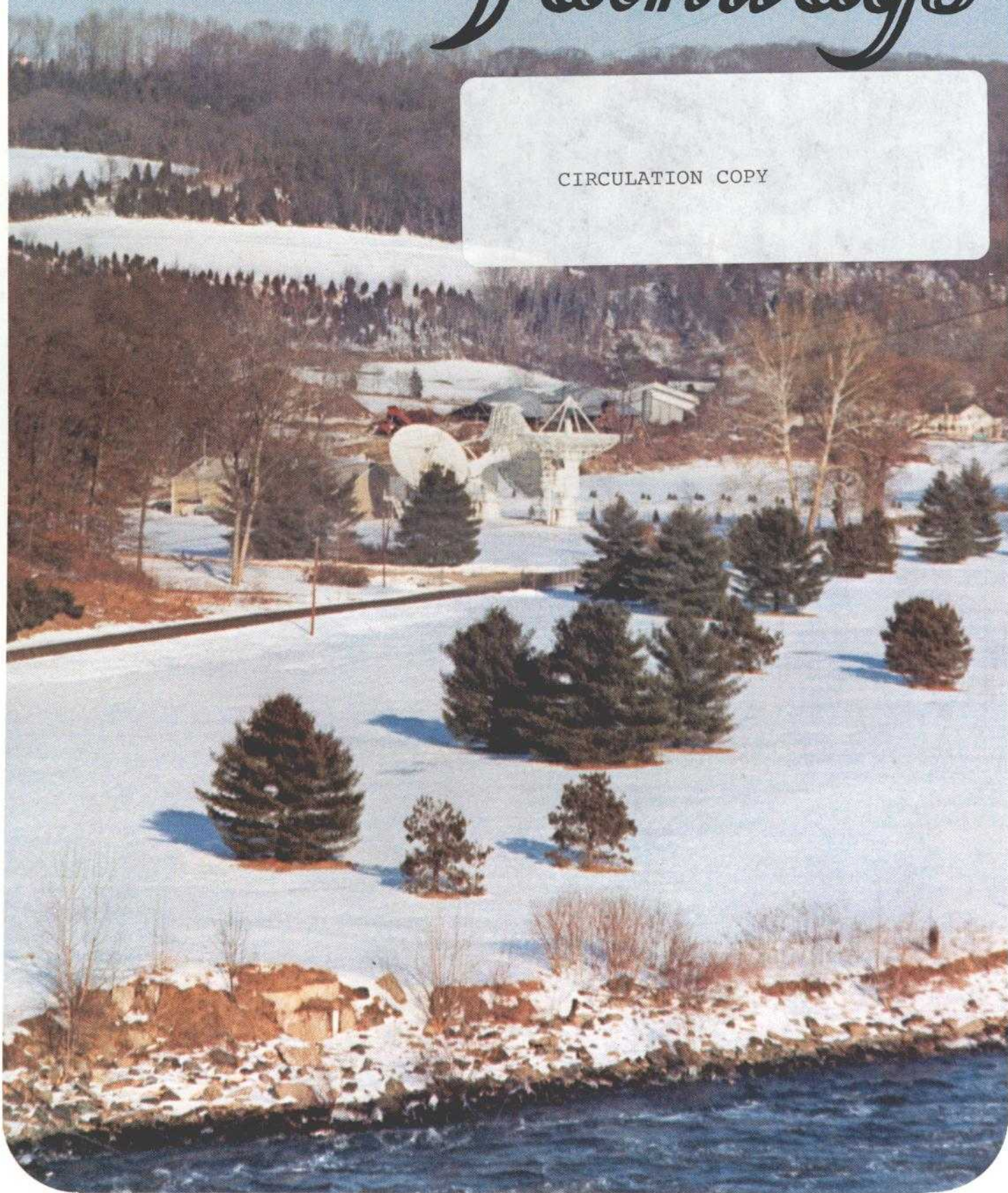


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The Mariners' Satellite,

MARISAT,

**a new means of communications
on the high seas; safety link in distress.**

By HERBERT M. LEVINE

When a Thor Delta 2914 rocket soared into space from Cape Canaveral on February 19, it carried MARISAT, a new maritime communications satellite developed by a COMSAT GENERAL joint venture. The successful launching of MARISAT, the first communications satellite to serve the commercial maritime industry, marks the most notable technological innovation in marine communications in three-quarters of a century.

MARISAT will meet communications needs of the U.S. Navy and the commercial shipping and offshore industries. It offers to the maritime community new facilities which will save money, help people in distress on the high seas and, perhaps, even speed the search for new energy resources.

The need for improvements in maritime communications had long been recognized. Communications on the high seas have depended primarily on high-frequency (HF) radio which is subject to severe fading and interference, manually-operated ship and shore stations and slow-speed Morse Code of about 10 to 20 words per minute.

In the pre-satellite age, no continuous, highly reliable commercial communications system was available on the high seas. Delays of eight to ten hours in transmitting messages were normal. Soon after COMSAT was

The maritime industry has long been concerned with the improvement of communications. The American Institute of Merchant Shipping estimates that by the year 1980, the number of vessels of more than 1,600 gross tons on the high seas at any one time will reach 14,000. More than 90 percent of present ship-to-shore communications uses century-old, radiotelegraphy "brass key" technology. Communications satellites will dramatically change marine communications.

created, however, its scientists considered the problem. "We looked into the maritime satellite situation in 1964," says Sidney Metzger, Assistant Vice President and Chief Scientist of COMSAT. "We knew we could build a maritime satellite, but we were uncertain about the economic potential."

An opportunity to proceed arose in 1972 when the Navy gave consideration to the use of maritime satellites as an interim measure for its Atlantic and Pacific operations; existing communications satellites were phasing out, more advanced satellites would not be ready for several years, and the Navy required a service which would bridge the interval between its existing facilities and the more extensive capacity planned for its Fleet Satellite Communications (FLTSATCOM) System.

At this point, COMSAT moved to meet the challenge. It had studied the potential market and concluded that communications satellites, which could serve both Navy and commercial maritime needs, might be economically feasible. COMSAT submitted a proposal in which it would assume the risk of putting up the satellites.

The Navy accepted the offer and signed a contract in 1973 for two years' service with an option for an additional year. The satellites were designed so that, as the Navy service phased out of the program, the satellites' capability could be used to increase private commercial maritime services above those provided initially. Contracts were awarded to Hughes Aircraft Company to build the satellites, and to Philco-Ford Corporation to construct the earth stations.

Although the first MARISAT launching was delayed because of various technical problems, the Navy's own Fleet Satellite Communications program also was delayed so that the Navy's need for MARISAT continues.

The System

MARISAT will remedy the deficiencies of maritime communications. It offers high quality communications nearly free of the conditions which produce interference with traditional maritime communications. To provide such service, COMSAT GENERAL has incorporated advanced technological features into the system's three major components—satellites, shore stations, and ship terminals.

Mr. Levine is a professor of political science at the University of Southwestern Louisiana. He is widely published as a freelance writer and is the author of several books.

The satellites

Three satellites, each with a design life of five years, have been built. The first one is being placed into geostationary orbit about 22,240 miles above the equator at 15° West Longitude. It will serve the U.S. Navy, commercial shipping and offshore industries in the Atlantic and Western Indian Oceans. A second satellite will be placed over the equator at 176.5° East Longitude in mid-May to serve the Pacific Ocean area.

Most of the capacity of the operating satellites will be leased to the Navy for its communications in the lower end of the UHF band. The satellites, however, also contain communications repeaters operating in the maritime frequency bands of 1535—1645 MHz for satellite/ship transmissions and six and four GHz bands for satellite/earth transmissions.

Each of the satellites can serve maritime needs over an area of roughly 60 million square miles, or about one-third of the earth's surface.

The Atlantic and Pacific satellites will cover two-thirds of the world's ocean area from 70° North to 70° South latitude. Actually, the Atlantic Ocean satellite will be far enough east to include the most heavily traveled routes of the Indian Ocean area—the Persian Gulf, the Gulf of Oman, and the Indian Ocean sea lanes around southern Africa. The Pacific Ocean satellite will extend service from the United States to the Strait of Malacca. A large section of the Indian Ocean and a part of the Pacific Ocean west of South and Central America will not be covered unless it is decided to use the system's third satellite for this purpose.

The shore stations

Two earth stations have been constructed. A station at Southbury, Connecticut, will serve the Atlantic

areas, and a similar station at Santa Paula, California, will serve the Pacific.

The busiest shipping lanes of the world will have access to the MARISAT System.

In addition to providing MARISAT communications service, the stations will also be used for telemetry, tracking and command. They are linked by 24-hour telephone/data lines with the COMSAT GENERAL System Control Center in Washington, D.C., and also interconnect with the U.S. terrestrial network.

The ship terminals

COMSAT GENERAL has ordered 200 terminals from Scientific-Atlanta. The commercial customers may purchase or lease these terminals. The Navy, however, will provide its own fixed and mobile terminals to operate with the satellites.

The ship terminals represent a major breakthrough in maritime communications technology. Each above-deck unit includes a four-foot antenna and amplifier. The antenna system, which must continuously point at the satellite within a degree or two, corrects for the roll, pitch and yaw of the ship. The radome-protected antenna has an automatic steering system designed to keep the antenna "locked on" to the satellite at all times.

The below-deck unit consists of a console with communications and control equipment, teleprinter and telephone. The ship terminals have been designed for ease of operation. For example, a shore station can automatically command the ship terminal to switch to a specific channel and communication is initiated automatically. The ship operator, however, can request a channel, a process which takes one-thirtieth of a second.

Capacity

The MARISAT satellites will be capable of providing voice, data, telex and facsimile services.

Voice—Any ship will be able to interconnect with the domestic telephone network.

Data—Alternate voice data communications at 1,200 and 2,400 bits per second (with speeds up to 50 kilobits per second available if needed) can be supplied.

Telex—Telex messages can be transmitted, received, and interconnected with worldwide teletype networks.

Facsimile—The system can transmit drawings, manifests, weather maps, and other graphics that can now be carried domestically via the telephone network.

Telex/TWX messages, which can be transmitted instantly around the clock, will be received aboard ship automatically.

When MARISAT service begins, each satellite will be able to handle 44 duplex telegraph channels, and one voice circuit for commercial customers.

Services

MARISAT will serve the maritime industry in many ways. Among its major advantages are:

- Savings in time and money. In the past several years the commercial maritime industry has become more automated. Very Large Crude Carriers (VLCC's) of over 250,000 tons are 50 times the size of tankers that operated during World War II. Larger tankers—Ultra Large Crude Carriers (ULCC's)—with double the capacity of the super tankers are being planned. The large tankers require no more crew than did their World War II-type counterparts.

Cargo ships have experienced similar improvements. Container ships such as RO/RO (roll on and roll off) and LASH (barges carried aboard ship and handled by an onboard elevator) require fewer crew members than earlier

cargo ships. These vessels use new methods of loading and unloading cargo which have lowered the cost of manpower and reduced in-port time.

Today's tankers and cargo ships employ advanced technology, enjoy greater productivity, and represent higher initial capital costs. The cost of operating many of these ships is more than \$1,000 per hour, if they are in-operative for a day or even for several hours, operating costs will be unnecessarily high.

- Improving the search for new energy resources. Currently, offshore oil exploration requires the use of seismic vessels to locate oil reserves through geophysical surveys and analyses.

Sophisticated equipment on these ships records masses of data on magnetic tapes which must be brought back to shore before being sent to a central processing area.

"MARISAT could make a valuable contribution in providing faster and more efficient transmissions of seismic data for the offshore oil industry through a high speed data (HSD) serv-

ice," says David W. Lipke, Director, Mobile System Planning for COMSAT GENERAL. COMSAT GENERAL is actively investigating the feasibility of offering this kind of service.

MARISAT will help other components of the offshore oil industry. MARISAT terminals can be used on drilling rigs, tankers, supply and pipe-laying vessels, crew boats, and small cargo ships.



Photo courtesy of the Port Authority of N.Y. and N.J.



Photo by Stephen P. Keller

- Speeding rescue operations. MARISAT can be used for humanitarian purposes. An immediate connection will be made at an earth station for a direct circuit from a ship terminal to rescue authorities. On the east coast of the U.S., the connection will be made to Commander, Atlantic Area, U.S. Coast Guard, located in New York City; and on the west coast, to Commander, Pacific Area, U.S. Coast Guard, in San Francisco.

The process of making an emergency call has been made technically simple. The terminal itself contains a DISTRESS button. COMSAT GENERAL officials anticipate that such a feature will be made a mandatory requirement. The Inter-Governmental Maritime Consultative Organization

PATHWAYS

(IMCO), the agency responsible for international maritime safety, can then gather more information which will enable it to revise the Convention for Safety of Life at Sea.

Marketing

COMSAT GENERAL has created a worldwide sales and service organization to sell or lease, install and maintain MARISAT terminal equipment. In the U.S., sales offices are located in New York, Houston, and Washington, D.C. Marine electronics firms, which have agreed to sell and service the terminals as overseas agents for COMSAT GENERAL, are located in Brussels, Copenhagen, Paris, Hamburg, Piraeus, Rome, Tokyo, Amsterdam, Oslo, Madrid, Stockholm, and Croydon.

"We are enthusiastic about the acceptance of MARISAT by the maritime industry," says David W. King, COMSAT GENERAL's National Maritime Satellite Sales Manager. "Our sales experience shows that the shipping companies see the managerial advantages of the system."

By the end of 1975, terminal equipment had been installed aboard 14 ships.

- Four Norwegian vessels: the *Royal Viking Sea*, a cruise ship; the *Nopal Branco*, a car carrier; the *Toyama*, a container ship; and the *Ferncraig*, a tanker. They are part of the SATKOM project, a Norwegian government/shipping industry group which has leased four COMSAT GENERAL terminals.

- Five tankers: the *Esso Copenhagen*, *Esso Wilhelmshaven*, *Esso Bangkok*, *Esso Philippines*, and *Esso Malacca*, operated by the Exxon International Company, a division of Exxon Corporation.

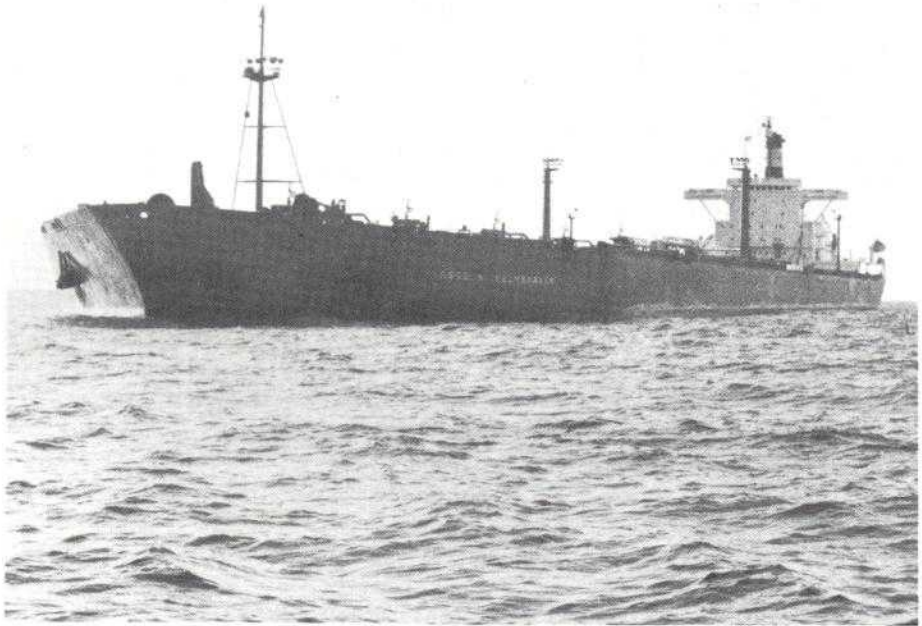
- The *Mormacstar*, a new tanker vessel owned by Moore-McCormack Bulk Transport; the *American Ace*, a container vessel owned by U.S. Lines; the *Lash Atlantico*, a container vessel of the Prudential Grace Lines; and the *Mobil Aero*, a tanker of the Mobil

Oil Corp. The owners of these vessels are participating in a cooperative cost-sharing program with the U.S. Maritime Administration (MarAd). MarAd has leased COMSAT GENERAL terminals for installation on six U.S. flag vessels.

- The seismic ship, *Deep Sea Explorer*, the lead vessel in SEAGAP, an oil exploration corporation composed of Phillips Petroleum Company, Getty Oil Company, AGIP (the commercial oil interests of Italy), and Hispanoil.

In addition, recent orders for COMSAT GENERAL terminals include:

- Cable and Wireless, Ltd., United Kingdom, for lease of one terminal for the cable ship *CS Mercury*.



- The Swedish Telecommunications Administration for the purchase of one terminal.

- Atlantic Richfield Corporation for lease of a terminal for the tanker, *ARCO Prudhoe Bay*.

- The Canadian Ministry of Transport for lease of one terminal for the icebreaker, *John A. MacDonald*.

- Nippon Yusen Kaisha, the NYK Line of Japan, for lease of a terminal for the *Kamakura Maru*.

Subject to Federal Communications Commission (FCC) approval, the

charges for telex and telephone service between ships and the contiguous United States have been set. Proposed telex charges are six dollars per minute, one minute minimum, for on-demand service.

For monthly service there will be a charge of \$800 per ship plus four dollars per minute over 200 minutes minimum usage (with a minimum term for this service of one year).

Operator-assisted calls for telephone service and data transmission up to 2,400 bits per second will cost \$10 per minute with a three-minute minimum.

Telex and telephone service between ships and points beyond the contiguous United States will be subject to the above rates plus applicable international communications charges and ship station charges, if any.

Customers have the option of leasing or purchasing shipboard terminal equipment. The lease rate is approximately \$1,300 per month (plus an additional one-time charge of \$3,000), and the purchase price is approximately \$52,545.



Bob Matthews of the Maritime Operations Department and crew leave harbor with terminal equipment to be installed on the Esso Wilhelmshaven anchored off the Island of Aruba.

Organization

COMSAT GENERAL sought authorization from the FCC in 1973 to establish the MARISAT System for provision of maritime communications service to the Navy and commercial customers beginning in 1974. The FCC ruled in April 1973, however, that certain carriers which were then offering maritime radio services should

be given the option to participate in the ownership of the system.

In August of 1975, pursuant to FCC order, COMSAT GENERAL entered into a MARISAT Joint Venture Agreement with RCA Global Communications, Inc. (RCA GLOBCOM), Western Union International, Inc. (WUI), and ITT World Communications, Inc. (ITT WORLDCOM). The interests of the par-

ticipants are as follows: COMSAT GENERAL, 86.29 percent; RCA GLOBCOM, eight percent; WUI, 3.41 percent; and ITT WORLDCOM, 2.3 percent.

COMSAT GENERAL was designated manager of the joint venture and was charged with the responsibility for the establishment, operation and maintenance of the MARISAT System. Each of the participants will market its share of the satellite capacity available for commercial maritime services. Each will share in Navy revenues in proportion to its ownership interests.

Initiatives in planning for maritime communications have not been limited to the MARISAT venture. For example, European countries plan to launch an experimental satellite called MAROTS, and the Inter-Governmental Maritime Consultative Organization (IMCO) has organized an international conference to consider the formation of a new international organization, the International Maritime Satellite Organization (INMARSAT). COMSAT and COMSAT GENERAL have worked actively with all these initiatives to promote the prospects for global maritime communications.

The White House Washington February 19, 1976

Today's launch of the world's first communications satellite dedicated to maritime use represents a significant step forward in bringing modern communications capability to our nation's naval and commercial shipping interests.

Our economy and our national defense are fundamentally dependent on our commercial and military maritime fleet which guards our shores and provides our most important vehicle for international trade and commerce. Until now, our maritime industry has had to tolerate slow and inefficient communications because of the limitations of conventional technology. In an age where satellites have provided the ability for instantaneous global communications, it is both timely and appropriate that this new technology be made available to our maritime interests. It will surely result in more efficient and economical shipping operations, as well as savings in both lives and property.

The launch of this new satellite is representative of the genius and creativity of the American people. It is yet another example of our success in harnessing technology to improve our way of life. The information and experience gained from this venture should be of great value to other nations as we begin to plan jointly for similar satellite services on an international basis.

I proudly applaud this new innovation in communications satellite technology.

Gerald R. Ford

Editor's Note.

In the May/June 1975 issue of the *COMSAT NEWS* the Southbury Earth Station was featured and the staff of the station recognized. In this MARISAT Special Edition of *PATHWAYS* it is considered appropriate that the staff of the Southbury station again be recognized.

David L. Durand
Station Manager

M. C. "Bart" Bartlett
Station Engineer

James W. Nelson
Senior Facilities

Eileen O. Jacobsen
Station Secretary

Technicians

David W. Davies

J. Gary Firtick

Marc D. Gordon

Ronnie L. Hicks

David S. Kellie

Roger S. Miner

EDITOR'S NOTE. *Three hundred years ago, less than half a century after Englishmen established themselves in Connecticut, the first settlers arrived in that portion of the beautiful valley of the Pomperaug River which now constitutes the Town of Southbury. Whereas the Nation is preparing to observe the 200th anniversary of its birth, Southbury celebrated Tercentennial Week in 1973.*

MR. CLARK, *historian emeritus of Connecticut folklore, served on the Southbury Tercentennial Committee, researching, assembling and editing the material contained in the Tercentennial publication Saga of Pomperaug Plantation, excerpts of which, with Mr. Clark's authorization, provide the material for this feature. PATHWAYS extends its appreciation to Mr. and Mrs. Howard Clark, to the officials of the Town of Southbury, and to Dave Durand and Eileen Jacobsen of the Southbury Earth Station, for their assistance.*

In editing the material for the publication, Mr. Clark made every effort to preserve the documentation in its original form and style and in the language in which it was written.

PHOTOS BY PATHWAYS EDITOR
JOHN J. PETERSON

In the Beginning

Prior to 1673 Southbury belonged to the Indians. It had so belonged ever since the retreat of the glacier, since the disappearance of that mile-high sheath of ice overhead, which in melting left us our eskers, drumlins and other glacial formations—since the day of the elephant, the caribou and exotic fauna said to have roamed our neighborhood from time to time nine thousand years ago.

In celebrating this the third century of the white man's succession, it seems not amiss to recall for a moment the red man and to inquire what sort of place he made of it during those ninety centuries of his stewardship. We are now in process of learning that he had quite a surprising civilization about 2500 B.C.

In 1673, then, the Pootatucks inhabited all Pomperaug Plantation, fished its many sparkling streams and cropped its land. They were a peaceful and intelligent clan, by far the most powerful in Western Connecti-

MARISAT's Atlantic Region Command Post; 300-year heritage

Saga of Pomperaug Plantation

BY HOWARD CLARK

cut, who traded widely with other tribes, worshipped a single God (though like the white man sometimes paying more heed to their devil), buried their dead in a sitting position like some ancient Mediterranean peoples and developed a system of "telegraphy" by which they could communicate within two hours with all their cousins up and down the Housatonic River for a distance of two hundred miles.

They were farmers as well as hunters and fishermen, raising corn which they stored in cribs for the winter, beans, squash and tobacco, and planting apple orchards. At the very center of their holy orchards they set up their council fires where they solemnly smoked with visiting chiefs, entertained them with athletic exhibitions and watched the powwows (medicine men) perform their mystic orgies. They spoke the Mohegan language common to all New England tribes and had a quartz mine and "factory" for the crafting of arrowheads on the east bank of Lake Lillinonah, where are still found artifacts of interest, piecemeal and whole. (ED. NOTE. *Area located two miles from station.*)

The Pootatucks were tributary to the Mohawks of New York State as were all tribes west of the Connecticut River; those to the east paid their tribute to the Pequots. They had to ante up their tax of grain every year or two but this was in a sense a system of welfare insurance, for in time of famine the Mohawks were pledged to feed them, and did so. Those clans which failed to pay up were made to regret it; the Mohawks descended on them with terrifying cries of, "We are come, we are come, to suck your blood!" and proceeded to plunder, kill and carry away captive those too slow at making it to the safety of the fortress.

The Pootatucks, under their sachem and sagamores, had their principal seat in a South Britain village, on the high ground west of lower Pomperaug River. This village commanded a spectacular view of the Housatonic valley, its heights being approached from South Britain by way of Indian Gate. They had a strong fortress on Castle Rock and a secondary village in Nonnewaug. (ED. NOTE. *The principal site is one mile southeast of the earth station.*)

Joining together these three important points was a trail or roadway, wide, policed and well compacted from the passage of many feet as it followed the tortuous bends of the Pomperaug River from trout pool to sparkling trout pool. Along it went all manner of festive activity, from ritual dances in which all participated, to impromptu snake dances, or just the simple parading of a youngster's first kill with bow and arrow for the admiring shouts of older hunters. Hardly a day passed without a parade of some sort from village to village along this Indian Main Street, with solemn ritual or just to let off steam.

This Indian trail is of particular interest to us for with scarce any change in direction, and only a job of paving, we know it now as Southbury Town Street—Flood-Bridge Road, ending at the Bent of the River (South Britain). There is, however, one other significant distinction: from this familiar highway-trail the terrain in all directions was in their day easily visible for many rods thanks to the Indian's autumnal habit of burning the fallen leaves, a safe thing as he did it but long denounced as wanton savagery by the white man. Listen to a description of Southbury by a visitor of the day:



*Howard Clark, novelist, author of *The Mill on Mad River* and *the Saga of Pomperaug Plantation*, featured in this issue of *PATHWAYS*, has lived in Southbury since 1934, arriving there from Texas by way of Princeton.*



Approaching Southbury Earth Station on River Road bordering the Housatonic River, then . . .

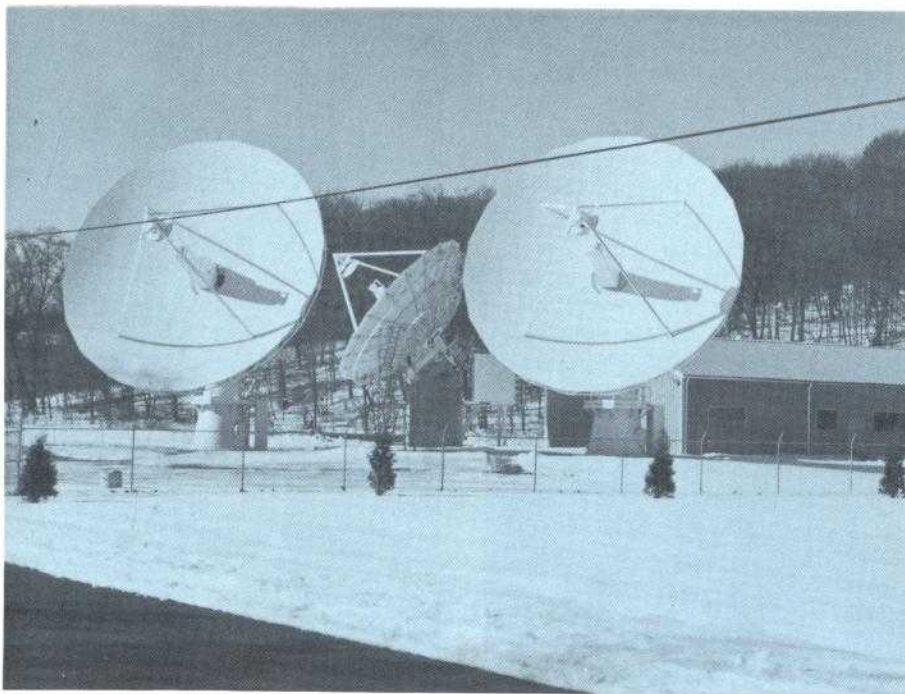
"While the red man possessed the country and every autumn set fire to the fallen leaves, the forests presented a most noble and enchanting appearance. The annual firings prevented the growth of shrubs and underbrush and destroyed the lower branches of the trees, so the eye roved with delight from ridge to ridge and from hill to hill; like the divisions of an immense temple crowded with innumerable pillars, the branches of those shafts interlocked forming the archwork of support to that leafy roof which covered and crowned the whole. But since the white man took possession and the annual fires have been checked, the woodlands are now choked with shrubs and young trees obstructing the vision on every side and converting these once beautiful forests into rude and tasteless wilderness."

Our Southbury forefathers bought and scrupulously paid for by treaty every acre acquired from the Indians. Thus they avoided much of the bad blood, wars of annihilation and lively pre-breakfast tomahawkings suffered by some other pioneers; but thereby hung misunderstandings and dissension of another sort. The American Indian lacked any concept whatever of private ownership of land; with him all title was vested in the tribe which conquered and held it, and he merely privileged to its enjoyment along with his fellow tribesmen.

So that, in "selling" land to the white man it is now pretty well established that he meant merely to bestow on the newcomer a like privilege with himself—of enjoyment in common. Hence the subsequent "dishonest" demands of the Pootatucks that certain purchases be bargained afresh and paid for again and again—Kettletown was bought in this way three separate times, one copper kettle evidently not being sufficient remuneration for its exclusive use.

We can imagine the proud Indian's start of surprise to find fences suddenly blossoming to impede a freedom of movement that had been his for nine thousand years; to say nothing of his horror the first time he was ordered back on the trail as trespasser, under threat of a very businesslike blunderbuss in Puritan hands.

Our Indians successfully resisted most efforts to Christianize them, though a few joined the church and even sent children to the white man's schools. One of the exceptions was Sachem Weraumaug who, during his final illness, succumbed to the missionary zeal of Rev. David Boardman of New Milford and permitted him to attend his bedside in the South Britain village, to the horror of the sachem's wife and most of his people. One day the sachem sent for Mr. Boardman to pray at his bedside, but no sooner had he arrived in black hat and coat on a very hot day, and begun



... arriving on site, one gets the feeling of having returned to an unspoiled environment interrupted only by a man-made road and the symbols of advanced technology.

proceedings, than Weraumaug's wife secretly dispatched a small son for the powwow to don his horrible regalia and commence counteraction.

This placed Mr. Boardman on his mettle so that he prayed the louder, and the powwow, accepting the challenge, set up a truly hideous shouting, howling and rattling of prophylactic bones. The clan gathered to witness this test of power and settle once and for all who had the more powerful medicine. There ensued a battle of epic proportions which brought on the run the last Indian within earshot and set them to laying bets, for the red man was an enthusiastic gambler on any odds under heaven.

It was a matter of honor now for the powwow to tire out the minister, and Mr. Boardman of New Milford was quite as fully resolved on his side not to be put to silence by any blind worshipper of Satan. The louder the one prayed, mopping his brow the while, the louder did the other howl; a neutral witness claimed the weird engagement lasted three hours and ended in a double-knockout. The powwow, exhausted and shedding bits of the warmer regalia, gave one final unearthly yell at the thought of los-

ing, took to his heels down the hillside and never stopped until he was cooling himself up to his painted nose in the waters of the Housatonic. As for the desperate and despairing Mr. Boardman, he was physically unable to follow and had to be revived on the spot.

About that ingenious "telegraph" of the Pootatucks: it was a chain of GUARDING HIGHTS manned by disciplined and devoted acolytes, from whose pinnacles they communicated with neighbors up and down the river by an elaborate system of cries and stylized signals repeated from station to station.

After selling off to the white man the last of their Pomperaug Plantation, the Pootatucks left Southbury and their loved South Britain village and moved up to Kent. Here their cousins the Wyantenucks possessed a secret valley of the Housatonic, fertile and enchanting and hid by mountains from the covetous paleface. This became the new happy hunting ground, from which they returned to Southbury from time to time only to visit the graves of their ancestors, scatter wild flowers over them and leave the ritual gift of food.

No Mules, No Covered Wagons

It was a murky afternoon in late April of 1673 on the Housatonic River, and there seemed to be nothing anywhere to indicate historic significance in that date or place. Low fog dirtied the patches of old snow spotting the banks as the southward flowing river took one more of its crazy jogs to the east; bits of ice clung to the shores though in midstream the tumbling waters sparkled clear. The weather was cold, too cold for Dutchman's-breeches, but just right for the carp. By the thousand they fought with frantic leap over each other's backs to make way upstream to the spawning beds. They were long as a man's arm and were so many they looked like a shadow river pressing upstream just beneath the surface.

Presently there came canoes, too, moving up the primitive river, though not so swiftly—fifteen of them swinging into view around the bend below present Rochambeau Bridge, each low in the water with human freight and each towing a sturdier raft of logs on which was piled high all manner of goods. Where the carp sported against the swift water the newcomers moved ponderously, paddled by weary men who had already come a long way and saw no end to their labors; they looked worn out, fearful and heavy-hearted.

From a distance these might have been a party of the dread Mohawk come to exact tribute of grain from the Pootatucks and forced instead to battle for plunder from his tepee villages. Closer inspection proved them to be white men, and their rafted cargoes white men's freight: plows, bags of seed grain, axes, tents and blankets; in the canoes fifteen men, nearly the same number of women and some small children too well-disciplined to give way to complaint or tears.

It was a youthful group but no one was any longer singing; the oldest, except for the leader (alert and concerned in the first canoe), were in their teens and twenties; and they were lost. The men paddled stubbornly on, sleeves rolled high on round, winter-marbled arms, black hats tugged low over anxious eyes and rifle ready between their knees; their women paddled bow and watched for rocks below the surface while they

guarded the precious family Bible in their linsey-woolsey laps. All the men were wet to the waist from going over the side among the carp to manhandle those cumbersome rafts through the rapids; two of the women were obviously pregnant.

They were an advance party of pioneers from Stratford, twenty miles downriver on the Sound, migrating in search of religious liberty. Puritan Congregationalists were always doing that, and these were seeking a land

A small drum rattled, and at the signal of authority the flotilla swung grudgingly to starboard; they were now abreast a tributary river flowing in from the right and their commodore in the lead canoe with wife, dog and three children was halted in the confluence of the two waters, calling for a council to decide what to do. The Indian directions had been simplicity itself: "Turn up a large river flowing in from the north, paddle eight miles and come to the beautiful Pomperaug

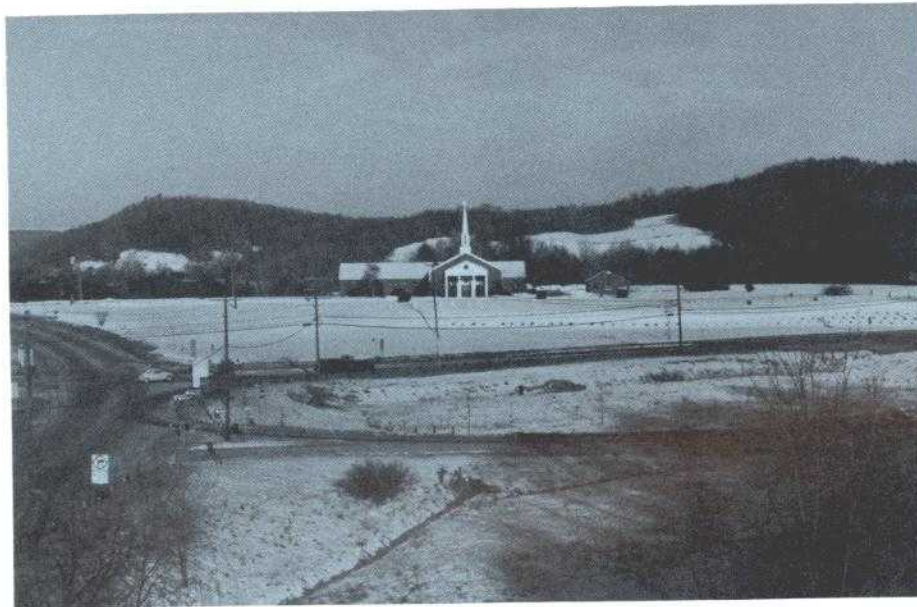
Now it could be said for sure that these were farmers; from those canoes came an undeniable fragrance of cow. On the rafts trailing astern were carpenter and masonry tools so they must be builders; there was a tripod for surveyor's instruments in the lead canoe of Deacon Minor; even the tiniest tot wore his deerskin coat, so they had to be hunters, too. And of course those trolling lines reaching far down-current meant they were fishermen, though no one seriously expected carp in frantic haste for the spawning grounds to have much of anything else on their minds. Above all they were patently men and women of sober speech and habits, making their religion a part of serious daily living.

