio equipment, unless the vessel owner received Maritime Administration (MARAD) subsidies. Therefore, many ships continued to use medium frequency (MF) equipment. High frequency equipment has a range of several thousand miles; whereas, medium frequency transmitters have a limited range of approximately 200 miles during the day and 1,000 miles at night.

While the U.S. merchant vessels have continued to live with the medium and high frequencies, the U.S. military forces have shifted to radio teletype equipment and satellite systems. These advanced military communications have reduced the ability of merchant ships to communicate with military vessels. World War II demonstrated our tremendous need for cargo vessels. Therefore, clear communication between merchant and military ships is essential to national security. If this gap between military and commercial vessels continues, our military readiness will surely suffer.

Thus, our nation's interest in safety at sea and in military preparedness should cause our government and private sector to look at new technologies for maritime communication. Can satellites be employed to address this need? Indeed, they can.



Coast Guard also has the task of managing ship traffic to avoid accidents in U.S. ports. Shown is a computer terminal used in managing traffic in Houston Ship Channel. Coast Guard photograph by Dale L. Puckett.

Marisat:

The Marisat system, soon to become the Inmarsat system, provides telex and high quality voice, slow scan television, facsimile, and data transmissions around the clock. This, when combined with land-based communications systems, provides the users with dependable transmissions regardless of distance, weather or ionospheric conditions. Thus, a ship may be contacted directly at any time by satellite, as compared to about 22 percent of the time using marine telegraph.

Initially, the Federal Government, through MARAD, jointly funded 10 Marisat terminals installed on U.S.-flag ships to prove the feasibility of the system and to determine the long-term cost/benefits of satellite communications for our cargo ships. At present, a Marisat system costs $50,000 to $75,000 per ship.

In 1978, it was projected by a MARAD study that the cost benefit ratio for the use of the Marisat system over 10 years would be approximately 4.83:1 for a container ship and 3.79:1 for a tanker; or a savings of $30,000-$50,000 annually per ship due to reduced delays in the ship's annual schedule.

Only 39 of our 290 U.S.-flag tankers currently use the Marisat system, and only 21 of our 286 U.S.-flag cargo ships use this system.

Sarsat:

A particularly exciting marine safety satellite system, planned for launch in May 1982, is the Search and Rescue Satellite Aided Tracking System (Sarsat). Sarsat is a multi-national venture in which NASA participates which will employ low-altitude, polar orbiting satellites. Sarsat's relevance to marine safety is the speed and efficiency by which an emergency signal, sent from an Emergency Position Indicator Radar Beacon (EPIRB) on a ship, can be received by the satellite and transmitted to a ground terminal. The ground terminal can then determine the EPIRB's position.

Implementation of Sarsat will greatly enhance ship safety. Currently, all U.S. vessels must carry an EPIRB, which is designed to float free and send an automatic distress call if a ship capsizes. However, the EPIRB's signal must be picked up by a receiver (usually an airplane) in the same general area, and the signal only indicates that the distress is within a 25-mile radius. The Sarsat system will cause many more EPIRB signals to be picked up and will reduce the distress location to within a 10 mile radius. An even more sophisticated Sarsat may be waiting in the wings. This experimental system will use an onboard spacecraft computer. The computer will not only pick up the EPIRB's signal, but will actually determine the distress location within a 2.5 mile radius. The satellite will be able to process and store the information until it is within range of a ground station, instead of merely retransmitting the signal as it receives it from the EPIRB. Fully implemented, this experimental system will provide global coverage of EPIRB signals since the satellite will no longer need to be in line-of-sight of both the EPIRB and the ground station. The EPIRB message could even be encoded to provide the name of the vessel, its county of origin, and possibly the time elapsed since the accident. The new system may increase probability of detection of EPIRB distress calls to 95 percent.

The first Sarsat satellites are scheduled for launch in May 1982 to cover the western North Atlantic and eastern North Pacific. The more advanced system may be launched in 1989. To date, the cost of developing the Sarsat System is $24 million of which $1.3 million is being requested in fiscal 1982 to complete the costs of the first satellite. An additional $3.7 million was orginally requested in the Carter budget for an initial investment in three follow-up satellites, but the 1982 Reagan budget proposal deleted this. Without the $3.7 million, there will be delays in procuring search and rescue instruments needed for the follow-up spacecraft.

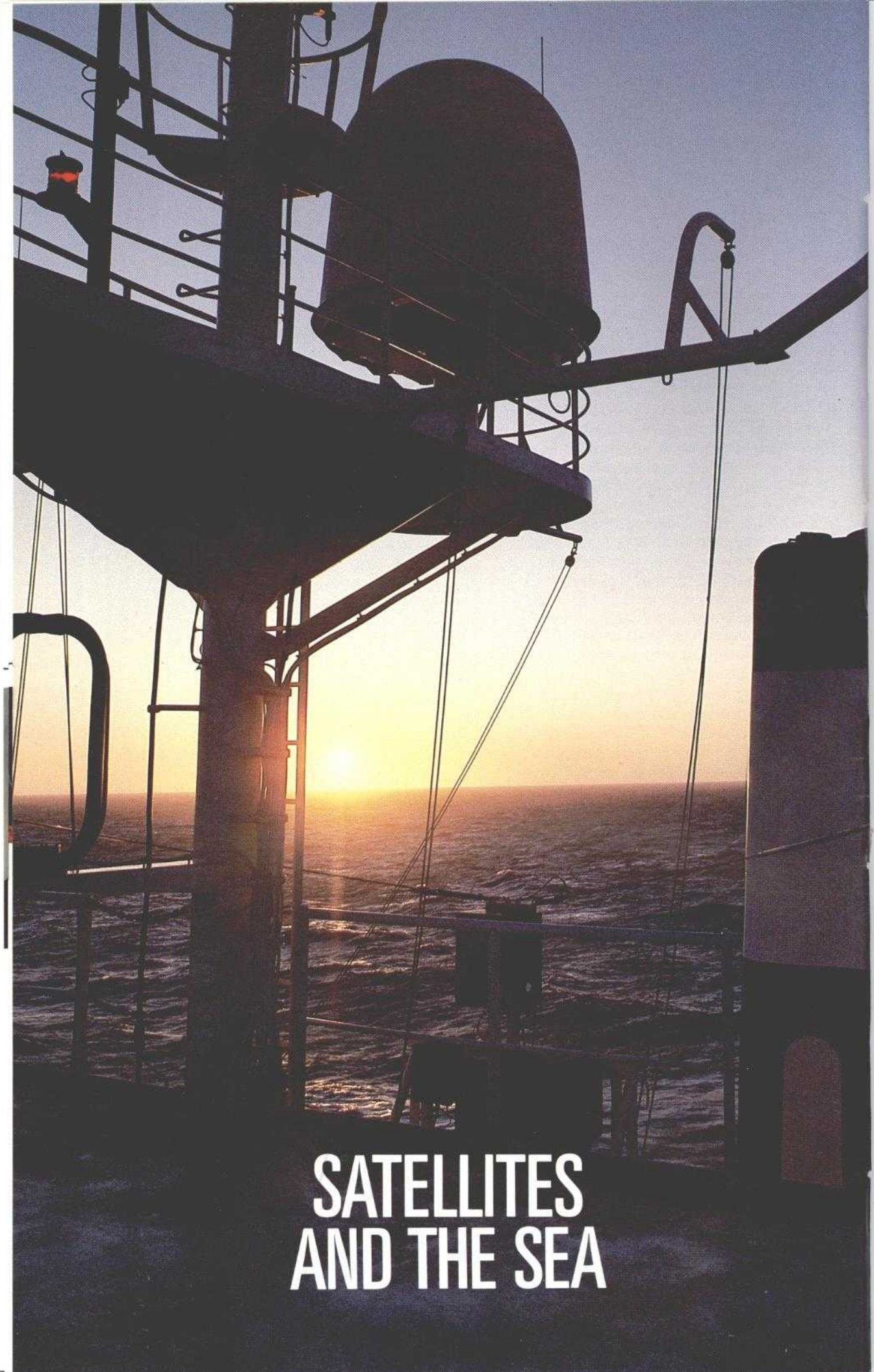
A House-Senate Conference Committee is now considering the fiscal 1982 appropriation for NASA, and it may be that the Committee can be persuaded to reinstate these needed funds.

Radio communications on U.S. vessels need not be left in the state Marconi left them. In a time of budgetary cuts in the government's services to the people, we must be careful not to let go of the assets our government has created for our own security. Congress has an obligation to maintain a strong defense posture and to protect our merchant seamen at sea. An investment in Sarsat and Marisat will deliver returns on both safety at sea and national security.

As Chairman of the House Merchant Marine and Fisheries Committee, I support continued government assistance to global maritime satellite systems. We do not know if better communications could have saved the 34 men onboard the S.S. Poet, nor do we know when we may need to contact our merchant seamen or Coast Guardsmen in a national emergency. But we must not allow our seamen to die needlessly, nor can we afford to be ill-prepared for national defense purposes.

Today, as I write this article, the U.S. spacecraft Voyager II is filming the rings and moons of Saturn, while we remain in contact every minute with her and watch the film at home on our television sets. If all goes well, in a few years Voyager II will send us similar photographs of Uranus and Neptune. It is inconceivable that, while we communicate with the far-flung depths of our Solar System, we may still be unable to reach our merchant vessels right here on our own planet's oceans. The technology for maritime satellite communications is here. We need only to choose to employ it.

Buoys are essential to mariners within coast waters to keep them away from hazards and help them stay on course. Coast Guard Aids to Navigation team prepares to load experimental buoys on tender at Sault Ste. Marie, Michigan. Coast Guard photograph by Tom Gillespie.



SATELLITES AND THE SEA

The early development of international and domestic satellite technology concentrated on providing communications between fixed points to serve widely separated land masses, and to carry large volumes of traffic. We always knew that the same technology was uniquely suited to provide communications to mobile points. Satellite relay of radio signals is far and away the single best method for achieving reliable, high-quality communications with ships and aircraft operating beyond the range of conventional line-of-sight communications.

It was 12 years after the first commercial satellite, Early Bird, started providing "fixed" communications services before the first commercial mobile (or "unfixed" as someone once called it) satellite service became a reality.

Then, in 1976, three 720-pound satellites were launched and positioned in geostationary orbits over the Atlantic, Pacific and Indian Oceans. They provided the world's first reliable, high-quality communications to ships at sea. That was the advent of the Marisat System, the introduction of modern mobile telecommunications to vessels operating in the major ocean regions of the world.

Now, we look forward to a second generation of maritime satellites, with the establishment of the Inmarsat System. The pioneering Marisat System, however, has a special place in history. The more than 800 ships now served by Marisat, the more than five years of operational experience and of steadily increasing traffic, in short, the international acceptance by the shipping and offshore industries of mobile satellite communications—all these form the foundation for the anticipated growth of **Inmarsat** in the 1980s.

However, a decade of often-painstaking progress on institutional issues preceded the technological and operational success of Marisat.

In this article, we'll review some milestones in the history of maritime satellite communications, describe some of the planning and design considerations that went into Marisat, some of our experiences with the operational system, and will indicate how in many ways the transition from Marisat to **Inmarsat** is proceeding very smoothly. For one thing, the transition has been simplified by an Inmarsat Council decision to initially lease all three Marisat satellites' L-band capacity, starting February 1, 1982.

The Beginnings

One of the early actions taken was in 1966 when a subcommittee of IMCO (Inter-Governmental Maritime Consultative Organization) meeting in London decided to study the problems and promise of providing maritime communications via satellite. This was one year after the satellite, Early Bird, pioneer of today's global Intelsat System, was placed into service over the Atlantic, providing the first commercial satellite link between North America and Europe.

In 1971, the World Administrative Radio Conference in Geneva allocated frequencies for the development of maritime satellite communications services. Earlier, mobile satellite communications demonstrations via the ATS-1 and ATS-3 NASA satellites, and dramatically successful communications experiments between **Comsat Laboratories** and the passenger liner Queen Elizabeth 2, operating through an Intelsat satellite, had stimulated considerable interest in using satellites for improved maritime communications.

In 1973, the IMCO Assembly took the initiative in setting up an international conference on the establishment of an international maritime satellite system, which set in motion the chain of events culminating in the birth of **Inmarsat** in July of 1979.

'Gapfiller'

Meanwhile, while progress was being made in international forums, the U.S. Navy was looking in 1972 for a way to fill an anticipated gap in its UHF satellite communications capability prior to the deployment of its FLEETSATCOM satellites later in that decade. In 1973, the Navy decided to lease the necessary UHF capacity for a limited period of time on a commercial basis from **Comsat**. Due to the limited time period and purpose of the lease, the Navy called the service "Gapfiller." **Comsat** called the overall system Marisat.

continued next page

*by **Edward J. Martin**, Vice President, Maritime Services, Comsat World Systems Division*

Maritime communications via satellite, a success in the form of the pioneering Marisat system, should prosper under Inmarsat.

Captain Dirk Posthumus of Holland America Cruises uses telephone linked to Marisat system on board the S.S. Rotterdam. Photo by William J. Megna.

In devising its successful proposal, **Comsat** knew that any satellite it proposed would last long beyond the short duration requirement of the Navy. Also, the size satellite which could be placed into orbit by the Delta launch vehicle was greater than necessary to meet the Navy requirement. So, **Comsat** proposed a hybrid satellite: one capable of providing the UHF services required by the Navy for an initial period of at least two years, and one equipped with transponders operating at frequencies in the maritime service bands to provide commercial communications to ships at sea and offshore facilities. The Navy service would begin instantly and run at a peak during the initial years of the life of the satellites, while maritime services could be expected to start at a low level and increase steadily through the lifetime of the satellites. It was a unique, relatively risky, but successful proposal. The award of the Navy contract in 1973 actually represented the first military lease of capacity on a commercial satellite system. The maritime L-band capability, of course, made possible the world's first offering of maritime satellite communications.

Marisat System

Each Marisat satellite has three transponders (radio repeaters). The UHF transponder contains three channels, one wideband (500 kHz) and two narrowband (25 kHz) channels. Each channel can be activated or deactivated by ground command. Each satellite also has two transponders for L-band service for commercial maritime users. One transponder translates shore-to-ship signals from 6 GHz to 1.5 GHz, while the other translates ship-to-shore signals from 1.6 GHz to 4 GHz.

One unique design feature of each satellite is the employment of an L-band transmitter which can be operated at three different power levels. This permits the limited satellite power to be shared between UHF and L-band users, making it possible to switch more power to increase service to maritime users as demand increases, while reducing power and service to meet declining Navy needs.

The Marisat program was transferred in 1973 from **Comsat** to a then-new subsidiary, Comsat General Corporation, and ownership of the system was opened up to other U.S. maritime communications carriers. Three U.S. international record carriers decided to share ownership and joined **Comsat General** in a partnership known as the Marisat Joint Venture. **Comsat General** owns 86.29 percent of the system with the balance owned by the other three partners—RCA Global, ITT Worldcom and WUI.

Marisat was originally conceived as a two-ocean program with three satellites procured—one for the Atlantic, one for the Pacific, and one for an on-the-ground spare.

In February and June 1976, the first two Marisat satellites were successfully launched from Cape Canaveral and stationed over the Atlantic and Pacific areas. Later that year it was decided to deploy the spare satellite over the Indian Ocean area. The success of the third satellite launch completed a global capability which exceeded original plans.

Shore stations at Southbury, Connecticut, and Santa Paula, California, are linked to the Atlantic and Pacific satellites, respectively. The shore stations are equipped with 42-foot parabolic antennas which transmit to the Marisat satellites in the 6 GHz band and receive in the 4 GHz bands. A third shore station located at Yamaguchi, Japan, began operations with the Indian Ocean Marisat satellite in late 1978. In addition to handling normal communications traffic, the U.S. (Southbury and Santa Paula) stations provide satellite tracking, telemetry and command

(TT&C) services; a station at Fucino in Italy provides TT&C services for the Indian Ocean satellite.

The first commercial telephone call recorded, on July 9, 1976, was via the Atlantic Ocean Marisat satellite between the seismic ship Deep Sea Explorer located off the coast of Madagascar in the western Indian Ocean, and her home office in Bartlesville, Oklahoma. Later, Officer R. Payne exclaimed. "This is the most fantastic communications I've ever seen."

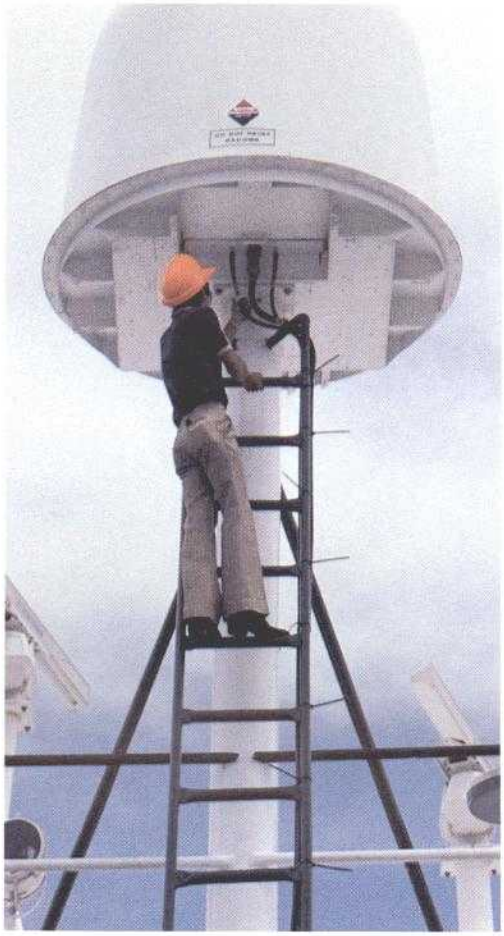
That call was made possible largely due to equipment procurement decisions made three years earlier. In 1973, Comsat General took steps to protect its interest as the largest system owner by ordering 200 mobile terminals to ensure that the necessary shipboard equipment would be available to users in the shipping and offshore industries. This succeeded in making a rapid start in service possible. Today, a large number of terminal models have become available for lease or purchase, as marine equipment manufacturers in the United States, Europe and Japan compete for this marketplace.

Marisat Services

The Marisat System incorporated some of the most advanced communications technology available at the time to service a unique mobile-based market. Use of the satellite communications capacity for both voice and telegraph is on a demand-assigned basis. Voice grade channels are provided on a single-channel-per-carrier (SCPC) basis, using companded frequency modulation (FM). Telegraph channels use a time division multiplex (TDM) operation in the shore-to-ship direction, and a time-division multiple-access (TDMA) operation in the ship-to-shore direction. In each direction, 22 telegraph channels share the same frequency. Control of the network is exercised through the shore-to-ship TDM channel.

Maritime users are provided with the following services:

Telex—standard 66 words-per-minute telex services are fully interconnected with worldwide teleprinter networks. Call set up and clear down procedures, as well as signalling between ship terminals and gateway switch facilities, are handled automatically at the shore station.



A technician from Satellite Services, Inc., of Houston, Texas, performing antenna radome installation on board the seismic vessel Acadian Commander in the Houston Ship Channel. Photo by William J. Megna.

Telephone—telephone communications between ship and shore, once fully operator assisted, have been improved to semiautomatic operation on U.S. calls. Now, ship-to-shore calls through the two U.S. shore stations are fully automatic, dial accessed to their destinations. Sometime in 1982, shore-to-ship calls via the two U.S. shore stations will also be possible on a direct dial basis.

Medium speed data—the telephone channel can be used to transmit data, typically at rates up to 2,400 bits per second, for interconnection with the public network.

Facsimile—both analog and digital facsimile can be transmitted, utilizing the telephone channel.

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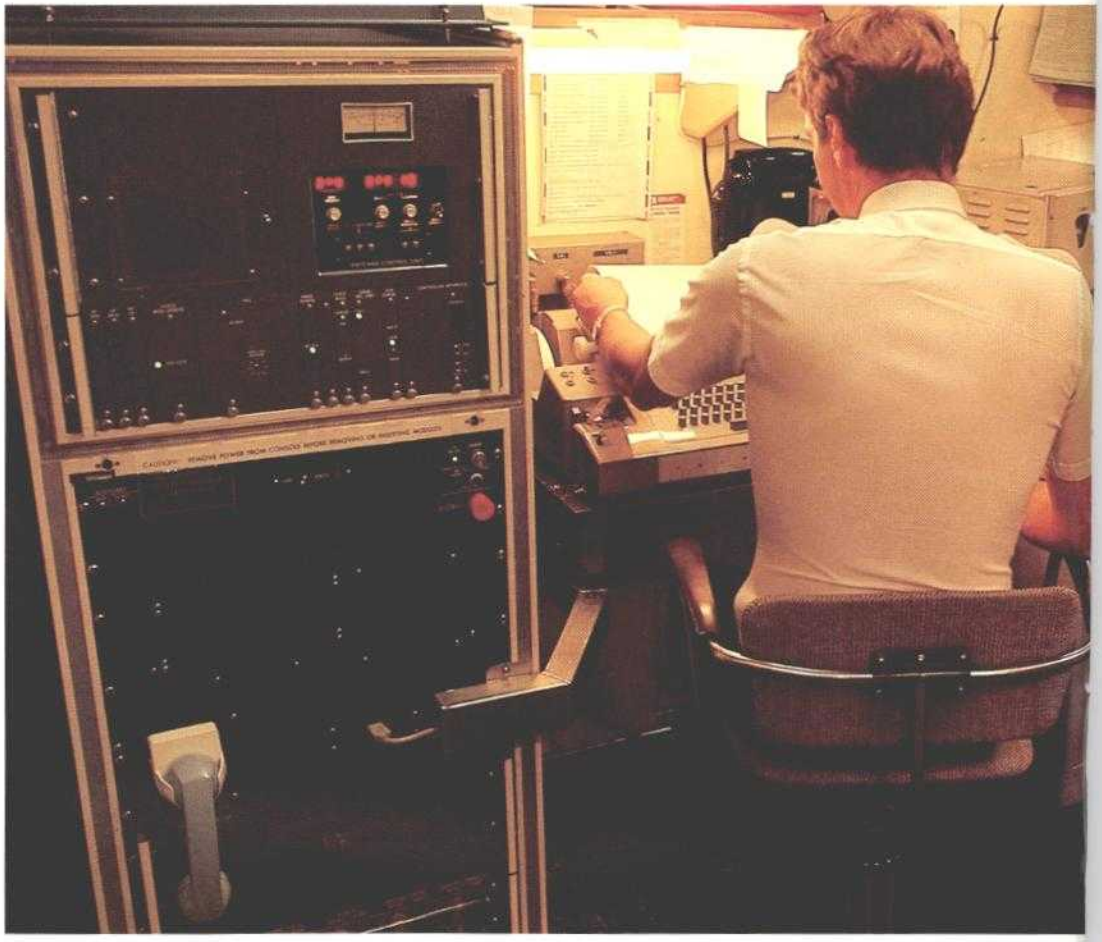

Radio officer on board Holland America Cruises' S.S. Rotterdam using telex portion of ship's Marisat terminal.

High-speed data—a new tariffed service was offered this year for ships with appropriately equipped terminals to transmit data at 56 kilobits-per-second in the ship-to-shore station. A voice-band data circuit is available for coordination with the ship during simplex 56 kbps transmissions, as required by the user.

System Growth

The Marisat System, now in its sixth year of successful operation, has experienced steady growth both in the number of shipboard terminals and in the volume of communications traffic.

The number of ship terminals commissioned for use in Inmarsat has increased dramatically over the years, as has the amount of communications traffic carried, indicating a growing international acceptance of satellite communications by the maritime community.

Marisat Traffic Statistics

	1976	1977	1978	1979	1980
Terminals Commissioned	34	92	166	293	542
Telephone Calls	2,083	10,051	24,299	46,379	74,276
Telephone Minutes	17,915	104,945	293,604	426,549	681,505
Telex Calls	7,036	35,651	117,181	240,319	449,434
Telex Minutes	12,000	114,863	376,303	735,157	1,385,867

As of the end of July of this year, the number of terminals commissioned for operation in Marisat had increased to 775. These figures represent convincing evidence that the tide of acceptance for maritime satellite communications is rising worldwide.