Deacon Minor was a capable man and thorough, but he was ponderous. Full of honors for a man of 39, he was Captain of Militia, Justice of the Quorum, Town Clerk, surveyor and Churchman, as well as Indian interpreter—ordinarily a popular and vastly respected citizen. As Militia Captain to these same men on Muster Day he issued orders, kept the lieutenants and sergeants hopping and damned well got martial obedience.

Pomperaug Discovered

They paddled on and came to the Shepaug, and though this turned out to be an even smaller river, they swallowed their disappointment and swung right up it as the fog lifted and a lowering sun burst at last through the western clouds dead ahead to reveal directions. If they had missed the Pomperaug they would make the best of it. With a will they slipped again over the side and laboriously warped the rafts through the chill rapids of a mountain torrent. They came to Roxbury Falls where they must abandon their vessels and backtrack afoot cross-country. Leaving the two bachelor proprietors to guard everyone's possessions, they started east, and here they came upon the second perplexity—Deacon Minor's brindle hounddog Benediction baying every step of the way, and nowhere evidence of another human.

When Bene continued to howl and would not be consoled, they gripped their firearms at the ready, placed women and children within the hollow square they formed of their bodies



Traveling north on Interstate 84 the Sacred Heart Church is visible on the outskirts of Southbury. Behind the church rises South Britain's Rattlesnake Rock, considered one of the "hights" by the Indians, one from which neighbors communicated with one another by an elaborate system of cries and stylized signals repeated from station to station up and down the river. Of the early communications system it is said the Indians could send messages along the tributaries from Southbury and South Britain into New York and Canada in a matter of a few hours. Rattlesnake Rock lies within a stone's throw of the Southbury station.

called Pomperaug Plantation which they had bought sight-unseen from the Pagasett Indians of Derby the year before; there they meant to found a church where they could worship as they pleased, not as their parents bid them worship.

They were repeating the old Congregationalist story of schism—battling over matters of conscience, falling out over doctrine and fleeing away to outlandish places—first from Scrooby, England, to Holland, then back from Holland to England and finally across the seas to Columbus' new world where they would continue to divide and flee.

lands." Deacon Minor had received the directions first-hand from the Pagasetts as he was adept at Mohegan and other Indian dialects; but with no sun and no compass how could men positively agree which way was north?

So here they were again, halting to inspect another unknown tributary, looking in the drifting fog no more impressive than the others they had bypassed, on a river that wriggled across the landscape crazy as a snake with a hangover. Forming their ragged circle about the lead canoe they doffed the broad black hats and once more bowed in prayer for guidance.

and marched east for seven miles, the dog baying at every step. Had they paused anywhere to investigate behind rocks and trees they would have resolved the mystery—a puzzled Indian eye behind each, following the white man's every move since they spied his canoes' erratic behavior from the heights of Pootatuck Village.

They came to Good Hill, and by the brilliant fire of a golden sunset made out, spread below them, the most welcome of all sights to a lost traveler: the new home. The Pomperaug snaked its way through a smiling countryside of enchanting appearance, then dashed straightway for the Housatonic after one final hairpin bend.

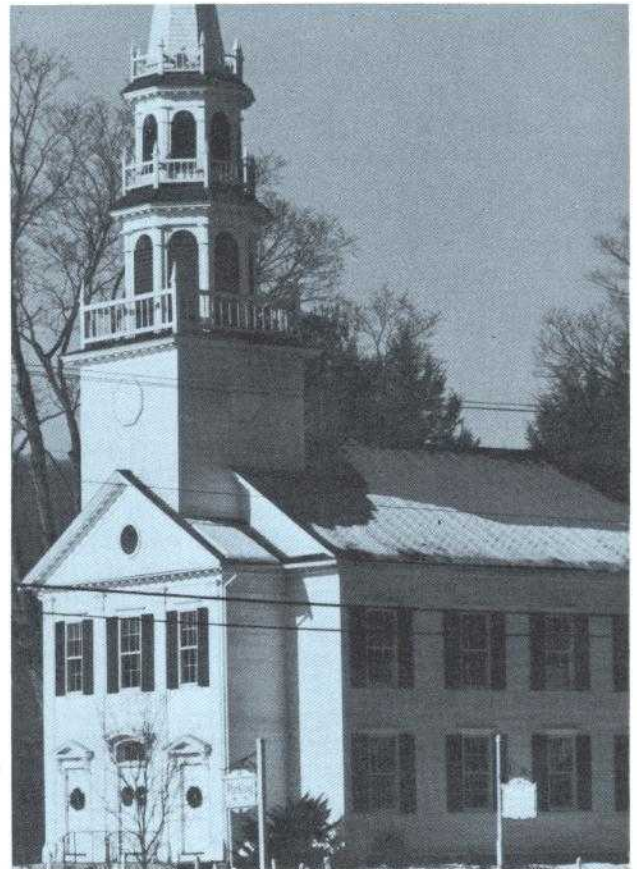
There before them lay their Pomperaug Plantation. They did not have to be told they had arrived at last and yonder was the land of milk and honey they and their progeny forever would protect and defend against defacement by alien invader. They dropped to their knees and profound was the chorus of Halleluiahs to a just and merciful God, each in his own words beseeching Heaven for strength and guidance in the new undertaking.

A Veritable Fairyland

First light of next day found the pioneers moving down through a veritable fairyland along that Indian Main Street paralleling the river. They handled and sniffed the soil on both sides and found it good. Sachem Aquiomp, Pootatuck chieftain, and his sagamores led the way toward their main village with Deacon Minor translating the answers to everybody's questions. When they arrived at the Bent of the River and climbed the rise from Indian Gate to Pootatuck Village the thirteen men were seated about the council fire in the sacred orchard where the pipe of peace was lit and passed to them; and it was then they were told that the purchase from the Derby Pagassetts was not enough, the lands must all be bought again.

Afterward they argued this with great indignation but Deacon Minor reassured them and they set to making their first and second choices according to charter. Then all had to regather at the beat of the drum and return to Roxbury Falls to bring their canoes and rafted goods around by the Pomperaug, at the mouth of which, this time, they blazed a giant syc-

South Britain Congregational Church, the oldest church structure in Southbury, built in 1825 for \$695.



more tree and wrote in large letters, "P.P.—this is it," for the benefit of the Stratfordites soon to follow.

So, reunited at last with fifteen canoes drawn up the riverbank and fifteen tents staked ashore under a mammoth oak tree, they spent their second night from Stratford and their first on Pomperaug Plantation. That tree would give its name to Southbury's northernmost section: White Oak. It has long ago disappeared but the spot, like Pilgrim Rock, is commemorated by a stone on old Crookhorn Road and the White Oak section of the Indian Trail is now officially an Historic District, never to be defaced by "developers."

The second party arrived shortly from Stratford, and others after that, until the separation was complete and schism a thing of the past. Nothing was allowed to delay the swift securing of their lands; if all was to be repurchased from the Pootatucks, Deacon Minor drove them to it with a will. The first such repurchase was signed that same month, April 26, in the Deacon's hand and the pictograph marks of the Sachem and his sagamores; it comprised all the land from East Meadow, Woodbury, to the

Bent of the River, South Britain; "two miles wide and four miles long" and they paid for it "one gray coat of homespun manufacture, a hatchet and a little powder and lead."

This piece turned out to be more like nine miles long and of proportionate error in width; but Deacon Minor, surveying it after drying out and mending his compass, let himself be persuaded to accept in good grace for the proprietors, saying that Indians "always measure in both directions from the center."

Only then would Deacon Minor allow the home lots to be chosen along Indian Trail. Then they set about in earnest making a town that would be "a pure republic in embryo, where the people themselves would forever decide their fate in august Town Meeting discussion where all might speak up and say his piece." Pomperaug Plantation would eventually be divided (sometimes by religious schism) into seven towns or parts of towns but none would ever lose sight of the original goal: "to propagate intelligence and good morals, that the light of liberty shall continue to shine on this land we cherish and defend, until That Perfect Day."

Between Wars, in Linsey-Woolsey

Our pioneers had prayed for peace, on Good Hill, but they were not to be blessed with much of it for a while. War with the Indians broke out even before they could get settled on the new land, the tribes of New England combining in the year 1675 in King Philip's War to drive the white man back into the sea. Though the Pootatucks remained friendly and did not join the rebels, the pressures of the conflict bore most heavily on such exposed frontier settlements.

Fortified houses had to be constructed even if it meant neglecting barns and cribs; they were placed at intervals up and down the Indian trail, surrounded by palisades of sharpened logs set deep in the earth and manned day and night. Captain John Minor's house was transformed into one of these; he was too busy drilling recruits to do any surveying, anyhow. Pomperaug Plantation became a community besieged, and Rev. Zechariah Walker shot and killed two Indians of a "foreign tribe" caught skulking in the cart path below the parsonage.

One quarter of the colony was required to stand at arms at all times, and especially during those two hours just before and just after dawn, when Indians preferred to time their forays; agricultural workers en route to the fields they were clearing and ploughing must go there in collective bodies

of not less than six, a situation similar to the latterday kibbutz of the Israelis. Once on the land, and ploughing, it was the rule to leave one rifle at each end of the furrow so as never to be cut off from means of defense.

Eventually all this was too much, and the Pomperaug planters regretfully loaded their canoes and their freight rafts and returned downriver to the old folks in Stratford, for the duration.

After the uprisings were put down in 1676, most returned upriver and resumed where they had left off—though Deacon Minor, as Town Clerk, had to threaten some with eviction. By 1678 the building of church and town were again going forward.

In 1674 the name of Pomperaug Plantation was officially changed to Woodbury by order of the General Court, "bury" meaning borough. For many years thereafter, however, the original name continued in general use and the official brand for the colony's horses was never changed from a "P."

Church bells were expensive things that only great cities like Philadelphia could afford; the inhabitants of the Plantation were called together for other purposes by the same drum that bid them to muster. The drummer stood atop Masonic Lodge Rock and employed a different roll, or beat, for church service, train band, town meeting or fire and alarm.

During the first summers, divine

service was held out-of-doors at Bethel Rock, and those first winters at the home of one or another of their number. Meanwhile they were working on their first Meeting House and great was their joy when it was completed in 1681, "twenty rods below Reverend Walker's house, on the cartway to the corn mill." They celebrated the occasion with a feast of thanksgiving which all attended, even the Pootatuck Indians.

The pioneers appeared at church dressed most soberly. The men wore those broad-brimmed black hats showing a steel buckle, linsey-woolsey shirt, deerskin coat and breeches and red woolen stockings inside wooden shoes called for some strange reason, French falls—these latter of such enormous size it is difficult to see how they managed to do so much walking. The women wore small, white pinched bonnets and linen shortgowns over dresses "with waists as abrupt as possible," red woolen stockings and the same great wooden shoes as their men.

They had a great deal of walking to do. There was no such thing as coach or carriage of any kind, nor any roads suitable for them had there been any (the Indian Main Street contained trees to shade it in the heat of summer). So, they walked, or they canoed, or rode horseback, the woman riding "pillion" with her arms around her man from behind; later she would use a saddlecloth and face the horse's tail, a pretty about-face for a lady at anything more lively than a walk!

"Ride and Tie"

Whole families could go to church on a single horse—they called it "Ride and tie." Father and the older children would start out afoot at the first sound of the drum, mother and the smaller ones following on horseback; when the riders overtook the walkers along the old Indian trail there would be an exchange all around, and this continued until Meeting House, "down that cartpath to the corn mill," was reached and Old Dobbin unbitted to his grain. Coming even "ride and tie" from as far away as Kettletown meant an early start and a good many exchanges; it eventually was to result in the breaking away of Southbury from the rest of the Plantation.



Bullet Hill Schoolhouse, built in 1789, considered the oldest public school building in continuous use in the United States.

The Minister was the most conspicuous social figure in town—Deacon and Captain of Militia close seconds; children were expected to form line and silently “make their obeysances” when he called, not speaking unless spoken to by the great man. Next in importance came the lawyer, then the doctor. The first physician in Pomperaug Plantation was Dr. Butler Bedient who came in 1712, followed shortly by Dr. Ebenezer Warner.

Straightlaced and sobersided as they were, they had a gay social side to their lives and it was centered around the togetherness of work, such functions as corn-huskings when finding a red ear entitled a man to kiss every girl around the barn, candle dippings, hog-butcherings, quilting bees (when the men sat on the floor beneath the great quilting frame suspended from eyebolts in the ceiling, there to pass the scissors on request, thread and wool, and “keep the party in stitches”); among all those pretty feminine ankles, and a certain levity allowed, this must have been a pleasurable task even with those ankles ending in those monstrous French Falls).

There were soft-soap boilings, sugaring-off when the maples were tapped, and skating parties when the first ice was thick enough to hold one’s best girl and her friends, on the millpond.

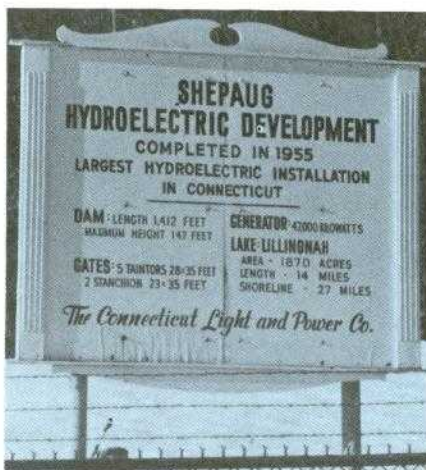
A young lady, when paying a visit, would carry along her spinning wheel (or allow it to be carried by her beau); on arrival her flying fingers and swift feet (for this work she took off the French falls) would make the wheel sing and whirl a merry accompaniment to social gossip. Then she could take the yarn she had spun and knit a pair of stockings or mittens before the visit was over and time to go home. The dye tub with its hinged cover near the fireplace became by common consent the “anxious seat” of the beaux making their calls. The bundling act came later, after acceptance all around and the couple was allowed to be going steady.

Commoning Day

There were special days of endearing memory: Commoning Day when “all fourfooted beasts that live by

grazing” were driven by the small fry to pasture, in September or early October after the last of the rowan was in—late, as main cut of hay was never done until July. Commoning Day was occasion for much skylarking and youngsters were not forbidden to take a fishingpole along.

Other special days were for house-raisings when all dropped their own work to help the newcomer or new-married at carpentry, and the cider flowed until the bush was hoisted onto the roof-tree; wood-spells for gathering firewood (especially those giant backlogs expected to keep burning for twenty-four hours, and so huge they had to be sledded into the house behind a team of horses and halted when their steaming nostrils were even with the bed in the next room, for then the log would be exactly in line with the andirons).



Casting its shadow over the Southbury Earth Station is Connecticut's largest dam which holds back the waters of the almost 20,000-acre, man-made Lake Lillingnah.

Sometimes with the best of attention the fire went out; this was a tragedy requiring the family's fleetest of foot to take a metal container with a short handle and looking much like a miniature stove, race to the nearest neighbor and borrow coals. Hence the old interrogation, “Has thee come after fire?” whenever one cut any visit too short.

But the really big days were two: Muster Day when the men gathered on the common in uniform of sorts

and all day long their trainbands marched and countermarched to squeal of fife and roll of drum while booths dispensed to the youngsters such succulents as gingerbread, lemonade (rare and expensive) and great lumps of rock-hard candy very like today's all-day-suckers. The second in popularity was Commencement Day, for schooling ranked very high in the frame of aspiration; there were speeches, contests, awards, honors and prizes of every kind. Independence Day, dearest of them all, was yet to come.

“On general trainings, the band with beating of drum and squealing of fife formed in two lines before the parsonage. Rev. Noah Benedict at this signal proceeded to the making of a most bewildering mixture consisting of rum, eggs, sugar and boiling water. Two huge-handled glass mugs now received their fill and the gentleman in his long silken robe of ceremony, cocked hat well brushed, silk stockings and highly polished silver shoebuckles, made ready to go out and greet the band.

“But one final ceremony! With a grand gesture he drew a red-hot poker from the fire, stirred the flip up rapidly with it, bowed to the delighted men, took a swallow from each smoking mug, then passed them down the lines until all had had their swig. Then, heading the procession, he led them to the tavern where he presided at the festive Muster Day dinner.”

It must be understood that the above was written well before the day of temperance reform, when hospitality quite literally “flowed”. Every household had its undercupboard well stocked with liquors of every kind. Cider (so hard it was blue) was the universal beverage, with West Indies rum running it a close second. Every laborer got his daily half-pint or you got trouble; the morning dram (at least for the men) was as important as breakfast itself; funerals and weddings continually circulated the hospitable glass, toddies being mixed right on the coffin lid as at an Irish wake.

The Sabbath Day

Since church service was by far the most important function in Pomperaug Plantation, let us go inside the cleanly swept Meeting House on Sab-



Chapel in Southbury's Russian Village

bath Day morning: "On the last beat of the drum (from Masonic Lodge rock) the sacred hour was arrived; the last family horse was tied up to his grain in the horse shed and the children all in place in the pew.

"The pastor entered the pulpit in all his silken elegance, and clambered up the steep stair to shut himself in with the half-doors beneath the soundingboard. The congregation remained hushed and standing until he reached his desk and was seated, then the first hymn, usually 'Old Hundred,' was deaconed off two lines at a time with the pitch set by a stroke of the tuning fork on the choir rail. Afterward came the long prayer and after that the longer sermon while the tithingmen circulated to rouse the sleeper or repress the irreverent youngster with 'growing pains' in his legs.

"Afterward there would be an hour for luncheon in the Sabbaday Houses, of doughnuts, cheese and hot spiced cider, then all would reassemble in Meeting House for a full repetition of what they had endured that morning." After all, it was for this they had raised their cry of Schism! And separated from their parents in Stratford.

Fifty-seven years after Pomperaug Plantation's church was built "down that cartpath toward the cornmill," schism again raised its head; this time it was Southbury which repeated the old habit of separation, withdrawing from the Woodbury church and becoming an Ecclesiastical Society with South Britain in 1731. Thirty-five years later South Britain in its turn

found all that walking too much, and in 1766 got permission to build its own church. So far as the history books tell us, these were amicable withdrawals and no repetition of what occurred in Stratford. Southbury's first church building was completed in 1732, almost directly across the Indian trail from White Oak schoolhouse; South Britain's was "staked" only a few feet south of where the present edifice now stands. The two Societies together became a separate town from Woodbury in 1787.

Southbury became a town the year slavery was outlawed in New Jersey, the year John Fitch built the first American steamboat and sailed it down the Delaware River, and the year of the first recorded strike in the U.S. when the printers of Philadelphia won a six dollar a week wage. It was the year David Crockett was born in Hawkins County, Tennessee (he who was to die at the Alamo for Texas independence), and three years before George Washington, the father of his country, would be inaugurated first President of the United States, on the Federalist Party ticket, to hold office for seven years and ten months. Our War of Revolution from England was by this time already over and won.

The British Government had for some time unhappily experimented with ways to make the American Colonies pay as big dividends as the Spanish seemed to be getting from theirs. The Revolutionary War was the outraged protest of American colonists against unjust pressures when King

George undertook to belittle, ridicule and diminish their hard-won institutions. These brought on the First Continental Congress, and the echo of the drum was suddenly everywhere in the land as patriots of all thirteen colonies mustered and began to train in earnest.

Not the least among the thirteen was Connecticut, its cities, towns, and plantations becoming most active in prosecuting a war which must follow such incredible mismanagement. History is filled with the exploits of Connecticut soldiers, both sublime and ridiculous, its generosity in supplying them with the goods of war and its stout defense against an arrogant and pitiless enemy. An example: "Supplies sent from Pomperaug Plantation: 159 pairs of shoes, 165 pairs of stockings, 144 woolen shirts, 6 linen shirts, 117 fulled overalls, 29 linen overalls, 2 greatcoats, 1 pair of leather breeches, the whole being valued at 763 Pounds, 1 Shilling, 0 Pence."

Ticonderoga Surrendered

The first conquest of territory from the British by the united colonies, and one of the war's most brilliant exploits, belongs chiefly to Connecticut—the capture of Fort Ticonderoga, May 10, 1775.

On that date Col. Ethan Allan of Connecticut (a native of Litchfield but married to a Southbury woman, Mary Brownson, and an owner of Southbury property in Ragland) assaulted the Fort with eighty-three hand-picked men. He forced his way into the presence of the British commandant by sheer audacity and demanded the surrender of the whole fortress. When asked by the startled commander (who of course thought Allen had a formidable army with him) in whose name the demand was made he raised his sword and shouted, "In the name of the Great Jehovah and the Continental Congress!" (Thereby proving some good Congregationalist upbringing!) The Fort was turned over to him without the loss of a man, along with large quantities of arms, much rum (which they immediately went to work on) and sorely needed military stores; and thus was secured from the enemy a vital passageway from Canada.

SOUTHBURY

One thousand Connecticut men were sent pouring into the Ticonderoga area before the enemy could rally, the 13th Regiment under command of Col. Benjamin Hinman of White Oak which held and garrisoned both Ticonderoga and also the fort at Crown Point.

General Washington never slept here, but he did come riding through our town, September 19, 1780 with General Lafayette en route from Peekskill to Hartford to interview General Rochambeau. Consequently, the French army of General Rochambeau passed through Pomperaug Plantation in June of 1781 on its way from Newport to Yorktown to join General Washington in his critical operations against Cornwallis. They camped in carefully prearranged bivouacs—one night on Breakneck Hill and one in Newtown but there was much visiting back and forth in Pomperaug Plantation from Middle Quarter to White Oak, where the townspeople brought the soldiers gifts of food and spirits. The young ladies of Southbury tendered a dance to the younger officers in their gay French uniforms, while older citizens paid respects to the General at the home of Hon. Daniel Sherman. As they pulled tent stakes in the morning six local youths volunteered on the spot and marched away with them.

The year the French marched through Pomperaug Plantation marked the last town meeting related to supplying of replacements to the Continental Army: "Voted, to fill up our quota to the number of 106 men." "Voted, that the Town (of Southbury) raise 12 men and that the Select Men divide the Town into 12 Classes, each Class to raise one man on the list of 1781."

Et Cetera and Potpourri

While Southbury was always primarily an agricultural town, it had in many ways to be self-sufficient; South Britain early became the industrial section of Pomperaug Plantation, with Southford running it a close second. There was abundant water power and mills sprang up everywhere, for the manufacture of hats, buttons, brads, shears, knives, silver spoons, thimbles, hoopskirts and even bustles! In addition there were tanneries,

clothiers, grist mills, sawmills, cider mills and two forges for the fabricating of iron; whisky distilleries abounded; a three-story carpet yarn mill was built, a satinet factory, steel animal traps (it is said that at one time anywhere in Canada you saw a trap, nine chances out of ten it would be stamped, South Britain, Conn.) and a



woolen mill. At the time of the Civil War as many as 60 shops and small factories flourished.

The New York and New England R.R. began service here in 1881 and continued until 1948. Stone abutments for the bridges are still standing in the Pomperaug and Housatonic Rivers. Route No. 84 now uses part of its right-of-way.

On a Saturday morning in December 1892, a serious collision took place on the line when Engine No. 155 left Sandy Hook with orders to stop at Pomperaug but disobeyed them and attempted to make the Southford station instead. On the heavy upgrade of the single track at the second milepost, they met local freight No. 83 coming downgrade at full speed. William Beebe, engineer of the freight, was quick-witted enough to blow his whistle, down brakes and throw his engine into reverse before the two came head-on together. He was killed, as was Michael Casey, fireman of No. 155; three other men

Heritage Village is an adult residential community on 1,000 acres across from Southbury's Town Street. Early American in style and appearance, it is designed for a population of 4,500 and was built at an approximate cost of \$100 million.

were injured while still others saved themselves by leaping clear. The two engines were driven so furiously together that their very boilers were telescoped one inside the other, and the two tenders hurtled atop the next cars.

"Publik Worship"

There are eight churches in Southbury. The oldest, United Church of Christ, had its beginnings when Southbury withdrew from Ancient Woodbury Ecclesiastical Society and formed its own in 1732 as the Southbury Congregational Church.

In 1930 at the Russian Village of Churaevka, the cornerstone of a small chapel was laid as a memorial to the Cathedral of St. Savidur in Moscow which was demolished by the Soviets in the early twenties. It is only about 14 feet square with walls of local field stone, but it has an onion-shaped dome. It was consecrated in 1932. On feast days the Chapel is too small to accommodate all the people, so

women with scarves over their heads stand with their families outside the clearing, hands folded in prayer as the interior, with its old hanaina lamps and white-washed walls covered with ikons, barely accommodates the priest and choir singing in Russian.

Tweaking Hitler's Nose

In the fall of 1937, the German Bund under the leadership of Fritz Kuhn tried to establish in our town a training camp for Bund members from New York City. They had actually purchased a tract of 1200 acres in Kettletown and were clearing it for a drill ground when Mr. Henry McCarthy, who owned and operated a general store, became suspicious and contacted town officials. A large black Mercedes-Benz car stopped at his store and four husky, well-dressed men entered to make arrangements for supplies and very large amounts of food they said they would be needing as they meant to spend some time in town.

The next stop of the Mercedes-Benz was St. Pierre's Garage in Southbury, and their identity was revealed when a reporter for the Waterbury Republican & American recognized one of the four as Fritz Kuhn, Hitler's Number One man in the Eastern U.S. First Selectman, J. Edward Coer, lost no time but leaped into action.

He resolved to put a spike into Mr. Fritz Kuhn's plans, and by resurrecting an old blue law against working on Sunday, never repealed, he got the workers all arrested and held for court action. Meantime he had warned and called a Town Meeting at which to establish a Zoning Commission and actually zone the Town. Southbury received international encouragement and news coverage; this writer was in Bermuda at the time and you may imagine his surprise to find the entire cover page of the local newspaper Royal Gazette and Colonist Daily, covered with one, single enormous picture of the South Britain Congregational Church, and inside the full news story of that town meeting. Southbury was called "the first place in the world where the Third Reich was defeated," the first to "tweak Hitler's nose, . . ."

COMSAT seeks judicial review of FCC's rate case decision

COMSAT has petitioned the U.S. Court of Appeals for the District of Columbia Circuit for a review of the rate case decision issued by the Federal Communications Commission (FCC) on December 4.

COMSAT also asked the court for a stay of the decision pending the judicial review. At press time for this issue, the Court had not acted on either petition.

In its decision, the FCC ordered COMSAT to file lower rates for its INTELSAT operations and established 10.8 percent to 11.8 percent as the prescribed rate of return for those operations. This rate of return was less than COMSAT had proposed, as was the rate base allowed in the FCC decision.

COMSAT petitioned the FCC for a stay of the rate case order pending the judicial review. The FCC denied this petition on January 28. But it stayed the date on which COMSAT must file new tariffs (previously set as January 26) until the Court rules on COMSAT's petition for a stay.

"Unless the FCC decision is modified as a result of judicial review, it will have a substantial adverse effect on the Corporation's future earnings," Joseph H. McConnell, Chairman of the COMSAT Board of Directors, and Dr. Joseph V. Charyk, President of COMSAT, advised shareholders in a letter. The text of their letter follows.

On December 4, 1975, the Federal Communications Commission rendered a Decision in its first investigation of COMSAT's rates and charges for our international satellite services. Unless modified as a result of judicial review, the Decision will have a substantial adverse impact on the Corporation's future earnings. In fact, we are unaware of any decision by any regulatory commission that has resulted in such substantial cuts in the potential earnings of a utility company.

The 115-page Decision covers virtually all aspects of our international satellite business. With respect to those issues which have the greatest impact on future earnings, the Commission's Decision was unfavorable to the Corporation. It applies traditional rate-making concepts to a unique and untraditional business venture. Thus, in our view, the Commission failed adequately to recognize COMSAT's special situation as a start-up company during the early years after its incorporation pursuant to an act of Congress for the purpose of carrying out a stated national policy objective. Furthermore we believe that the Commission failed to appreciate the

unprecedented risks of the satellite business. The Decision has the effect of penalizing successful innovation and appears certain to discourage equity investment in new ventures that are rate regulated.

As you know, the Commission ultimately determines the rate base of the Corporation—the assets held by the Corporation for its regulated business—and sets the rate of return the Corporation is allowed to earn on that rate base. Three basic conclusions reached by the Commission will have a major adverse impact on COMSAT:

- *Rate Base.* The Commission disallowed more than half of the Corporation's proposed rate base by eliminating from it items designed to permit the Corporation to make up for the inability of the Corporation—and its shareholders—to receive a fair level of earnings during COMSAT's start-up years.

- *Capital Structure.* The Commission artificially "imputed" 45% debt to COMSAT's capital structure, although COMSAT has had an all-equity capital structure since its inception. The Commission does not contend that COMSAT has had any need for

Continued on page 22

Japan hosts international conference on digital satellite communications



The Third International Conference on Digital Satellite Communications was held recently in Kyoto, Japan, under the sponsorship of INTELSAT, The Institute of Electronics and Communications Engineers of Japan, and the Institute of Television Engineers of Japan. During the three-day conference technical visits were made to the Japanese Overseas Telecommunications Agency (KDD), the Japanese Domestic Telecommunications Agency (NTT) and the facilities of Nippon Electric Company and Fujitsu Company, both important contractors in the INTELSAT System and manufacturers of digital equipment.



Dr. B. I. Edelson, COMSAT Labs Director (right), presents a photograph of Japan taken from a LANDSAT Satellite to Mr. Mitsuomi Kimura, Chief Engineer of KDD, Chairman of the Conference and keynote speaker.

During the course of the conference it became apparent that much progress had already been made in introducing digital technology in satellite communications in such systems as SPADE and TDMA and that rapid progress could be expected with the introduction of many advanced digital techniques in INTELSAT, MARISAT and various domestic and specialized systems.

—Dr. B.I. Edelson



Dr. John Harrington, COMSAT Vice President, delivers the Technical Survey of the Conference. A total of 53 technical papers from eight countries classified in nine technical sessions on such major themes as TDMA, DSI, Echo Control and Digital TV was presented. Sharing the dais with Dr. Harrington are, left to right: Dr. H. Shin-kawa of KDD, Japan; Dr. G. Quaglione, Telespazio, Italy; Prof. T. Osatake, University of Tokyo; Dr. Harrington; Mr. M. Kumura, KDD; and Mr. W.G. Geedes, GPO, United Kingdom.



Time out was taken from the Conference to attend a reception sponsored by KDD and banquet featuring Japanese food and Geisha dancing. At the end of the three-day conference many of the attendees visited the shrines and gardens of Kyoto, the old capital city of Japan. Dr. T. Sekimoto of Nippon Electric Company (left center) exchanges views with Dr. H. L. Van Trees of COMSAT at the reception.



W. G. Geddes, Chairman of the IN-TELSAT Board of Governors, delivered the keynote address entitled, "Digital Satellite Communications in the INTELSAT System, Past, Present and Future."



Among the more than 200 participants representing 18 countries and two international organizations (INTELSAT and ESA) were, left to right, K. Chitre of INTELSAT, and B. I. Edelson, G. D. Dill and S. J. Campanella of COMSAT.

INTELSAT Board approves TTC&M contracts, R&D authorization at 18th meeting

EDITOR'S NOTE. *The following order of business concluded by the Eighteenth Meeting of the INTELSAT Board of Governors in late November was not carried in the previous issue of PATHWAYS due to the early deadline of the Holiday issue.*

Twenty-five Governors representing 73 of the 91 Signatories attended the Eighteenth Meeting of the Board of Governors.

Among its actions, the Board:

Technical and Operational Matters

- Approved contracts for tracking, telemetry, command and monitoring (TTC&M) services with Telespazio (Italy) and Overseas Telecommunications Commission (Australia) and also decided to continue these services at U.S. earth stations. The contracts are for a three-year period with options for INTELSAT to extend them for a fourth or fifth year.
- Approved new research and development authorizations for 1976 of \$5,563,000 (exclusive of procurement, legal, and general and administrative costs). The new authorization includes \$1,245,000 for in-house exploratory research and studies, \$2,128,000 for in-house work on development projects, and \$2,190,000 for contract commitments.
- Approved the conduct of TDMA field trials in the Atlantic Ocean Region during 1978. COMSAT and the French and German Signatories have committed to participate, meeting the requisite minimum that three participants be available for the field trials.

- Expressed serious concern over the potential interference STATIONAR satellites may cause the INTELSAT sys-

tem, and requested the Executive Organ to vigorously protect the integrity of the INTELSAT system under the ITU Radio Regulations.

- Authorized the Secretary General to arrange for notification to the International Frequency Registration Board (IFRB) of INTELSAT IV and IV-A frequency assignments.

- Authorized a French request for lease of one-half transponder, subject to preemption, to provide domestic communications between France and the island of La Reunion in the Indian Ocean. The lease will be for a five-year period expected to commence on June 1, 1976.

- Decided the Secretary General and the Management Services Contractor (MSC) shall develop a format for collecting from Signatories data on precipitation at 14/11 GHz earth station sites. The MSC will assess the required transmission margins using specified techniques, and will propose transmission performance criteria.

- Requested the MSC to finalize the RF performance characteristics for 31.7 db earth stations, specifications for modulation/access techniques for use with such stations, and a program for assessing the quality of compound-ed FM and delta modulation systems.

- Approved the following non-standard earth stations:

Montreal (Canada) to be used for TV coverage of the Olympic Games during July 7—August 2, 1976;

Monrovia (Liberia) to be used for communications to Italy and the U.S. until replaced with a standard station by end 1978 (if that is delayed, SCPC—Single Channel Per Carrier—will be used);

L'Enfant Plaza (U.S.) for tests and demonstrations free of charge until

December 1, 1976;

First National City Bank (U.S.) for four months, to provide alternate voice/data traffic on an experimental basis to London;

Unattended Earth Station (U.S.) free of charge, to conduct experiments and demonstrations for one year expiring January 1, 1977.

The approvals are subject to relevant conditions in each case.

Legal and Financial Matters

- Decided to continue its previous policy of not obtaining flight series insurance for INTELSAT.

- Established a space segment charge for unidirectional single and multideestination 4 KHz FDM/FM service for broadcast press service. The charge for single destination service will be one-half unit at each end; for multideestination service one-half unit at the transmit station and one-quarter unit at each receiving station.