Marisat Transition to Inmarsat

In 1978, the year before Inmarsat came into being, the question of who the United States participant would be was resolved with the passage of legislation

by the U.S. Congress designating **Comsat** as the U.S. operating entity in **Inmarsat**.

That 1978 Act is an amendment to the Communications Satellite Act of 1962, which provided for **Comsat**'s participation in **Intelsat**. Thus, **Comsat** has been mandated by the U.S. Congress to carry the responsibility of representing the United States in two international organizations—**Intelsat** and **Inmarsat**.

A new Maritime Services organization has been established within **Comsat**'s World Systems Division. This organizational unit, which has been staffed with experienced personnel, serves as our company's focal point for the management of all maritime satellite communications services, as well as participation in **Inmarsat**.

Of course, betting on the future by users of **Inmarsat** has been made a lot easier by the thoughtful transition planning of **Inmarsat**. The assurance that all ship terminals using the Marisat System will also be able to use the Inmarsat System has been crucial for planning an effective continuity of service and a smooth transition. Inmarsat ship terminal standards are designed to be compatible with the existing Marisat ship terminal standards. The Marisat Joint Venture and **Inmarsat** will exchange information on ship equipment type-approval and commissioning data to ensure continuity in those areas.

From the U.S. perspective, we view Marisat as a proud predecessor to **Inmarsat**. Marisat has a record of more than five years of successful operation. It has proven the existence of a broad marketplace for improved maritime communications by the variety of ships and offshore facilities now equipped with Marisat terminals: freighters and container ships, drilling platforms, passenger ships, tankers and LNG carriers, fishing ships, construction barges, government ships, yachts, seismic ships, ice breakers, tugs, cable-laying ships, and others. It has opened the market to a range of services—from telex and telephone to high-speed (56 kbps)data. It has already been used for a variety of emergency and distress situations, affecting the well-being and very survival of seamen. Marisat is a true pioneer, the foundation for the launching of the new and expanded international Inmarsat System.

Installation completed, technicians from Satellite Services, Inc., view the Marisat antenna radome on board the seismic vessel Acadian Commander. Photo by William J. Megna.

We at **Comsat** look forward to the successful introduction of the Inmarsat System. We foresee greater use, a variety of new services that will contribute to improved operations and safety at sea. The broad international character and composition of **Inmarsat** reflects the concern of the major seafaring nations of the world that the communications so vital to the maritime community will continue to be improved. **Inmarsat** assures that improvement, and we are committed to its success in the years ahead.

MARISAT

The Marisat radome antenna on board the cruise ship S.S. Rotterdam. In the background, the city of Vancouver, British Columbia, Canada. Photo by William J. Megna.

The mariner's help on the high seas

by **Hale Montgomery**
Director, Market Communications
Maritime Services

A good deal of human drama has been played over the Marisat system since it began service in 1976. Sometimes, the system carried portentous news of a rescue at sea. And at other times the communications were as lighthearted as a fair breeze.

Over the past five years, we have collected a number of anecdotes which may do more to explain the steady day in and day out operational heartbeat of this system than all the promotional prose we could muster. The following is a collection of some of those anecdotes, many of them printed in editions of *Marifacts* magazines.

Ocean Ranger—In 1976-77, the world's largest semi-submersible drilling rig, the Ocean Ranger, was operating in the Bering Sea 110 miles offshore of Dutch Harbor in the Aleutians. Walter M. Simmonds, an engineer for Atlantic Richfield, told us the only problem with Marisat was that it was so easy to use Arco had problems with people "getting too long-winded" and running up big telephone bills. "They used it for everything, weather reports, reports on work in progress; they even ordered groceries by satellite," he said.

"I kissed the thing each morning"—On the night of June 29, 1979, the tanker El Paso Paul Kayser ran aground and stranded on the treacherous La Perla in the heavily traveled Strait of Gibraltar. The ship and her cryogenically-cooled cargo of liquified natural gas (LNG) constituted a serious hazard at sea. In a dramatic ship-to-ship operation at sea, the cargo was transferred to a sister ship, the El Paso Sonatrach, and the El Paso Paul Kayser was refloated. Marisat communications were used extensively during the tense days of salvage operations. Captain F.E. Schumaker of the El Paso LNG Company gave a first-hand account of the operations at a symposium in Houston later that year. Asked if he felt that satellite communications played a vital role in the successful conclusion of the salvage operation, Captain Schumaker replied:

"I think it was a very positive contribution to it. We must have been on either voice or telex communication with the Houston office on technical matters for three or four hours a day during this time. It's impractical to perform the type of detailed calculations onboard a ship that were needed to assess the situation of the vessel. I think without that communication, the uncertainty of the operation would have been a lot higher. Personally, I kissed the thing (the terminal) each morning when we started because it was a very big help to us."

"Well done"—Captain Warren G. Leback, the Vice President of El Paso Marine Company, added a personal letter of thanks to **Comsat General** concerning this same salvage operation. He wrote:

"The Comsat General (telephone) operators on duty at the time were Agnes Tomlinson and Connie Sarle. We would like to offer our thanks to these very fine operators for a job well done with minimum delays and maximum efficiency. We do not intend, by complimenting these two, to detract from the outstanding performance turned in by the rest of the operating staff at the (Southbury) earth station during the days that followed.

"The outstanding performance of the Comsat General operating team, during this emergency, only serves to strengthen our belief that the selection of Marisat for our fleet, was in fact, the proper decision."

A Song at Sea—A group of officers on the British tanker Post Enterprise were listening to Radio Luxembourg one evening in 1977 when they decided on a whim to send in a song request by Marisat telex. Confirmation was received aboard the British merchant ship that the request had been received ashore. The requested song, "Sailing," was played within ten minutes.

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Rescue Impossible Without Marisat—Especially bad conditions prevail for conventional marine radio communications in certain areas of the Persian Gulf. In 1976, a young sailor aboard the Norwegian ship Ferncraig suffered a severe injury when he slipped and hit his head on the ship's deck. Although in sight of land, the ship could not raise the local coast station. A message requesting helicopter transport for the injured seaman was sent via Marisat to the United States, then back to Dubai in five minutes, according to the radio officer, Jan Oygard. Within four hours after the accident, the seaman was under treatment in a hospital in the city of Dubai. Mr. Oygard was quoted in the Norwegian newspaper Aftenposten as commenting:

"There are some especially bad conditions for radio communications in this area, which cause long waiting periods. It would be impossible to carry out a similar rescue action this quickly without having satellite communications onboard."

"Just Tell Me Where to Send the Ambulance"—The container ship Lash Turkiye was steaming through rough 30-foot seas about 900 miles off Bermuda in February of 1977 when a crewman slipped off a ladder and was seriously injured. The Captain, Harry Parker, decided to call the U.S. Public Health Service Hospital on Staten Island, New York, on Marisat telephone. The hospital operator took down the information and asked the Captain for the local address of the ship. "Nine hundred miles off Bermuda," said Captain Parker. Apparently thinking it unbelievable that Captain Parker was calling from a ship at sea because of the clarity of the call, the operator several times asked the Captain where he was calling from. Captain Parker repeatedly responded: "Nine hundred miles off Bermuda." Finally, in exasperation, the operator broke in again saying, "I've heard all that. Just tell me where to send the ambulance!"

Rendezvous Off Queen Charlotte—The tanker Arco Juneau had a full load of Alaskan oil and was heading for Long Beach, California, when she ran into a storm which built to gale-force winds of 30 knots near the Queen Charlotte Islands off the Canadian coast the morning of April 29 this year. Two seamen went on deck to secure a pilot ladder. An especially heavy sea broke over the starboard side of the ship as they were working on deck. One crewman was able to drop flat on the deck as the wave passed over him. But the other crewman, who had grasped the ship's guard rail for safety, was swept down the length of the deck and received multiple injuries, including compound fractures above and below his left knee, two broken arms and a broken jaw. During a lull which followed, two medically-trained crewmen succeeded in retrieving the injured seamen from the heaving deck, and administered first aid. Using Marisat for communications with the public health services hospital in San Francisco, the Captain was relayed medical advice including that he place the seriously-injured seaman in a Stokes litter, a type of form-fitting stretcher to hold his injured leg in a rigid position. Doctors later credited this with not only saving the man's leg but possibly his life as well. Again using satellite communications, rescue efforts were coordinated: a Canadian Coast Guard helicopter airlifted the injured man who was eventually delivered to Vancouver General Hospital where a team of specialists were standing by to receive him. Rescue operations were successfully coordinated, perhaps a life was saved, during what one officer dryly recalled as a day of "very adverse weather conditions."

Milestones
in Maritime Communications

1899
The American liner "St. Paul" is believed to be the first vessel to have "a floating wireless station" aboard. In November of 1899 she received a wireless message from a Marconi station on the Isle of Wight.

1906
The radio telegraph distress signal SOS, a rhythmic three dots-three dashes-three dots in Morse Code, was adopted at a Berlin conference as the international call for help at sea. Some persons interpret SOS as meaning "Save Our Ship," but the letters actually have no intrinsic meaning.

1912
Sunday, April 14, the luxury liner Titanic sank with a loss of 1503 lives, including her wireless operator, J.G. Phillips, whose SOS was first heard by the radio officer on the California at 11:20 p.m. The Titanic tragedy inspired regulations requiring increased transmitting power and 24-hour manning of radio rooms for passenger-carrying ships.

1922
First ship-to-shore two-way voice communications took place between a station at Deal Beach, N.J., and the SS America, 400 miles at sea.

1927
The word "Mayday" was adopted as the international distress call for maritime radio telephone. "Mayday" originated in *"m'aidez,"* French for "help me."

1929
High seas radio telephone service became available to the public.

1965
First commercial communications satellite, Early Bird, began operation.

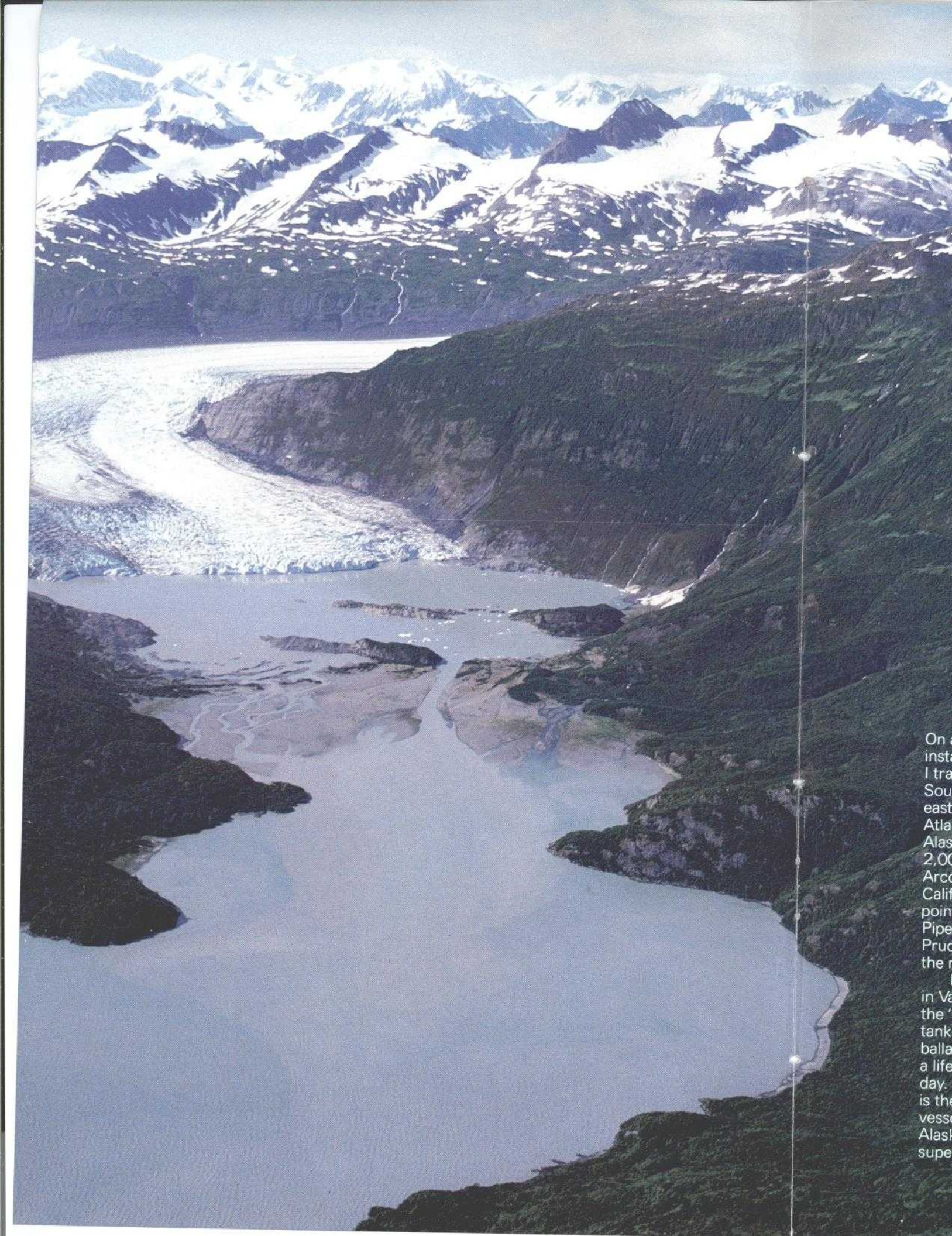
1973
Application for Marisat system filed by **Comsat** (subsequently assigned to **Comsat General**) was approved by the Federal Communications Commission.

1976
- Launch of Marisat satellites:
  February 19 Atlantic Ocean
  June 9 Pacific Ocean
  October 14 Indian Ocean
- Marisat commercial service dates:
  July Atlantic area
  August Pacific area
  November (1978) Indian Ocean area
- First commercial Marisat telephone call:
  July 9, 1976, from the seismic ship Deep Sea Explorer to the U.S.
- First ship equipped with a Marisat terminal:
  The tanker ESSO Wilhelmshaven.*

1979
Inmarsat (International Maritime Satellite Organization) came into being on July 16.

1982
Inmarsat is scheduled to begin operations on February 1, leasing the commercial capacity on all three existing Marisat satellites as part of its initial space segment.

** The tanker Esso Wilhelmshaven*



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The scene near Valdez, Alaska, as photographed from the air. Columbia Glacier, left, is surrounded by the Gach Mountains whose highest peaks reach 13,000 feet above sea level.

ALASKA to CALIFORNIA

on the Arco Alaska with William J. Megna

On assignment to photograph Marisat installations on board a variety of ships, I traveled to Valdez on Prince William Sound in the Gulf of Alaska, 250 miles east of Anchorage. I was to board Atlantic Richfield's supertanker the Arco Alaska and to let her take me on the 2,000-mile route from Valdez to the Arco marine terminal in Long Beach, California. Valdez is the terminating point for the 800-mile-long Trans Alaska Pipeline, which carries crude oil from Prudhoe Bay, above the Arctic Circle, at the rate of 1.5 million barrels per day.

Linking the crude oil storage tanks in Valdez with the oil craving market of the "lower 48" is a lifeline of oil supertankers which come into the harbor on ballast, load up and then return south—a lifeline that averages two vessels per day. An important part of that lifeline is the Arco Alaska, one of the largest vessels carrying crude from the Trans Alaska Pipeline. The two-year-old supertanker is, at 952 feet in length, over three football fields long and measures 166 feet in width and 60 feet in draft when loaded. When filled, she carries 1,310,000 barrels of crude oil or about 55,020,000 gallons. Heading her 28-member regular crew is Captain John Piotrowski, a 13-year veteran of the sea and a Ship's Master since 1977. I had an opportunity to talk at length with Captain Piotrowski about the value of Marisat to him personally and to his ship and crew during my six days on board the vessel. I also had an opportunity to talk at length to several other members of the crew including Scott Hale, Chief Engineer, and Richard Giffen, Communications/Electronics Officer. With the kind permission of the Atlantic Richfield Company, I am pleased to be able to present some of the comments of the three Arco Alaska officers concerning Marisat as recorded on tape. I am also pleased to present my photographs.

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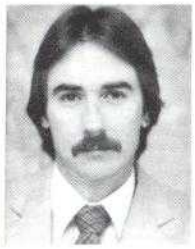
Words and photographs by ***William J. Megna,***
Chief Photographer, Comsat Magazine



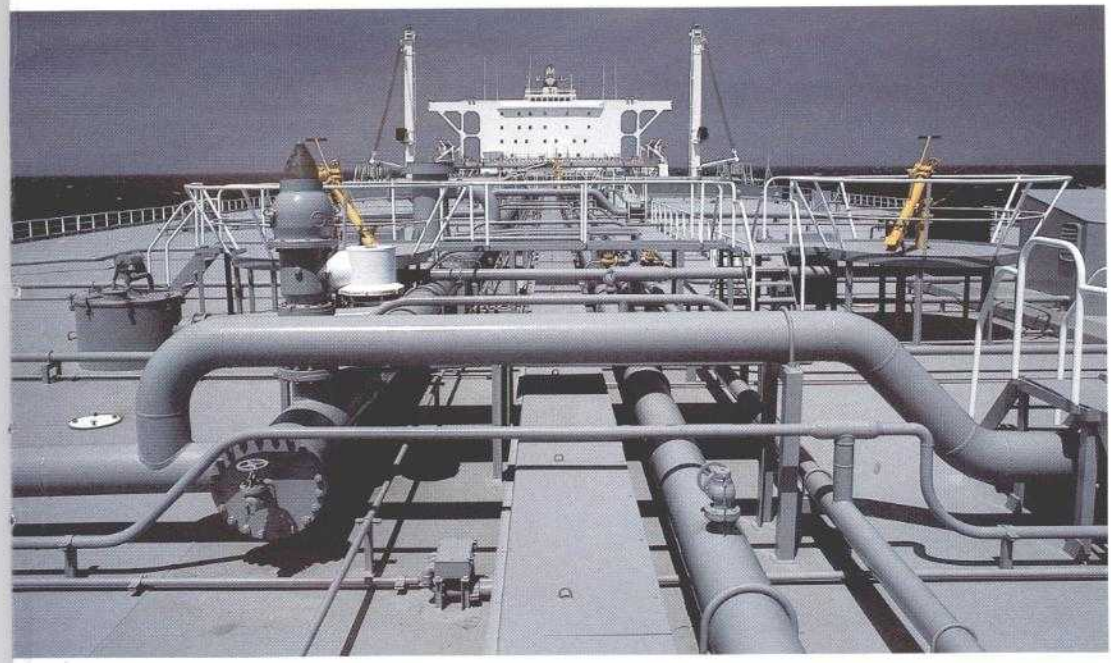
Captain Piotrowski

Q: *How is the Marisat system helping you with your job?*
Piotrowski: *I'll tell you one thing, it would be hard to get used to running a ship without it right now. The instant communications when necessary is very helpful. I don't know if you're familiar with what we have to go through if we're communicating without Marisat—the need for shore stations relaying messages, etc. Instant communications and privacy are the biggest assets. I can pick up that phone right there and call the office and I know that I'm talking to that person in the office and only that person. I mean not everybody in the Pacific can listen to everything I am saying. With single sideband radio, I'm talking to every ship in the Pacific that's tuned in to my frequency.*

Q: *How often do you use Marisat?*
Piotrowski: *Just about every day. With Marisat, we can send something like a payroll message. That goes out every two weeks from the ship. It shows everybody on the crew, how much money they have been advanced. It shows all the different hourly overtime rates, the hours overtime at different rates. Now try to send something like this out via single sideband radio. That would be ridiculous, and the cost would be prohibitive too. Through Marisat, the office receives directly the whole payroll message typed out.*

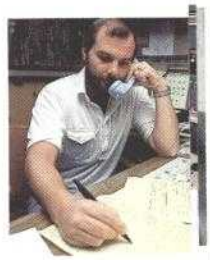
Q: *How else do you use Marisat for teletyped messages?*
Piotrowski: *We make heavy use of the system for transmitting repair requisitions to our home office. These are usually very lengthy and very complicated. You just wouldn't send something like that on single sideband radio.*

Q: *Do you know of cases where Marisat has saved lives?*
Piotrowski: *I can't say that for sure, but I have used it for medical emergencies, instances where I needed professional medical opinion right away. About a year ago, a crew member had an accident on deck and lost a finger. We have a well stocked medicine chest onboard, but any medicines or injections we use, we're supposed to give on advice from a public health service or independent physician. In this case, we used Marisat to call a health service in San Francisco, and they went over the procedures we should follow. That was one incident. Another time, a crew member passed out on deck. Once again, I used Marisat to get the proper medical advice.*



Q: *Is there anything negative you would care to say about Marisat? Is there anything you would like to see updated or changed?*
Piotrowski: *You know I really can't say anything negative. The system is relatively new and compared to every-*

Facing page, the 952-foot-long Arco Alaska, her Marisat antenna clearly visible, in Valdez Harbor. Lower left, the Arco Alaska underway in the North Pacific as seen from bow of ship. Below, Captain John Piotrowski, the Arco Alaska's shipmaster, talking to home office through Marisat connection.



thing else available for communications at sea it's the best. Yes, when I get awakened out of a sound sleep at 5:00 in the morning to take a Marisat call, perhaps then you might say that the system is too convenient.

***Q:** You can merely sit at your desk in your quarters and make long-distance calls. Is that right?*
***Piotrowski:** When we're heading south, I'll call our home office, and we'll work out all the details about docking. It's just very convenient. Oh, yes, a negative point. I think the cost is prohibitive for personal calls. I hope that as the system becomes more refined costs will start to come down. My guess is that just as with computers, with each refinement costs will come down and down.*

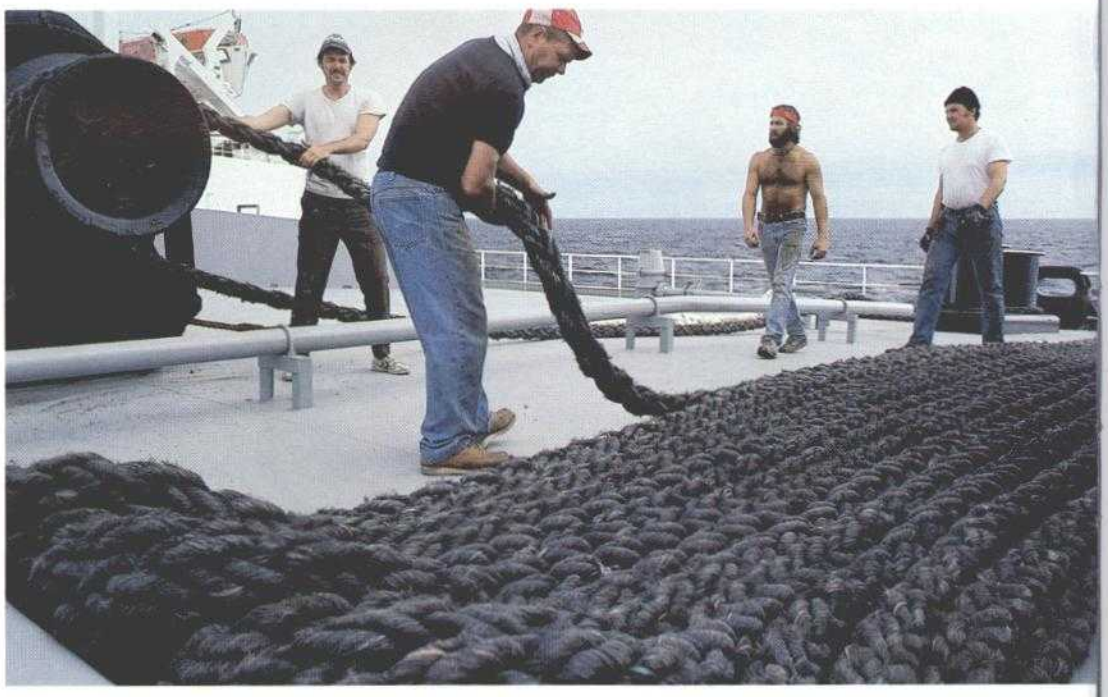
***Q:** Is there anything else you'd like to add?*
***Piotrowski:** Satellite communications is one of the best things I've seen come along for the marine business. I just think it's an excellent system.*

Chief Engineer Hale

***Q:** How do you use Marisat?*
***Hale:** I use it mainly for calling in repairs on items that we cannot repair on the ship. I let the port engineer know what we're going to need repaired when we get to port. I call him and give him machine numbers, card numbers, information like that. If you had to send information like that by hand, by telegraph, it would be very involved and take a long time. That's what I like about the system. You feel a lot safer out here because your help is just a phone call away. You can get hold of someone very quickly and tell them your problems. If they can't help you, they can get hold of somebody that can help you.*

***Q:** How would you summarize the benefits of Marisat?*
***Hale:** We've got instant communications. That's what I like. You just feel so secure that if there's a real emergency, and you need information you can call for help. It used to be that out here on the high seas you were pretty much on your own. Of course, that's what you're trained for, but still there are times when you need help.*

continued page 26



Below, Scott Hale, Chief Engineer of the Arco Alaska, photographed in engine room. Right, crewmen lay out hawsers in preparation for docking in Long Beach, California.