The tariff was established with the proviso that the multideestination facility will not be used to provide facilities similar to a network of point-to-point, two-way circuits at a charge lower than that prescribed by INTELSAT for such circuits.

Administrative and Organizational Matters

Granted a 6.9 percent cost-of-living increase to the Executive Organ salary structure and individual salaries to take effect from January 1, 1976. The Board approved the establishment of housing and educational benefits, and increases to the current allowances for dependents of employees.

The Intelsat Board reports were prepared by Eleanor Alberstadt of the U.S. INTELSAT Division.

\$150-million plus '76 budget OK'd at 19th Board Meeting; seeks Director General nominations

The Nineteenth Meeting of the Board of Governors was held in Washington, D.C. January 21-28, 1976. Twenty-four Governors representing 70 of the 91 Signatories attended the meeting.

The Board approved the text of a letter to all Signatories soliciting nominations for the position of INTELSAT Director General. The letter contains the following terms: nominations are due by 1 May 1976; selected candidates will be interviewed May 27 or 28; the term of office will be six years; and the initial salary \$60,000 net of taxes.

Among its other actions the Board:

Financial and Legal Matters

- Decided to reduce the full-time charge from \$8,460 per year to \$8,280 per year (\$690 per month) effective January 1, 1976.

- Decided to reduce regular occasional use charges proportionately, and to maintain the rates for television, cable restoration, program channels and SPADE at their present levels. The rate of compensation for use of capital will be 14 percent.

- Approved the overall INTELSAT budget for 1976, which includes \$83.8 million in operating expenses and \$70.4 million of capital expenses.

- Included in the total INTELSAT budget is the MSC's operating expense budget, which was approved with the proviso that the MSC and the Secretary General are to examine the entire budget and report to the next Board Meeting on savings which can be effected.

- Approved revised procedures for coordination and notification of INTELSAT system information with the ITU and authorized the Secretary General to transmit the procedures to those ITU Administrations whose Governments are Parties to the INTELSAT Agreement. The revised procedures will go into effect 60 days from the date of letter, by which time Administrations are to have indicated the manner in which they will consent to INTELSAT filings.

Technical and Operational Matters

- Noted the Management Services Contractor's (MSC) summary of the preliminary technical evaluation of the five proposals received in response to INTELSAT V RFP, and the work program leading to a signed contract by the end of 1976.

- Noted the proposed new standard for a 31.7 G/T station using SCPC and will consider its approval when further studies on operational and financial effects have been submitted. The MSC and the Secretary General, as appropriate, will develop for the May Board of Governors Meeting a specification for SPC/FM equipment; revision of the current 40.7 db/K standard to take into account communications with the proposed 31.7 standard earth stations; further studies of operational constraints for small stations using FD/FM/FDMA; and studies required to establish levels of charge.

- Approved an agreement for lease of one half-transponder to Spain, on a non-preemptible basis, to meet domestic communications requirements between the Spanish mainland and the Canary Islands from March 27, 1976. The Board agreed that the existing lease with Spain/Mexico may be cancelled on entry into force of the new agreement. The existing lease will be accommodated on INTELSAT IV-A(F-1) until March 27.

- Approved an agreement for lease by Nigeria of a second transponder on a preemptible basis. It decided to tender advice to the Meeting of Signatories that service under the Nigerian leases, and the provisionally-approved Zaire allotment, would meet the requirements of Article III b(ii).

- Authorized the Secretary General to write the Arab Telecommunications Union (ATU) expressing INTELSAT's interest in meeting the needs of ATU members, requesting information on the telecommunications requirements of the ATU members in order to study possible methods of providing service, and offering to es-

tablish a dialogue.

- Approved a three-year program under which the MSC will evaluate transmission impairments caused by the use of both FM and PSK (e.g., TDMA) carriers in the future INTELSAT system.

- Approved a program for evaluating the performance requirements of TDMA/DSI derived voice channels.

- Authorized non-standard stations in Chad, Sierra Leone, Thailand and Upper Volta to operate in the FDM/FM mode to a single destination, and requested the MSC to study and report to the next meeting on the possible operational impact of permitting these stations to operate to a second destination.

- Approved an experimental 4.5-meter station at Isfjord, Norway, to work with the Norwegian-leased transponder for a one-year period; and a receive-only experimental station in the United Kingdom to have access to the space segment free of charge.

Administrative and Organizational Matters

- Decided to recommend to the Fourth Meeting of Signatories that the present capital ceiling of \$500 million be increased to \$900 million, such increase becoming effective upon approval by the Meeting of Signatories.

- Decided that the Working Group on permanent management arrangements should continue meeting as required, to assist the Board in endeavoring to complete by July its study on permanent management arrangements and recommendations on the organizational structure of the Executive Organ, for submission to the second meeting of the Assembly of Parties (September, 1976).

- Approved one-year extensions of the assignments for Dr. Mineo Sugiyama and Mr. Yoshikazu Tsuji of Japan, to work with the MSC staff.

The Twentieth Meeting was held in Washington, D.C. from 10 through 17 March, 1976.

Advanced satellite services to private-line users proposed by SBS

Satellite Business Systems is seeking authorization to develop an advanced domestic satellite communications system to provide private-line network services to large industrial, government and other users.

SBS filed applications with the Federal Communications Commission for an advanced digital communications system that will allow each customer with geographically dispersed locations to combine voice, data and image communications into a single, integrated, private-line, switched network using higher frequencies in the 12 and 14 gigahertz (GHz) bands. Small earth stations will be located at customers' premises, minimizing users' terrestrial communications costs.

In its applications, SBS estimated that total investment for the system will approximate \$250 million through 1979, when operations could commence, if the SBS applications are approved in a timely manner.

Using the higher-frequency 12 and 14 GHz bands, the proposed system will provide users with a wide range of services, including:

- Direct access to fully switched, multimegabit-per-second data transmissions;
- Efficient voice-grade communications with minimum dependence on terrestrial facilities;
- Adaptive networks that satisfy the dynamic requirements of users with complex communications needs;
- Communications capacity to meet user requirements without geographical constraints;
- Integrated voice, data and image communications using digital technology.

Advanced technology and equipment in the system will allow access by multiple earth stations to the satel-

lite's transponders (radio repeaters) on demand through signals divided into time bursts, rather than through frequency division.

Plans call for the operational system to include two satellites in geostationary orbit at 22,240 miles altitude. One will be the primary operational satellite, while the other will serve as a second operational satellite and a backup to the primary one. A third satellite will be procured as a group spare.

Each satellite will have a seven-year design life, eight transponders, and will be launched by a Delta launch vehicle. The satellite's beam will provide coverage for the 48 contiguous states.

The system also involves the use of relatively inexpensive small earth stations which will employ solid-state components and will be designed generally to operate unattended.

Rooftop Earth Stations

The SBS earth stations can be sited on rooftops or in open areas at customers' premises. They will be equipped with small antennas, approximately 16 or 23 feet in diameter, depending on location. Modulation and access equipment at each station will perform digital coding of voice-grade signals, echo suppressions, switching and multiplexing.

SBS's carrier services will begin and end at the entrance and exit ports of the earth station facilities. On request, SBS will arrange for connecting links to its earth stations. All access ports will be compatible with conventional telephone interfaces in the case of voice-grade traffic, and with established industry standards in the case of digital data inputs. This will allow customers to connect their existing terminal equipment, provided it adheres to such standards.

SBS data access ports will accept bit streams irrespective of their character code, message content or line



Signing the agreement establishing the Satellite Business Systems (SBS) partnership are, seated left to right: John M. Galvin, Senior Vice President, Aetna Casualty & Surety; P.M. Foley, IBM Vice President; and John A. Johnson, President, COMSAT General Corporation. Witnessing the signing are COMSAT President Joseph V. Charyk (left) and Philip N. Whittaker, Acting President, SBS.

protocol. Data line control techniques will be external to the SBS system facilities and under the control of users, SBS said.

To aid in developing the system, SBS asked FCC to approve a limited Pre-operational Program to gain experience in systems operations.

For this Pre-operational Program, SBS proposes to lease space segment facilities from a domestic satellite carrier operating in the 4/6 GHz bands.

Newly-Formed Partnership

SBS is a partnership of newly-formed, wholly-owned subsidiaries of Aetna Life & Casualty, COMSAT General and IBM which seeks to establish an all-digital domestic satellite system serving large industrial, government and other users. Each of the subsidiaries intends to become a one-third owner of the partnership.

Upon FCC approval of SBS's applications, Aetna's subsidiary initially will acquire a 15 percent ownership interest, and the subsidiaries of COMSAT GENERAL and IBM each will have a 42.5 percent ownership interest. The balance of Aetna's investment will consist of loans which are convertible into equity to bring Aetna's total ownership to one-third. Costs of operating the venture will be funded equally among the three partners once FCC approves SBS's applications.

The Subsidiaries

The name of CML Satellite Corporation has been changed to COMSAT GENERAL Business Communications, Inc. It remains a wholly-owned subsidiary of COMSAT GENERAL and is its representative as a partner in SBS.

Under the new partnership agreement, three steps were taken to establish SBS:

COMSAT GENERAL Business Communications, Inc., acquired a nearly 50 percent ownership interest in SBS in return for transferring all of CML's former assets and liabilities to SBS;

The new, wholly-owned IBM subsidiary, Information Satellite Corporation, acquired an equal ownership interest in SBS in return for cancellation of claims against SBS for prior funding of CML's operating expenses;

The new, wholly-owned Aetna subsidiary, Aetna Satellite Communications, Inc. acquired a nominal ownership interest in SBS.

The total expenditures in the venture to date, including COMSAT GENERAL's earlier purchase of CML stock, amount to approximately \$11 million. Under this agreement, the IBM and COMSAT GENERAL subsidiaries have shared these expenditures equally. And, until approval of SBS's applications, they will continue to divide equally costs of operating SBS.

Partners' Committee Guidance

Policy guidance and direction of SBS is exercised through a nine-member Partners' Committee, with membership and voting rights shared equally among the three partners. An Executive Committee, composed of one member representing each partner, will be responsible for providing policy direction to SBS between meetings of the Partners' Committee.

SBS will have its own officers and employees responsible for the day-to-day operation of the partnership. However, pending action by FCC on SBS's applications, the SBS staff will be augmented by a limited number of employees assigned to SBS by the affiliates.

Philip N. Whittaker, on assignment from IBM, will serve as acting president of SBS during an interim period. Once FCC approves SBS's applications, no director, officer or employee of Aetna, COMSAT GENERAL, IBM or the subsidiaries will be an officer or an employee of SBS.

Hilliard W. Paige, who as CML's chief executive since 1973 played a major role in the restructuring of the venture, stated that with the conclusion of the restructuring, his major contribution to the new venture will have been completed, and that he will be joining, as an organizing partner, a new Washington-based consulting group.

RFP schedule set for AEROSAT spacecraft

The AEROSAT Space Segment Board meeting in January in Paris, France, announced that requests for proposals for two AEROSAT spacecraft were to be issued March 1.

The Board, composed of representatives of the European Space Agency (ESA), COMSAT GENERAL Corporation and the Government of Canada, took note of the previous meeting of the AEROSAT Council, made up of users of the system, and decided on the request for proposals in accordance with an established schedule.

The schedule calls for requests for proposals to be submitted to industry, March 1; the submission of proposals by industry, June 15; and a target contract date, November 15, 1976.

The spacecraft are to be used as part of the AEROSAT Program designed to test and evaluate the use of satellites for voice and data communications to aircraft flying transoceanic routes. The Space Segment will consist of two multi-frequency satellites and related ground control and calibration facilities.

INTELSAT IV-A Launch

The second in the new series of communications satellites, the INTELSAT IV-A(F-2), was successfully launched from Cape Canaveral Air Force Station, Florida, at 6:56 p.m. EST, Thursday, January 29, 1976. The new satellite was placed in transfer orbit by an Atlas-Centaur rocket.

The INTELSAT IV-A (F-2) apogee motor was fired on Friday, January 30, 1976, placing the satellite in synchronous orbit. Following a controlled drift and test period, the satellite will be on station over the Atlantic.

Continued from page 16

additional capital since the \$200 million stock offering arranged in 1964 by the Presidentially appointed Board of Incorporators. The Commission concluded that the shareholders, many of whom invested in the initial stock offering, should be penalized for the decision that the Corporation should have a 100% equity capital structure—a decision in which neither the shareholders nor their elected directors had a voice. Moreover, while the Commission's Decision characterized COMSAT's maintenance of a 100% equity capital structure as "an unreasonable policy", the Commission did not acknowledge that it had recently rejected, until the resolution of the Rate Case, a proposal by COMSAT to invest more money in COMSAT GENERAL, which would have placed the Corporation in a position to use debt financing.

• *Rate of Return.* Despite the extraordinary risks inherent in the launch and operation of a communications satellite system, the Commission decided that the Corporation's international business is currently no more risky than AT&T. Based on this premise, and on the artificial debt/equity ratio imputed by the Commission to COMSAT, the Commission allowed an overall rate of return of only 10.8% on the reduced rate base being prescribed.

The Decision does not require refunds of amounts already received from our customers. Moreover, since it applies only to our international satellite services, the Decision has no current direct impact on the satellite programs in which our subsidiary, COMSAT GENERAL Corporation, is engaged. Nevertheless, unless the Decision is modified significantly, it will result, for at least the next several years, in annual net income substantially lower than we have achieved in recent years.

The Corporation has endeavored to estimate the effect of the Commission's Order, had it then been in effect, on the earnings per share during the latest 12-month period for which financial data has been reported. Such a calculation cannot be precise because clarification of certain elements of the Order is under discussion

between members of the Commission's staff and the Corporation. Moreover, certain essential ingredients of required revenue and tariff calculations cannot be assumed to be identical for that 12-month period and for any future period. Therefore, we call your attention to the fact that the figures cannot be considered a precise indication of earnings in the future. Nevertheless, as an indication of the serious impact of the Decision, whereas corporate earnings for the 12-month period ending September 30, 1975, were \$4.84 per share, Management estimates that the impact of the Commission's Decision, had it been in effect during that period, would have been a reduction in earnings to approximately \$1.80 per share, or a reduction greater than 60%.

The Decision requires the Corporation to reduce its rates in the immediate future. In addition, it requires us to revamp completely our rate structure. Management intends to take every appropriate action to seek reversal or modification of the Decision. We have filed a petition for judicial review with the United States Court of Appeals for the District of Columbia Circuit, and we intend to seek a stay of the Decision pending judicial review. Management cannot, of course, predict the outcome of the litigation.

Freitag joins COMSAT General

Joseph Freitag, Jr., formerly Director of Business Development, United Technologies International, has joined COMSAT GENERAL as Director of Business Development, reporting to Fred W. Morris, Vice President, Corporate Development.

Mr. Freitag's responsibilities include development of a program to search for, consider and develop new business ventures for COMSAT GENERAL that promise contribution to corporate earnings and growth in areas, both regulated and non-regulated, which are complementary to present business activities.

An engineering graduate of Rensselaer Polytechnic Institute, Mr. Freitag also holds a Master's Degree from the Harvard Graduate School of Business Administration. In addition to United Technologies International, he has also been previously in the employ of General Telephone and Electronics Corporation, TRW Systems, Hughes Aircraft Company and RCA.

In his previous positions he has managed overseas marketing distributorships, licensing agreements and a number of joint ventures. A native of New York City, he is in the process of relocating his wife and three children from Wilton, Connecticut, to the Washington area.

*Renee Channey,
WGMS Radio staff
announcer and host
for COMSAT's
"World of Music,"
broadcast every
Wednesday between
8:05 and 9 p.m., tapes
an interview with Mr.
Manuel Nieto, Jr.,
President of the
Philippines Overseas
Telecommunications
Corporation, with the
assistance of Christo-
pher Karb, WGMS
engineering super-
visor. The interview
was broadcast during
a February program
featuring the music
and composers of the
Philippines.*



COMSAT Board declares quarterly dividend

The Board of Directors of COMSAT at its January meeting declared a regular quarterly dividend of 25 cents per share. The dividend is payable on March 15, 1976, to all shareholders of record as of the close of business on February 13, 1976. It is COMSAT's twenty-second consecutive quarterly dividend and seventh at the 25-cent rate.

COMSAT General names Houston office manager

Wayne E. Rentfro, previously with TPCO of Houston, Texas, has been named Manager of COMSAT GENERAL's new office in Houston.

A graduate of the U.S. Coast Guard Academy and the U.S. Naval Flight School, Mr. Rentfro has had extensive experience in the marine equipment and operations field. He has held managerial positions with other Houston firms, including Wallace and Tiernan, Decca Survey Systems and Tideland Signal Corporation.

Mr. Rentfro will have the responsibility for sales of COMSAT GENERAL's MARISAT services to the shipping and offshore interests in the southeastern United States. The new office is located at 8700 Commerce Park Drive, Houston.

Fletcher/Fulbright Fellows briefed at COMSAT

Eight Fletcher/Fulbright Fellows from Central and South America visited COMSAT Headquarters recently and were briefed on the role of COMSAT in the field of international commercial communications satellites. The students had extensive backgrounds in communications and were particularly interested in recent satellite developments and their effects on Latin America.

The students visited COMSAT at the request of Congressman Spark Matsunaga of Hawaii. They were under the direction of Professor William Barnes of Tufts University while in Washington. They were briefed by James T. McKenna of the Public Information Office.

Congressional staffers briefed



Several senior congressional staff personnel received a briefing recently at the Plaza on COMSAT's posture relative to Maritime Systems. The briefing was requested by Mr. Brian Moir, a member of the staff of the Subcommittee on Communications of the House Interstate and Foreign Commerce Committee. Shown in the above photograph are, left to right facing camera: James Fogarty, James Graf, Ward White and Nicholas Miller of the Senate Commerce Committee; James Gehrig of the Senate Aeronautical and Space Sciences Committee; and Mr. Moir. Seated across the table, left to right, are: Ronald Coleman, House Interstate and Foreign Commerce Committee; COMSAT's Thomas Zimmer and Robert Bourne who conducted the briefing; H. W. Wood, Vice President, U.S. INTELSAT Division; and G. J. Rauschenbach, COMSAT, Congressional and Government Relations.

AT&T request filled in record-breaking time

Responding to an urgent requirement from AT&T, COMSAT negotiated a contract, assembled, shipped, installed and checked out the necessary equipment and implemented 50-kilobit circuit service to Germany in less than three weeks.

Alerted to AT&T's need, COMSAT Marketing proposed the lease of a COMSAT-owned DICOM terminal, since the German earth station was not equipped with sCPC (Single Channel Per Carrier) equipment, and negotiated a contract with the German Post Office.

The completion of the requirement within an almost impossible time frame demanded the maximum effort on the part of many people and divisions within COMSAT: James E. Kolstrud and James A. Castellan of the Earth Station Engineering Division aligned and tested the DICOM terminal at the Labs with the help of Robert F. Hefe of the Modulation Techniques Department; James R. Warren's Maintenance and Supply Center packaged the equipment for overseas shipment in a single day; and William C. Barr, Senior Procurement Officer, and Legal's Milton C. Nom-

kin negotiated a contract with the Deutches Bundespost.

Other COMSAT personnel involved included Edwin W. Wabnitz, Senior Procurement Officer, who arranged for the air shipment and Customs clearance of equipment on an expedited basis; Joseph O. Wellington, Manager, Rates and Tariffs, who filed a tariff for service to Germany; and Cynthia R. Clarke of the Legal Division who filed the service application with the FCC.

Kolstrud flew to Germany to help install the equipment at the Raisting Earth Station. Testing was performed over a period of four days with the cooperation of the Etam, West Virginia, earth station staff. The circuit went operational a few days before Christmas. COMSAT was commended by both AT&T and the Deutches Bundespost for its outstanding performance.

COMSAT is now operating 50 kilobit circuits to Hawaii, Australia, Spain, the United Kingdom and Germany with the new digital service, initiated in 1972, showing promising signs for future growth, according to Marketing Director George A. Lawler.

Labs Closeup

ROSA LIU, Librarian

By SHIRLEY TAYLOR

COMSAT is fortunate to have an outstanding, well-stocked Technical Library at the Labs. The guiding light behind this successful operation is Rosa Liu, Labs Librarian.

Since Rosa came to COMSAT nearly three years ago, there have been many changes in the Library. From less than 6,000, the number of volumes has grown to about 8,000, with 400 periodical subscriptions. New books come in at the rate of about 30 every three weeks or so for a total of between 800 and 1,000 books per year. Rosa selects or approves most of them, some on the recommendations of the Library Committee, a volunteer advisory group consisting of Pier Bargellini, Gary Gordon, Walter Morgan, Akos Revesz, and William Wu.

She also occasionally orders books requested by others. Rosa herself handles all administration, cataloging, and literature research. Circulation control and computer processing are handled by her Assistant, Betsy Christie, who also stands in for her in her absence, with additional help from Debbie Boxwell, a part-time, work-study program student from Damascus High School.

Rosa was born Rosa Lie in Jakarta, Indonesia, of Chinese parents. She moved with her mother and younger sister and brother to Hong Kong at the age of eleven, where the family lived with her grandfather, a businessman there, now retired. Since she knew only the Indonesian language, she spent the first six months in private tutoring learning English. She attended Convent Schools, learning some French in the process, and graduated in 1966.

Her grandfather brought her to the United States, and to the D.C. area in particular (there was an uncle in Landover, Maryland, who taught at American University). Rosa enrolled in the University of Maryland, graduating in three years with a major in English Literature. Her mother, sister Linda and brother Geoffrey joined her in 1969. She earned her Master's Degree in 1970, and was married shortly thereafter to Roland Liu, a fellow graduate student from Burma. Like Rosa, Roland, although of Chinese descent, speaks no Chinese. He

earned his Master's Degree in Computer Science and is employed by the C&P Telephone Company.

Possessing a newly-acquired Master's Degree in Library Science, Rosa became Project Manager at Tracor, Inc. in Rockville, where she set up library systems on contract for such government agencies as NASA and HUD. She gained invaluable technical experience at Tracor but wanted a permanent library of her own rather than one set up for somebody else on contract. She came to COMSAT in April 1973.

Rosa feels the purpose of the COMSAT Labs Technical Library is to provide information and participate in the research effort of the Laboratories. In this regard there is a great deal of research activity by the Members of the Technical Staff, as well as supporting staff members—40 percent of the books are out on loan, some of them on "indefinite loan" until needed by others. (One of the frequent questions asked of the new Librarian when she first came was, "Can I check out the Librarian on indefinite loan?")

Rosa is of the opinion that the Library is not used as extensively as it could and should be. She recommends that Labs employers discuss their information needs with the Library staff, enabling the staff to locate the necessary material more easily. The Library, although well stocked in the technical area, is for the use and



assistance of all employees in diversified areas.

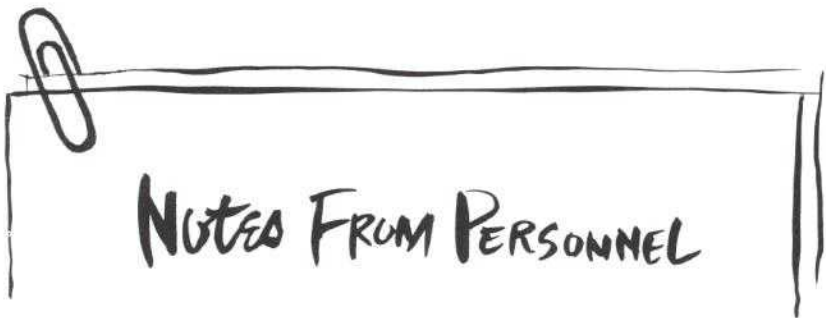
Rosa would like to see the establishment of Selective Dissemination of Information (SDI), where a profile on each person's field and interests would be kept, and where the technical staff could be kept abreast of current material in their areas of interest.

Recently, Rosa and her husband returned from a five-week trip to Hong Kong and London to visit relatives of both. It was a grand reunion with Rosa's grandfather, whom she had not seen since he came to this country for her wedding, and was her first return to Hong Kong since 1966. Although she still has relatives in Indonesia, she has no immediate plans to go there, but would like to someday and also to visit Europe.

The Lius recently bought a house in Rockville. Their favorite weekend activity is to entertain with small dinner parties. Rosa enjoys creative cooking and specializes in dishes Chinese (particularly barbecued spare ribs) and Indonesian (notably Saté, similar to shishkebab, served with peanut sauce accented with spices freshly ground with mortar and pestle). She spends a lot of time reading and enjoys mysteries and gothic novels, but also does a good bit of her professional reading at home.

Speaking of her feelings about her work at COMSAT, Rosa says: "I can't think of a nicer bunch of people or any I'd rather work with."

It's pretty safe to say that the patrons of the Labs Library feel the same way about Rosa.



NOTES FROM PERSONNEL

Medical and dental deductibles for 1976

Employees are reminded that a new deductible must be satisfied at the beginning of each calendar year for medical and dental insurance. In order to establish a claim, so that accumulations to satisfy the deductible may begin, a claim form must be submitted with the first claim of the calendar year for both plans. Subsequent claims may be submitted without a claim form by marking them "COMSAT G19502," if they do not pertain to an accident, major disability, or a previously established claim. A separate claim form is always required for these claims.

If in the process of having either medical or dental services performed in 1975 that were not completed, a claim form must be submitted with the first claim in 1976, even though a claim was established in 1975. For example, if the employee or a dependent was in a periodontic program in 1975 which is continuing into 1976, a claim form must be submitted with the first claim for 1976. Also, if undergoing treatment as an in-patient or out-patient in 1975, which treatment continued into 1976, a claim form must be submitted with the first claim for 1976.

Following are some hints to speed up the processing of claims:

- Always submit a claim form with each separate accident, major disability or new illness.
- When submitting a claim for pregnancy benefits, submit both hospital and doctor's claim form at the same time.
- If covered by a second medical insurance through spouse's employer, be sure to complete appropriate section on claim form. If claim is the result of an automobile accident, automobile insurance carrier must be listed.

Social Security Tax deduction increased

The deduction for Social Security Taxes (FICA) has been increased to a maximum of \$895.05 for 1976. The 5.85 percentage deduction remains the same, however, the wage minimum has been increased to \$15,300.

Although contributions to Social Security are substantial, employee contributions represent but half of the total with the Corporation contributing an equal amount on behalf of its employees.

New Service Awards Program introduced

The Corporation has introduced a new Service Awards Program effective March 1, 1976. The most significant change to the program is the addition of an award after one year's service with the Corporation and an award following 15 years service. Also included are new five and 10-year awards.

Service awards will include such items as: one year, women—charm, men—tie tac/lapel pin; five years, women—bracelet/brooch (with three sapphires mounted with logo), men—tie tac/lapel pin/tie bar (with three sapphires mounted with logo); 10 years, women—bracelet/brooch/necklace/ring (with one diamond and two sapphires mounted with logo), men—tie tac/lapel pin/tie bar/cuff links/watch band (with one diamond and two sapphires mounted with logo).

The 15-year service awards will be similar to the 10-year awards except the settings will be made up of two diamonds and one sapphire mounted with logo. The diamonds included are all high quality and full cut. More detailed information regarding the new program is expected to be available soon.

Bicentennial reflections: personal contributions to our Nation's growth

By Pat Cramer

In the remaining months of 1976, each of us will participate in the celebration of the Bicentennial of the American Revolution. In doing so, many of us will purchase commemorative items we hope will eventually increase in value.

In 1776 our nation was in the middle of a revolution, unable to properly feed, clothe, and resupply its faltering Continental Army. Some countries, when approached for assistance, turned down the request, feeling there was little chance that a loan could be repaid. When citizens were approached, assistance was given—in the sum of \$27 million—through purchase of government securities.

Today we are able to continue this fine tradition through the U.S. Savings Plan. The Plan is a secure, beneficial and uncostly means of helping our country as we help ourselves.

Purchasing U.S. Savings Bonds helps the Government manage the national debt, as well as to finance programs vital to our individual and collective well-being. Today's Savings Bond dollars are used to improve the environment and raise our standard of living (including housing, education, transportation, and health.)

The 1976 U.S. Savings Bond Campaign will begin in just a few short weeks. Last year's Drive ended with only 10 percent employee participation. COMSAT would like to wave its flag high in celebration this year. This is a good time to enhance our country's prosperity for the next 200 years. The responsibility is ours—the time for change is now. We urge each of our fellow employees to share in the wealth of our nation by participating in this year's Drive.

Why not purchase U.S. Savings Bonds for commemoration—they are displaying Bicentennial replicas. They are a secure way to invest in America while saving for your personal future. (These bonds earn six percent interest when held to maturity.) We are also certain the value of Bonds will increase.

Worth Noting



Duty calls

Winter weather fails to deter these staffers at the Andover Earth Station from getting to work.



"Gallon clubbers"

Being presented certificates by COMSAT President Joseph V. Charyk for having donated a gallon of blood or more to the Red Cross are, left to right, Malvin B. Williams, Mike S. Bond, Joan E. Lewis, Carl J. Reber, Dr. Charyk (presenting certificates), Nurse Hazel Durant (program coordinator), Paul F. Cooke, Richard J. McBride, John T. McManus, Donald S. Ross and Jeremy F. Parker. The donors were honored at a Gallon Blood Club luncheon.



Blood donors

During the January visit of the D.C. Chapter of the American Red Cross, 77 donors gave blood, according to Nurse Hazel Durant, program coordinator.

Editor's Note. Unfortunately, magazine space does not always permit the detailed coverage corporate employees are entitled to in "making news," consequently, when space is limited, this column will give recognition in capsule form.

Dr. B. I. Edelson, Director, COMSAT Labs, was one of the 21 newly-elected Fellows of the American Institute of Aeronautics and Astronautics recently honored at the Institute's Fellows Dinner.

Robert D. Briskman, Assistant Vice President, Fixed Systems, COMSAT GENERAL, has been named by the Institute of Electrical and Electronics Engineers to serve on its Board of Directors.

George J. Tellmann, Manager, U.S. Systems Operations, received a Master of Arts Degree in International Relations from American University.

Jiausen Jih, Manager, Engineering Applications Department, Labs, received a Doctoral Degree from George Washington University.

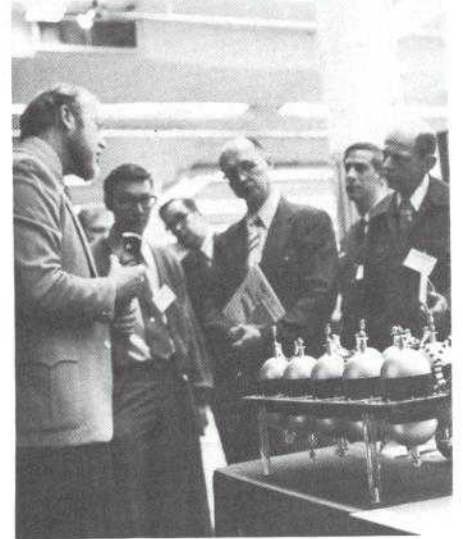
A. F. Standing, a Member of the Technical Staff, COMSAT Labs, received a professional Degree of Engineering from the School of Engineering and Applied Science of George Washington University. According to Standing, this is the first year the professional degree has been offered and he is its first recipient. Degree work is similar to that required for a Doctorate, exclusive of a thesis.

Daniel N. Crampton, former English instructor at Moorhead State College, has joined the Office of Public Information as a writer in the Publications Section.

CU INCREASES DIVIDEND

The Board of Directors of the COMSAT Credit Union recently announced an increase in its annual dividend rate from six to 6.25 percent, effective with the fourth quarter of 1975. This is equivalent to an annual yield of 6.40 percent.

TAKE STOCK IN AMERICA—
BUY BONDS!!



Labs AIAA exhibit

Neil Helm of COMSAT Labs describes the Labs-developed Nickel Hydrogen battery to attendees at the American Institute of Aeronautics and Astronautics Meeting and Display held late in January at the Sheraton Park Hotel in Washington, D.C. The new batteries promise significant improvements both for systems reliability and life expectancy of future satellite systems.



Ducks out of water

"Just wait until Spring then we'll get our pond back," these relocated ducks seem to be saying as they watch unusual lunch-time activity on the pond at the Labs. Due to the recent spell of cold weather, the usual scene of strolling employees watching the ducks at play on the pond has been reversed. Trying out their skating skills are: Norma Moran and Tom Kirkendall (in foreground), Richard Eichinger and George Meadows; Joan Prince (seated on bench) watches Gert Van Ommering make a snowball while Ken Green prepares to put on his skates.

Network Bits

Field Correspondents

Andover

Joanne Witas

Brewster

Dorothy Buckingham

Cayey

John Gonzalez

COMSAT General (Plaza)

Jen Baldwin

Etam

Bev Conner

Fucino

Sandy Tull

Jamesburg

Warren Neu

Labs

Carol Van Der Weele

New York

Stephen Keller

Paumalu

Bob Kumasaka

Plaza

Gloria Lipfert

Santa Paula

Pat Hogan

Southbury

Eileen Jacobsen

BREWSTER. The past year at Brewster was relatively quiet other than for the last minute rush to take vacation days that could not be carried over into 1976. The annual CEA picnic was held again at Alta Lake State Park with an abundance of good food and games for all.

There was only one addition to our COMSAT family in 1975, **Ann Patricia**, the first child for **Wayne** and **Bonnie Colpitts**. It is with deep regret, however, that we take note of the death of one of our station staff, **Clarence "Clancy" Wyrick**, in December.

Our CEA Christmas Party was held at the Steak House in Bridgeport and was its usual success in spite of the weather. Station ski enthusiasts are bemoaning the lack of snow on the Loup-Loup and Mission Ridge ski slopes but continue to hold out hope for snow and a few days of skiing before the end of winter.

—Dorothy Buckingham

CAYEY. After a period of convalescing following a bit of surgery it's back to the job for your correspondent.

Our COMSAT GENERAL MARISAT project representatives **Bela Banyasz** and **Jack Ehrmann** are missed, station personnel felt they could really have been classified as ambassadors. Operations is keeping a close watch on the MARISAT site with daily visual checks and weekly operational.

With the Holidays past everyone is suffering with the usual weight increase problem, that is everybody but our secretary **Ada Gonzalez**—saved from overeating by a tonsilectomy. The **Ralph Camachos** are the parents of a new baby girl born in January.

After months of preparation, pre-planning and waiting the Station is ready for MARISAT. Manager **Luis R. Rodriguez** saw to it that equipment got priority processing from ship, through Customs then to Cayey, not an easy task. With the hardware on site, representatives of COMSAT GENERAL, Scientific Atlanta, Bussmann and Associates and our station people speedily completed the construction phase. Even the weather cooperated with hardly a rain cloud passing by and a hard-to-take mean temperature of 78 degrees.



Scientific Atlanta technicians work on antenna feed assembly.

The principals involved other than station personnel were Bussmann and Associates' Frank Palou; Scientific Atlanta's Marvin Shoemake, James Smith and Perry Johnston; and COMSAT GENERAL's **John Eberlink**, **Banyasz** and **Ehrmann**. All equipment has been checked out and is operational.

—John Gonzalez

COMSAT GENERAL (Plaza). MARISAT ship terminal deployment continues with installation on the *Esso Wilhelmshaven* in Aruba, an island at the end of the Netherlands Antilles, 15 miles from Venezuela.

The installation of the terminal was accomplished by Radio Holland under the supervision of **R. Matthews** of the Maritime Operations Department.

Bob found out, however, that technical problems were not the only ones he had to overcome in completing the installation. Following two days of equipment preparation, Bob and his crew had to transport the equipment 12 miles out to sea where the *Esso Wilhelmshaven* was anchored.

Not all unscheduled delays are unpleasant, a fact readily attested to by **Steve Bauman**, Maintenance and Installation Engineer for the Maritime Operations Department. Steve was scheduled to install a MARISAT ship-board terminal on the *Deep Sea Explorer*, operated by Phillips Petroleum, during its stopover in Abijan, Africa, on the Ivory Coast.

Arriving in Abijan, Africa, he found there had been a slip in the ship's scheduled arrival. Comfortably berthed in the city's Hotel Ivoire, Bob took advantage of the hotel's swimming pool—500 feet long and encircling the back and one side of the hotel—the bowling alley, the casinos and restaurants, the shopping mall and the only ice skating rink in Central Africa.

During the afternoons he could watch some unique entertainment, the local children throwing rocks at the bats escaping the 100-degree heat in the trees lining the sidewalks. Finally, the ship arrived and Steve's "vacation" came to an end. He spent 24 hours installing the terminal, then, it was back to the office.

—Jen Baldwin

ETAM. The Station Christmas Party was held at the home of the **Bill Mayes** with good food and beverage plentiful. CEA members closed out the year 1975 with a final luncheon. **Paul Mauzy** was recently promoted to Technician. CEA members elected **Mike Britner** 1976 Chairman with **Betty Bell**, **Gerry Reeves**, **David Cross** and **John Banister** of COMSAT and **Bob DeNigris** of ITT chosen as Representatives.

—Bev Conner

FUCINO. There was no let-up of activity here during the phase-out of

1975 and the beginning of 1976. December proved busy, there was the RCA launch with Fucino monitoring the satellite through the TT&C antenna. With the launch out of the way there were the preparations for the Italian style Christmas which starts early in the month with Advent and builds up to a crescendo of Holiday celebrations during which old friendships are renewed. The New Year is brought in in Times Square fashion at the local "piazza" with dancing, singing and fireworks.

January was a busy month with the INTELSAT IV-A launch and Page representatives here for approximately two months to upgrade the SSMG System. Congratulations are in order for **Lee Jondahl**, he's celebrating his tenth anniversary with COMSAT.

—**Sandy Tull**

JAMESBURG. The annual Christmas Party was relocated for 1975 after years of being held on the Monterey Peninsula. The name of the site should give some idea of the party setting, the Longbranch Steak and Saloon located in the Frontier Motel. It was western style atmosphere complete with rustic furniture and decor from spurs to saddles and bartenders attired in the style of the day. Prime rib and (or) sirloin steak were served to the individual choice. The dress of the partygoers ranged the full gamut from white tie and tails to cowboy boots (less spurs).

Needless to say, music was western style with the group repertoire consisting primarily of hoedown theme interspersed with current tunes. In addition to music and dancing, entertainment was provided by a trio of belly dancers. Before the evening was over we were to find that this was a great form of exercise. Summing up the evening, at last, a place where the East meets the West.

—**Warren Neu**

LABS. Greetings from the frozen realms of Clarksburg, Maryland. Even with temperatures well below freezing there is much news about Labs employees. **Don** and **Bettie Wentworth** gave themselves a Christmas present, a new home, and started moving in the day after. The **Alnutts**, **Marie** and **Benji**, did the same but managed to move in before Christmas Day.

Bill Windell was released from the hospital in time to spend the Holidays at home. Congratulations to the **Bill Wu** family on the arrival of new son **Begann U.** (six pounds, five ounces), and belatedly to the **Its'hak Dinstains** on the birth of a son **Ilan M.** (eight pounds, five ounces).

Many vacations to report on with the headliner the six-week trip of **Rosa** and **Roland Liu** to London and the Orient: there was a night out with relatives in London at the Playboy Club, and time spent over the Holidays with Rosa's grandfather in Hong Kong.

Bob Dendall and family spent the Holidays in Florida with Christmas Day at Disney World, then off to Miami and scuba diving off the Florida Keys for **Bob** and son **Scott**. **Burt** and **Betty Edelson** vacationed in San Juan with their children over New Year's. The **George Weltis** recently returned from a week's ski trip in New Hampshire with no obvious injuries.

Dixie Miller and family spent Christmas with their families in Little Rock, went on to Dallas for the Cotton Bowl game and a Razorback victory and remained in Dallas for New Year's Eve. For **Karen** and **Bill Updike** it was Christmas in Kansas with relatives, and we understand it was a snowy one. **Holly Pryatel** visited her family in Allentown, Pennsylvania, during the Holidays with a side trip to New Jersey.

COMSAT's Basketball Team, coached by **George Meadows**, is starting the season off in a winning way. COMSAT moved into the more advanced "A" Division in the City of Gaithersburg Basketball League. With two straight championships in the "B" League they needed the challenge. The newest addition to our championship team is former George Washington University star, seven-foot tall **Clyde Burwell** who works in the Communications Processing Lab.

A comment for our fellow employees: we could use some support for our team, so come on out. The team plays Sunday afternoons at Gaithersburg Junior High School with games starting at either 2 or 3 p.m. If you need further information contact Coach Meadows.

Jiausen Jih, Manager, Engineering Applications Department, or "J.J."

as he is known to his fellow employees, received his Doctoral Degree from George Washington University last month. A reception was held in his honor by his Labs coworkers.

—**Carol Van Der Weele**

NEW YORK. Instant communications with the merchant ships of the world is the goal of COMSAT GENERAL'S MARISAT service. As our representatives to the U.S. maritime industry, we are constantly involved with the business of shipping. In our last column we presented an overall view of the Port of New York. In this one we would like to introduce the COMSAT family to the maritime industry and the latest developments in ocean shipping.

The Port of New York includes cargo and tanker terminals in New York and New Jersey. Over 8,000 ships owned by more than 200 companies call at the Port every year. New York is the leading port in the U.S. for containerized cargo. Specialized cargo handled at the port includes petroleum, chemicals, sugar, ore, lumber and newsprint. Twenty-five shipping and petroleum companies have their headquarters in the metropolitan area and over 100 others handle their marine operations from here.

One of the most dramatic developments in ocean shipping is "containerization." Formerly, cargo ships spent three to five days in port discharging or loading. A "container" is essentially a modified truck trailer which can be loaded or removed at high speed and immediately passed from the ship to rail or truck transport with complete security from door to door. A modern container ship can unload almost 1,000 containers in 12 hours.

—**Stephen Keller**

PAUMALU. While work activities leveled off during the Holidays, the new year brought some major projects.

The biggest, in January, involved the Paumalu-1 antenna drum room modifications. The modifications included weatherproofing and air-conditioning the room, installing a hoist for raising and lowering test equipment, and running new waveguide and power lines from the drum room

to the ground floor of the antenna building.

Ali Abu-Taha, from the Earth Segment Engineering Division, was project engineer **Joe Chow**, Station Facilities Maintenance Supervisor, coordinated and supervised the project. The drum room is the primary work area used by the Spacecraft Test Team in conducting in-orbit communications tests following the launch and synchronous orbiting of spacecraft.

It was back to the classroom in January and February for TTC&M Technicians. The subject matter was HP 2100A Computer Maintenance with Senior Technician **Tim Kolb** serving as instructor. Tim recently completed a two-week training program on the computer at the Hewlett Packard plant in Cupertino, California.

Norman Schroeder and **Peter Weiss** of COMSAT Research and Engineering spent two weeks at the station checking out software for the SSMG HP 2100A Computer to expand its capability.

And finally, we witnessed the making of a TV commercial for one of Hawaii's leading department stores. A TV crew spent most of a day at Paumalu filming two professional models dressed in the latest women's fashions, using the station's antenna and rolling green hillside as background.

—**Bob Kumasaka**

PLAZA. Accounting Division personnel elected again over the Holiday Season to contribute to the Children's Hospital Fund instead of mail-

Nancy Wisner of Accounting and the Children's Hospital poster are constant reminders of the Division's annual Christmas drive to donate funds to the hospital in lieu of exchanging cards.



ing individual Christmas cards to their fellow employees. According to **Donna Higgs**, Treasurer of the COMSAT CEA, the employees have followed this practice since 1971, contributing an average of \$100 each year. The 1975 contribution exceeded the average with Accounting Division employees forwarding \$113.63 to Children's Hospital.



Pat Kiernan offers this snapshot in response to the many queries concerning former Senior Vice President George P. Sampson's retirement activities in Florida.

The CEA is also in receipt of a letter of appreciation from Mrs. Augusta K. Widmer, Director of Volunteer Services at Children's Hospital, "for the huge assortment of toys you donated for our children to use."

Elected to the CEA Board of Directors at the recent annual election were Plaza representatives **Jen Baldwin**, **Martin Kelinsky** and **Pat Irby**. Elected from the Labs were **Henry Mueller** and **David Perlmutter**. The new members join **Vince Jordan**, **Evelyn Smith**, **Dirk Vanderloo** and **Carol Van Der Weele** to make up the 1976 Board of Directors.

Eighth Floor's **Marion Timmons** flew to Parris Island, South Carolina, last month to attend the graduation of her son Charles from the Marine Corps' "Boot" camp. Pfc. **Pat Peterson**, son of PATHWAYS Editor **John Peterson**, is off to Puerto Rico with the Second Marine Division.

Congratulations are in order for **Ron and Judy Jennings** on the birth of daughter **Rebekah Ann**, for **Dennis** and **Sandra Beaufort** on the birth of son **Jeffery Sean**, for **Vic** and **Margaret Slabinski** on the birth of daughter **Ann Louise**, for **Melvin** and **Chiyoko Link** on the birth of

daughter **Jennifer Naomi**, and **Roberto** and **Lidia Oliva** on the birth of son **Andrew Robert**.

—**Gloria Lipfert**

SANTA PAULA. After a long period of preparation, the first MARISAT satellite has been launched. We're expecting a busy year with another MARISAT yet to go as well as two COMSTAR satellites scheduled for launch.

While waiting for the first launch, station personnel devoted their off-work hours to typical Southern California winter sports: **Jeff Gnass** planting grass and averaging 200 miles a week on his bicycle; **Charles Kraft** starting a book collection which explains why he hasn't been able to catch any fish; **Karl Jesinghaus** scuba diving for lobster; and **Dan Geer** trailing the fleet in the winter sailboat racing (much discussion has been heard about the purchase of a new boat).

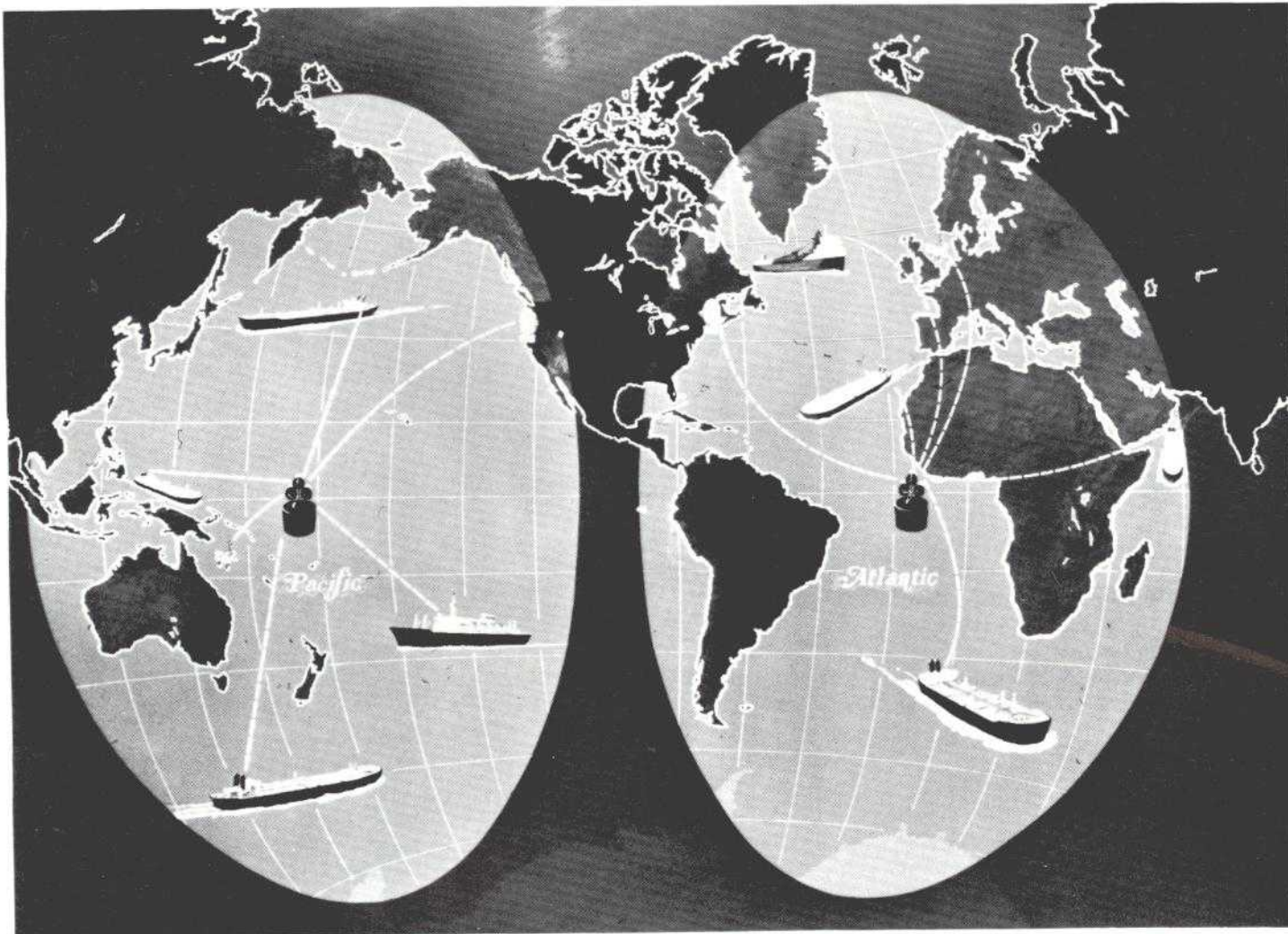
—**Pat Hogan**

SOUTHBURY. January has been a month of severe weather conditions here along the Housatonic River, ranging from many days of below zero temperatures, extreme gusts of wind of up to 65 miles an hour with weekly snowfalls—one giving us up to 18 inches of snow.

Even with the severe weather, however, we've observed many kinds of wildlife near the site. Manager **Dave Durand** sighted two bald eagles above the antennas, one mature and one immature. Lake Lillinonah above the Shepaug Dam is frozen solid, but Lake Zoar below the dam and across from the station is still navigable to the two swans living on the lake. Two of the local field mice tried to move into the station but were gently evicted.

Roger Miner, Senior Technician, spent two weeks in Skokie, Illinois, attending the ASR-33 Machine Teletype Maintenance Course, followed by two weeks' vacation in warm and sunny Martinique. During January, several advertisements for Maritime Communications Operators for the station were run locally. Towards the latter part of the month **Susan Newborn** of Personnel and **Madeleine Cantin**, a consultant, visited Southbury to conduct tests and interviews with the applicants.

—**Eileen Jacobsen**



MARISAT - CALLING ALL SHIPS AT SEA ...VIA SATELLITE

Soon you will be able to communicate directly, instantly, 24 hours a day with ships at sea and offshore facilities via satellite. Through COMSAT General and the new MARISAT Satellite System.

We have the *complete* facilities to keep your office in constant touch with anything afloat.

Telex, telephone, medium and high speed data, facsimile, can be exchanged faster, more economically and in privacy with COMSAT General services.

To put it all together, we also have custom-designed mobile terminals available now for installation aboard ships or offshore mobile rigs. These terminals, for lease or sale, are supported by COMSAT

General's worldwide network of sales and service agents.

Our services through the MARISAT System will help you manage things better . . . save time and fuel by more efficient scheduling of ship movements, cut costs for in-port time needed for repairs, etc.

MARISAT is the first satellite system designed solely to serve the maritime and offshore industries. A revolutionary advance in marine communications.

Major ship lines, and offshore users, already have come aboard our system. When it comes to satellite communications, talk to the experts. Ask us for information on COMSAT General's *complete* satellite communications services, via MARISAT.



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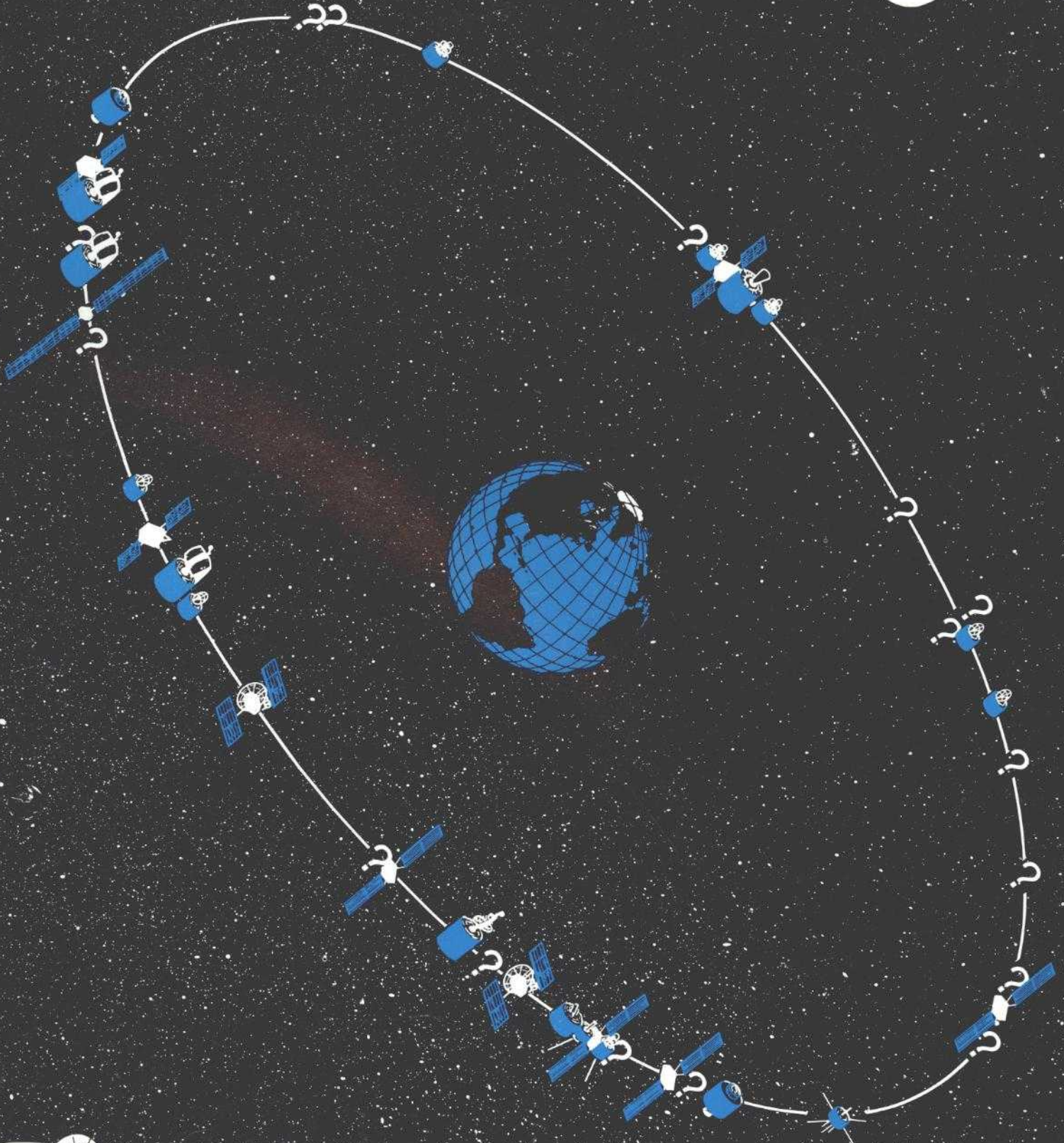
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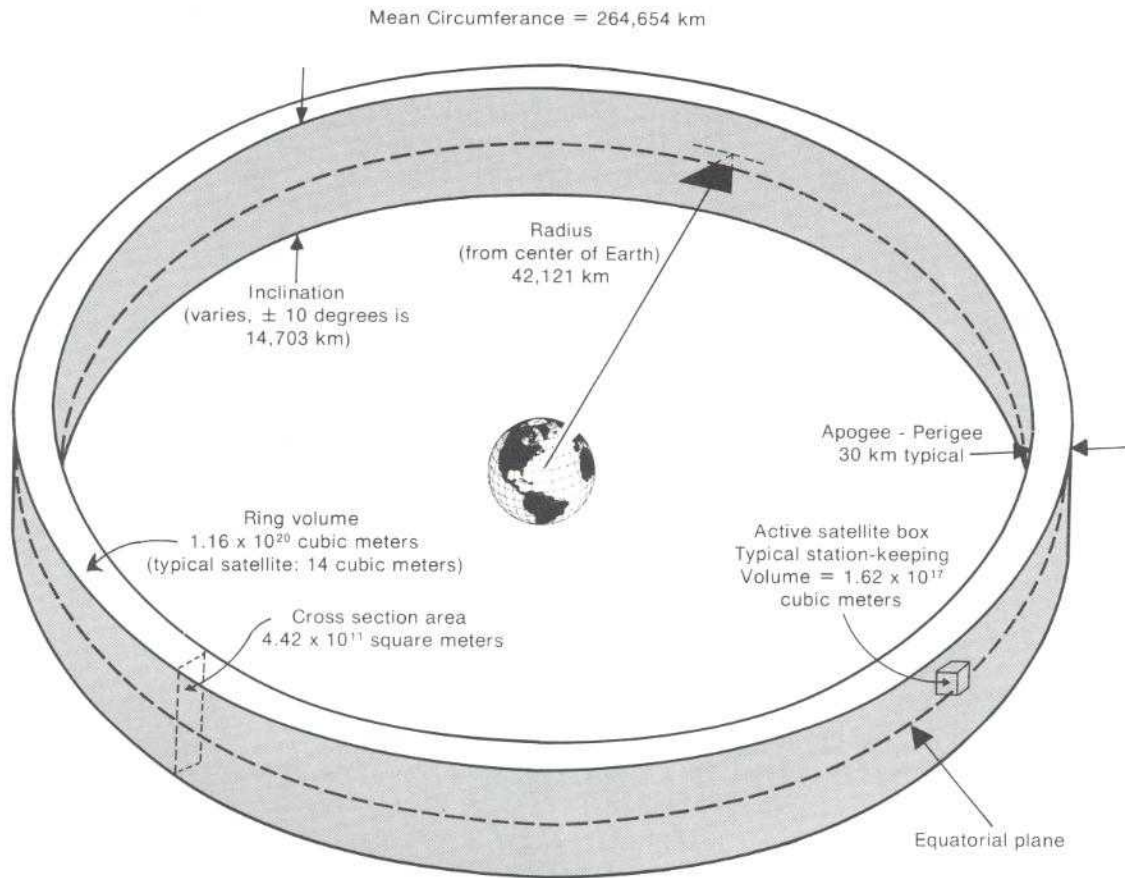
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*"The eye
went out
and looked"*

BY WALTER L. MORGAN
AND JOHN J. PETERSON

The Geosynchronous Orbit

Have you ever given thought to the concept of a world without synchronous orbiting communications satellites or microwave, a world in which one's view was limited to the capacity of individual eyesight?

How far would you be able to see? Five miles, fifty, a thousand? Actually, if standing on the ocean's shore looking toward the horizon, you would

Mr. Morgan is a Senior Staff Scientist on the Project Staff of the Assistant Director, Technical, COMSAT Laboratories.

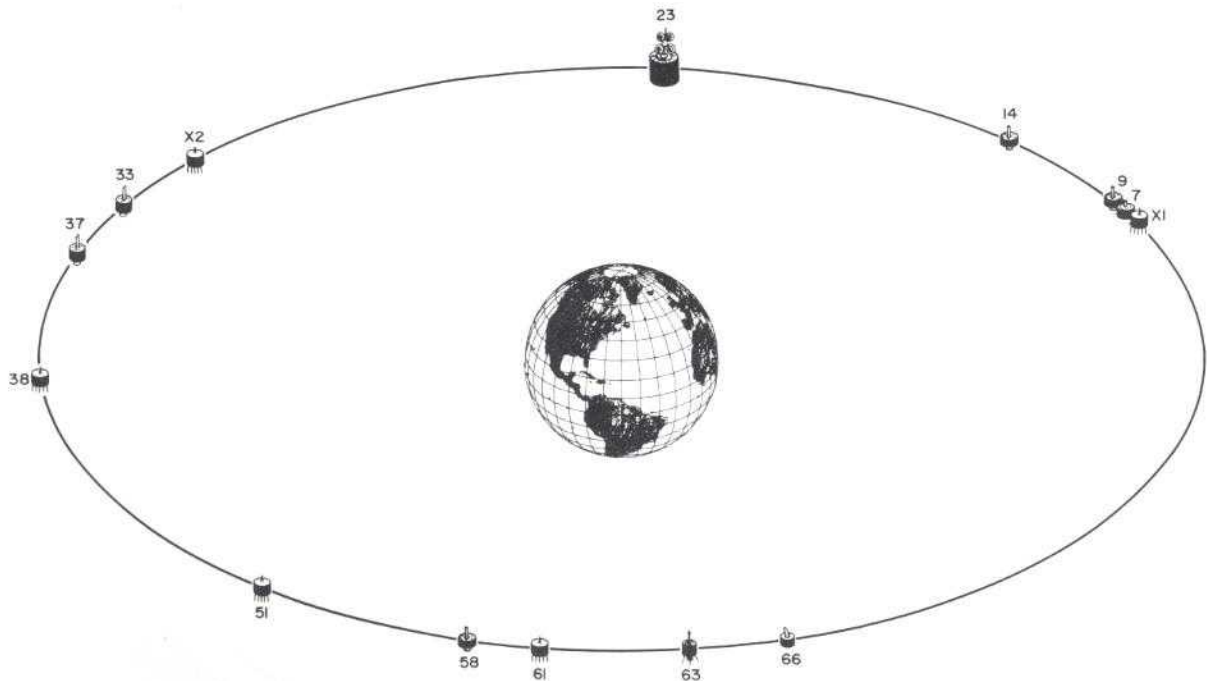
be able to see what appears to be a coming together of the sea and sky about four miles away. If you decided to sit down at the water's edge the distance would be reduced by half and the horizon but two miles distant.

In order for an object to be seen light must travel between the object and the eyes. Aristotle and his contemporary philosophers believed the "eye went out and looked" and picked up an object and returned it much as radar does today. The intrinsic brightness, or absolute magnitude of the object in our field of view is the only

limit to the distance we can see, providing the light has a clear path to our eyes.

The three or four miles we can see from the shores of the ocean is determined by the curvature of the earth. Looking skyward with the unaided eye we can see the Andromeda galaxy, a collection of billions of stars, nine billion billion miles away. The earth's

*Mr. Peterson is Editor of
PATHWAYS.*



Geosynchronous Satellites Launched Prior to 1970

Key: 7 SKYNET 1, 9 INTELSAT III F3, 14 INTELSAT II F2, 23 TAG-SAT, 33 INTELSAT II F3, 37 INTELSAT III F4, 38 ATS-1, 51 ATS-5, 58 INTELSAT III F2, 61 ATS-3, 63 INTELSAT I F1, 66 INTELSAT II F4, XI SYNCOM-2, X2 SYNCOM-3.

limiting curvature can be dismissed when viewing the stars; it cannot when trying to see "across the hill" or "over the horizon."

Before the advent of the geosynchronous orbiting satellite, microwaves were recognized as ideal for transmission of electronic traffic including real-time television, the medium permitting the extension of sight. But microwaves travel in a straight line (as opposed to short-wave transmissions dependent upon ionospheric reflection); consequently, the transcontinental microwave system employs relay towers spaced at approximately 30-mile, line-of-sight intervals across the country. Without satellites to extend one's vision across the Atlantic Ocean, as an example, it would require a string of relay stations floating on vessels 30 miles apart, or one huge tower 475 miles high in the mid-Atlantic.

And it is this desire to see beyond the hill or the horizon that has been the real challenge to the scientist and engineer concerned with communications. In 1945, British science fiction writer Arthur C. Clarke wrote of things to come in space communications. He envisioned radio-controlled rockets steered into orbits beyond the

Geosynchronous or geostationary?

The word "geosynchronous" is making its appearance more and more frequently in articles about and discussions of man-made satellites. Searching through dictionaries is of little help since it is a comparatively new word, and few lexicographers, if any, have as yet included it.

"Geosynchronous" was coined from Greek roots and means simply, "synchronized to earth." When applied to a satellite, it means one whose orbital plane period is the same as the time it takes the earth to rotate once on its axis. A satellite in "geostationary" orbit, that is, stationary with respect to the earth, remains at one spot over the earth. To the observer it seems to hover over the one spot, hence, the term "geostationary" (although, actually, nothing in the universe is really stationary). To be geostationary the satellite must have a zero inclination, that is, lie in the equatorial plane and have no east-west motion.

earth's atmosphere and left there to broadcast scientific information back to earth. He noted an orbit in which a body, whose plane coincided with that of the earth's equator, would revolve with the earth and remain stationary above the same spot on the planet.

The restrictions on the reach of the human eye were lifted with the launch of SYNCOM II in the Spring of 1964. Although the new satellite did not achieve a perfect "stationary" orbit, it did become the first space vehicle to operate in the orbit, the orbit which today houses scores of communications satellites. That same year SYNCOM III was launched into a synchronous equatorial orbit, remaining stationary over the earth, and subsequently proving the theory of earlier visionaries by relaying the Olympics from Japan to the United States, then to Canada and Europe.

Three days after its successful April 6, 1965, launch, EARLY BIRD, the world's first commercial communications—and second geostationary—satellite entered the orbit over the Atlantic Ocean. From its fixed position, EARLY BIRD, launched by COMSAT as Manager for the INTELSAT Consortium, could view one-third of the earth's surface, linking the United

States and Europe. Through the new satellite, man's vision had been extended to encompass two major continents.

In the ensuing years satellites in increasing numbers have assumed positions within the orbit, with the number expected to reach more than 90 by 1980. At the end of 1975, 40 satellites occupied space in the synchronous orbit, 16 of which had been launched by COMSAT for the international body of nations.

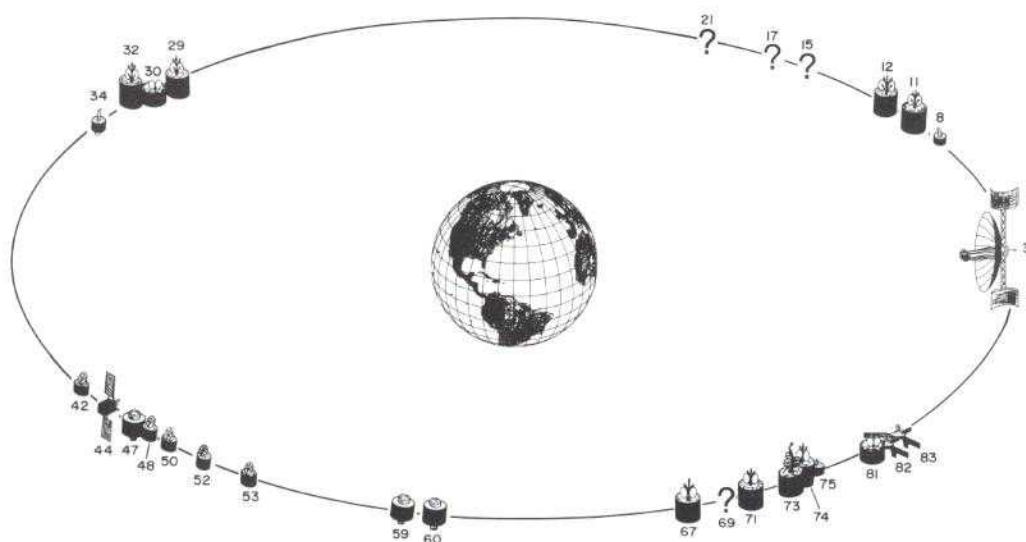
The true synchronous orbit is a nearly circular path directly over the equator, 42,164 kilometers (26,200 miles) from the center of the earth.

hour), a satellite will complete its circular path within 24 hours. Actually, the orbital time is 23 hours, 56 minutes and 4.091 seconds, one sidereal day, the time, measured with respect to a fixed star, for one rotation of the earth. Due to the eastward motion of the earth in its orbit around the sun, the rotational period with respect to the sun is about four minutes longer.

In most conversions to the sidereal day, 24 hours are equated to 23.935 hours or 1,436.1 minutes. INTELSAT uses the sidereal period of 1,436.1 for the satellites; for example, the orbit of the INTELSAT IV

lites. For example, domestic (U.S.) satellites may maintain a separation of four degrees with one degree equivalent to 735 km (457 miles). The point being made here is that, although the orbit appears crowded, distance between domestic satellites spaced four degrees apart is equivalent to that from Washington to Dallas, Texas, or Denver, Colorado.

The four and six gigahertz (GHz) frequency bands are the most congested, especially for the United States domestic "arc." This congestion has resulted in minimum earth station antenna sizes being imposed by the Federal Communications Com-



Geosynchronous Satellites Launched Between 1970 and 1975

Key: 3 ATS-6, 8 SKYNET 2B, 11 INTELSAT IV F5, 12 INTELSAT IV F1, 15 COSMOS 637, 17 STATIONAR 1 (RADUGA), 21 MOLNIYA 1S, 29 INTELSAT IV F8, 30 DCSC-II, 32 INTELSAT IV F6, 42 WESTAR 2, 44 SATCOM 1, 47 SMS-2, 48 ANIK-1, 50 ANIK-1,

50 ANIK-3, 53 WESTAR 1, 59 SMS-1, 60 GOES-1, 67 INTELSAT IV F7, 69 COSMOS 775, 71 INTELSAT IV F3, 73 INTELSAT IV-A F1, 74 INTELSAT IV F2, 75 NATO-2, 81 SYMPHONIE 1, 83 SYMPHONIE 2.

Actually, the distance of the satellite can vary slightly and its orbit can be inclined a few degrees to the true orbit and be considered near enough to "geostationary" to be practical.

Taking the parameters of EARLY BIRD as limits, the orbit then can be likened to a belt approximately 30 km thick (about 20 miles), 14,703 km high (9,138 miles), and having a volume of 41,700,000 km (10,010,777 cubic miles). Three satellites within the orbit, spaced 120 degrees apart, can practically cover the globe with line-of-sight microwave coverage.

Moving at approximately 11,000 km an hour (nearly 6,900 miles an

(F-4) is 1,436.1980 minutes, the INTELSAT III (F-4) is 1,436.9067, and the INTELSAT II (F-4) is 1,436.1237 (figures as of March 1976).

For all practical purposes the geosynchronous orbit consists of several arcs, each determined by the areas being served, and which may be grouped as Atlantic Ocean/Europe, Indian Ocean, Eurasia, Far East, Pacific Ocean and the Americas. Of these the first and last are the most occupied.