Left, Arco Alaska crewman jogging on deck, a favorite way to keep in shape for the crew of the supertanker. Below, the Marisat terminal on board the Arco Alaska.

Communications/Electronics Officer Giffen

Q: *How long have you worked with Marisat?*
Giffen: *About three and half years. Previously I did a lot of teletype work, but it was all on high frequency radio.*

Q: *How is Marisat helping you do your job?*
Giffen: *It makes it so much easier. Our traffic is handled almost exclusively on Marisat. All our messages to and from the office and to and from the agents, weather reports, reports that go to the Coast Guard—everything goes via Marisat except for the one brief period in Panama when we're between the coverage zones of the Atlantic and Pacific satellites.*

Q: *For how long a time during your Panama trips are you out of Marisat range?*
Giffen: *About 24 hours. You really miss it after you've gotten so used to it. You have to go back to pounding brass, which is what we call sending in code.*

Q: *In what ways do you think having Marisat onboard the Arco Alaska saves Atlantic Richfield money?*
Giffen: *The fact that we can send 50 or 60 words a minute at a nominal rate like $4.00 directly to the office has got to save us a lot of money. It's cheaper than sending telegraph messages to a postal station and having them relay it to the office. The other benefit, of course, is the advantage of time. The minute you push the button and transmit your traffic it's in the home office.*

Q: *What do you like best about Marisat?*
Giffen: *Number one is its dependability, the fact that you've always got communications, with the one exception of the gap between the Atlantic and the Pacific. It's always there. You can always get through and it's quick and sure.*

Below, Richard Giffen, Communications/Electronics Officer of the Arco Alaska. Below right, ship coming into Long Beach Harbor. Tug at left is coming into position to aid the ship in docking.

BOON FOR THE OFFSHORE INDUSTRY

by **Robert L. Eichberg**, *Director, Market Development, Maritime Services*

It has been only a little over five years since maritime satellite (Marisat) communications first assisted the world oil industry in expediting the flow of information to and from offshore seismic, drilling and construction operations. In all three of these elements of the offshore industry, mobile maritime satellite communications use has become an overwhelming success. To date almost every major offshore exploratory venture has in one way or another used communication services of the Marisat satellite system.

The offshore industry prior to the advent of mobile satellite communications operated in a segmented manner. Poor communications between isolated offshore operations meant that conglomerate companies were isolated from the daily operations of their far-flung offshore exploration interests. Today good communications is changing this manner of operation. Dependable maritime satellite communications allow financial and manpower decisions relating to offshore operations to be made expeditiously in headquarters offices as if these operations were located next door. Strong indications are that during the 1980s mobile maritime satellite use by the offshore industry will become a standard operational tool of the industry.

Bear in mind that the operating cost of a seismic ship can exceed $20,000 to $30,000 per day, operation of a semi-submersible drilling rig can exceed $100,000 to $150,000; the laying of pipe offshore including the use of crane barges for lifting and a support operation of supply and crew boats can easily exceed $250,000 to $350,000 per day and extend over a period of months of actual operation. Dollar numbers become staggering when you realize that hundreds of these operations are working every minute of the day, worldwide.

A little over five years ago it was almost impossible to evaluate exploratory seismic and well log data from seismic ships or mobile drill rigs until land-based geologists had a chance to analyze and compare newly acquired data received with historical data obtained from earlier explorations. This process took 30 to 60 days to accomplish because of inaccessible transportation and communications to deliver the new data. Today, valuable seismic and well log data can be sent direct and almost in real time from the ship to a process center via Marisat. The analysis can be made while the seismic and/or exploratory drill rig is still on station. The quick turnaround analysis of data can result in the ship or rig either commencing operations or leaving the area and exploring elsewhere. This flexibility saves a tremendous amount of time and money for the petroleum industry. Offshore exploration today exists off the shores of every continent. The Inmarsat System will be serving every country of the world which has a continental shelf. It is predicted that by 1990 drilling in 1,000 feet depths, 300 to 600 miles offshore, will be an everyday occurrence. Today, the industry has limited itself in most instances to drilling depths no greater than 300 to 500 feet and has stayed within 200 miles of landfall. At drilling depths of 1,000 feet 300 to 600 miles at sea, costs of drilling and bringing the product to market will skyrocket. Satellite communications therefore will become absolutely essential for coordinating offshore activity and become a contributing factor in lowering cost of operations.

Dramatic increase of mobile satellite communications service (Inmarsat) in the 1980s will follow the expected growth of the offshore industry. Present political and regulationary restraints prohibiting use of international communications while a vessel is in port or from drilling operations in a nationally leased zone probably will be eased. This will facilitate more use of maritime satellites. The offshore industry will represent a population of hundreds of thousands of floating people during the next decade. Business as well as services to people will be fully accommodated via Inmarsat.

The decade of the 1980s will see dramatic expansion of offshore activity and Inmarsat use will be a common denominator for well-coordinated telecommunication throughout the industry.

INMARSAT

the Director General's view

by **Olof Lundberg**, *Director General, International Maritime Satellite Organization*

It may seem curious, in an age where satellite communications have long been integrated into many walks of life, to talk of the advent of satellite links with ships at sea. The fact that the maritime community has been allowed to lag quite significantly behind the landsmen's in entering the Space Age is due to two main factors.

Throughout history, seafarers have been known for their self-sufficiency, so obviously crucial to the ability to survive the isolation and dangers of the high seas. The limitations of HF radio, hardly changing since Marconi, did comparatively little to ease this.

At the same time, the technology had to evolve that would result in an antenna small enough to be carried on a ship yet able to carry high-quality communications, an antenna capable of being aimed constantly at a minute point in space as the ship rolled and tossed and journeyed across the sea.

The appeal of satellite communications at sea is enhanced by the heightened concern for human safety that exists today plus perilously-high operating costs for shipowners that, in turn, demand maximum efficiency.

Added to that is the growing importance of ecological considerations particularly with respect to the oil industry, plus the fact that suitable shipboard equipment has become widely available at acceptable prices, all of which means that shipowners are having to reappraise their approach to communications quite radically.

To this end, the International Maritime Satellite Organization (**Inmarsat**) has been set up to run a new global satellite communications system, a system bringing the advantages of VHF communications to remote sea areas. The obvious benefits are reliability, clarity and speed.

The system is therefore ideally suited and indeed primarily concerned with maritime safety. Handling of distress calls and urgent safety messages is being planned as a priority, primary service to users. All forms of communications, including telex, telephone and data transmission to both facsimile and teleprinter equipment plus high-speed data at 56 kbit/s, will be available from the start.

Already, many users have welcomed the satellite facility purely on the grounds of its safety advantages. Once established, therefore, it can reasonably be expected to revolutionize shipping safety and management.

For this reason, the Inmarsat Directorate already has a team of engineers committed to an aggressive policy of development and improvement of services and systems. By the time **Inmarsat** comes into operation on February 1, 1982, studies for a range of new services and special-purpose ship antennas are likely to be well in hand.

It was, in fact, back in 1973 that the first major initiative on maritime satellite communications was taken by the Intergovernmental Maritime Consultative Organization (IMCO). The IMCO Council decided then to convene an international conference to consider establishing maritime communications on an international basis. That conference, however, did not conclude its task until September 1976, by which time private enterprise had already gotten in on the ground floor with the establishment of the Marisat network by Comsat General Corporation.

Marisat's pioneering role was impressive. A network of three Marisat spacecraft was

established in 1976 with an earth station on each of the U.S. seaboards later followed by one other in Japan.

Growth was accordingly fairly slow at first but the end of 1980 saw a total of 550 ships and offshore craft equipped with ship earth stations (SES). Meanwhile, the international conference convened in 1976 by IMCO had generated a commitment to set up **Inmarsat** as a new international organization, and it came into effect in July 1979.

Forecasts made a year and half ago suggested that the number of ship terminals might approach 4,500 by 1990 and would be some 750 by mid-1982. The anticipation of an international footing for satellite communications, with the expectation that the spread of earth stations will lower costs, has clearly lent a significant boost in the response by the maritime community. In the past nine months, the user figure has risen by nearly 65 percent to a total now approaching 900. The response has been such that **Inmarsat** is being forced to revise drastically its most optimistic estimates, originally based on the early Marisat growth rates.

Provided that **Inmarsat** can meet IMCO's requirements for the safety and distress system and satisfy the growing demands from the users through innovations in services and technology, practically all ships sailing the high seas may well be equipped for satellite communications around 1990. That would be a number considerably larger than previous estimates.

The membership in **Inmarsat** includes all major maritime nations east and west, north and south. The number of signatories has grown from 24 in 1979 to 36 today, with more seriously considering membership.

The organization is run along similar lines to the now well-established International Telecommunications Satellite Orgaization (**Intelsat**). The Inmarsat governing body is a Council on which most Signatories, usually the national PTT and, in the case of the United States, **Comsat**, are represented. Council members, who meet at least three times a year, usually at the organization's headquarters in London, have voting rights corresponding to their investment share. **Comsat** holds 23.4 percent. In addition, an Assembly of Representatives of member governments meets every two years, each member having equal voting rights. The second such meeting is scheduled for November of this year.

Inmarsat's responsibility is to provide the space segment for a worldwide network of coast earth stations set up and operated by the member states themselves. Ships will buy or lease their own terminals and will be allocated satellite channels on demand by **Inmarsat**'s network coordination stations based at three of the coast earth stations.

For its first generation system, **Inmarsat** has leased capacity on two satellites, one operational and one spare, in each of the three major ocean regions. Offering 30-40 channels each, these craft are expected to meet the needs of the first five years. In addition, the three Marisat satellites are to be leased for an interim period to ensure continuity for the users.

By the end of next year, a further eight coast earth stations should be in operation around the world, followed by another nine the next year and four more by 1985. It is this proliferation that is expected to lead to an overall lower charge for users to the extent that landline extensions will be shorter.

The benefits of the system will, of course, be available to vessels of all nations without discrimination, regardless of Inmarsat membership, and the Organization will be operating on a basis of accepted commercial principles with revenues derived from provision of the satellite time to users from either land or vessel.

The future for **Inmarsat** is attractive. It would be incautious to try to predict its scale and form, but it is clear that planning a second generation of satellite capacity is an early priority and it will have to be significantly larger than the first. The high quality ship-to-shore links offered via satellites have the capability to extend to the maritime community all those new services presently being conceived for the telecommunication users on land. A ship or an offshore platform is now as easy to reach as the office across town. The future Global Maritime Distress and Safety System scheme, to coordinate search and rescue communications on a worldwide basis, will be centered on satellite communications. And, of course, to all those possibilities, **Inmarsat** will be the key.

SHIP-ROUTING

by Lawrence W. Moore
Product Manager, Fleet Services, Environmental Research & Technology, Inc.