At first glance it appears there is the tendency of "crowding" within the orbit; actually, there is substantial space and spectrum between satel-

mission, FCC. In spite of this congestion, Satellite Business Systems, SBS, using the 12 and 14 GHz bands, may be located adjacent to existing domestic satellites without causing interference.

A brief comment on the use of bands should be made in passing. In the Washington area alone there are numerous broadcasting stations. Some operate in the .54 to 1.6 MHz band, commonly referred to as "AM"; others broadcast in the 88 to 108 MHz band, called "FM"; others in the 54 to 216 MHz band, "VHF-TV"; and still others at 470 to 806 MHz, "UHF-TV". In a few cases the facilities for these

different services may be physically co-located—on the same antenna tower. Since they are on different bands they do not interfere with each other.

In similar fashion, two satellites may be adjacent to one another and not cause any interference if they are separated in frequency (different bands). Other methods are also available such as cross-polarization of the signals and non-overlapping spot beams. Just as television channels are reused from city to city as the result of the physical separation of broadcasting services, INTELSAT reuses the 6/4 GHz bands by physically separating the satellites.

In addition to the physical dimensions of the geosynchronous orbit there is the added dimension of time; for example, drift rates of adjoining satellites may cause them to occupy the same point in space, but at different times. Consequently, the odds of a collision between them is remote. And, being on different frequency bands, there should be no electrical interference.

As the number of satellites in the geosynchronous orbit grows so does the number of new services. The MARISAT and MAROTS satellites serve offshore maritime traffic while AEROSAT will

provide communications for international aircraft. Television distribution to local centers and CATV (cable television) is a reality by means of domestic satellites. Broadcast TV to simple receivers with antennas of 10 feet and smaller is emerging through NASA's ATS-6, the Communications Technology Satellite, Japan's Broadcast Satellite Experiment and the Soviet's STATIONAR T.

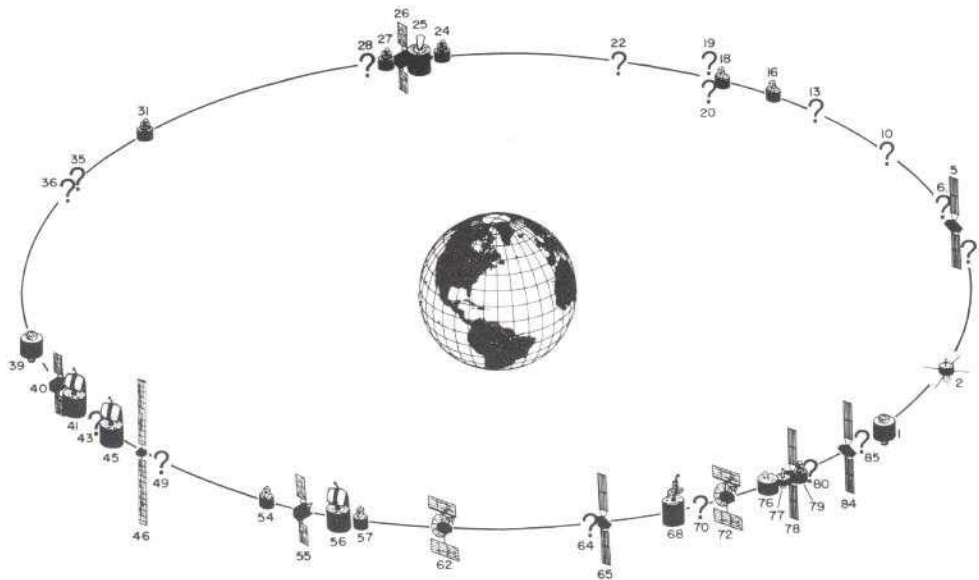
Weather information is being collected by the United States' SMS/GOES programs (Synchronous Meteorological Satellite/Geostationary Orbit Environmental Satellite); Europe (METEOSAT), Japan (GMS) and the USSR will be establishing synchronous weather stations in the coming years to form a global ring. Dedicated domestic communications systems are already in operation in the U.S., Canada (ANIK), and the Soviet Union (STATIONAR I or REDUGA). Indonesia will launch PALAPA this year and Brazil, India, the Arab states and others are considering satellite systems.

It is inevitable that the question be raised by the curious as to the fate of the inactive satellites. As long as they are active, possessing fuel, the capability exists to control their movement. COMSAT has shown this flexibility by moving satellites from a fixed

position over one ocean to comparable positions over other oceans. But once their fuel is exhausted, they go into an uncontrollable drifting mode, unaffected by the drag of the earth's atmosphere, passing the active satellites like "ships in the night," unlike low orbit satellites which are drawn earthward by the drag of the earth's atmosphere.

As the synchronous satellites exhaust their fuel they drift back and forth about the nearest gravity "valley." The (east-west) longitudinal amplitude of the drift is established by the longitude at which the satellite runs out of fuel. The inclination (north-south motion) of these abandoned satellites will build up at the rate of about 0.9 degrees a year. There are no known damping mechanisms to reduce their oscillation. The two equatorial orbit plane valleys are located around 75 degrees East Longitude, at the Equator south of India over the Indian Ocean, and 105 degrees West Longitude, at the Equator south of Mexico over the Pacific Ocean.

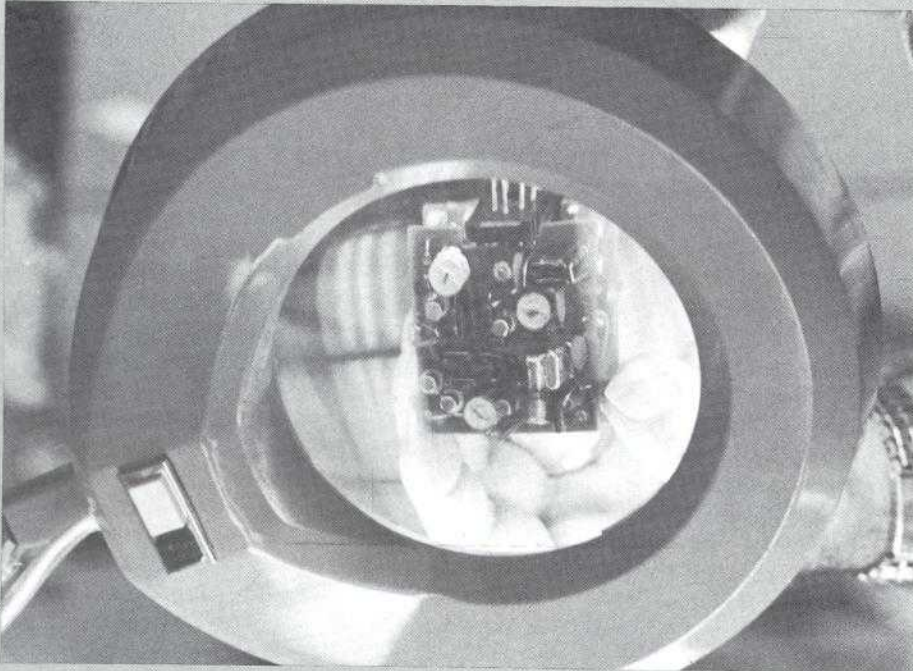
Charts on pages 2, 3 and 4 originally appeared in Spring 1976 issue of COMSAT Technical Review.



Geosynchronous Satellites Launched or To Be Launched After January 1, 1976

Key: 1 METEOSAT, 2 GEOS, 4 STATIONAR 2, 5 MAROTS, 6 STATIONAR 9, 10 STATIONAR 5, 13 FUTURE METEOROLOGICAL SATELLITE, 16 (SPARE), 18 PALAPA, 19 STATIONAR 3, 20 STATIONAR 6, 22 STATIONAR T, 24 ETS II, 25 CS, 26 BS, 27 GMS, 28 STATIONAR 7, 31 MARISAT, 35 TDRSS, 36 STATIONAR 10, 39 FUTURE SMS, 40 SATCOM-B, 41 COMSTAR-FLTSATCOM, 64 TDRSS, 65 AEROSAT, 68 INTELSAT IV-A F2, 70 STATIONAR 8, 72 FLTSATCOM, 76 NATO-3, 77 SIRIO, 78 AEROSAT, 79 MARISAT, 80 STATIONAR 4, 84 OTS, 85 TV BROADCAST.

COMSAT'S Maintenance and Supply:



Bob Riblet makes use of a large, lighted magnifying glass to repair a microwave oscillator printed circuit board.

Tucked away in the upper recesses of the COMSAT Laboratories in Clarksburg, Maryland, a maze of windowless bays and sophisticated workshops constitute the day-to-day world of Jim Warren and his small team of specialists.

On the organizational chart of U.S. Systems Management, this group headed by Warren can be found identified by the title Maintenance and Supply Center—M & S for short—functionally a misnomer, a misnomer in its implication that M & S is a creature performing the routine services characteristic of maintenance and supply departments.

It is only after a guided tour and an enthusiastic briefing by Manager Warren that M & S is recognized for what it really is, a sort of Mayo Clinic of the worldwide communications network, a clinic with a capability encompassing the whole communications spectrum ranging from early diagnosis through "surgery" and re-

habilitation of the far-reaching system of earth stations and antennas.

Although M & S is a revenue-producing, multi-million-dollar-a-year business, cultivating additional income for COMSAT is coincidental to its primary mission of serving COMSAT and the communications network. Accordingly, it is the reputation for quick and efficient response to the needs of the global system that gives the most satisfaction to Warren and his group.

Filling Urgent Requests

On April 22, 1975, Warren received an urgent wire from the Tulancingo Earth Station in Mexico requesting a High Value Tube (HVT), a tube critical to the station's remaining on the air. He activated his supply process and, at 7:15 a.m., April 25, was notified by WTC Freight Forwarders in San Francisco that the tube was on its way to the station. At 1:20 p.m. the same day, the all-important tube was in Mexico City and en route to the earth station.

Clinic for the Global Satellite Network.

Pierce Stine, Supply Supervisor, doesn't look on this 72-hour response as a case out of the ordinary. "There is hardly a week that goes by that we don't get a similar request from some part of the world with 'URGENT' stamped in large letters all over it," said Stine. "It's common knowledge throughout the communications world that we have the expertise and equipment to supply our own earth stations, consequently, it's assumed we can handle the problems of others.

"A similar request to an outside supplier might require a minimum wait of 120 days. Here at M & S we can pull it off the shelf (actually stored in a bonded warehouse) and have it on its way in a matter of hours. The reason we can respond so quickly in contrast to the vendor's time gap is simply a matter of practicality.

"Let's take a new HVT costing around \$23,000 with a shelf life of 2,000 hours," continued Stine. "Because of our continuing need for these we carry them as stock items, confident that they will not exhaust their life span on the shelf. A vendor can't afford to do this and risk their becoming obsolete. A vendor receiving such an order would probably have to gear up to producing one from the ground up, assuming the return would be considered sufficiently worthwhile to justify diverting the time and manpower for a possibly one-time effort."

On January 30, 1975, M & S received a request from the Carnarvon, Australia, TTC&M Station for a Varian Klystron Tube Model crucial to the operation of its High Power Amplifier (HPA) and COMSAT's TTC&M capability.

Stine was notified on February 2 that the tube had been released from the warehouse in San Francisco and turned over to WTC. On February 5 word was received that the tube was on its way to Australia with an ETA (Estimated Time of Arrival) in Sidney of February 13. Considering that the time period included three non-working days, procurement of an export license, clearance through customs, and handling of the shipment by the Australian Overseas Telecommunications Commission prior to delivery to Carnarvon, Stine feels that 10 working days from request to delivery is pretty good service.

Self-sufficiency Necessary

According to Warren, however, replacing defective items with new replacement parts is not always the most practical or cost-efficient way to go and M & S is a stickler on requiring vendors to adhere to their warranties.

"But to make sure that we're self-sufficient, that is, not completely dependent on the vendor," says Warren, "we have our own in-house

capability to repair or rebuild component parts, which capability has proven of inestimable value to stations requiring quick service in order to remain on the air.

"For example, although earth stations normally carry a spare High Value Tube, it is not unusual for the spare to be used and not reordered for one reason or another. Let me cite a specific instance. On June 3, 1975, we received another urgent request from the Tulancingo, Mexico, earth station for a tube. We didn't have a new one in stock and the station would probably have had the minimum 120-day waiting period if ordering through a supplier. We had a repaired tube on the shelf and in a little more than a week the tube had been cleared through customs, shipped, and received in Mexico City."

Stine points to Supply's continuing effort to reduce its response time. "We found, for example, that with the concurrence of Australia's Overseas Telecommunications Commission, we could expedite deliveries by shipping directly to the Australian stations.

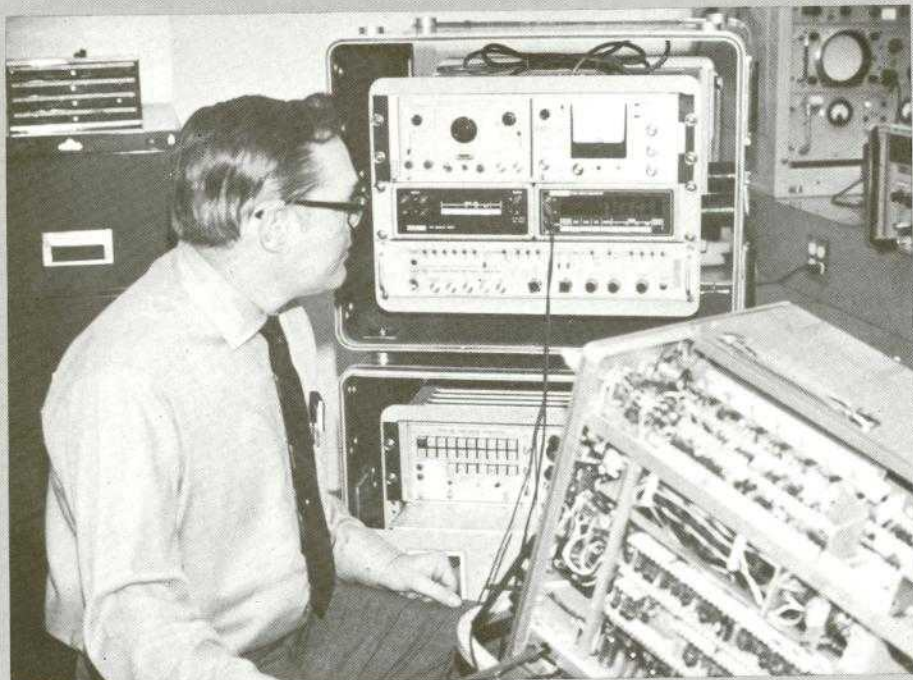
"On the morning of January 9 of this year, we received a request from Carnarvon for a tube for its HPA (High Power Amplifier). Following a telephone call to San Francisco, we

were informed by WTC Freight Forwarders that the item was on its way with an expected ETA in Sidney, Australia, of January 12, at 10 a.m. The tube physically arrived at Carnarvon January 16. By eliminating one of the steps in the delivery process we had reduced the 10-day response time to less than a week. Actually, we had the tube in Australia within 72 hours of the request."

The High Value Tube (HVT) is only one of the more than 10,000 items, with a total value of three million dollars, stocked by Supply. The record shows that on June 13, 1975, M & S received a request from Pakistan for a crystal (valued at \$106) used to change frequency in a solid state source. It was essential to communications between the Pakistani Earth Station in Deh Mandro and Longonot, East Africa, via the Indian Ocean satellite. Within a week the crystal, small enough to fit into the palm of one's hand, was winging its way across the ocean to Karachi, Pakistan.

Lee Bolinger, Service Manager, is quick to pull a letter out of the file to make the point that all response is not quite so impersonal—telephone calls, teletype messages, letters of request, bills of lading, export licenses, and sundry other formalized details. Periodically service arrives at point zero where a formalized system does not meet the requirements of the moment. A paragraph of a letter from former Etam Earth Station Manager Bill Carroll to then Vice President George P. Sampson tells the story.

"The heat exchanger on our offline HPA failed at 10:15 p.m. last night and our Facilities Mechanics were called to the site. They determined the pump was at fault. We do not stock a spare pump at the station, and so, at 2 a.m. this morning, I called Mr. Lee Bolinger of the M & S Center at his home, and requested that we be supplied with the spare pump at the Service Center. Mr. Bolinger obtained the service of Mr. Pierce Stine, and they proceeded to the depot, loaded the spare pump on a truck and Mr. Stine was on his way to Etam by 3 a.m. Driving over our mountainous roads that were icy, and through snow and sleet, Mr. Stine arrived on the site just prior to 8 a.m. Our Facilities Mechanics



An oscilloscope taken from storage is calibrated by Chuck Franklin.

installed the new pump and Mr. Stine started his return at 9 a.m., hauling the failed pump to be repaired."

Again on February 11, 1976, in response to an "urgent" request for a Traveling Wave Tube (TWT), used in the intermediate power amplifier at Jamesburg, the TWT was hand-carried to United Airlines. Using the airline's small-package service, the tube arrived in Jamesburg 29 hours after the initial request.

Need for Services Grows

Such examples are representative of the services provided by M & S in meeting its original mandate to support the COMSAT operating earth stations, in-house and in the field. Initially intended to meet divisional requirements, M & S has graduated to inter-company support operations.

"We now routinely provide part or all of these same services to COMSAT GENERAL's Domestic and Overseas Operations Offices, COMSAT and COMSAT GENERAL's Operations and TTC&M Centers, Laboratories, Computer Centers and International TTC&M Stations under the INTELSAT Management Services Contract," said Warren.

"Our services are actually divided into three specific functions. Anything that has a service connotation—spare parts supply and administration, calibration or repair services—is Bolinger's responsibility. He is assisted by Stine in the area of supply and Charles 'Chuck' Franklin in maintenance.

"A second function," continued Warren, "we call field support or Field Services under Henry 'Hank' Schutzbier. Hank supervises some 11 automated and semi-automated programs and sophisticated cryogenic and digital repair facilities.

"Finally, to take care of the unforeseen, special projects, and the implementation of new programs, we rely on the Special Projects function under the direction of Richard 'Dick' Eliason.

"Most people assume that, because we are housed here at Clarksburg, we are a part of the Labs. Actually, we report to William B. Carroll, Director, U.S. Systems Management, and are a rent-paying tenant, rent which, incidentally, we would have to pay someone else if we were located else-

where. So it's an arrangement that has an advantage for the Labs, in that we provide income in the form of rent, and advantageous to us in that we have a wealth of expertise available to us when we need it."

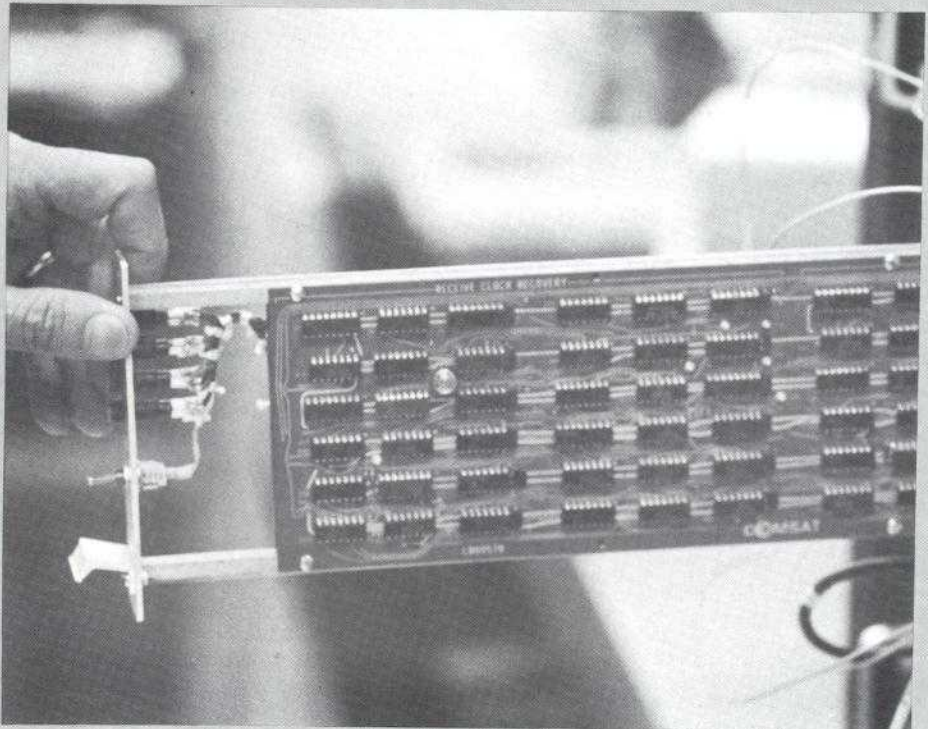
Although the functions required of M & S suggest a sizeable staff, the opposite is true. With an authorized strength of 22 people, including administrative, M & S is able to perform an estimated 95 percent of its logistical and maintenance work in-house.

Warren admits to instances requiring him to use other sources. Since

M & S and the Vendor

"We've instituted a Warranty Administration Program," said Warren, "which has resulted in the initiation of more than 800 major vendor actions from 1969 through 1975 resulting in reimbursement to COMSAT or equipment replacement with an aggregate value of almost \$600,000. The total for last year alone was in excess of a quarter-of-a-million dollars.

"Another value of the program is that it allows us to keep current on the status of suppliers involved in communications technology; that is, whether or not a vendor is still in



COMSAT designed and built Single Channel Per Carrier, SCPC, module card being tested in the M & S Center mock-up.

M & S services nine generations of equipment, each made by a variety of vendors, it is sometimes difficult to identify and predict areas of failure. Consequently, the remaining five percent requires a judgment as to the economic feasibility of going to an outside supplier or attempting to meet the need in-house. In some instances this judgment is not Warren's to make, for example, when a vendor has gone out of business or is not interested in providing the service on a one-time basis. In such instances, M & S must gear up to do the job itself.

business and has the personnel, facilities and interest in repairing or duplicating an item needed."

Assuming the supplier is still active and has the willingness to respond to the request, Warren must still take into consideration the cost and time involved, sometimes too high and too long. In such cases, the task is turned over to Eliason's Special Projects to repair the unit or to build a new one from the ground up.

"The answer to the question, why use COMSAT, why not go directly to the vendor, is simple," says Warren. "We have the expertise and the capa-

bility to provide the service. We have not solicited outside work but it has come to us to the degree that it is a significant part of our total effort.

"I would estimate that we have serviced more than 50 accounts on a one-time emergency basis or as required by open-ended contracts with our regular customers. Why does our business continue to grow? Well, put yourself in the place of a telecommunications entity in a foreign country. You have a major transmission coming up and a serious malfunction has occurred or there is a fear of one. You have two alternatives. One, you can turn to the master contractor who built the station, who had a subcontractor build the subsystem, which subcontractor purchased most of the hardware from a variety of vendors.

"In which instance the subsystem is traced to its origin and the reconstruction process begun, assuming the vendors have not terminated their relationships and are willing to divert their efforts to a one-time product. The process is costly and time-consuming with delivery requiring from 90 to 180 days at the earliest. Then there's the question of the end product meeting the specifications. This is one alternative.

"The other alternative: go to COMSAT M & S, have them pull the part you need from the shelf, or repair or rebuild the subsystem in the minimum time, stay on the air and complete your transmission; all at cost plus a markup for COMSAT, a routine business procedure. So really, there's not much of a choice to be made on the part of the station.

Profile of a Tube

"We spend between \$250,000 and \$350,000 a year purchasing High Value Tubes, and usually you don't think of tubes in terms of \$500 to \$23,000 apiece. But many things can happen to knock out these tubes and, with such expensive items at stake, you had better be able to recognize a problem fast and fix it. Aside from the human factor in the field, we do everything we can to keep on top of potential problems.

"We keep track of every high-value tube we buy by serial number. We run a history on it—where it goes, its expected life span, the filament hours it accrues and so on. If it fails, and the

record shows the failure was premature because some segment did not live its estimated life, then we can turn to the supplier, giving him a target to shoot at. There is also the possibility the tube can be rebuilt, either under warranty at no cost, or at about 50 to 60 percent the cost of purchase of a replacement. At the same time we're talking to the user station to determine the cause of failure in the event the cause might be traced to some malfunction at the site. We don't just go ahead and put in another tube hoping it doesn't burn out.

"Because the dollar value of our tube business is big," continued Warren, "we have a bonded storage arrangement with the supplier who maintains custodial care of the spares under an extended warranty until we have need for them. This way we don't have to store them, they are covered by warranty, and we know exactly how many we have and where they are.

"The beautiful thing about our parts support," said Warren, "is that we are fully automated and it makes little difference whether we are servicing seven stations or 100. In going from the initial seven accounts to the present 28 we have added less than one-man's efforts, and if we expanded

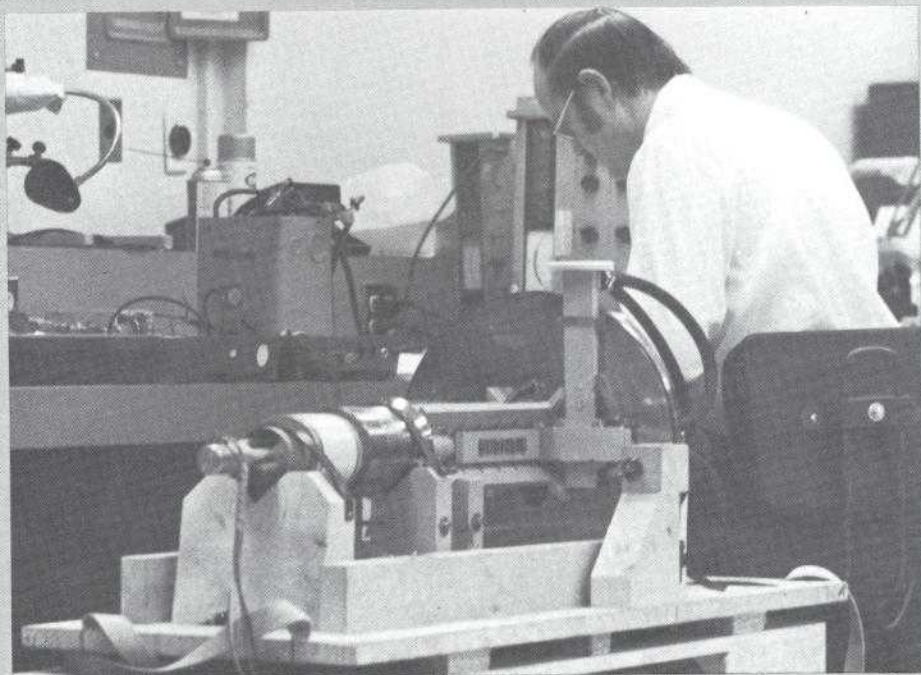
to 100 we would probably only require two additional people."

In 1975, M & S initiated 1,478 procurement requests involving 5,180 line items with a value totaling \$1,513,822. The 1975 totals showed an increase in procurement actions of more than 20 percent in line items requested over the previous year. During the last quarter of 1975 supply transactions were completed for "other accounts" to include earth stations in Africa, Argentina, AT&T Long Lines/Etam, Brazil, Nicaragua, Australia, Italy, Canada, Colombia, Iran, Mexico, Pakistan, Portugal, Saudi Arabia, United Kingdom and Venezuela.

Maintaining the System's Integrity

In the area of maintenance, Warren offers his Calibration Team program as an outstanding example of the contribution M & S makes toward preserving the system's integrity.

"Calibration had its beginning during the early days of the space program," recalls Chuck Franklin. "Initially, test equipment was accepted with the assumption that it was accurate. However, as requirements became more stringent, both the military and industry became more conscious of the need for absolute accuracy and reliability. Consequently,



A Siemens eight-kilowatt HVA tube undergoing testing by George Robertson.

the pendulum swung in the other direction and calibration of test equipment became a fact of life."

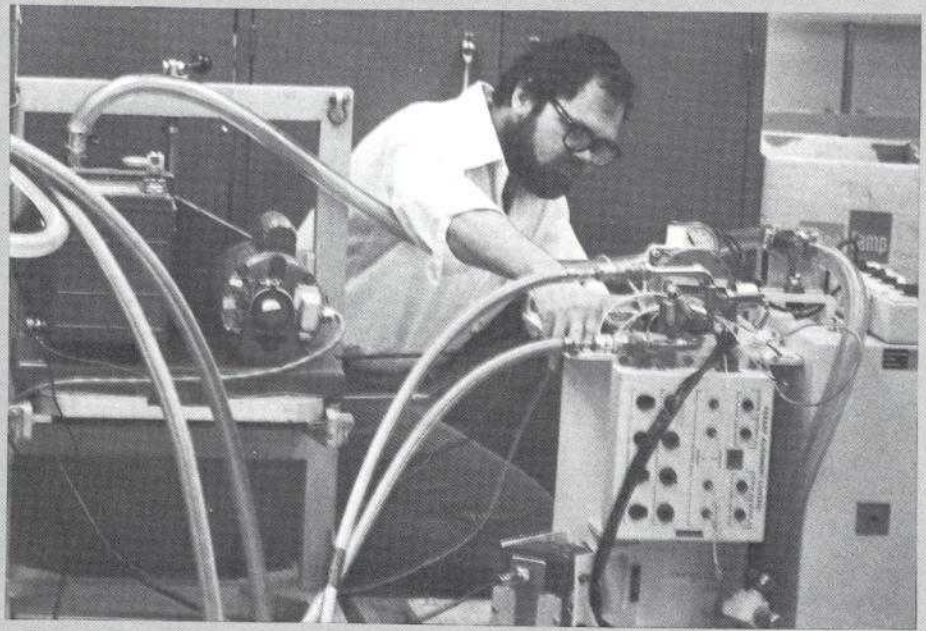
During 1975 the Calibration Team traveled 40,000 miles to 17 locations in North and Central America, completing 1,841 certifications and spending 197 days in the field. In the final quarter of the year alone, the team visited earth stations in Mexico, Nicaragua, Puerto Rico and AT&T/Wheeling, West Virginia.

"Test equipment is calibrated," Franklin continued, "in accordance with contractor specifications which are related to those established by the National Bureau of Standards. We can calibrate our test equipment to where it meets NBS guidelines. Recognizing, however, there is a difference between field conditions and laboratory conditions, we calibrate field test equipment up to a specific and acceptable tolerance. Incidentally, all station test equipment is calibrated at one time or another, either at the site or here at M & S."

Early in March a Calibration team, made up of Bill McGuire and George Hannah, departed for COMSAT GENERAL's Santa Paula station for a stay of one week. From there the team was scheduled to visit Jamesburg, California, for 10 days, Paumalu, Hawaii, for three weeks, and Brewster, Washington, for 10 days before returning to Clarksburg.

The team calibrates test equipment used to judge the integrity of every part of the station operation, ranging from baseband (lowest band) to RF (microwave) to include active and passive test equipment: frequency meters, counters, power meters, voltmeters, signal generators, oscilloscopes, alternators, and current shunts as examples. Time spent at an individual station is determined by the amount and age of equipment to be calibrated.

Carrying special equipment with it, the team can perform approximately 95 percent of the repair work required in the field. In addition, it isolates continuing problems and recommends replacement parts. In the beginning each station was visited annually, but as some of the equipment aged, visits were advanced to nine months. During visits, the team also gives instructions in the use of newer equipment.



Ray Hashberger overhauling an AIL (Airborne Instrument Laboratories).

Calibration teams have responded to requests to visit earth stations in the Philippines, Korea, Jamaica, Puerto Rico and Nicaragua among those located outside the continental United States. Since 1970, teams have calibrated test equipment at Canada's TELESAT and COTC earth stations on a recurring basis. The fastest calibration run, according to Franklin, is probably made at the Canadian earth station on Frobisher Bay on Baffin Island. (The team used to visit Frobisher Bay, located above the Arctic Circle, in February but now goes in April.) As the team left after its last visit the temperature was 40 degrees below zero, the wind was blowing at 30 miles per hour, and the team had to travel to and from the station by snowmobile. A plane goes to the island twice a week. The team works around the clock in order not to lose any time between planes.

Reports Important

Warren places high value on reports from the stations. An automated maintenance analysis program requires them to report every piece of hard maintenance they perform: manpower utilization, equipment failure rates, mean time between failures, service availability and the like. A simple tabulation based on summary reports will reveal whether or not a chronic ailment exists requiring an equipment change.

These same summary reports are used to determine five and ten-year projections and the interface of equipment. Other automated programs permit a look into such areas as future spare requirements, lubrication and grease analysis—for example, a defective bearing could put an antenna out of service for three months at a cumulative cost of three million dollars.

"The real money-saver," said Warren, "is in the capability to recognize a problem before it gets started. In reports from Cayey and Paumalu, it was noted that there was a dust-collection anomaly observed with new, air-cooled transmitters. This meant to us inefficient cooling and potential trouble. The stations cleaned the dust off and asked us where it was coming from. The dust was collecting on a fin which serves basically the same purpose as the radiator in your car; when the radiator gets plugged up your engine overheats. We have gone to the supplier and told him our problem. We seem to agree that the problem is in the use of an electrostatic dust collector instead of a mechanical filter. If this is the problem, then the replacement of the collector will prevent a more serious development later on.

"I don't want to play down the station's performance in solving many of these problems", he continued.

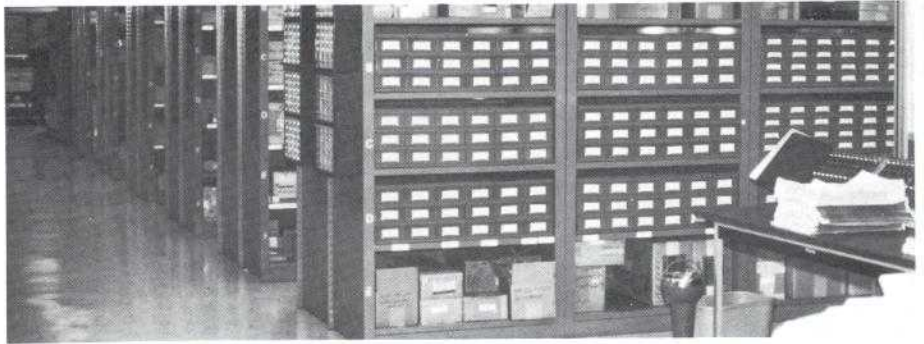
"In many instances their reports cite malfunctions found and corrected and supplied us merely for the record.

"In the area of quality assurance we work very closely with the Labs. For example, we purchased some amplifiers which didn't come up to our specs. We sent them back and they were returned to us still not meeting the specs. The next time we sent them back they were accompanied by the Labs quality assurance rep and all the problems were corrected."

Cooling the System

The responsibilities of M & S cannot be measured in numbers of people involved. For example, the cryogenics facility is a one-man shop run by Ray Hashberger. In general terms cryogenics is the art of refrigeration, of tremendous significance when one considers that probably 90 percent of the amplifiers, really the heart of the communications system, are cooled to 17 degrees Kelvin (comparable to -429 degrees Fahrenheit) which is near absolute zero.

According to Hashberger, noise in a system is caused by molecular movement and the colder the material the less the movement. When absolute zero is reached, movement stops. Any noise induced into the satellite system requires increased power to transmit from a satellite reducing the number of channels available. If use



Thousands of parts valued in the millions of dollars are stocked by M & S at the Labs.

is reduced from 1,200 channels to 600 on a satellite the impact on potential income becomes apparent.

"What we do is to take an amplifier located near the antenna feed, for example," says Hashberger, "and cool it to nearly zero, reducing the molecular movement of the component, by expanding helium gas. In lay language, by means of refrigeration, we reduce molecular motion to an absolute minimum with a resultant decrease in noise."

M & S Growth Continues

Increasingly, M & S has become a service operation for the entire corporation. COMSAT Operations Center initially asked for a part-time technician and the necessary equipment to service a few teletype machines. From this beginning M & S now provides teletype maintenance and serv-

ice for over 400 major assemblies. This service, if contracted out, would probably cost \$150,000 annually. This includes service for teletype here in the U.S. and operations as far away as Saudi Arabia, under a lease agreement with COMSAT GENERAL. M & S also services the Labs' minicomputers, a service for which the Labs is billed.

"As I said at the beginning, M & S is a pretty big operation," concluded Warren. "Our own annual capital budget runs at about \$250,000. Our controllable expense budget is somewhere around \$600,000 annually. When added to expenditures against 'other accounts,' we spend something like \$7.5 million a year. All in all, for 20-plus people, we think we're pretty big business in a very unique field of operations."

Washington-Moscow Hot Line to shift to INTELSAT/MOLNIYA satellites

The Washington-to-Moscow direct communications link (DCL or Hot Line), is now scheduled to be shifted to INTELSAT and MOLNIYA satellites in the second half of this year. The U.S. and U.S.S.R. completed the negotiation of technical and operating agreements earlier this year.

The satellite hot line originally was planned to begin in late 1974, but was delayed by Soviet postponements in launching the MOLNIYA III satellites, according to Willis K. Naehner, Deputy Assistant Secretary of State for Communications. Mr. Naehner headed the U.S. delegation which met for a week with a Soviet delegation in Moscow in March. The U.S. delegation included two COMSAT

officials, George A. Lawler, Director of Marketing, and William Lee, Manager, INTELSAT Operations; three U.S. Government representatives; and three representatives of ITT Worldcom.

Heading the 13-person Soviet delegation was Dr. V. P. Minashin, Chief, Satellite Department, U.S.S.R. Ministry of Communications.

For redundancy, the hot line will utilize two parallel routes, one via MOLNIYA satellites and one via INTELSAT satellites. Earth stations for the INTELSAT path are the COMSAT-operated facility at Etam, West Virginia, and Soviet stations at Moscow and L'Vov. For the MOLNIYA route, the U.S. Army operates antennas at Ft. Detrick, Maryland, and the So-

viet Union Ministry of Communications operates antennas in that country.

ITT is the U.S. carrier providing the Hot Line service via INTELSAT to the Department of Defense, in coordination with the State Department. COMSAT provides the INTELSAT satellite circuits to ITT.

The Hot Line was first established in 1963, via terrestrial facilities, following negotiations in which George P. Sampson was the U.S. technical representative. Mr. Sampson (Major General, U.S.A.-Ret.) retired in 1975 as a COMSAT Senior Vice President. In 1971 the U.S. and U.S.S.R. agreed to upgrade the Hot Line to parallel satellite routes.

The first MARISAT satellite, sta-

tioned over the Atlantic Ocean, is now providing full communications service to the U.S. Navy.

The satellite is the first in a new maritime satellite system designed to provide communications to the Navy and the commercial shipping and offshore industries.

It was launched from Cape Canaveral, Florida, February 19, and is now in a geostationary orbit at 22,240 miles altitude at its assigned position at 15 degrees West longitude over the Atlantic Ocean.

Following a series of in-orbit tests, that portion of the satellite dedicated to use by the Navy and utilizing UHF frequencies was thoroughly checked out, and service initiated to the Navy, starting Thursday, March 25, in advance of the previously scheduled April 1 date. The service is fully satisfactory, providing communications capability never before available to ships at sea.

Navy Secretary J. William Middendorf, II, formally inaugurated the service with the first operational message broadcast on April 5 to Navy ships.

"The transmission of this message," Middendorf said, "marks the achievement of a major milestone as we move toward the realization of a real-time worldwide command and control communications system. Op-

First maritime satellite

serves U.S. Navy

erations on the Atlantic . . . satellite represents the first major step toward providing improved links between our Fleet and shore commands."

The Navy is using the entire UHF capacity of the satellite for communications between its own fixed and mobile terminals. Under a lease arrangement the Navy will pay approximately \$11.5 million for a full year of service via this MARISAT satellite.

In-orbit testing is continuing on that portion of the first MARISAT satellite devoted to commercial maritime service. It was announced March 19 that the satellite was not usable for commercial service because of random variations in signal strength in the commercial communications links. Testing of these links is progressing without interruptions to the Navy UHF service. If commercial service should be possible in the future, an announcement will be made at that time.

A second MARISAT satellite, intend-

ed for positioning over the Pacific Ocean, is scheduled for launch May 27. The Navy also has contracted to use the UHF capacity of this satellite when service is available.

Assuming that testing of this second spacecraft establishes its satisfactory performance in all respects in the Pacific Ocean area, for both Navy and commercial service, a third spacecraft will continue to be available for launch over the Atlantic Ocean. Such a launch could take place in August.

The MARISAT System is owned by four companies under a joint venture arrangement approved by the Federal Communications Commission. COMSAT GENERAL (which also serves as System Manager) holds an 86.29 percent ownership interest; RCA Global Communications, Inc., eight percent; Western Union International, Inc., 3.41 percent; and ITT World Communications, Inc., 2.3 percent.

Atlantic Richfield tanker becomes 16th ship to get MARISAT terminal.

COMSAT GENERAL Corporation and the Atlantic Richfield Company, ARCO, have reached an agreement for the installation of a terminal to operate with the MARISAT satellite system on the *S.S. Arco Prudhoe Bay*, a 70,000-ton, 525,000-barrel tanker commissioned at Bethlehem Shipyard in Baltimore, Maryland, in 1971.

Atlantic Richfield plans to conduct a nine-month evaluation test of satel-

lite communications on this vessel. Additional ships of the Atlantic Richfield fleet could be similarly equipped in the future if the outcome of the evaluation proves this new communications medium to be as reliable as expected.

Currently transporting crude oil from Cook Inlet, Alaska, to U.S. west coast ports, the vessel will also load North Slope crude oil at Valdez,

Alaska, when the trans-Alaska pipeline becomes operational.

Atlantic Richfield said it looks upon the use of this advanced communications system as a continuation of its investigation of possible ways of enhancing the safety of its vessels, their crews and cargoes.

Communications via the shipboard terminal and the MARISAT satellite system could be valuable during those periods when *Aurora Borealis* (Northern Lights) makes it difficult to communicate on high frequencies.

To date, 15 commercial vessels have been equipped with COMSAT GENERAL terminal facilities. The *S.S. Arco Prudhoe Bay* will be the 16th ship.

Board authorizes INTELSAT V contract negotiations at twentieth meeting

The Twentieth Meeting of the Board of Governors was held at INTELSAT Headquarters in Washington, D.C., in March. Twenty-four Governors representing 63 Signatories were present. With the accessions of Bangladesh and Qatar, INTELSAT currently has 93 members.

The Board authorized the Management Services Contractor to commence negotiations of INTELSAT V contracts with Aeronutronic Ford, Hughes Aircraft Company and TRW for their body-stabilized satellite design and with Hughes for its spin-stabilized satellite proposal. Among its other actions the Board:

Technical and Operational Matters

- Decided to consider at its next meeting recommendations for continued INTELSAT V negotiations and to consider draft contracts, with a view to approving an INTELSAT V contract at its July meeting. However, the Board also provisionally scheduled a meeting in early September, if necessary, to act on a final INTELSAT V contract.

- Authorized the Management Services Contractor to make \$7.3 million in progress payments to NASA during 1976, for long-lead items for up to seven additional Atlas-Centaur launch vehicles.

- Authorized the Management Services Contractor to request from Telespazio (Italy) and INTELAM (Cameroon) proposals for additional tracking, telemetry, command and monitoring facilities, including an additional antenna; and requested the Advisory Committee on Technical Matters to review the need for such an additional antenna.

- Approved plans for an Earth Station New Technology Seminar, to be held in Munich, Germany, from June 14-18. The seminar will cover dual polarization and 14/11 GHz

earth station technology which will be required for the INTELSAT V operation.

- Approved provisional guidelines for use by the Management Services Contractor and Secretary General in discussing intersystem coordination with other organizations; decided that the guidelines will not be applied retroactively, and instructed that they be reviewed and further refined.

- Approved non-standard earth stations in Maraba (Brazil), Bon Espoir (Seychelles), and Bamako (Mali), subject to certain technical conditions in each case.

- Granted final approval to Port Louis (Mauritius), Kota Kinabalu and Kuantan (Malaysia), and Manaus and Boa Vista (Brazil) non-standard earth stations.

Financial and Legal Matters

- Approved the 1975 financial statements, and economies suggested by the Management Services Contractor in its 1976 departmental expense budget.

- Approved requests by the Dominican Republic, Malaysia and Senegal that their investment shares not be increased, and decided that correspondence sent in notification for the 1977 adjustment of investment shares shall indicate that late requests for lower shares will not be considered.

- Decided that the rights of Lebanon as a Signatory will be suspended effective March 28, if sums due from it for the 1975 adjustment of investment shares have not been paid by that time. This will allow INTELSAT to retain the March 29, 1976, and future revenue distributions. When payment is made Lebanon's rights will be restored.

- Decided to consider at its next meeting sanctions for users which are over three months in default for utilization charges.

- Requested the Management

Services Contractor and Secretary General to study and report on the financial penalties which may be experienced for television programs by users operating on the major path satellite in the Atlantic Region.

Organization Matters

- Approved reports to the Fourth Meeting of Signatories, held recently in Singapore on INTELSAT finances, future space segment programs, and activities in the last year including the progress of the Board's study of permanent management arrangements, and the classification of domestic traffic in Nigeria and Zaire as international.

- Endorsed INTELSAT's application to participate as an observer in CCIR and CCITT meetings, and decided that future proposals for changes to INTELSAT's relations with other organizations require prior Board approval.

- Instructed the Special Committee on the Headquarters Agreement to complete discussions with the U.S. Government by May 1, and submit a draft agreement with recommendations for action to the next Board meeting.

- Approved one-year extensions for Messrs. Tooru Inoue and Pierre Neyret, nominees of the Japanese and French Signatories, and one-year assignments for Messrs. Jean Paul Berges and M. E. Butcher, of the French and UK Signatories, to work with the staff of the Management Services Contractor.

The Twenty-first Meeting will be held in the Netherlands, at the Hague, in May.

The preceding report was prepared by Ellen D. Hoff, International Affairs, U.S. INTELSAT Division.

John A. Johnson, President of COMSAT GENERAL Corporation, has been nominated by management for election to the Board of Directors of Communications Satellite Corporation (COMSAT).

Mr. Johnson and 11 incumbent directors compose the slate of nominees.

Mr. Johnson was nominated to fill the board vacancy resulting from the decision of John B. M. Place not to stand for reelection this year because of current demands on his time. Mr. Place is Chairman, President and Chief Executive Officer of the Anaconda Company, New York. He has been a COMSAT Director since 1973.

Mr. Johnson has been President of COMSAT GENERAL Corporation, a wholly owned subsidiary of COMSAT, since 1973.

The directors will be elected at the 1976 Annual Meeting of Shareholders, to be held Tuesday, May 11, at 2:30 p.m. EDT at the Sheraton National Hotel in Arlington, Virginia.

The 11 incumbents nominated for reelection are:

Joseph H. McConnell
Joseph V. Charyk
Gordon Edwards

COMSAT General President Johnson nominated to Board

William W. Hagerty
John D. Harper
John L. Killion
Melvin R. Laird
Rudolph A. Peterson
Bruce G. Sundlun
Leo D. Welch

Under the Communications Satellite Act of 1962, as amended, the COMSAT board consists of 15 directors, 12 of these elected by the shareholders and three appointed by the President of the United States with the advice and consent of the Senate.

In April 1975, President Ford reappointed Frederic G. Donner and George Meany as members of the COMSAT Board of Directors for terms expiring, respectively, at the 1977 and 1978 annual meeting of shareholders. Their reappointments and the previously announced appointment of Edward E. David, Jr., the third Presi-

dentially appointed COMSAT director, are awaiting confirmation by the Senate. (Dr. David is Executive Vice President-Research, Development and Planning, of Gould, Inc., a manufacturer and developer of electrical, electronic, electro-chemical and industrial products.)

Mr. Johnson joined COMSAT in 1963. From 1964 to 1974, he was Vice President-International, and became Senior Vice President in 1974. Before joining COMSAT, he was General Counsel of the National Aeronautics and Space Administration.

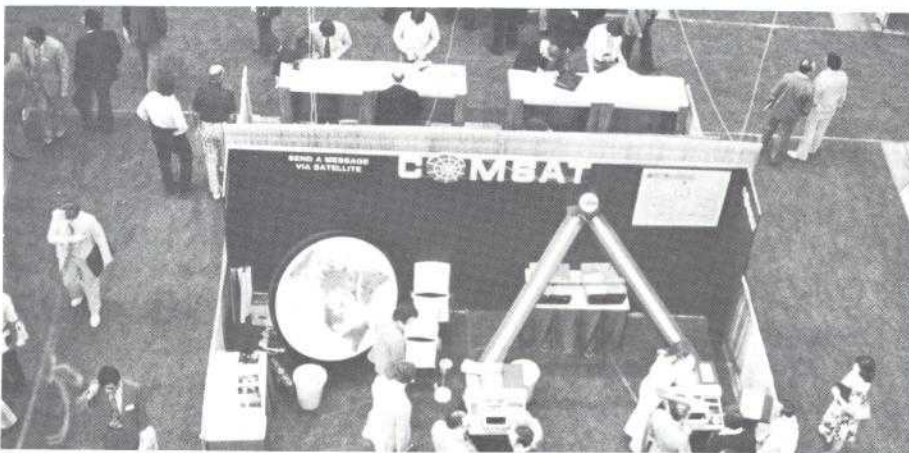
COMSAT GENERAL, the subsidiary headed by Mr. Johnson, is engaged in a number of major satellite programs. The Maritime Communications Satellite Program (MARISAT), a joint venture led by COMSAT GENERAL, has already begun operation via its first satellite, which is on station over the Atlantic Ocean. Two more MARISAT satellites are scheduled for launch later this year and will provide service for the U.S. Navy as well as commercial shipping and offshore industries in the Pacific region as well as the Atlantic region.

The first satellite of the COMSAT GENERAL series to be known as COMSTAR will be launched soon to provide service within the United States. The entire capacity of three COMSTAR satellites has been leased by AT&T.

Another COMSAT GENERAL program, presently in the developmental stage, is an international joint venture called AEROSAT. AEROSAT satellites will provide high quality, diversified communications service to aircraft on transoceanic flights. COMSAT GENERAL, the European Space Agency and the Government of Canada are the AEROSAT joint venture participants.

In addition to electing directors at the annual meeting, the shareholders will appoint independent public accountants for the coming 12 months and act on a shareholder's proposal.

COMSAT exhibit at INTERFACE '76



More than 3,500 people attended seminars and viewed exhibits among which was COMSAT's DIGISAT during INTERFACE 76, the five-day Data Communications Conference held recently in Miami, Florida. COMSAT's demonstration consisted of a Rapifax digital facsimile transceiver operating over a DIGISAT circuit with another transceiver to illustrate the application of DIGISAT service. Transmissions were "looped" through an Atlantic Ocean INTELSAT IV-A satellite and Etam, West Virginia, DIGISAT equipment with page copy being exchanged at the rate of 9,600 bps (bits per second).

Photo by Allan W. Galfund

English appointed SBS VP/General Counsel

William D. English, formerly Vice President and General Counsel of COMSAT GENERAL Corporation, has been appointed Vice President and General Counsel of Satellite Business Systems, SBS.

Mr. English has been serving as a member of the Board of Directors of COMSAT GENERAL and as a member of the Board of the joint venture established by COMSAT GENERAL, the European Space Agency and the Government of Canada to carry out an aeronautical satellite program. Prior to joining COMSAT GENERAL, he was with the parent company, COMSAT, from 1965 to 1973, serving as Assistant General Counsel.

Before joining COMSAT, Mr. English was Legal Advisor to the U.S. Mission to European Communities in Brussels, Belgium, 1962-1964, where he participated in the negotiation and implementation of the U.S.-EURATOM Cooperation Program for the development of atomic power plants in Europe.

SBS is a partnership organized by subsidiaries of COMSAT GENERAL Corporation, Aetna Casualty and Surety Company and International Business Machines Corporation. SBS has applications pending before the Federal Communications Commission for an all-digital, advanced domestic communications satellite system principally to serve large commercial, industrial and governmental customers.

INTELSAT Signatories meet in Singapore

The Fourth Meeting of Signatories of INTELSAT was held in Singapore during the early part of April at the invitation of the Telecommunication Authority of Singapore.

Included on the agenda of the Meeting of Signatories was the determining of the minimum investment share entitling a Signatory or Group of Signatories to be represented on the INTELSAT Board of Governors; the recommendation of the Board that

INTELSAT's capital ceiling be increased from \$500 million U.S. dollars to \$900 million to permit financial flexibility for the INTELSAT V spacecraft program; and consideration of the annual report of the Board of Governors on the activities of INTELSAT, the annual financial statement and the Board's report on future programs.

Also on the agenda was the consideration of applications from the Signatories of Nigeria and Zaire for use of the INTELSAT space segment, for their respective domestic public telecommunications services, on the same basis as for international public telecommunications services.

The Meeting of Signatories, which meets annually, is composed of all Signatories to the INTELSAT Operating Agreement. Membership currently stands at 93 with each Signatory having one vote in the Meeting. The Minister for Communications of Singapore delivered the welcoming address at the opening session.

Worth Noting

Sidney Metzger, Assistant Vice President and Chief Scientist of COMSAT, is one of the 104 outstanding American engineers elected this Spring to the National Academy of Engineering. Mr. Metzger was cited for his contributions to the development of early radio systems and communication satellite systems.

Dr. S. Joseph Campanella, Director of Communications Processing Laboratory, COMSAT Labs, has been elected a Fellow of the American Association for the Advancement of Science.

Robert D. Briskman, Assistant Vice President, Fixed Systems, COMSAT GENERAL, has been nominated by the Board of Directors of the IEEE to be Executive Vice President of the organization.

Receiving Patent Incentive Awards at the Labs recently were **James Allison**, **Joseph Campanella**, **Joseph Jankowski**, **Robert Dendall**, **Arthur Standing**, **Henri Suyderhoud**, **Michael Onufry** and **Chester Wolejsza**.

Zimmer elected U of Va Rector

William L. Zimmer, III, a Director of COMSAT, was recently elected Rector of the University of Virginia, succeeding Joseph H. McConnell, Chairman of the COMSAT Board of Directors.

Mr. McConnell retired from the University Board of Visitors and as the University's 32nd Rector. He was first appointed to the Board by Governor Mills Godwin in 1968, and was elected Rector by the Board in 1970.

Mr. Zimmer was appointed to the Board of Visitors by Governor Linwood Holton in 1972.

Each man is an alumnus of the University. Mr. McConnell received a B.A. from Davidson College in 1927 and an LL.B. from the University of Virginia Law School in 1927. Mr. Zimmer received an A.B. from the University in 1934 and an LL.B. in 1937.

A number of distinguished Virginians have served as Rector of the University. The first was Thomas Jefferson, the second was James Madison.

Mr. McConnell, former President of Reynolds Metals Company, has been a COMSAT Director since 1969 and Chairman of the Board since 1970. Mr. Zimmer, President and Chief Operating Officer of A. H. Robins Company, Inc., has been a COMSAT Director since 1973.

Noted author guest on COMSAT's "World of Music"

Arthur C. Clarke, celebrated space author, was a recent guest on COMSAT's radio program "World of Music" broadcast weekly over Washington Radio Station WGMS. During the interview with WGMS staff announcer Renee Channey, Mr. Clarke examined the future of communications satellites.

"Today's system is expensive, requiring elaborate ground stations which cost in the millions of dollars. New ones, much cheaper, are on the way and will eventually be within the reach of everybody. Communications satellites are going to provide a capability not possible before, including making practical the use of wristwatch telephones allowing people everywhere to be in immediate contact with each other. This capability is going to restructure society, making it possible to do any job we like almost anywhere and lessening the need to travel with much of our work done from home. Commuting is going to be reduced, solving many of our traffic and city problems.

"One of the things that our new communications development program predicts is that satellites will enable us to have in our homes an instrument called the "Telesafari," a kind of a wide-screen, full color, high definition television which will allow the home viewer to join a safari group anywhere in the world in real time. Your guide would carry a camera and microphone and he would suffer the heat and mosquitoes, for example on the Amazon, while the viewer enjoyed the safari from the comforts of his home. Although expensive in the beginning, ultimately, such travel will be within the economic reach of everyone."

Mr. Clarke also discussed his new book "Imperial Earth," a novel about human life 300 years from now as seen by his main character Duncan Makenzie, a resident of a moon of Saturn, during a visit to earth for the U.S. Quincentennial.

He predicted, during the interview, that there will be permanent colonies on other planets 50 years from now with a colony, perhaps similar to the base at the South Pole, on the moon.

"There will be colonies established at all inhabitable places during the next century," said Clarke, "with



Noted author Arthur C. Clarke is interviewed by staff announcer Renee Channey of Washington Radio Station WGMS. The taped discussion was aired during a recent broadcast of the COMSAT-sponsored weekly radio program, "World of Music."

exploration of the solar system being big business in the twenty-first century. This is a part of our expanding culture which, although taking thousands of years to happen, is moving faster now with the exploration and colonization of the solar system completed in a matter of centuries, and then we will be looking out at the stars."

Gantt becomes acting General Counsel

John B. Gantt, principal assistant to William D. English since 1973, has become Acting General Counsel of COMSAT GENERAL according to an announcement by John A. Johnson, President of COMSAT GENERAL.

Mr. Gantt has been with COMSAT since 1966, serving in the regulatory contracting and international areas. He received his law degree from the University of Virginia and a Bachelor

of Science (physics) from Carnegie Institute of Technology.

Employees to work in Summer Jobs Program

Six employees of COMSAT, selected from various departments, are being made available for one day to assist the Metropolitan Washington Board of Trade and the National Alliance of Businessmen in the annual "Summer Jobs for Needy Youth Program" under the Chairmanship of Redskin Coach George Allen.

Last year the program was successful in identifying over 26,000 jobs in the private sector for needy, in-school youth from the metropolitan area. The success of the program according to Kenneth J. Cubitt, Chairman of the Program's Support Committee, is dependent upon telephone solicitations by volunteers estimated to require approximately 4,000 hours.

COMSAT Board declares regular quarterly dividend

COMSAT reported consolidated net income of \$11,041,000, or \$1.10 per share, for the first quarter of 1976, as compared with \$12,692,000, or \$1.27 per share, for the first quarter of 1975. Net operating income accounted for \$10,104,000, or \$1.01 per share, of the quarter's consolidated net income, as compared with \$10,766,000, or \$1.08 per share, for the 1975 first quarter. Other income, net of taxes, totaled \$937,000, or 9 cents per share, as compared with \$1,926,000, or 19 cents per share for the 1975 first quarter.

The revenues of \$37,276,000 for the first quarter exceeded those for the 1975 first quarter by \$801,000, or two percent. Revenues from the Mainland-Hawaii leased transponder were \$2,010,000 less than during the

Labs on Montgomery County Bicentennial Blue Ribbon Tour

COMSAT Labs is among those identified as "Blue Ribbon Groups" by the Montgomery County Bicentennial Commission offering tours to the public during the month of May, commemorating the two-hundredth birthday of the Nation. The following paragraphs have been extracted from the Commission's news release.

Heightened public interest in Montgomery County's industrial base will result from plans for a blue-ribbon series of science/industry tours in May that herald the "Focus on the Future" by the Montgomery County Bicentennial Commission.

Participants include some of the Nation's most futuristic-thinking organizations headquartered in Montgomery County.

COMSAT, National Naval Medical Center and National Institutes of Health start the scientific parade with tours on Sunday, May 1. Other companies are offering a bonanza of top-flight scientific excursions into the future with everything from

first quarter of 1975. In addition, revenues from temporary services were lower by \$613,000. Revenues from full-time services other than those derived from the transponder lease increased \$3,408,000 as a result of continued growth in use of the global system. Full-time half-circuits leased to COMSAT's carrier customers increased to 3,836 at March 31, 1976, as compared with 3,330 a year earlier.

Operating expenses, including income taxes, totaled \$27,172,000, an increase of \$1,463,000 from the first quarter of 1975. Higher depreciation charges associated with the launch of additional satellites (INTELSAT IV-A F-1 and F-2 and the first MARISAT) together with a higher cost of operations accounted for the increase in operating expenses.

The reduction in other income was principally accounted for by the Corporation's share of operating expenses of Satellite Business Systems (a partnership formed by subsidiaries of COMSAT GENERAL Corporation, IBM, and Aetna Casualty and Surety Company. Lower investment income and

nuclear lab cutaways to robot demonstrations.

"Open House" is a definite first for some agencies taking part in the future focus program. Others, that offer an annual public Visitors Day

allowance for funds used during construction also contributed to the reduction.

The Board of Directors of COMSAT, at its monthly meeting declared a quarterly dividend of 25 cents per share, payable on June 14, 1976, to all shareholders of record as of the close of business on May 14, 1976. It is COMSAT's 23rd consecutive quarterly dividend and the eighth at the 25-cent rate.

COMSAT's petition for judicial review of the Federal Communications Commission's rate case Decision of December 4, 1975, is pending in the U.S. Court of Appeals for the District of Columbia Circuit. Also pending in the Court is COMSAT's petition to stay the Decision until the completion of judicial review. Pending a ruling by the Court on COMSAT's petition for a stay, the Commission has delayed the filing date and effective date for the lower rates that are required by its Decision. Unless modified, the Decision would have a substantial adverse effect on the revenues and earnings of the Corporation.

program, have geared their schedules so that May will see a continuing exhibition of imaginative projects in communication, security, medicine, energy and nuclear research. Admission is free to all events.

Scroll presented to National Bureau of Standards



Robert D. Briskman, Assistant Vice President, Fixed Systems, COMSAT GENERAL, left, presents a scroll on behalf of the Institute of Electrical and Electronics Engineers, IEEE, to Mr. Ernest Ambler, Acting Director of the National Bureau of Standards, on the occasion of the Bureau's 75th Anniversary. Briskman is a member of the IEEE's Board of Directors.

COMSAT TECHNICAL REVIEW has often been described as the most widely quoted journal in the satellite communications field. Evidence is now available to prove that this statement is true.

Nine of the 29 technical articles reprinted in Volume 14 (January 1976) of the AIAA Selected Reprint Series, "Satellite Communications Systems," were taken from CTR. Included also in this "best-of-the-past-decade" selection of papers were five articles, authored by COMSAT personnel, that were published in other journals, and eight articles edited by COMSAT people, principally by Pier L. Bargellini, Chairman of the CTR Editorial Board. COMSAT engineers and scientists similarly dominate listings in the supplemental bibliography of 100 significant papers singled out for reference.

A contribution by the Laboratories to 22 of 29 articles in this special volume, the only one devoted exclusively to satellite communications, demonstrates quite clearly the leadership role that COMSAT has played in the advancement of satellite communications technology.

"Numerous important contributions on satellite systems and technology have appeared in print since

CTR articles chosen for AIAA Selected Reprint Series

the launch ten years ago of the first commercial communications satellite, EARLY BIRD," the editor of the AIAA Reprint Series says. "Emphasis . . . is on pertinent publications, regardless of age. However, most of the latest developments and future systems concepts are in publications less than five years old."

The nine authors and CTR articles given historical recognition by AIAA are:

- B. I. Edelson and A. M. Werth, "SPADE System Progress and Application," Vol. 2, No. 1, 1972.

- W. G. Schmidt, "The Application of TDMA to the INTELSAT IV Satellite Series," Vol. 3, No. 2, 1973.

- N.K.M. Chitre, "Baseband Distortion Caused by Intermodulation in Multicarrier FM Systems, Vol. 2, No. 1, 1972.

- J. C. Fuenzalida, O. Shimbo and W. L. Cook, "Time Domain in Analysis of Intermodulation Effects Caused by Nonlinear Amplifiers," Vol. 3, No. 1, 1973.

- R. R. Taur, "Ionospheric Scin-

tillation at Frequencies Above 1 GHz," Vol. 4, No. 2, 1974.

- C. A. Blackwell, "Earth Stations: INTELSAT IV Communications Systems," Vol. 2, No. 2, 1972.

- L. Pollack and W. Sones, "An Unattended Earth Terminal for Satellite Communications," Vol. 4, No. 2, 1974.

- J. L. Dicks, "Domestic and/or Regional Services Through INTELSAT IV Satellites," Vol. 4, No. 1, 1974.

- R. W. Gruner and W. J. English, "Antenna Design Studies for a U.S. Domestic Satellite," Vol. 4, No. 2, 1974.

Papers authored by COMSAT personnel but published in other journals included:

- J. G. Puente, J. G. Schmidt and A. M. Werth, "Multiple Access Techniques for Commercial Satellites," Proceedings of the IEEE, Vol. 59, No. 2.

- J. L. Dicks and M. P. Brown, Jr., "Frequency Division Multiple Access (FDMA) for Satellite Communications Systems," *IEEE Eascon Conference Record*, 1974.

- O. G. Gabbard and P. Kaul, "Time-Division Multiple Access," *IEEE Eascon Conference Record*, 1974.

- W. Korvin and R. W. Kreutel, "Earth Station Radiation Diagrams with Respect to Interference Isolation Capability: A Comparative Evaluation," *AIAA Progress in Astronautics and Aeronautics: Communications Satellites for the 1970's*, Vol. 25, 1971.

- W. L. Pritchard and P. L. Bargellini, "Trends in Technology for Communications Satellites," *Astronautics and Aeronautics*, Vol. 10, No. 4, April 1972.

Ten-year awards



Recently presented Ten-Year Awards by COMSAT President Joseph V. Charyk were, left to right, David G. Reiser, Julius L. Levatich, Robert B. Schwartz, Pete C. Reynard, Dr. Charyk, William C. Gaunt, E. Rock Mattos, Aaron B. Coleman and Larry G. Hastings.

Gerstner succumbs to heart attack

John F. Gerstner, a former employee of COMSAT and until recently associated with Satellite Business Systems, died recently of a heart attack at his home in Alexandria, Virginia. He was 53.

Born in Columbus, Ohio, Gerstner retired from the Army in 1967

Continued on next page.

Credit Union elects new officers

With a record attendance in excess of 200 members, shareholders of the COMSAT Federal Credit Union filled two vacancies on the Board of Directors from among the slate of eight candidates and elected two new members to serve on the Credit Committee at its recent ninth annual meeting.

Edward Wright was reelected for a three-year term while William Hanson became the Board's newest member. Following a special meeting of the Board the following officers were elected to serve until 1977: J. H. Kilcoyne, Jr., President; E. N. Wright, Vice President; C. W. Simms, Treasurer; and J. A. Wakeling, Secretary. The new additions to the Credit Committee are Frances Shepherd and James Dunn.

COMSAT President Joseph V. Charyk addressed the meeting and participated in the drawing for door prizes which were won by Diane Palmer—\$50 in shares; Ronald Kos—two radial tires; and Stanley Shubilla—use of the COMSAT box at the Capital Center for a hockey game.

The meeting was presided over by CU President Kilcoyne and included reports from the Treasurer, the Credit Committee and the Supervisory Committee. In his report on the financial health of the Credit Union, Treasurer C. William Simms pointed to 1975 as another successful year for the Credit Union with shares reaching a level of about \$2.5 million and a record level of dividends paid on those shares. Lending rates remained consistently lower than those charged by similar institutions in the Washington area with an average interest rate of approximately 9.8 percent charged on all outstanding loans.

with the rank of Colonel following 27 years' service and participation in World War II and the Korean conflict. His last assignment was as Chief of the Communications Service Division of the Defense Communications Agency.

Don Stribling, left, "hamming" with his father.



Don Stribling,

Paumalu's "Ham" operator

By BOB KUMUSAKA

"This is KH6HSW".

Station KH6HSW is Donald W. Stribling, one of more than 350,000 radio amateurs scattered throughout most of the countries of the world, a Technician at the Paumalu Station.

Don recently competed in the 1975 CQ World Wide DX CW Contest held late in November. Although contest results have not yet been made public, Don is hopeful he will again finish at the top of his class of operation and receive the coveted Certificate of Award given the ama-

With respect to dividends, reported Simms, the annual dividend continued at six percent through the first three quarters of 1975, rising to 6.25 percent for the fourth quarter. The total amount paid out in dividends in 1975 exceeded \$100,000 representing an increase of about 35 percent over 1974 and marking the first time in Credit Union history the \$100,000 dividend level had been surpassed. Earnings continued to rise, amounting to over \$200,000 in 1975, a 24 percent increase over the previous year.

Following retirement he was Director of Special Studies for Western Union until 1969 at which time he joined COMSAT's Marketing staff as Manager, Market Development. Prior to joining SBS he had been Director of Marketing for CMI Corporation.

teur attaining the highest score in each class of operation in each participating country. He has received the award for Hawaii in each of the previous three contests.

During the recent contest, he was able to almost double his last year's score with well over 100,000 points and a total of 678 different contacts. To do this he was "on the air" 42 hours of the 48-hour contest period.

Don's interest in amateur radio dates back to his grade school days. He credits his early interest in radio for leading him into a career in electronics. His amateur preference is the DX operation, the art of long-distance contacts, using the International Morse Code. He has constructed his own antenna systems and transmitter equipment at his home in Wahiawa.

A licensed amateur for the past 23 years, Don gets the greatest enjoyment in "talking" with people from different parts of the world. He spends a minimum of 10 hours a week at his set primarily on weekends, when radio amateurs around the world are most likely to be operating.

Over the years Don has made contact with literally thousands of other "ham" operators scattered across the globe, many of whom have become good friends. He is hopeful of "talking" to other amateurs at other COMSAT locations and encourages them to remember his call sign—KH6HSW.

Enrollment open for Thrift and Savings Plan

By MEL WILLIAMS

As a COMSAT/COMSAT GENERAL employee, you have at your disposal a number of ways to save through payroll deductions for an unexpected emergency, the purchase of a home or an automobile, putting the children through college, that long-awaited vacation, or as a supplement to your retirement income.

One of the ways to save to satisfy long-range goals is the COMSAT Thrift and Savings Plan. This Plan is available to all regular COMSAT/COMSAT GENERAL employees with participation starting at the beginning of any calendar quarter after the completion of six months of continuous service. The Corporation will contribute to the Plan, on your behalf, an amount equal to 50 percent of your savings, or one dollar for each two you save. You may save from one to six percent of your base salary, and if your salary changes, your payroll deduction will automatically change accordingly.

To join the Thrift and Savings Plan, or to increase or decrease the amount of your payroll deduction, you should contact the Personnel Department at least 30 days prior to January 1, April 1, July 1 or October 1. Deductions or changes will become effective the first pay period ending in the quarter.