Weather Advisory Services to the Maritime Industry

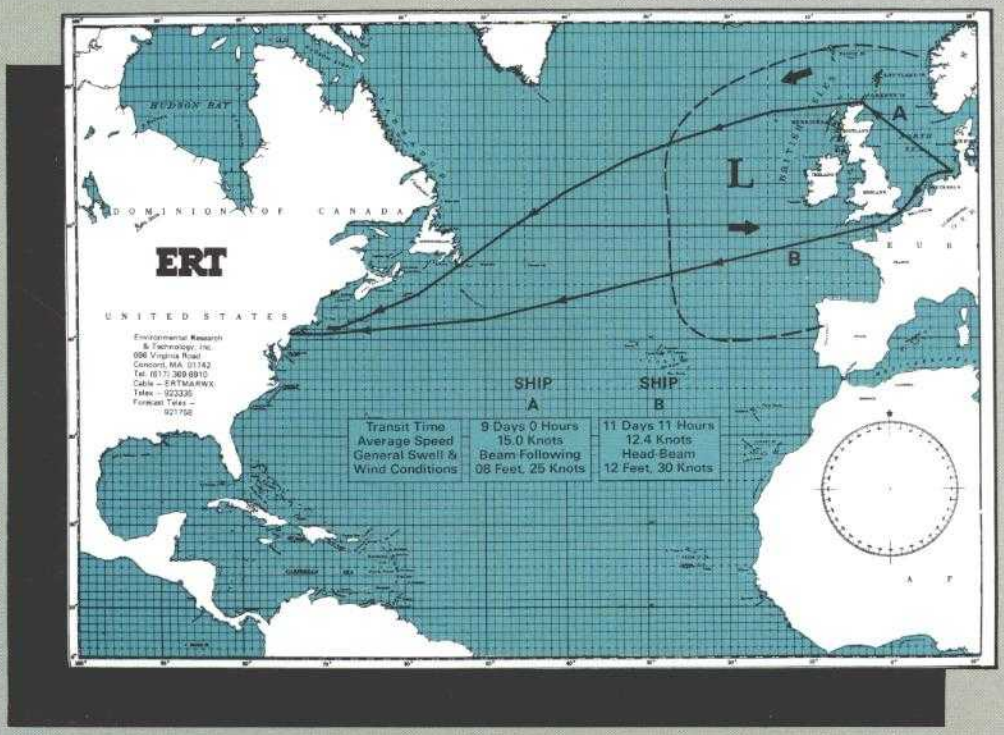
The challenges shipmasters face today are no different than the ones masters faced several thousand years ago: to get their ships safely from one port to another, ideally on time and with cargo and ship undamaged. Maritime optimum track routing from Environmental Research and Technology, Inc. (ERT), is a step toward this goal. The service uses the latest weather forecasting and communications techniques to help a shipmaster start out on an optimum route and maintain an optimum route during the voyage. The ERT service has two particular advantages over conventional route planning.

- The single most important advantage is that this service recommends the best route for a specific ship. The route planning is not regional nor meant for all ships sailing in that part of the globe but instead is tailored to the needs of a particular ship, whether part of a fleet or sailing singly. The tracking service considers a ship's size, shape, weight, cargo, speed, and fuel as well as information compiled on the ship's past performance.
- The routing service takes advantage of satellite and computerized weather data sources as well as conventional sources, such as pilot charts for a particular month and information from the National Weather Service.

The following example demonstrates the utility of the routing service:

Westward to New York

Two ships sailing from Bremerhaven to New York encountered a deep stationary storm centered west of Ireland producing high winds, seas, and swells. (The winds in such a storm circulate counterclockwise; see map. "L" stands for low pressure zone.) Ship B embarked first. Its master tried to circumvent the storm by taking a southwestern route through the English Channel, but his ship ran into the high winds and swell. The ship was forced to proceed for two days at half speed and to heave-to for an entire day. As a result, Ship B lost two days in transit and both ship and cargo sustained some damage. Ship A took a route recommended by the ERT maritime optimum track routing service. Satellite images had shown company weather forecasters that ships could not avoid the storm because it was huge and stationary. The forecasters therefore recommended that Ship A take a northern route to take advantage of



the easterly winds in that area of the storm. Her master took the recommended track north of Scotland. She ran into high seas, swell, and waves, but they were astern and gave the ship a "push." She did not lose significant time or suffer damage. Ship A arrived in New York 59 hours ahead of Ship B. Taking the optimum track saved Ship A time and her owners substantial sums of money.

In the North Atlantic during winter months, a new storm forms approximately every three days. The ERT routing service monitors the storms to route a ship around their paths, or, if that is not possible, so that the vessel can use the winds to advantage.

Weather and Wave Forecasting for Ship Routing

The development of new technology during World War II and since has substantially improved weather forecasting at sea. Systematic wave observations have also been of crucial importance in improving voyages. Some recent developments are:

- Studies of sea-state have proven that wave height and direction affect ship speed more than wind does.
- Such studies have shown that every ship is affected slightly differently, depending on its configuration, its speed, and its cargo. An optimum track differs, therefore, not only for each ship but for each voyage of the same ship because of changes in cargo and weather and sea-state.
- Weather-observing satellites and communications satellites have improved weather predictions and communications.
- Computerized models can predict sea-state and weather conditions more accurately and faster than was possible before. Such models can be combined with shipboard weather observations, and prognoses can be relayed in turn to a shipmaster.

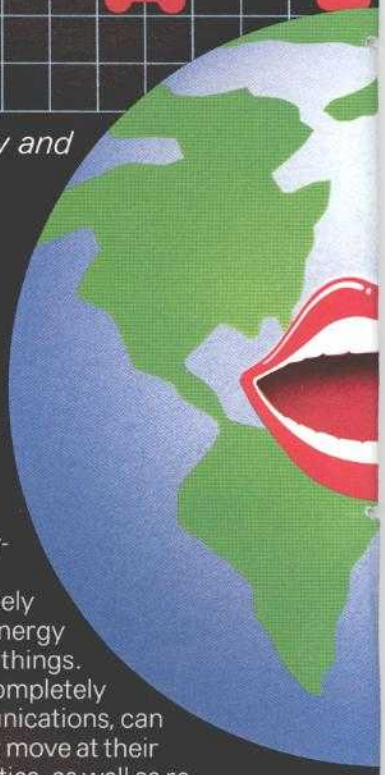
Conclusion

Providing a optimum track for a vessel requires more than even the best communications and weather forecasting. A ship routing service must take into account ship handling characteristics, cargo characteristics, the economics for the voyage and the year, the operating style of the shipmaster, and ocean currents and depths as well as the weather. Knowledge of all these factors is increasing with experience.

*For more information on **ERT**'s ship routing service, contact the ERT Global Forecast Center at 800.225.1204.*

GLOBAL

The future world of the telecity and



by Dr. Joseph N. Pelton, Executive Assistant to the Director General of Intelsat

The following article is an adaptation by the author for Comsat Magazine *of a portion of his book,* Global Talk, *jointly published by Sijthoff & Noordhoff International Publishers B.V., Alphen aan den Rijn, The Netherlands, and The Harvester Press Ltd., Brighton, Sussex, England. The Editor.*

"What will the cities of the 21st and 22nd Centuries be like?" This is a question that can most accurately be answered by the reply: "They'll be a lot different than the cities we know today." Man has lived in towns, villages and cities for only about 10,000 years (or about 0.2 percent of man's five-million year existence). For over 9,000 years, cities and towns were compact trading centers that provided a community stronghold for common defense. In 1300 A.D., Peking was the world's largest city, with an area of about 50 square kilometers. A 7-kilometer (or 4-mile) walk on foot took you from one side of the city to the other.

The 20th Century city and its recent offspring, the vast urban megalopolis, are the clumsy and inefficient result of cars, trains and explosive industrialization. The San Diego/Los Angeles urban system is hundreds of times larger than 14th Century Peking.

Yet, even today the forces of change are visible which if we analyze them promise a new urban future. There is the need to escape from our past, e.g., energy shortages, urban crime, high housing costs, overcrowded slums. There is also the positive force of new technologies in transportation, robotics, computers and communications. When these negative and positive forces are creatively combined, what may emerge is what Alfred Hsi Liu and I have termed in *Global Talk*, "The Humanized Telecity." Telecities will be diverse in many respects, but still have certain common features. These common aspects will not be of design or of appearance, but of function.

Telecommunications, Not the Car

Telecommunications, and not the personal automobile, will be central to the telecity. Ideas and information move much more freely and with less energy than people or things. People, with completely mobile communications, can thus physically move at their leisure. New cities, as well as retrofitted ones, will be organized around a special electronic network. This system will provide people with cheap, energy-efficient and pollution-free means of "Talking," "Going," and "Thinking." Thus, we call it a TAGOT network. Telecommuting to work, teleschooling, telemedical services, teletraveling, teleshopping, telebanking and telemailing are only some of the obvious services that are on tomorrow's doorstep. Communications satellites, space platforms and fiber optic networks will be linked to large national and international computer systems that will become a part of this global TAGOT network. These TAGOT networks can bring economic prosperity, promote energy efficiency, extend leisure time hours, encourage corporate decentralization, and provide many other benefits in areas like personal security, and choices of living style in rural, suburban or urban living environments. Life on the farm or in a megastructure will both be available, reasonable options.

Yet, only the naive promise a future cornucopia of harmonious bliss for all

· TALK

the telecomputerenergetics enterprise

mankind. The trend lines that lead to predictions of the telecity do not promise that it will be humanized. Quite the reverse. Invasion of privacy, massive computerized data banks, oppressive public and private concentration of power, overcentralization of key services and support systems, electronic monitoring and surveillance, technological unemployment and the social stresses of living in an "electronic cell," are only some of the most obvious problems to be solved. If, for instance, children receive their education on home computers and telescreens and daddy's office is in the den or living room, what does that mean for the future employment of teachers, the socialization of children, the relationships between parents and children and between husband and wife? Adjustments to the telecity may not be easy!

Experiments like Walt Disney World's EPCOT project in Orlando, Florida, or the Frank Lloyd Wright Institute's House of the Future project in Phoenix, Arizona, provide us interesting insights into the future. More often than not, however, such projects tell us only how the technology works. Policymakers in the government or in industry learn precious little about how people will "function" in the future telecity. If the coming world of Global Talk is going to be a nice place to visit and live, we must begin to study how the future telecity will become the "Humanized Telecity" that we truly wish for our grandchildren and our great grandchildren.

Regulation of the Telecomputerenergetics Enterprises

The telecity of course is but one of the issues with which our 21st Century "postdecessors" will have to cope. One of the more likely issues of the 21st Century will be the regulation of the powerful, far-flung new "telecomputerenergetics" enterprises. These enterprises will combine within a unified entity the technologies, equipments and services now categorized as communications, computers, energy and robotics industries and at least part of the transportation and construction industries.

Much has been made of the growing market competition between the American telecommunications and computer giants, AT&T and IBM. This, however, may be indeed only a part of the puzzle of future commercial enterprises of the 21st Century as we find that there is likely to be a convergence of all "intelligent" industries in the next century.

Advanced R&D activities in the so-called "smart" or "intelligent" industries, such as computers, telecommunications and robotics, have become increasingly important in the last decade. It has been little noted in this regard, however, that research in certain areas (such as artificial intelligence, semiconductor material research, fiber optics, laser technology, optical and electronic switching technologies and network design, etc.) all have become increasingly important to a very broad range of enterprises. Key technologies have spread across lines that used to separate activities quite nicely. By the 21st Century, however, industrial categories like aerospace design and manufacturing, robotics, telecommunications, computers and energy may have gone the way of the dinosaurs.

continued page 34

Fortified with an understanding of all these factors, one finds certain significant patterns emerging. First of all, we find traditional market boundaries being disregarded with abandon. We find that the Exxon Corporation has moved into information systems, computer chip design and manufacture, electronic motor production and a wide range of other areas that are "intelligent" enterprises, as opposed to "dumb" resource-extractive processes to be expected of a traditional oil company. We see such phenomena as Exxon and Thomson-CSF (the French electronics giant) collaborating on solar energy research projects known as SAHEL. We also see Volkswagen acquiring Royal Office Machine products. We also see the world's largest automobile manufacturers making extensive and rapid investments in robotics assembly line production techniques.

Economies of Logic: R&D Leverage

In short, the more the subject is investigated, the more it becomes apparent that not only are there "economies of scale" and "economies of scope" that create economic incentive for corporate giants to grow larger in their traditional areas of expertise, but there are "economies of logic" that promote technological concentration through R&D leverage. This phenomenon will increasingly motivate all large industrial enterprises to move to establish a technology base across a wide range of scientific inquiry in the so-called "smart" fields of commercial enterprise. These telecomputer-energetics corporations will have to have the economic resources to establish a sophisticated research and development capability across many fields.