The Plan has two investment funds known as Fund "A" and Fund "B". Both Funds are managed by Morgan Guaranty Trust Company of New York, selected by the Corporation to act as Trustee and Investment Manager of the Plan. Fund "A" is an income Fund with the primary objective of preserving the amounts invested. Investments will be primarily in securities with a fixed rate of return, such as certificates of deposit and Treasury Notes. Fund "B" is a diversified Fund with the primary objective of increasing the value of amounts invested. Usually investments will be in common stocks; but at the discretion of the Trustee, portions of the Fund may be invested in such things as preferred stocks and debt securities. For this reason, Fund "B"

may be subject to greater risks of depreciation in market price than investments in Fund "A."

Before investing in either Fund, it should be clearly understood that no guarantee is provided against loss or a guarantee that you will realize a gain, since the risk of a loss can never be completely eliminated from any investment program. Therefore, careful consideration should be given as to how you want your "Savings Account" and "Thrift Account" funds invested. The following investment direction options are available:

100 percent in Fund A.

100 percent in Fund B.

50 percent in Fund A and 50 percent in Fund B.

75 percent in Fund A and 25 percent in Fund B.

75 percent in Fund B and 25 percent in Fund A.

Once a member of the Plan, the Trustee will maintain two accounts for you. The first account is your "Savings Account," which contains the value of your payroll deductions. You will have, at all times, a 100 percent vested right to this account. The second account is your "Thrift Account" which accrues the value of the Corporation contributions made on your behalf. This account becomes yours over a three-year period following the year of Corporate contributions. For example, if you join(ed) the Plan in 1976, the Corporation contributions over the next few years would vest as follows:

If your employment terminates because of retirement, total and permanent disability or death, you or your beneficiary will receive 100 percent vested rights to both accounts as determined by the next valuation date. If your employment terminates for any other reason, you will receive the full value of your "Savings Account" and the vested portion only of your "Thrift Account." The non-vested portion of your "Thrift Account" will be forfeited.

After the conclusion of each year, Plan participants will receive a statement from the Trustee showing the value of each account as of the end of the year.

NOTES FROM PERSONNEL

Bond drive opens

By PAT CRAMER

The 1976 COMSAT U.S. Savings Bond Drive opened formally in May. This year, in addition to the regular options for saving, COMSAT is initiating the Bond-a-Matic Program. Employees earning an annual income in excess of \$15,300 are eligible to participate in the program. Specifically, Bond-a-Matic allows for participation without an increase in normal payroll deductions by allowing the F.I.C.A. portion to be diverted to the purchase of bonds once the F.I.C.A. requirements have been fulfilled.

The following are those questions most frequently asked relative to the purchase of Savings Bonds.

What are the denominations of E Bonds and how much do they cost?

\$25 Bond—\$ 18.75

\$50 Bond—\$ 37.50

\$75 Bond—\$ 56.25

\$100 Bond—\$ 75.00

\$200 Bond—\$150.00

\$500 Bond—\$375.00

\$1,000 Bond—\$750.00

Can an employee sign up for Bond-a-Matic only?

Yes.

Does an employee have to wait until his/her income totals \$15,300 to sign up for Bond-a-Matic?

No. In fact, to be sure Bond-a-Matic starts on time, an employee should sign up during the annual Savings Bond Campaign.

What interest rates do Savings Bonds pay?

The present rate is six percent, compounded semiannually, when held to maturity. Series E Bonds earn four-and-one-half percent during the first year; thereafter, a higher percentage rate is earned to average six percent for the maturity period of five years.

Is there a limit to the amount of Bonds I can buy?

Yes. The current annual limitation is \$10,000 face amount (\$7,500 issue cost) for Series E Bonds. Where Bonds are purchased in co-ownership form, each co-owner may hold the maximum amount together—\$20,000 face amount.

Network Bits

Field Correspondents

Andover

Barbara Richardson

Brewster

Dorothy Buckingham

Cayey

John Gonzalez

COMSAT General (Plaza)

Jen Baldwin

Etam

Bev Conner

Fucino

Sandy Tull

Jamesburg

Warren Neu

Labs

Carol Van Der Weele

New York

Stephen Keller

Paumalu

Bob Kumasaka

Plaza

Glora Lipfert

Santa Paula

Pat Hogan

Southbury

Eileen Jacobsen

ANDOVER. After a long winter, spring has come to Andover with the snow melting and deer browsing daily on the bare ground between the Radome and the Control Building. As many as 10 have been seen at one time.

TTC&M personnel did their usual outstanding job this time in providing critical launch support for the MARI-SAT satellite. They had to become familiar with many new characteristics associated with the spacecraft while station configuration and procedures had to be modified in minimum time to accommodate the launch.



Lynn Lepage

Lynn Lepage, daughter of **Chuck** and **Joan Lepage**, became the subject of much state newspaper publicity by leading the Rumford High School Girls Gymnastic Team to take the state championship title. Freshman Lepage was the all-around point leader, carrying Rumford to its first state title. All-around State Champion for 1976, Lynn placed first all-around, first in the uneven bars, second in vaulting, third on the balance beam and fourth in floor exercise. Twenty-five schools were represented with 95 competitors. Lynn, although a freshman, is considered the top female gymnast in the state. Her older brother, Mike, is the boys 1976 State Champion on parallel bars. Needless to say we are proud of the Lepage family.

—Barbara Richardson

ETAM. An oyster luncheon, sponsored by the Etam CEA, was held in the station Canteen in February.

Paul Mauzy underwent surgery recently but is now fully recovered and back at work. Three of our "fair weather" employees took off for Florida within a few days of each other: **Bill** and **Betty Bell** headed south, followed by **Roger Parsons** and family with **Mike O'Hara** and wife right behind.

Bob Leard and wife also headed south, spending 10 days in Texas. Station Manager **Bill Miller's** vacation required his return to the station to recuperate. He took a week to work on his new house. Although it's not yet complete, he and his wife **Bev** are now officially in their new home.

New car fever has struck Etam with **Bill** and **Betty Bell**, **Vic Molek**, **Carl Cooper**, **Lenny Gifford** and **Paul Mauzy** all coming out with new automobiles. **John Bannister** and family are living contentedly in their recently purchased mobile home set up along "our" Green Valley Road not far from the station. **Sam St. Clair** and **Andy Thomson** are preparing for their coming vacations; both have recently purchased new trailers.

Robert M. Leard, son of **Robert E.** and **Doris Leard**, recently exchanged wedding vows with Jane Bennett. The newlyweds will live in Parsons, West Virginia. **David Helfgott**, son of **Paul** and **Diane Helfgott**, had a Bar Mitzvah in April.

The installation of the two new

800 kw turbines to be used as back-up power generation is nearing completion. **Jack Gore** and **Bill Reece**, along with Solar representatives, have spent considerable time at the station during the installation.

—Bev Conner



Toni Loomis during vacation in Egypt.

PLAZA. Senior Executive Secretary **Toni Loomis** of Corporate Affairs recently returned from a vacation to Egypt to report her trip "fascinating." Toni visited Cairo, Aswan and Luxor; climbed into the pyramid at Giza built by Cheops and up the Aga Khan's mausoleum near Aswan; sailed in a felucca on the Nile; entered King Tutankhamen's tomb in the Valley of the Kings; and spent as much time as possible in the Cairo Museum. The highlights of her trip, said Toni, were her visits to Luxor and the Valley of Kings.

William "Bill" Alvis retired on April 16 after 10 years with COMSAT. A member of COMSAT's Marketing Division, Bill has been in the Washington area for 26 years. His birthplace was Texas—but he's not returning there. He and his wife, **Agnes**, will move to their house at Hayes Beach in Scotland, Maryland, where they intend to fish, garden, bicycle, cut wood, load up the station wagon, "just take off on trips," and spend time with the grandchildren.

Patricia Kiernan, U.S. INTELSAT Division, and **Jean Lutwin**, COMSAT GENERAL, spent eight delightful days in March sunning and relaxing at the Macuto-Sheraton on the beach in Caracas, Venezuela.

The CEA Women's Softball team is regrouping for another year on the diamonds and is also in the market for a coach and team manager. Contact **Harriet Biddle** in Room 5035 for information.

AMTRAK Sales Representative Renee Holloway reminds us of the *Off-Peak* excursion fares offered by AMTRAK entitling the traveler to a 25 percent discount on all round-trip coach travel, except the Metroliner, between most stations on the Washington and Boston line. Board an AMTRAK train anytime, except Friday and Sunday between noon and 6 p.m. and return to your point of origin within 30 days.

Renee also points to the *Colonial Corridor Excursion Ticket* as a vacationers' bargain. It offers a coach round-trip between Boston and Washington, with stopover privileges en route, for only \$40. A one-way *Colonial* ticket is only \$25. Half fares are charged for children under 12 years.

In his best procurement ever, **Lew Meyer**, Assistant VP, Procurement, made a major policy switch and refused to follow the established policy of competitive bidding. The "sole source" procurement was made on March 9, 1976 when the Meyers' daughter **Laraine Meyer Ochoa** gave



Sole source procurement

birth to a son **Lewis R.**, weight seven pounds and two ounces, in Miami, Florida.

—**Gloria Lipfert**

SANTA PAULA. With the coming of warm weather and a full orange crop to our part of California, preparation for our role in the May COMSTAR and MARISAT launches is underway and a busy year is expected after a long period of construction here at the station.

Dennis Hill and **Karl Jesinghaus** have returned from Southbury where they attended a MARISAT communications training course and assisted in the spacecraft testing effort. **Gordon Johnson** is taking some vacation now anticipating a busy summer. With the appearance of spring,

bicyclists have emerged and the winter TV watchers are obvious.

—**Pat Hogan**

SOUTHBURY. **Jim Nelson**, Station Facilities Engineer, and his family took a vacation in Florida recently visiting Disney World and enjoying the sun. **Roger Miner** (K1DQV), Senior Technician, vacationed in St. Martin in the West Indies and participated in the ARRL International DX Competition. Participants in the competition operated voice and cw and made over 9,000 contacts. The antennas were provided by **Dave Durand** (W1WR) and the expedition's first contact was **Gary Firtick** (W1EBC), Senior Technician at Southbury.

Station Manager Durand gave a presentation to the Cheshire Rotary Club resulting in numerous requests from other organizations for similar talks. On our MARISAT launch day we were televised by WFSB-TV of Hartford, Connecticut, with **Marc Gordon** and Gary Firtick on camera on the console and Dave Durand being interviewed.

Dennis Hall has been on temporary assignment here from Santa Paula. He and **Karl Jesinghaus**, also of the Santa Paula station, are attending training on MARISAT communications equipment before returning to the West Coast.

—**Eileen Jacobsen**

End of May deadline for graduation photos

As in previous years, **PATHWAYS** will again carry a listing with pictures of the 1976 high school and college graduates, the sons and daughters of COMSAT, COMSAT GENERAL and INTELSAT employees. Since the graduates will be included in the May-June issue, it will be necessary that material and photos be submitted to The Editor, **PATHWAYS**, **no later than May 28.**

Photographs should be either graduation pictures or, in the absence of

such, head and shoulder shots. Photos can be either black and white or in color. Accompanying material will be limited to the full name of the graduating student, names of parents (Mr. and Mrs. John J. Smith) or parent, working location of parent (Headquarters, Labs, Jamesburg, etc.), name and location of school, and, for college graduates, the degree earned.

Additional material deemed of general interest should be submitted to

field correspondents for consideration for inclusion in their individual columns.

All such material should be on a separate sheet of paper—**do not write on the back of the photo** and **do not attach the paper to the photo with a paper clip.** Both methods frequently leave marks which are invisible to the eye but result in glaring flaws when the picture is "reshot" frequently making the photo unusable.

As a rule photographs are returned to the magazine by the printer following publication, which photos may be picked up at the **PATHWAYS** office. However, the possibility of photos being misplaced or damaged in the process does exist. Photos considered irreplaceable should not be submitted.



COMSAT'S
World of Music

COMSAT invites you to tune in for great listening enjoyment with music from lands and regions served by the global communications satellite system. Each Wednesday from 8:05 p.m. to 9 p.m.

At intermission, Renee Channey interviews a Comsat guest.

WGMS 570AM
103.5FM
WASHINGTON'S FINE ARTS STATIONS

May/June 1976
Volume 1 Number 5

Pathways

SATELLITE

COMMUNICATIONS SATELLITE CORPORATION
COMSAT GENERAL CORPORATION



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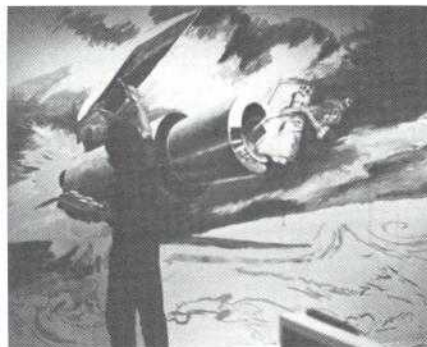
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This issue's cover is a reproduction of a mural in the executive wing of COMSAT Labs depicting the launch of an INTELSAT IV-A satellite. The artwork is particularly appropriate at this time since the first of the new family of advanced satellites was launched during the Bicentennial Year.

About the artist. Terry Rodgers, 28, of Wendell, Massachusetts, formerly of Potomac, Maryland, attended Walt Whitman High School



near Bethesda and is a graduate of Amherst, where he majored in the Fine Arts. Most of his painting is done on a 90-acre farm in Massachusetts owned by Mr. Rodgers and two friends. Painting professionally for the past three years, his works include portraits of the President and the Chancellor of the University of Massachusetts, and Representative Olin E. Teague of Texas, Chairman of the House Science and Technology Committee, which painting now hangs in the Committee Hearing Room of the Rayburn Building.

His painting of Mrs. Esther Goddard, widow of space pioneer Robert H. Goddard, will be hung in the Smithsonian's new Air and Space Museum. Last Fall he completed five months of work on the portraits of four Navy admirals which are now hanging in the Navy's Special Project Office in Alexandria, Virginia.

The mural shown on the cover is 10 feet high and 16 feet wide, representing the moment of jettisoning of the shroud. The ground mass South America. The Ground Elapsed Time approximately four minutes and 40 seconds after liftoff. The paint medium used by Rodgers is acrylics.

Shareholders gather for 13th Annual Meeting

We have reached a point where we are expanding the scope and nature of our services and developing new opportunities for the future.

COMSAT President Charyk

Following is the text of the remarks of COMSAT President Joseph V. Charyk at the 1976 Annual Shareholders Meeting held May 11 in Arlington, Virginia.

GOOD AFTERNOON ladies and gentlemen. I am pleased to report that the Corporation's activities are at the highest level of any year since its founding. We expect that we will have placed in service a total of six new satellites in 1976. Two INTELSAT IV-A satellites are for global system service; two MARISAT satellites are for maritime communications; and two COMSTAR satellites are for lease to AT&T for domestic U.S. communications.

In addition, we expect that contracts will be awarded by the end of the year for the manufacture of the follow-on global system INTELSAT V satellites, and for the manufacture of two aeronautical communications satellites. Applications are also pending before the Federal Communications Commission for construction of a unique all-digital domestic satellite system by Satellite Business Systems in which subsidiaries of COMSAT GENERAL Corporation, Aetna Casualty and Surety Company and IBM are in partnership.

We have, therefore, reached a point where we are expanding the scope and nature of our services, and we are developing still other new opportunities for the future. All of these programs are designed to meet the growing worldwide demand for a larger volume and variety of reliable and economical communications services.

The global system continues its remarkable growth. Worldwide, full-time use of the system increased by 16 percent in 1975; COMSAT's full-time use of the system increased by nine percent during the year. The worldwide network of earth stations was expanded by 19 antennas, 14 station sites and 11 countries. This is the second largest expansion of earth station facilities for any single year in the past decade. There are 427 station-to-station satellite pathways operating among 139 antennas at 111 earth station sites in 75 countries, territories and possessions.

Two of the new INTELSAT IV-A satellites were placed in service over the Atlantic Ocean earlier this year. They are being used to meet the growing demand for additional satellite capacity and the strong desire of countries in that region to be connected through the same satellite. About 50 earth stations will communicate simultaneously through the operating INTELSAT IV-A satellite. The other INTELSAT IV-A presently serves as a spare in orbit.

(Continued on page 3)

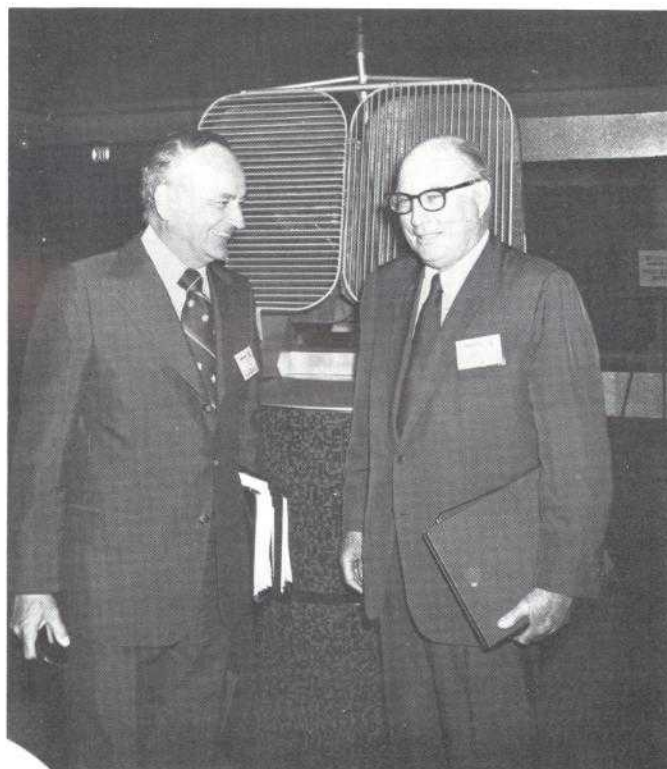
We expect that the Company will be in an even stronger financial position at the end of the 70's than it is today.

Chairman of the Board McConnell

Following is the text of the remarks of COMSAT Chairman Joseph H. McConnell at the 1976 Annual Shareholders Meeting held May 11 in Arlington, Virginia.

I WILL REVIEW the state of our business in general, including our financial outlook, and Dr. Charyk will address himself to the expansion and diversification of our services.

My report will indicate to you how active we are in making every effort to utilize our capital in the best interests of our company and its shareholders. Obviously, in the begin-



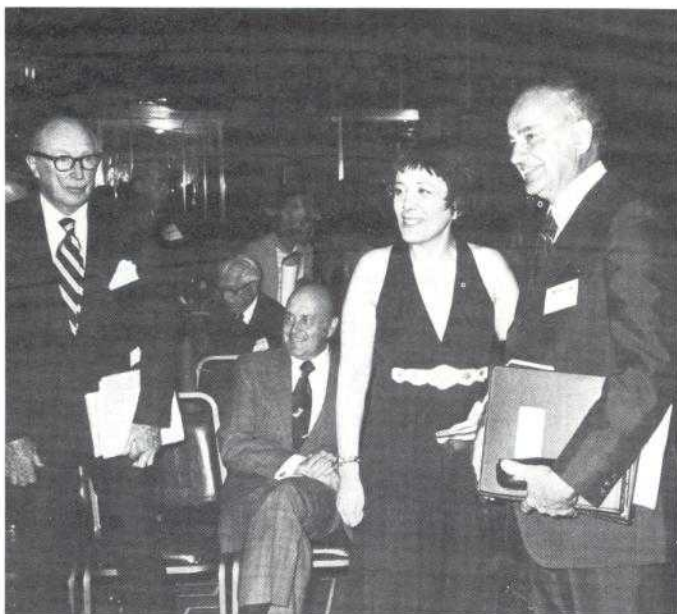
COMSAT's Chairman Joseph H. McConnell, right, and President Joseph V. Charyk immediately prior to the opening of the Annual Shareholders Meeting.

ning stages of some of our projects, we spend more than we realize in return, but this is necessary for the long-term future of our company.

COMSAT's consolidated net income totaled \$46.2 million, or \$4.62 per share in 1975, and \$11 million, or \$1.10 per share, in the first quarter of this year. Our global system services are still the primary source of our revenues, accounting for nearly 90 percent of our earnings.

Global system traffic between the United States and

(Continued on next page)



President Charyk and Shareholder Evelyn Y. Davis carry on an informal discussion at the meeting. Also in the picture are Chairman McConnell and Board of Directors Member Melvin R. Laird.

foreign points increased 15 percent in 1975, and an additional four percent in the first quarter of 1976. **The economic indicators point to continued growth in international communications traffic in the foreseeable future.** The share of this growth that will be carried by the satellite system will depend on rulings by the Federal Communications Commission concerning the distribution of traffic between satellites and undersea cables. If the FCC makes certain that the satellite system will receive an appropriate share of the international traffic growth, the expansion of the Corporation's services through the global system will be assured, even with the loss of traffic between the mainland and the so-called "offshore" points, such as Hawaii and Puerto Rico.

But an increase in traffic will not enable us to sustain or increase our earnings from global system services if we must reduce our rates to the extent required by the FCC's rate decision of last December. As we have informed you, if that decision is placed into effect without significant modification, it will result, at least for several years, in annual net income lower than we have achieved in recent years.

The FCC's decision denies us the opportunity to recover the inevitable earnings' deficiency of our beginning years of operations. There was no possible way for the company to earn money from its inception: no satellites were built; no satellites were in the air; no business was at hand. And yet, obviously, had we not had that beginning period, there would be no satellite communication as we now know it.

The failure of the Commission to permit a reasonable return on our stockholders' investment seems to us extremely unfair. Therefore, we have petitioned the U.S. Court of Appeals for the District of Columbia Circuit to review the

decision, and we have filed a motion to stay the decision—that is, to prevent it from going into effect—until the completion of both the Court's review of the decision and any subsequent proceedings.

The FCC has delayed the filing date for the lower rates required by the decision until the Court has ruled on our motion to stay. Thus, these lower rates are not yet in effect. We cannot predict the outcome of the proceeding before the Court of Appeals, and since the matter is in litigation, it would be neither appropriate nor productive for us to speculate on how the rate question ultimately will be resolved.

Through COMSAT GENERAL Corporation, we have embarked on programs for several innovative uses of satellite technology. We have worked long and hard to develop these new programs, and we are pleased that two of them are under way.

We have successfully launched the first of our maritime satellites, called MARISAT, and COMSAT General has begun to receive revenues from the U. S. Navy for its services. COMSAT GENERAL's investment in the MARISAT program, in which it has an 86 percent interest, is expected to total about \$100 million. COMSAT GENERAL is actively exploring with the Navy the possibility of expanded use of the system by the Navy, and a strong effort is being made to develop a substantial market in the commercial shipping and offshore industries. The success of this initial maritime satellite program, in the business sense, will depend on the extent of the Navy's use of the system and on the degree to which commercial interests subscribe for the service.

The first COMSTAR satellite, leased to AT&T, is to be launched the day after tomorrow, and, assuming a successful launch, COMSAT General will soon



Corporate Secretary Robert B. Schwartz and Meryl Rosen of the Office of the Secretary, left, respond to an inquiry from Shareholder Lillian Levy. Director of Personnel David S. Nye chats with another shareholder in the background.

begin to receive lease payments from AT&T. (This satellite was launched successfully on May 13.) COMSAT GENERAL's investment in the COMSTAR program will total about \$185 million. If each of three operational satellites performs satisfactorily for its projected seven-year life, revenues in the program will total about \$330 million. Of course, operational expenses must be deducted from this revenue.

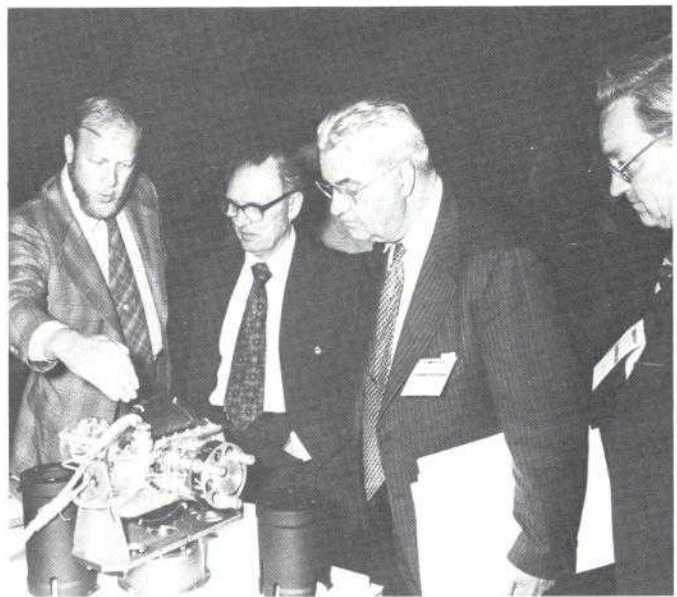
COMSAT GENERAL was selected, as we have previously announced, as the United States representative in a consortium for the establishment of an aeronautical satellite communications program known as AEROSAT. The selection of COMSAT GENERAL as the representative was made after extremely vigorous competition, and our staff is to be commended on winning the appointment. COMSAT GENERAL expects to invest about \$34 million in this project, and will lease satellite capacity to the Federal Aviation Administration, under a lease agreement currently being negotiated.

By far the most ambitious undertaking we have, however, is in our association in the Satellite Business Systems domestic satellite venture, referred to as SBS.

Our partners in this venture are IBM and Aetna Casualty and Surety Company. As I have said, this is a very ambitious program that will involve expenditures, over a few years, of several hundred million dollars, including funds invested by the partners and funds raised through outside financing. The SBS system applications are now pending before the FCC. If they are approved, and if the approval process is not protracted unduly, we expect that SBS's operations will begin in 1979.



A display of COMSTAR and INTELSAT IV-A models is described to shareholders by Allan Galfund of the Information Office.



Neil Helm of COMSAT Laboratories describes display equipment to interested shareholders.

Although this SBS venture, in our view, has very promising long-term prospects, the partnership, understandably, is sustaining, and will sustain, losses while the system and the business are being developed. These losses are being reflected in the operating results of the partners, including the consolidated operating results of this Corporation.

I am pleased to report that COMSAT is in a strong financial position. We expect that the Company will be in an even stronger financial position at the end of the 70's than it is today, and that, as the decade of the 80's dawns, we will have formidable financial resources to meet the challenges and to take advantage of the promising opportunities ahead.

Charyk (Continued from page 1)

The new INTELSAT IV-A satellites have a capacity to handle about 6,250 simultaneous telephone calls plus television, a capacity about two-thirds greater than the INTELSAT IV satellites. This large increase in capacity results primarily from the introduction of a new technology known as frequency reuse through beam separation. By means of satellite beam separation, geographically separated pairs of earth stations, operating through the INTELSAT IV-A satellite, can now use the same frequency at the same time.

Even as the new INTELSAT IV-A satellites enter service, plans are being made to meet global requirements of the early 1980's. It is expected that a contract will be signed later this year for the manufacture of the follow-on INTELSAT V satellites. These satellites will embody many technical innovations, and will have a

capacity of about 12,000 simultaneous telephone calls plus television.

It is indeed gratifying to be able to report that we are beginning to generate revenues from new services provided by COMSAT GENERAL.



Personnel's Mel Williams assists Shareholder Gladys Levy of Newark, Delaware, gather informational materials at the Annual Meeting.

The first of the maritime communications satellites in the MARISAT system was launched in February, and is stationed over the Atlantic Ocean. Service to the U. S. Navy began on March 25 through the portion of the satellite dedicated to that service. The initiation of service to customers other than the Navy—the commercial shipping and offshore industries—was delayed because of a technical problem in the commercial portion of the satellite. Various actions were taken to diagnose and correct the difficulty. Since that time, the commercial service portion of the satellite has been performing satisfactorily. Accordingly, while continuing to monitor the performance, we are planning to initiate commercial service on July 1. A second MARISAT satellite, to serve the Navy and other customers in the Pacific Ocean region, is scheduled for launch later this spring. (It was launched successfully on June 9 and is expected to enter service in July.)

The MARISAT system opens a new era in maritime communications. It represents the most significant advance in maritime communications since the introduction of the Marconi wireless at the turn of the century. Ships and offshore facilities in remote areas can be reached easily, reliably and speedily from company offices through earth stations on the east and west coasts.

Although the U.S. Navy will be the major user of the MARISAT system in the earlier years of the operation of the system, COMSAT GENERAL is carrying out a vigorous marketing program to provide maritime communications services to the commercial shipping and offshore industries. It is also exploring a number of ways to provide follow-on services to maritime customers after the present satellites will

have completed their service lifetimes, which we estimate to be five years.

COMSAT and COMSAT GENERAL are represented on the U.S. delegation to an intergovernmental conference negotiating agreements to establish an International Maritime Communications Satellite Organization, known as INMARSAT. INMARSAT is being patterned much along the lines of INTELSAT. Negotiation of the INMARSAT agreements is nearing conclusion, and we expect to have a significant interest in this venture.

We are also making progress in the provision of satellite services for domestic U.S. communications through two of COMSAT GENERAL's domestic satellite programs. One of these programs involves the lease of three COMSTAR satellites to AT&T for integration into the nationwide communications network. The first of the COMSTAR satellites is now scheduled for launch on Thursday of this week, and the second COMSTAR satellite is scheduled for launch in July of this year. Launch of the third satellite will follow toward the end of the 1970's. (See previous Editor's note.)

The COMSTAR satellites incorporate a technique known as cross polarization which permits reuse of the same frequency bands. This technique virtually doubles the capacity of a satellite by making more efficient use of the frequency spectrum.

The other domestic program involves construction of a unique domestic satellite system by Satellite Business Systems. SBS has filed system applications with the FCC seeking authorization to establish an all-digital domestic satellite system principally to serve large commercial, industrial and governmental customers. By using satellites that operate in the 12 and 14 gigahertz frequencies, rather than the conventional 4 and 6 gigahertz frequencies now shared by commercial satellites and terrestrial systems, SBS's



Two young visitors show considerable interest in the COMSAT Labs display in the lobby of the Sheraton National, site of the Shareholders' 13th Annual Meeting.

proposed system would permit a customer with geographically dispersed locations, using small earth stations at each location, to combine voice, data and image communications into a single, integrated, all-digital, private-line, switched-

network. If the SBS applications are approved in a timely manner, operations could begin in 1979.

The AEROSAT program is also targeted for 1979. AEROSAT is an intergovernmental program in which the U.S. Federal Aviation Administration (FAA), the European Space Agency and the Government of Canada will test and evaluate the use of satellites for communications with aircraft flying transoceanic routes. COMSAT GENERAL, the European Space Agency and the Canadian Government have entered into a joint venture to provide the space segment for this program. COMSAT GENERAL will lease its share of satellite capacity to the FAA. **It is expected that a contract for the manufacture of two aeronautical satellites will be awarded in November and that the first of the satellites will be launched in 1979.**

From this brief report on the status of our programs, it is apparent that all of our communications services are based on technological innovations associated with the Corporation's research and engineering efforts. In 1976, for example, COMSAT Laboratories spent approximately \$15 million for research, development and engineering support activities on behalf of INTELSAT, COMSAT and COMSAT GENERAL. Such investment has made a significant contribution to the advanced systems of today, and to those of the future. The new nickel-hydrogen battery and nonreflecting solar cell developed by the Laboratories will significantly increase the power of future satellites while reducing the in-orbit weight of power sources. Both of these components will be operationally tested on the Naval Research Laboratory Satellite (NTS-2) to be launched this year.

Ongoing research and testing of the effects of weather interference on transmission in the 12 and 14 gigahertz frequencies, the development of advanced digital transmission techniques, the "miniaturization" of earth stations and further increases in satellite power will eventually contribute to the economical availability of all-digital and other advanced satellite systems of the future.

Johnson elected to Board by Shareholders; eleven incumbents reelected

John A. Johnson was elected to the Board of Directors of Communications Satellite Corporation at the 13th annual meeting of COMSAT shareholders on May 11, 1976. It is Mr. Johnson's first term on the Board. He is President of COMSAT GENERAL Corporation, the wholly owned subsidiary.

The following 11 incumbent Directors were reelected: Joseph V. Charyk (President of COMSAT), Gordon Edwards, William W. Haggerty, John D. Harper, George L.

Killion, Melvin R. Laird, Joseph H. McConnell (Chairman of the COMSAT Board of Directors), Rudolph A. Peterson, Bruce G. Sundlun, Leo D. Welch and William L. Zimmer III.

Two other Directors, Frederic G. Donner and George Meany, are serving by appointment of the President of the United States.

All Directors were present for the meeting except Mr. Harper who suffered a broken leg several days earlier.

The shareholders reappointed the

Centimeter Wave Beacons, developed by the Laboratories, also have been installed on the COMSTAR satellites. These beacons will be used to obtain weather interference data for use in the even higher frequencies—those in the 19 and 28 gigahertz ranges. Use of these frequencies will make additional bandwidth available and will permit the use of advanced frequency reuse techniques that will result in immense increases in satellite communications capacity and flexibility.

Under the clearcut policies embodied in the Communications Satellite Act of 1962 and the INTELSAT agreements, the satellite has revolutionized world communications in a very short period. Over a hundred countries, territories and possessions are now using satellite services full-time. A major portion of all international communications and more than two-thirds of all transoceanic communications are going by satellite. Over a billion people, one out of every four on earth, can see events of international interest on television, "Live via Satellite." The cost of a telephone call from New York to London is 55 percent lower than it was before the EARLY BIRD satellite entered service in 1965, and the cost of a one-hour television transmission between New York and Paris is 80 percent lower than the charge that was established when EARLY BIRD first made possible live TV transmission across the Atlantic Ocean.

The benefits of satellite technology, however, need not be confined to public international communications. They apply to domestic U.S., maritime, aeronautical and other services, as well. Progress in the development of these services has been slow and, in many instances, exceedingly complex. Thus, there still remains an overriding requirement to devise institutional arrangements and regulatory procedures which will foster, rather than retard, the development of new satellite systems and services. Otherwise, realization of the full benefits of satellite technology will be delayed unnecessarily.

firm of Haskins & Sells as COMSAT's independent public accountants for 1976.

The shareholders also defeated a proposal by a shareholder to prohibit a director from standing for reelection "if he or she has been absent from the annual shareholders meeting for more than two years in succession with the exception of illness."