The power of new technologies born in the fields of electronics, photonics and advanced materials research will increasingly serve to make old boundary lines obsolete and passé. It is possible that we may also see other areas swallowed within telecomputer-energetic giants. Banks, investment firms, or even retailers (which are actually information processing enterprises), building construction and perhaps other activities, may find "unlikely" homes within gigantic industrial structures that would span a range of activities that once were found within as many as 25 or even 50 different corporations.

This leads us to some compelling but perhaps unanswerable questions. Is it desirable for mammoth telecomputer-energetics enterprises to be able to marshall such a powerful array of financial, institutional and technological weapons? If traditional market economy forces and economic profit are the only guide, what kind of world might the telecomputerenergetics industries create by the mid-21st Century? Can activities like the commercial exploitation of space only be effectively realized through technological mega-organizations of the telecomputerenergetics type? How powerful are the technological imperatives of the future? If they are indeed as strong as we suspect, does this truly mean that only enterprises capable of sustaining R&D establishments of the magnitude of a Bell Laboratories will be able to compete in the international marketplace of the future?

It will be recalled that the initial purpose of antitrust legislation in the United States and in other countries was to prevent 800-pound corporate gorillas from exerting undue competitive force against their rather scrawny competitors.

As we evolve more and more toward a total global economy, however, the issue becomes less a subject of how corporate competition will occur within a particular national economy, but the extent to which national corporate giants are able to withstand the competitive pressure of a 1,200 to 1,500 pound international corporate gorilla that has the strong support of a national government.

Today, there are only a few research corporations that can design a computer,

engineer a telecommunications network, build a satellite, design a ship for mining the seas, construct sophisticated solar-power systems, develop a high-efficiency fuel power cell or construct a sophisticated robotics device that can not only conduct simple mechanical operations but also can "see" and "reprogram" its activities. It seems, however, only a matter of time before several giga-dollar corporate enterprises will competently span this range of technologies. These intelligent industries will benefit synergistically from broad R&D programs, and technology transfers across boundaries that are now hopelessly obsolete.

Living in the Age of Future Compression

Small enterprises, with only modest R&D capabilities, will have short life expectancies. To the extent that small, highly specialized enterprises are formed and become successful, they will, through merger or acquisition, likely be integrated into the overall larger structure of the telecomputer-energetics enterprises of the future. Such a trend could help to stimulate economic prosperity but at the same time could also accentuate the 20th Century phenomenon that I call "future compression."

The world of Global Talk seems likely to be one where "progress" or at least "change" occurs at an ever faster rate. Yet, such tremendous concentration of power and technological expertise must also be a subject of considerable interest and not a little concern to public policymakers who must protect the public interest. They must provide for societal protections required to prevent ruthless economic exploitation, breaches of national security, or authoritarian abuses at the economic, the social and the political levels.

Although the subjects of the humanized telecity and telecomputer-energetics enterprises may seem to be widely divergent ones, in many ways they are very closely interrelated. Perhaps their most important relationship comes with regard to the simple issue of scale. Perhaps the key dimension of the future will be the scale that separates the citizen from his government, that separates an employee from his corporate employer, that separates a resident from his community, and that divides the individual knowledge of a citizen from the collective knowledge of a global society and its entire technostructure. We, as individuals, must be able to judge, to imagine, and to see in a scaled perspective. We must see how "things" in our daily lives relate to the past and present. If the individual cannot comprehend his everyday environment without fearing a strange or perhaps even alien future of which he knows not, then not only the future but the present as well, will become unwelcome. But if the key can be found to marrying advanced technology with human concerns, and a personalized scale can be developed that is comfortable to people in all walks of life, then the 21st and 22nd Centuries could yet be the golden age of mankind on earth and in the heavens as well.

Thus, the challenge of the future will be to create a world of Global Talk that is not only humane and livable, but one that is in a scale with human emotions and understanding. Our machines will have to be designed to live with and talk to human beings at a speed and in a way with which we are comfortable. Already we have computers and advanced communications satellites that can "think" and "talk" a million times faster than a human. Soon it will be a billion times faster.

We must not attempt to escape quickly from a human cultural past that for 99.8 percent of man's total existence involved hunting and foraging for game and berries. Man the hunter-nomad had for millions of years to trust his instincts and animal abilities in almost everything and his technology but little. It is thus almost instinctive for man to be cautious in placing his entire future into the hands of science and technology. The World of Global Talk will only be as good as we make it. Let's hope and pray that the telecity and the "intelligent" megacorporations of the 21st Century are able to harmonize the technological needs with the human ones.

WORLD SYSTEMS

COMSAT'S LINK TO INMARSAT

by ***Dr. John L. McLucas,*** *President, Comsat World Systems Division*

We wish the new International Maritime Satellite Organization (**Inmarsat**) well as it undertakes the large responsibility of managing a worldwide system for high seas communications via satellite, beginning in February of next year, and we are proud that the system **Inmarsat** is building upon is the pioneering Marisat system created by **Comsat** through its Comsat General subsidiary.

The use of the Marisat system as the basis of the new Inmarsat system means that for manufacturers of antennas and terminals used with the Marisat system and for users of the system continuity will prevail. Users of the system, for example, should notice little practical change in the service on that day when management of Marisat's commercial capacity is taken over by **Inmarsat**.

At **Comsat** it is the responsibility of our World Systems Division to work with **Inmarsat** to ensure the smoothest conceivable transition from one system to the other, and indeed many hours of work by many people have already gone into the task. Once **Inmarsat** is a fully operational system, World Systems will have responsibility for providing all the services **Comsat** offers through **Inmarsat**, as it is it's responsibility to handle all of the Corporation's statutorily-mandated services. The Corporation's services through the Intelsat system are the other major responsibility of World Systems.

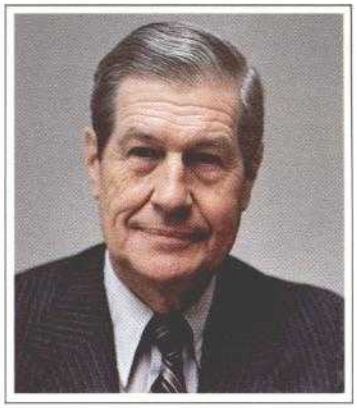
The group specifically assigned the task of working with **Inmarsat** is Maritime Services. It is headed by Mr. Edward J. Martin, Vice President.

Essentially three types of tasks are handled by the Maritime Services group—representation of **Comsat** in the Inmarsat organization, which has its headquarters in London, operation of the U.S. Network Control and Coast Earth Stations, and marketing; that is, making known the benefits of maritime communications via satellite to the widest possible audience.

Over the past several months, Maritime Services has been holding a series of seminars for both manufacturers of marine communications equipment and for users of marine communications at various cities throughout the country to explain the steps being taken to accomplish the Marisat to Inmarsat transition and how the system will operate under the management of **Inmarsat**. The attendance at these meetings has exceeded our expectations and shows us that interest in maritime communications via satellite is continuing to rise. Maritime Services has already held seminars for users of maritime communications in Los Angeles and New Orleans and will hold the next meeting of this type in New York City at the Whitehall Club on December 1.

At all of these meetings our basic message is a simple one. The formation of **Inmarsat** and the commitment of 36 countries to that organization, including all the major seafaring nations of the world, should give strong encouragement to prospective users and manufacturers alike that maritime communications via satellite is now accepted fact and is, thus, the most worthwhile of investments.

JOHN A. JOHNSON RETIRES



John A. Johnson, who has served **Comsat** since 1963 as one of its most skillful and respected senior executives, retired from his post as Chairman of Satellite Television Corporation on June 27. Mr. Johnson, 65, thus completes a distinguished and wide-ranging career at **Comsat**.

Mr. Johnson has exerted forceful leadership in the development of **Comsat**'s international satellite business and has played a major shaping role in the establishment and growth of the Comstar, Marisat, Inmarsat and SBS satellite systems. He served as a Comsat director from 1976 to 1981.

Since May 1980, when Mr. Johnson was elected Chairman of **STC**, he has been instrumental in developing the concept of satellite-to-home pay-television into a viable business proposition. He has effectively guided **STC** through its all-important initial phase and will continue to serve **STC** as a consultant and director.

Upon Mr. Johnson's retirement, Irving Goldstein was elected to the newly created position of President and has assumed the day-to-day management of **STC**.

Throughout his years with the Corporation, Mr. Johnson has held key executive positions. He was a central figure in the establishment of **Intelsat**, the International Telecommunications Satellite Organization. In 1964, while Vice President of **Comsat**'s International Division, Mr. Johnson was a member of the U.S. delegation to the Interim Communications Satellite Committee which made the initial arrangements for the creation of **Intelsat**. Mr. Johnson served as Chairman of the Interim Committee, composed of 14 member nations, until 1967.

When the definitive arrangements for **Intelsat** were entered into force in February 1973, Mr. Johnson was elected the first United States Governor to the Intelsat Board of Governors. At that time, there were 79 member countries in **Intelsat**. Today, Intelsat membership comprises 106 nations.

In February 1973, Mr. Johnson became the first President of Comsat General Corporation and served as Chairman and Chief Executive Officer of that subsidiary from May 1977 to August 1980. During this period, the Comstar and Marisat systems were put into place, the company entered the environmental information services field and began to manufacture specialized communications products, and the groundwork was laid for the start of **SBS**'s operations.

Mr. Johnson has been a director of Nicatelsat and Intercomsa, joint venture companies owned by **Comsat General** and the Governments of Nicaragua and Panama, respectively. Nicatelsat operates an Intelsat-system earth station near Managua; Intercomsa operates such an earth station near Panama City.

As President of **Comsat General**, Mr. Johnson represented the Corporation in the 1975 signing of the Satellite Business Systems Partnership Agreements with Aetna Life & Casualty and IBM Corporation. **SBS**, which became operational in 1981, is providing intra-company satellite communications services to over 20 corporations.

Mr. Johnson was also active in the 1979 establishment of **Inmarsat**, the International Maritime Satellite Organization. He was the first United States representative to the Inmarsat Council, which met initially in July 1979 in Brighton, England.

Before coming to **Comsat**, Mr. Johnson served as the first General Counsel of the National Aeronautics and Space Administration. He has also been General Counsel of the Department of the Air Force.

For the future, Mr. Johnson and his wife expect to do quite a bit of traveling. In September, they embarked on an extensive automobile trip to Central America. Mr. and Mrs. Johnson also look forward to having more time to spend with their family, especially their grandchildren.

N O T E S

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at CGIS recently when Erling P. Fossum was appointed to the post of Vice President, Finance and Administration. In his new post, Mr. Fossum will be responsible for CGIS's finance, accounting, personnel, and contract management.

Mr. Fossum comes to CGIS from Fisher Switches, a Santa Clara-based subsidiary of the Avnet Corporation, where he served as Controller.

Super Spice program announced by CGIS

Comsat General Integrated Systems (CGIS) has introduced a new software package for computer-aided design of analog and digital integrated circuits. Called Super Spice, the advanced program is the newest addition to a growing line of CGIS products used for electronic design.

The Super Spice program was developed by CGIS's Compact Engineering Division, a supplier of microwave applications software. It is a new, fully interactive time and frequency domain analysis package offering many powerful enhancements over the original Spice program.

The combination of CGIS's digital simulation program, Tegas V, its microwave analysis program Super Compact, and Super Spice, provide the engineering tools needed to address design simulation from discreet component circuits to complex IC networks. Timing evaluations are now possible from D.C. into microwave.

Three senior positions filled at TeleSystems

Comsat General TeleSystems has filled three senior positions within its ranks.

Richard W. Jahnke has been named Vice President, Marketing, John J. Imperial has been appointed Vice President of Engineering, and Victor Schendeler has been promoted to the post of Vice President, Manufacturing Operations.

As Vice President, Marketing, Mr. Jahnke is responsible for TeleSystems' day-to-day marketing operations, including domestic and international sales and product planning. Prior to joining TeleSystems, Mr. Jahnke spent 10 years with Plantronics, Inc., of Santa Cruz, California, in various sales and marketing positions, most recently as National Marketing Manager.

As Vice President of Engineering, Mr. Imperial is responsibe for all engineering functions at TeleSystems in the continued development of high technology state-of-the-art telecommunications products. Prior to joining TeleSystems, Mr. Imperial was the Vice President of Hardware Engineering at Digital Switch Corporation of Reston, Virginia.

As Vice President, Manufacturing Operations, Mr. Schendeler is responsible for all TeleSystems' manufacturing functions including procurement, manufacturing engineering, manufacturing planning and control, production, product integrity and test operations. He previously was Director, Business Development at TeleSystems. Prior to joining TeleSystems, he spent 13 years with Fairchild Space and Electronics Company.

New World Systems assignments announced

With the appointment of Irving Goldstein as President of Satellite Television Corporation, Comsat World Systems Division has changed the assignments of two of its officers—Joel R. Alper and Robert W. Kinzie. Mr. Goldstein previously was Senior Vice President of International Communications Services for Comsat World Systems Division. Mr. Alper's new position is Vice President for Communications Services. In this capacity, he represents Comsat on the Board of the International Telecommunications Satellite Organization (Intelsat), and he assumes responsibility for the planning, development and operation of Comsat's international satellite communications services.

Mr. Alper joined Comsat in 1974, following 12 years with TRW Systems,

part of which as TRW's European Regional Director. In 1977, he was named **Comsat**'s Director of Intelsat Affairs, and in 1978 he became Assistant General Manager for Operations and Representation. With the establishment of **Comsat**'s World Systems Division in 1980, Mr. Alper was appointed Vice President for Operations.

Mr. Kinzie's new assignment is Vice President, Finance and Administration. In this capacity, he is responsible for World Systems finance, contracting and procurement, personnel, software and data systems, and the Comsat Maintenance and Supply Center.

Mr. Kinzie's previous positions with **Comsat** have included Vice President, Project Management and Development of Comsat World Systems, Assistant General Manager for International Operations, Director of Intelsat Affairs, and Director of International Management Services.

ERT service aids government, industry

ERT (Environmental Research & Technology, Inc.) has taken a major consulting role in a new streamlined route through the environmental impact statement (EIS) process. Known as the "third-party" approach, this innovative strategy is being successfully used by mining companies and Federal Government agencies to save time, manpower and money while doing environmental studies required for a major industrial project to get underway.

Congress, through the National Environmental Policy Act (NEPA) of 1970, holds federal agencies responsible for protecting the environment of areas under their control. Since many mining operations are located in such regions, the mining industry has been subject to this mandate. However, after a decade of preparing EISs required by law, federal agencies (as well as mining companies and other developers affected by the law) became convinced that the usual EIS procedures were unnecessarily cumbersome. The statements sometimes took up to three years to complete. The manpower of the responsible federal agencies was often severely taxed in EIS preparation. Data analyses and preparation of an encyclopedic EIS took additional months. And, equally disturbingly, resulting information was not always presented for public review in useful form. In the final analysis, then, a company seeking to construct or expand facilities could suffer the expense of long delays.

The "third-party" EIS is a creative solution to these problems. Rather than burdening the federal agency with actual preparation of the EIS, responsibility is apportioned as follows: (1) the lead agency and the mining company hire an environmental consultant like **ERT** as an objective "third-party" to perform the necessary studies and prepare the EIS; (2) the mining company pays the consulting fee and the consultant is responsible to and under the direction of the federal agency; (3) the federal officials furnish guidance and control to the contractor and participate in the independent evaluation of the EIS; (4) the lead agency is responsible for the scope and content of the statement. The resulting "third-party EIS" benefits the public, the federal agency, and the company involved. The federal agency is spared the strain on its resources because a consulting firm, which is under its full control, actually prepares the EIS. The mining or other industry applicant, although financially responsible for the consultant's fee, saves the cost of delay for project start-up. Finally, the public can participate in the scoping process and can understand the EIS document because the consulting firm is required to write it in plain language.

ERT has served as the third-party consultant on several proposed western mine/mill operations with the Forest Service and the Bureau of Land Management. The procedure has been carried out successfully for several major projects and is under discussion by federal land managers for more projects. Although the mining industry has been the beneficiary of the third-party method thus far, this approach can be used for any project requiring an EIS including, for example, electrical generating stations, transmission lines, pipelines and railroads.

AT PRESS TIME

Third East Coast Earth Station wins zoning variance from Cleveland Township Zoning Board

A three-member zoning board representing Cleveland Township, Columbia County, Pennsylvania, voted 2-1 to approve **Comsat**'s request for a zoning variance for its proposed Third East Coast Earth Station. The decision was announced on September 17 in a five-minute meeting at the township's municipal building. Subsequently, the Cleveland Township Supervisors indicated their unanimous support to **Comsat** in a published article.

The property under option to **Comsat**, a 105-acre farm owned by a local family, is within the town's "Rural Agricultural District" and the zoning law does not specifically cover improvements to the property of the nature contemplated by **Comsat** as a "permitted use." **Comsat** sought a special exception under a section of the zoning ordinance which permits special uses within the Rural Agricultural District for "appropriate public uses or essential services."

Board Member Ronald Brown, who read excerpts from the board's 17-page opinion at the meeting, noted that **Comsat** must meet all the regulations of the Rural Agricultural District with the exception of the height regulations. Under the decision, **Comsat** must also repair any township roads damaged during the construction of the earth station.

The zoning board's decision, which can be appealed within 30 days, culminates months of discussion—in the form of town meetings and zoning board hearings—between Comsat representatives and residents of the Bloomsburg area. Prior to the zoning board hearing, **Comsat** had received the support of the overwhelming majority of the local residents and had received endorsements and resolutions of support from the Pennsylvania National and State Congressional delegations, the Columbia County Commissioners, the Roaring Creek Grange, the local school board, the Chamber of Commerce and other local groups. The final series of zoning board hearings was held at the Fisherdale United Methodist Church Pavilion in Numidia, Pennsylvania. Approximately 1,000 residents attended the meetings and hearings.

While it appeared that the great majority of citizens present at the three hearings were supportive of **Comsat**'s application, a few initially expressed concern about the safety of the station's operations. Five Comsat witnesses gave testimony and answered questions from local citizens and from the attorney representing opponents to **Comsat**'s application, John Mahalik, of Bloomsburg. **Comsat** was represented by James McClure, an attorney from Lewisburg, Pennsylvania.

At the hearings, Robert W. Kinzie, Vice President, Finance and Administration, World Systems, gave an overview of **Comsat**, explained **Comsat**'s need for a Third East Coast Earth Station, and described how **Comsat** would provide an essential service.

Richard J. McBride, Director, Project Management Division, Communications Services, outlined the details of the construction of the proposed station and its operation. He noted that approximately 30 permanent jobs would be available at the station, the majority of which would be filled by local applicants. Sidney Metzger, Vice President and Chief Scientist, explained the technical aspects of the station's operations. He testified as to the signal levels which would be emitted by the station's antennas, noting that the earth station would transmit a 2,600-watt signal directly to the satellite. "We estimate that the signal levels at the nearby towns would be thousands to tens of thousands of times below the most stringent standards in existence," Mr. Metzger said.

Dr. Herbert Pollack, a preeminent authority on the biophysical effects of low level microwave radiation, testified that there would be "no possibility of any

health hazard" to humans or animals. Dr. Budd Appleton, an opthomologist from Minneapolis, Minnesota, reiterated the testimony of Mr. Metzger and Dr. Pollack, adding that there was no evidence that exposure to microwave radiation at the levels emitted by the earth station could cause cataracts.

Attorney John Mahalik did not challenge **Comsat**'s scientific or medical testimony. Instead, he argued that the construction of the proposed station would not be consistent with the contemplated development of the area.

The zoning board found that "while it did not have the burden to do so, **Comsat** established that no harm would result from microwaves as utilized in its (the station's) proposed operation," and that the "use by **Comsat** constitutes an appropriate public use."

Comsat filed with the Federal Communications Commission on May 22 for permission to build the Pennsylvania earth station. Its application was placed on public notice on June 3; no opposing comments were filed. A decision is anticipated before the end of 1981.

Gunnar Hughes

Navy agrees to use Marisat at least one more year

The United States Navy has agreed to extend its use of each of the three Marisat satellites for an additional year commencing October 1, 1981. The Navy's contract with Comsat General Corporation contains an option clause that could be exercised for an additional 12 months of service. Contract value is about $16 million per year.

Service to the Navy is provided by **Comsat General** on the UHF portion of the Marisat satellites. Under an agreement signed with **Comsat General**, the new Inmarsat organization in London begins providing commercial service via the satellites' L and C bands on February 1, 1982. Comsat World Systems Division through its Maritime Services group is the Corporation's link to **Inmarsat**.

Launch, apogee motor firing are success for SBS-2

SBS-2 has achieved near-geosynchronous orbit and is drifting eastward toward its permanent location of 97 degrees west longitude. The second communications satellite of Satellite Business Systems (**SBS**) was launched on September 24 at 7:09 P.M. EDT from the Kennedy Space Center in Cape Canaveral, Florida, and the process of getting it from transfer orbit to near-geosynchronous orbit began on September 26 at 6:57 P.M. EDT when, under the direction of Comsat and SBS engineers at **Comsat**'s Launch Control Center, its apogee motor was successfully fired.

Satellite Business Systems' first satellite, SBS-1, was launched on November 15, 1980, and became operational early this year. Its permanent location is 106 degrees west longitude. Satellite Business Systems is a partnership among subsidiaries of Comsat General Corporation, IBM Corporation and Aetna Life and Casualty. Twenty-five organizations have to date signed up for its advanced private network Communications Network Service (CNS).

Successful launch of a second satellite offers the promise of three distinct benefits for **SBS** and its customers, according to Robert C. Hall, President of **SBS**: 1) **SBS** can fulfill its commitment to its customers of having full redundancy or backup on all the services it provides them. 2) Its capacity is doubled, and it thus enjoys considerable increased flexibility for traffic management. 3) New business opportunities open up, and, for example, it can proceed with its plan of leasing transponder capacity on a preemptible basis for specialized uses.

SBS first announced plans for a preemptible transponder lease service in mid-July and by September had received orders for two of the six service positions allotted for the service.

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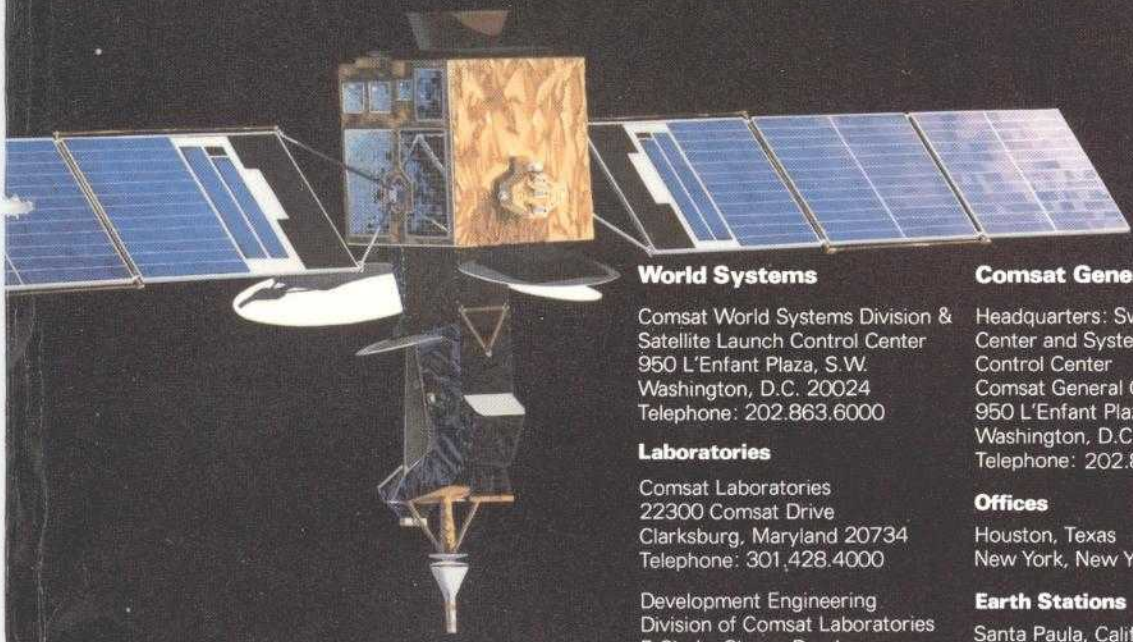

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