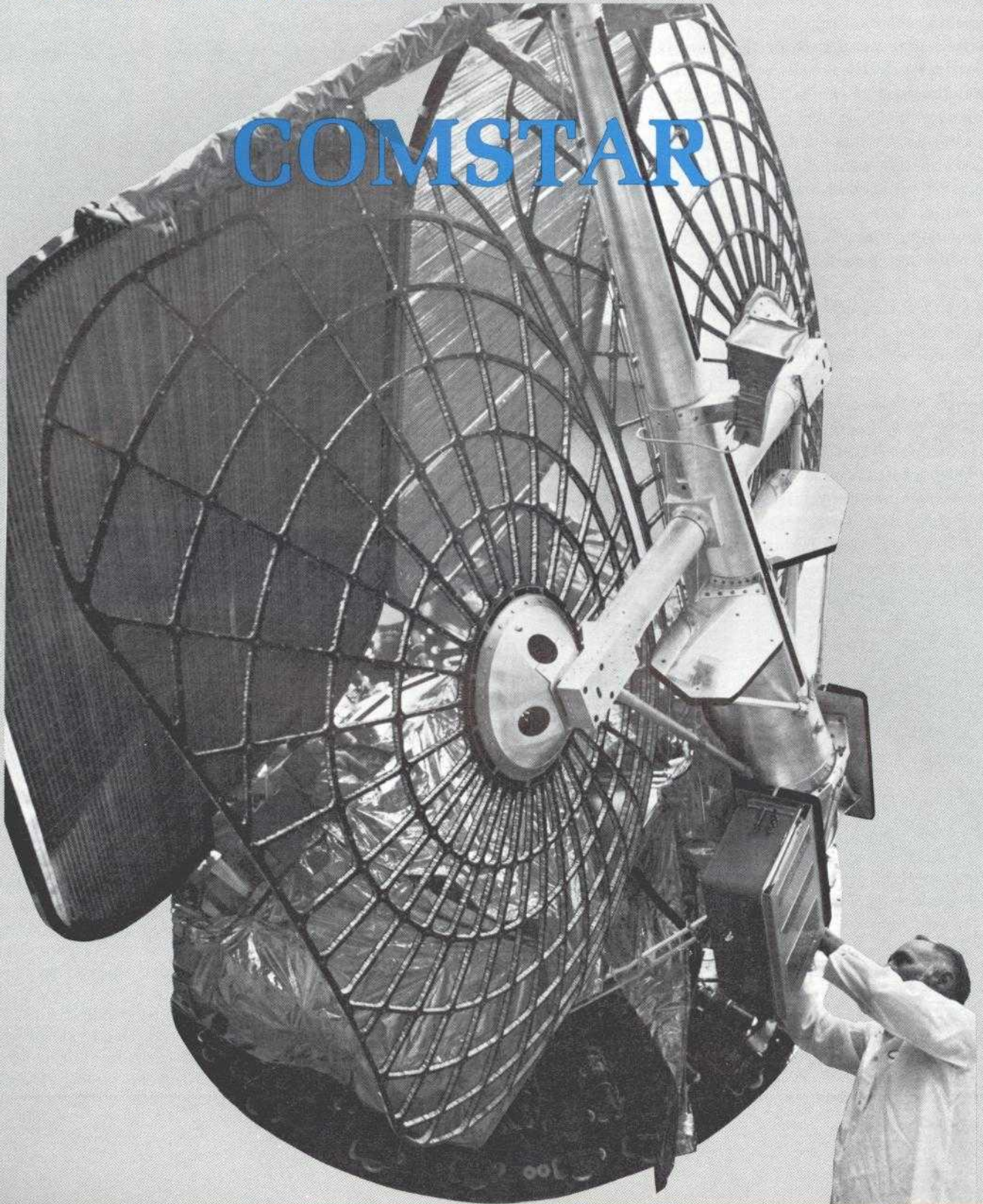
About 100 shareholders and guests attended the meeting, held in the Sheraton National Hotel, Arlington, Virginia.

As part of the Centennial Exposition in Philadelphia in 1876, Alexander Graham Bell exhibited his invention, an invention which would have an impact on the course of history—the telephone.

One hundred years later, as the Nation celebrates its Bicentennial, COMSAT continues in the vein of Inventor Bell, contributing significantly through its engineering expertise to the advancement of communications technology.

This is the story of one of these technological advances in this Bicentennial Year, the story of COMSAT GENERAL'S . . .

COMSTAR



BY DANIEL N. CRAMPTON

IN 1915 Alexander Graham Bell spoke into an exact replica of his original telephone and repeated his famous directive: "Mr. Watson, come here. I want you." As before, Bell's assistant was listening at the other end—but this time not in a nearby room.

Dr. Watson was 3,000 miles away in San Francisco. Bell was talking to him from New York. Together, they were inaugurating the first trans-continental telephone line. Stretching between them coast to coast were four copper wires strung along 130,000 telephone poles.

This summer will mark another "first" in long-distance telephone communications. Calls between such cities as New York and San Francisco will travel by COMSTAR, the first domestic satellite system to be integrated into the nation's message telephone network.

When service begins in July, many Americans will get their first chance to talk by satellite on a regular basis. Someone living in Atlanta, for example, who rings up his great-aunt in Eureka, California, is likely to have

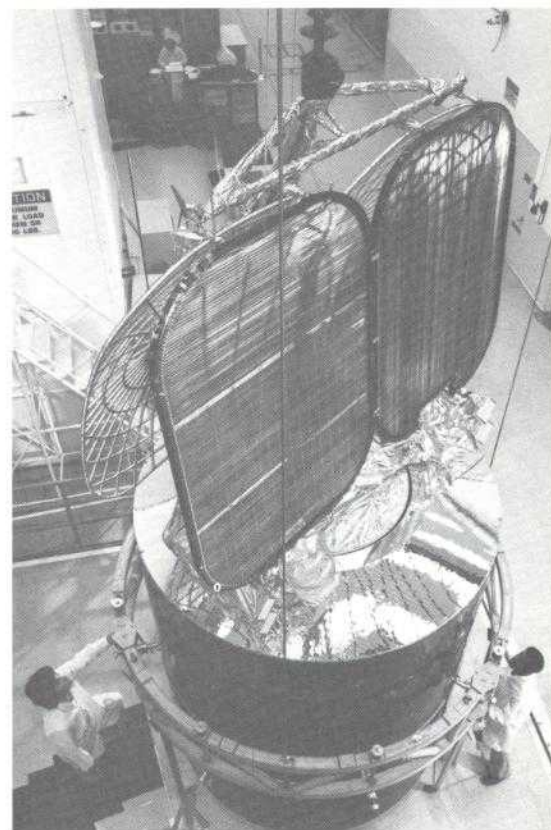
his cross-country birthday greeting relayed by a small drum of electronic equipment floating thousands of miles in space.

Until now, ordinary long-distance calls could not go this route. The two other U.S. domestic satellite systems supply voice circuits only to private-line customers and not to regular telephone subscribers.

But with the flawless launch on May 13 of COMSAT GENERAL's first COMSTAR, a portion of all message telephone calls between points in the continental U.S. will soon go by domestic satellite for the first time.

Positioned 22,240 miles above the equator at 128 degrees West Longitude, COMSTAR is able to "see" all 50 states plus Puerto Rico. This summer it initiates service to the continental 48 states and Hawaii.

COMSAT GENERAL owns and operates the satellites in the COMSTAR System, as well as the Tracking, Telemetry and Command (TT&C) earth stations at Southbury, Connecticut, and Santa Paula, California, and the System Control Center (SCC) in Washington, D.C.



The fan-like cross-polarized antennas atop the COMSTAR satellite.

When completed, the COMSTAR network will include three spacecraft in orbit, one of which will serve as a backup. Each COMSTAR will be boosted into a synchronous orbit so that it hovers over the same spot on the earth's surface.

The first COMSTAR is above the Pacific Ocean and over the equator roughly on a line south of San Francisco. The second is slated for launch on July 22, and the third in 1978. This timetable permits the system to have full in-orbit redundancy at an early stage and also in the late 70s and early 80s when the volume of communications traffic is expected to climb sharply. A fourth COMSTAR satellite is being built to serve as a ground spare.

American Telephone and Telegraph Company (AT&T) has leased from COMSAT GENERAL the full capacity of three in-orbit COMSTARS, each for seven years starting from the time it enters service.

Mr. Crampton is a Writer in the Office of Public Information



Robert D. Briskman, right, an Assistant Vice President and Director of the COMSTAR Program for COMSAT General, explains telemetry data to AT&T and GSAT guests in Hangar AM at Cape Canaveral a few hours before launch.

COMSTAR Spacecraft

EACH OF THE Hughes-built COMSTARs is 20 feet tall, 8 feet in diameter and weighs 3,347 pounds before liftoff. Each can carry the equivalent of at least 14,400 high-quality telephone conversations.

On board the satellite are 24 transponders, the units which amplify signals and transmit them back to earth. The transponders can accept signals in either analog or digital modes, and each has the capacity for 600 telephone circuits, or a high-quality color television channel, or digital data streams of about 48 megabits per second.

The COMSTAR satellite employs an advanced technological concept—frequency reuse by means of cross polarization—to double the satellite's capacity. Twelve transponders operate with a vertically polarized antenna; the other 12 with one horizontally polarized. Earth stations use a unique feed to maintain a high level of isolation between the two polarizations.

The resulting 90-degree separation is sufficient to prevent two signals on the same frequency from interfering with each other, thereby permitting the frequency bands to be used twice.

The COMSTAR is perhaps the most flexible satellite yet to be orbited. Six of the satellite's transponders can be switched from coverage of the 48 con-

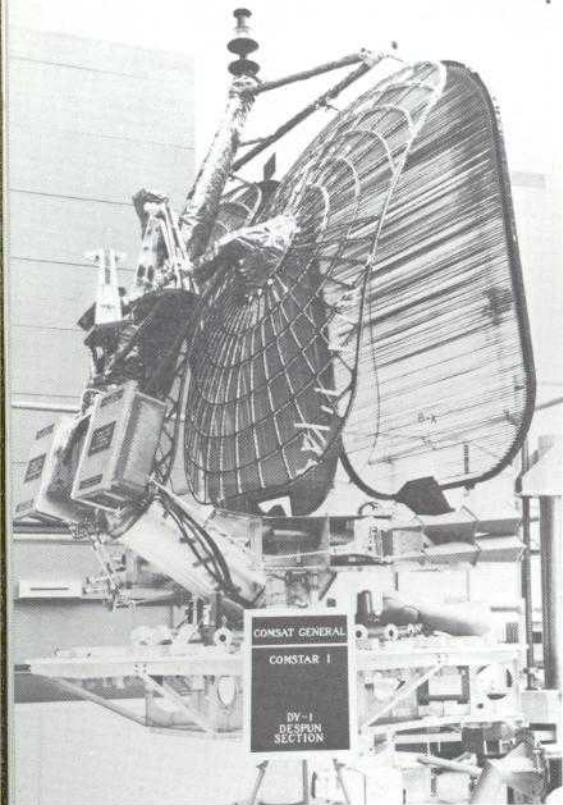
tiguous states to Hawaii. Another six transponders can be switched to cover Alaska alone, or the contiguous 48 states and Alaska together. Still another six can be switched to cover Puerto Rico. And all of this can be done instantly as ground commands activate on-board equipment.

The COMSTAR's antennas have one beam which takes in all of the contiguous 48 states, and three spot beams capable of serving Hawaii, Puerto Rico and Alaska. The power radiated from each of the transponders toward these locations is over 2,000 watts.

Satellite Control

TO CONTROL the satellites in orbit, COMSAT GENERAL provides tracking, telemetry, command and monitoring services through its ground stations at Southbury, Connecticut, and Santa Paula, California. Each station has a 42-foot diameter antenna and a 34-foot diameter non-tracking antenna serving COMSTAR.

The nerve center of the COMSTAR operation is the System Control Center at COMSAT headquarters in Washington, D.C. Telemetry data collected by the Southbury and Santa Paula stations are continuously fed into the Center to check on the "health" of the COMSTAR satellites. The Center monitors such "vital signs" as temperature inside the spacecraft, spin rate and battery voltage. It also uses ranging



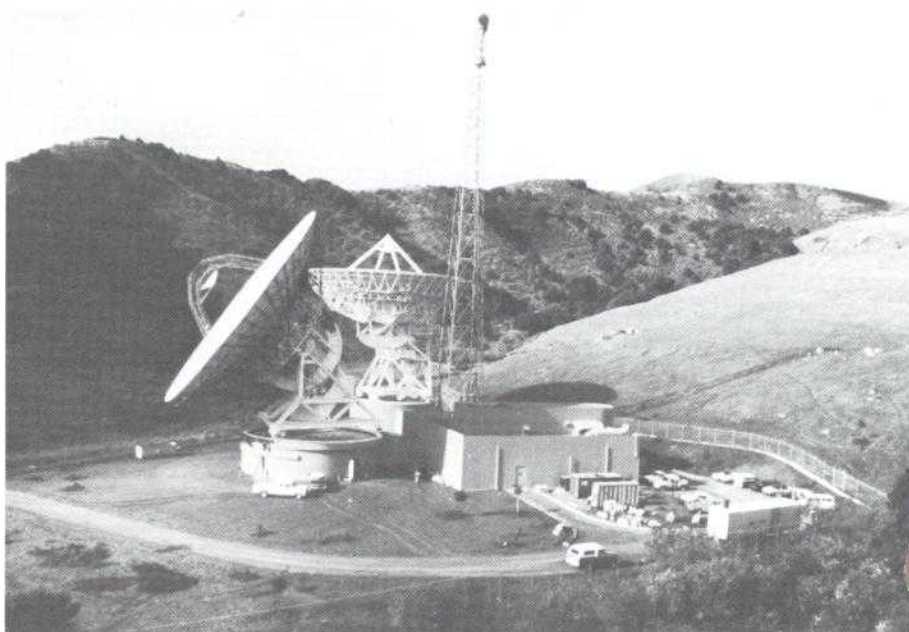
The 19 and 28 GHz beacons astride the antenna mast.

AT&T and GTE Satellite Corporation (GSAT), a subsidiary of General Telephone & Electronics Corporation, will use the capacity of the COMSTAR satellites jointly.

Earth stations have been built or are under construction at seven locations around the country. AT&T owns and operates four of them. GSAT owns and will operate three.

In approving this joint arrangement, the Federal Communications Commission (FCC) authorized AT&T and GSAT to provide domestic Message Telephone Toll (MTT), Wide Area Telephone Service (WATS), and Government Private Line Service. Data, TV and private-line services to non-governmental customers within the contiguous 48 states cannot be offered during the first three years of operations. However, the full range of satellite services can begin immediately to offshore U.S. points.

By adding satellite transmission to existing microwave radio relay and coaxial cable, AT&T and GSAT intend to bring a new flexibility and diversity to the nation's telephone network.



AT&T's earth station at Three Peaks, California, near San Francisco.

and tracking data relayed from the stations to determine the spacecraft's orbital position and attitude. Based on this information, the Center can initiate commands to activate electronic components in the satellite or maneuver it in orbit for stationkeeping purposes.

AT&T and GSAT Earth Stations

TO SEND and receive signals from the COMSTAR satellites, AT&T has constructed four earth stations, each located near one of the Bell System's major regional switching centers. The four stations are at Hawley, Pennsylvania, near Scranton; Hanover, Illinois, outside Chicago; Woodbury, Georgia, near Atlanta; and Three Peaks, California, north of San Francisco.

At each site are 98-foot diameter antennas pointed at the satellite. And connecting the earth station to the nation's ground communications network are newly built microwave links.

GSAT will have three earth stations working with the COMSTARS, one at Triunfo Pass, California, near Los Angeles, another at Homosassa, Florida, near Tampa, and a third at Sunset, Hawaii. Each of these sites is in or near the operating territories of three GTE subsidiaries: General Telephone Company of California, General Telephone Company of Florida, and the Hawaiian Telephone Company.

Situated 30 miles north of Honolulu, GSAT's Sunset earth station adjoins the COMSAT Paumalu earth station and will use one of the Paumalu antennas as a backup for its own.

The Sunset station will carry all Hawaiian domestic traffic starting in July. COMSAT's Paumalu station, however, will continue to process all Hawaiian international communications traffic via the INTELSAT satellites of the global system.

GSAT's Triunfo Pass antennas will start sending and receiving signals on January 1, 1977; GSAT's Homosassa station will begin operations in March 1977.

Centimeter Wave Beacons

THE COMSTAR satellites will participate in an experiment to test space-to-earth signal propagation at superhigh radio frequencies. On board each spacecraft are beacons

which transmit signals at 19 and 28 GHz.

Present satellites receive signals at 6 GHz and transmit them at 4 GHz. But because these frequencies are becoming overcrowded and new frequencies above 10 GHz have been approved for satellites, communications spacecraft of the future will most likely operate in the higher ranges where greater bandwidth is available.

But signals traveling at frequencies above 10 GHz—unlike those at 4 and 6 GHz—are subject to weather interference. Therefore, to permit attenuation, depolarization and phase coherence to be studied at these higher frequencies, transmitters on the COMSTAR will continuously send out signals at 19 and 28 GHz with over

COMSTAR Investment

ONCE COMPLETED, the COMSTAR satellites and earth stations will represent a total investment of approximately \$262 million. COMSAT GENERAL's estimated investment in the space segment is \$185 million. AT&T's projected earth station investment is \$43 million, and GSAT's is \$34 million.

If each of the three satellites performs satisfactorily over its seven-year service life, it is expected that COMSAT GENERAL will receive revenues of approximately \$327 million from lease payments made by AT&T.

ACENTURY AGO, amid the hoopla of the nation's Centennial Exhibition in Philadelphia, Bell's new invention was displayed. It was



COMSAT General's System Control Center in Washington, D.C., the "nerve center" of the COMSTAR System.

2,000 watts of effective radiated power.

COMSAT Laboratories designed and built the solid-state beacons, which use an IMPATT amplifier as a transmitter. This is the first time that a superhigh radio frequency beam of of such power has been sent from space using all solid-state equipment.

It is hoped that the data collected from this experiment will be helpful in designing future satellite systems, particularly those beaming to hundreds of small, inexpensive ground antennas.

ignored by the average visitor who was drawn instead to flashier exhibits like the Krupp Cannon and the giant Corliss Engine.

This July, amid the fireworks and Bicentennial ballyhoo, a third domestic communications satellite system starts service. The telephone user whose call is routed through the skies will not detect anything out of the ordinary. Yet, in the long run, the domestic satellite may have as revolutionary an impact on communications in this country as Bell's instrument had during its first 100 years.



When you visit Cocoa Beach, Florida, as often as Al McCaskill and Fred Ormsby of COMSAT's launch team do, you become familiar figures. The management of the Howard Johnson Motel, where Al and Fred usually stay, decided to recognize the two regulars, surprising them with an announcement on their return on the marquee. Not shown is the announcement on the opposite side of the marquee which, according to Al and Fred, is completely irrelevant: "Special rates for retired persons."

COMSTAR's day at the Cape

BY J. T. MCKENNA

If you're really curious about the communications satellite business, you must see at first hand the amount of preparation and attention to detail that goes into readying a satellite and its launch vehicle for liftoff.

When put together, a satellite is a marvelous and expensive piece of electronics. However, it doesn't begin to pay for itself until propelled successfully into the desired orbit.

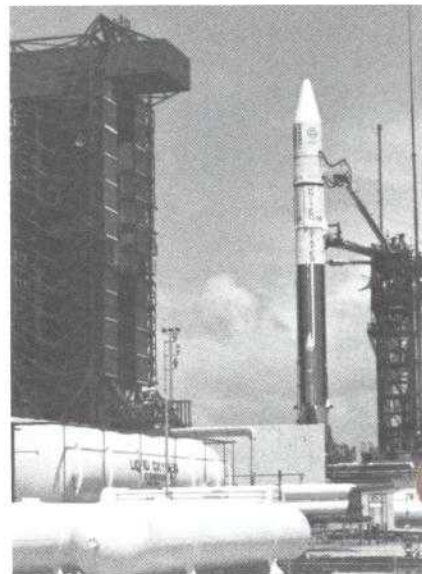
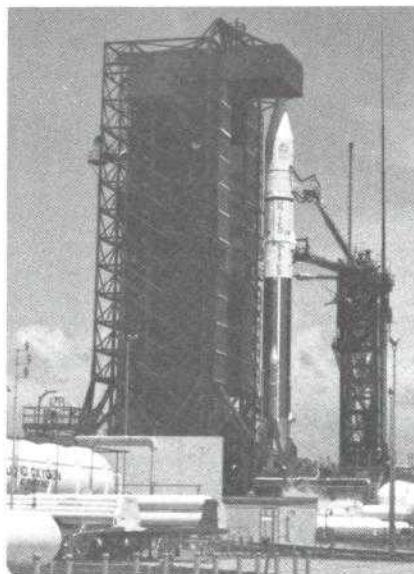
To see how the launch process works, you should visit Complex 36, at Cape Canaveral, Florida. Men and machines work together around the clock, checking and rechecking the white and silver Atlas/Centaur rocket, standing some 134 feet high.

From the base of the complex you can see very little of the launch vehicle. Rocket Number 38 is enclosed

The metal gantry enveloping the 134-foot launch vehicle with its satellite payload is rolled back approximately three hours prior to liftoff.



Frederick N. Ormsby of COMSAT's Launch Services Division, left, and Sidney Metzger, Assistant Vice President and COMSAT Chief Scientist, brief Radio Station WGMS Staff Announcer Renee Channey and James T. McKenna of the Information Office on the role of the Atlas/Centaur in the pending COMSTAR launch.



in a huge red metal gantry from which the launch crew is able to examine, check, prepare and make any necessary adjustments to the vehicle prior to launch.

Atop the launch vehicle is the payload, for this launch, the COMSTAR communications satellite. A pure white shroud covers the satellite to protect it from the atmospheric heating encountered on its way into space.

Approaching the first level of the launch pad you become aware of the immense power and size of the silver vehicle rising before you. The lower portion of the 13-story rocket, the Atlas section, is a thin, pressurized stainless steel cylinder with three powerful engines which, when ignited, will lift the rocket and its COMSTAR payload off the pad and into space. As you walk around the first level of the gantry you see two rugged yellow steel hold-down clamps and two stabilization struts used to maintain the vehicle in an upright position. At launch, the two hold-down clamps fly back from the thrust of the rocket's engines, releasing the vehicle to propel its payload into space.

As the gantry elevator travels upward, white-clothed technicians are everywhere, checking cables, wires

The first COMSTAR satellite is propelled into space from Complex 36 at Cape Canaveral and quickly disappears from sight.



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and instruments, all of which must function properly if the launch vehicle and its 3,300-pound payload of communications electronics is to reach space successfully.

When you leave the elevator at the peak of the gantry, the top section of the rocket with two-foot vertical letters spelling "COMSAT GENERAL" down the side of the shroud, becomes visible. Under the shroud is the \$23 million satellite secured to the frame of the Centaur and ready for its 22,000 mile ride into space. The split barrel at the base of the shroud has three large canvas panels which serve as access doors and allow the observer



a glimpse of the satellite. On launch day these canvas panels are removed and metal plates are bolted in place to protect the satellite from environmental hazards during liftoff. Beneath the satellite, wires and cables stretch out in every imaginable direction, carrying information to be checked by men and computers in the blockhouse some 130 feet below and 1,000 feet away.

All the activity on the launch pad is monitored in the blockhouse, a windowless, fortified building, circular in shape, constructed of cement and cinderblock, which provides the launch crew protection from the noise, light and thrust of the rocket's blast during liftoff.

Inside, video monitors, computer equipment and a submarine-type periscope allow launch personnel to observe the rocket and the surrounding



area as well as to monitor the countdown to insure that the rocket is ready for launch.

The launch day schedule calls for the monstrous red gantry to roll back from the rocket at 2:40 p.m. The rollback begins right on schedule and within 20 minutes the rocket is free of its red metal wrap and stands alone on the pad. As a precautionary measure, everyone except the blockhouse crew is moved beyond a three-mile perimeter of the launch pad prior to launch in the event of a failure during liftoff.

At 5:30 p.m. the countdown is proceeding on schedule and everything looks good. Liquid oxygen (LOX) vapors stream along the side of the rocket as the LOX tanks are being topped off. The only concern now is the weather. Thunderstorms in the area are being analyzed to determine their effect on the flight of the vehicle. After a 23-minute weather delay, the decision is made to "go" for liftoff.

The countdown resumes, and at 6:28 p.m., the mighty Atlas engines ignite; flames shoot out in all directions from the base of the launch pad. Within seconds the rocket has cleared the pad, carrying the first COMSTAR on its way into space.

Visually, it is all over within a matter of seconds. We proceed to the Mission Director's Center to follow the performance of the Atlas/Centaur and the COMSTAR satellite from data received from tracking stations. All goes well, and 28 minutes after liftoff, the satellite separates from the rocket and coasts alone in space. The rocket has done its job well.

Mr. McKenna is a COMSAT Information Officer

21st INTELSAT Board gives go-ahead to MSC to negotiate draft INTELSAT V contracts with Aeronutronic Ford and Hughes

The Twenty-first Meeting of the INTELSAT Board of Governors was held in May in The Hague, hosted by the Netherlands Post Telegraph and Telephone Administration (PTT). With the accession of the United Arab Emirates, INTELSAT now has 94 members. The Board instructed the Management Services Contractor to negotiate draft INTELSAT V contracts with Aeronutronic Ford and Hughes Aircraft Company for their body-stabilized satellite designs. Among its other actions the Board:

Technical and Operational Matters

- Decided to plan for three INTELSAT IV-A satellites in orbit by end 1977 in the Atlantic Region, noting that this will not require procurement of additional INTELSAT IV-A satellites.
- Decided to maintain for planning purposes the objective of having the first INTELSAT V satellite available for operation in the Atlantic Region by the third quarter of 1979.
- Decided that in planning for future facilities maximum use shall be made of available and planned resources.
- Instructed the Management Services Contractor to prepare for the next meeting a study of the operational plan for the INTELSAT IV, IV-A and V satellites in all three ocean regions, using more realistic elements as stated by the Board. The Board decided that the Atlantic Region study shall include: a primary, major path and spare satellite, which may be an operational spare, plus residual satellites of the previous design; use of earth stations which can reasonably be expected to be available based on information from Signatories; various elements of via routing and diversity ratios; and analysis of the availability of capacity to conduct TDMA field trials and dual polarization measurements. The Board decided that for the Indian Ocean Region a configuration of primary and spare

satellite should be studied to determine the operational plan, using increased steerability of the INTELSAT V 14/11-GHz east beam, offloading traffic to an Atlantic INTELSAT V at 340.5 degrees East Longitude, and the possible application of operational TDMA/DSI. The Board decided that the study shall include for the Pacific Region an operational plan for INTELSAT IV and IV-A satellites operating in a primary and spare configuration.

- Instructed the Management Services Contractor to include in the INTELSAT V contract negotiations the requirement for increased steerability of the 14/11-GHz beam and the specified performance for a satellite at 340.5 degrees E. Longitude.

- Approved specifications for Standard B earth stations of 31.7 G/T using SCPC/PSK, and revised specifications for Standard A stations. Specifications for Standard B stations using SCPC/FM will be considered after further study by the Advisory Committee on Technical Matters.

- Established a rate adjustment factor of 1.5 for Standard B stations providing telephony service and decided that normal rates will apply for television, except where the normal form of service is half-transponder television and full-transponder television is requested. In this case the charge at each end will be as for two television half channels. Associated audio will be charged at 2.5 times the normal rate. The 1.5 rate adjustment factor will be reviewed after experience has been gained regarding the impact of Standard B stations on the system.

- Decided that the procedures for approval, verification and control of Standard A stations shall also be applied to Standard B stations.

- Decided that future applications for continuing access by non-standard stations using FDM/FM for global telecommunications services will not be approved unless the applicants agree to convert to Standard B operation by no later than June 30, 1977.

- Requested the Management Ser-

vices Contractor after consultation with the Executive Organ to discuss with officials of Mauritius, the Philippines and the U.K. their operational plans and willingness to convert the Port Louis (Mauritius), Ascension Island (U.K.) and Cagayan de Sulu (Philippines) stations respectively to operation as Standard B stations.

- Decided that the Nauru station, which had been approved on the condition that the Board could require conversion to an SCPC mode of operation as of December 16, 1978, would be required to do so, and requested the Management Services Contractor to consult with Nauru on the possibilities of converting to Standard B operation before December of 1978.

- Requested the Management Services Contractor to consult with Liberia on its plans for installation of a Standard A antenna or converting to Standard B operation before the end of 1978, the time which had been specified for such action when the station was approved for access.

- Requested that the U.S. be consulted on NASA's plans for continued use of the Vanguard ship antenna and the possibility of converting the station to SCPC operation.

- Approved the Sanaa (Yemen), Blantyre (Malawi) and Christmas Island (U.K.) stations with the conditions that the stations convert to SCPC operation by June 30, 1977, and that the rate adjustment factor for telephony service until that time will be 2.5. Approved the Yamaguchi (Japan) station for continued access to the space segment free of charge in order to conduct depolarization experiments.

- Approved in principle requests from Nigeria and the Sudan for the lease, subject to preemption, of one spare transponder each in an Indian Ocean Region satellite to meet their respective domestic public communications requirements, and authorized the preparation of allotment agreements. This will be Nigeria's third leased transponder.

The preceding report was prepared by Ellen D. Hoff, International Affairs, U.S. INTELSAT Division.

(Continued on page 25)

Colino/Mtz.-Villarejo elected Chairman and Vice Chairman INTELSAT Board of Governors



José Mtz.-Villarejo
Spain

Richard R. Colino of the United States and José Mtz.-Villarejo of Spain were unanimously elected Chairman and Vice Chairman, respectively, of the INTELSAT Board of Governors, for one-year terms beginning May 27.

Representatives of 68 of INTELSAT's 93 member countries participated in the Fourth Meeting of Signatories held in April in Singapore. The delegates were welcomed by the Honorable Lim Kim San, Minister for Communications and National Development of the Government of Singapore.

COMSAT was represented by President Joseph V. Charyk; Mr. H. William Wood, Vice President, U.S. INTELSAT Division; and Mr. Richard R. Colino, Assistant Vice President, U.S. INTELSAT Division, who also attended the meeting in his capacity as Vice Chairman of the Board of Governors.

Mr. Goh Seng Kin, representative from the Telecommunications Authority of Singapore, was elected Chairman, and Mr. Harold White of the Overseas Telecommunications Commission (Australia) was elected Deputy Chairman. Elected as Vice

Mr. Colino succeeds Mr. William G. Geddes of the United Kingdom and Mr. Mtz.-Villarejo succeeds Mr. Colino.

Mr. Colino, the U.S. Governor on the Board, came to COMSAT in March 1965 and shortly thereafter became Director of the International Arrangements Division. Later the same year he was designated Alternate United States Representative to the ICSC. In 1968 he established the COMSAT European Office in Geneva, and served as its first Director until 1969 when he returned to Washington as Assistant Vice-President, International. In 1973 Mr. Colino was named U.S. Governor and in May of 1975 was elected Vice Chairman of the Board. In September of 1975 he assumed his present position as Assistant Vice President and Deputy Director, U.S. INTELSAT Division.

Widely published, his most recent publication is *The INTELSAT Definitive Arrangements: Ushering in a New Era in Satellite Communications*, published by the European

Broadcasting Union (EBU).

Mr. Mtz.-Villarejo, the Spanish Governor, has been a member of the Board and its predecessor, the ICSC, since 1972. He has served for five years as head of the Space Sector



Richard R. Colino
United States

of the National Telecommunications Company of Spain (CTNE). Prior to joining CTNE in 1971, he was Chief Engineer of the International Relations Division of ENTEL Spain. Mr. Mtz.-Villarejo holds the degree of Doctor Engineer of Telecommunications.

Signatories meet in Singapore; increase capital ceiling to \$900 million

Chairmen were Messrs. Correa de Mattos, Brazil (the Americas), Bjurel, Sweden (Western Europe), Vega, United Republic of Cameroon (Africa), and Sadfar, Saudi Arabia (Asia and Australasia).

The Meeting of Signatories adopted the recommendation by the Board of Governors that the capital ceiling of \$500 million presently in effect be increased to \$900 million, effective immediately. The Meeting of Signatories took this decision after having considered the Board's report on future programs and the estimated financial implications of such programs.

The Meeting of Signatories also determined that the minimum investment share entitling a Signatory or group of Signatories to representation on the Board of Governors will

be 1.251310 percent which is equal to the current investment share of the Signatory holding position 15 in the descending order of the investment shares of all Signatories.

At the request of the Signatories of Nigeria and Zaire and having considered the advice tendered by the Board of Governors, the Meeting of Signatories considered and approved their applications that their respective domestic public telecommunications services be considered on the same basis as international public telecommunications services pursuant to Article III (b) (ii) of the Agreement. This provision specifies that domestic public telecommunications services between areas between which the viable establishment of terrestrial wide-band

(Continued on next page)

Second MARISAT launched successfully; positioned over Pacific Ocean

The second MARISAT satellite for communications to ships at sea was launched from Complex 17A at Cape Canaveral, Florida, at 8:09 p.m. EDT on June 9.

The new MARISAT spacecraft was placed in near-synchronous orbit when its apogee motor was fired on June 11, during fifth apogee over the Pacific. The earth station at Paumalu, Hawaii executed the firing upon command from the COMSAT General Control Center in Washington, D.C.

The satellite is to be positioned in geostationary orbit at 22,240 miles (35,784 kilometers) above the Equator

at 176.5 degrees East Longitude over the mid-Pacific.

It is the second in the new maritime satellite system, MARISAT, designed to provide modern, high-quality communications to the U.S. Navy and the commercial shipping and offshore industries.

The first MARISAT satellite, now on station at 15 degrees West Longitude over the Atlantic Ocean, was successfully launched on February 19. Service was initiated to the U.S. Navy via this first satellite on March 25, and commercial service is scheduled for July 1.

With the launch of the second MARISAT satellite over the Pacific, full MARISAT System services via both satellites are planned this July for the U.S. Navy as well as commercial maritime interests.

For commercial users, the MARISAT System will be capable of providing telex, data and telephone communication to facilities equipped with appropriate terminals. The Atlantic satellite serves an area including the Atlantic Basin, western portions of the Indian Ocean and the Pacific Ocean off the west coast of South America. The Pacific satellite will serve the Pacific Basin, from the United States to the Malaysian Peninsula.

The MARISAT System includes shore stations at Southbury, Connecticut, for operation with the Atlantic satellite, and at Santa Paula, California, for operation with the Pacific satellite. These stations are interconnected with existing terrestrial public telephone and record/data communications networks. They also are linked with COMSAT GENERAL's System Control Center in Washington, D.C.

The system of satellites and shore stations is owned by four companies under a joint venture arrangement approved by the Federal Communications Commission (FCC). COMSAT GENERAL is a System Manager and principal owner, holding an 86.29 percent ownership interest.

The Pacific satellite was launched

by the National Aeronautics and Space Administration for COMSAT GENERAL on a Thor Delta 2914 launch vehicle. The space craft has a design life of five years. Overall height of the spacecraft is 12 ft., 6 in. (380 cm.); diameter, 7 ft., 1 in. (215 cm.); weight before liftoff, 1,445 pounds (654 kg.).

Three spacecraft have been procured for the MARISAT System, two for in-orbit use and a third as a spare. Prime contractor for the spacecraft is Hughes Aircraft Company. McDonnell Douglas Astronautics Company is prime contractor to NASA for the Delta launch vehicle. NASA is reimbursed for launch costs.

To use the system, ships and offshore facilities must be equipped with mobile terminals meeting rigid standards for operation with the MARISAT satellites.

To meet early demands for commercial service, COMSAT GENERAL designed and developed MARISAT terminal equipment, and has procured 200 units under a contract with Scientific-Atlanta, Inc. Shipowners and offshore operators can buy or lease these terminals through COMSAT GENERAL's company and agent marketing organization. A worldwide service network has been established to install and maintain these facilities. By the first of June, more than 20 commercial vessels had been equipped with COMSAT GENERAL MARISAT terminal facilities, and orders for additional terminals were being processed.

Men at sea today still depend primarily on radio telegraphy, slow "brass key" techniques using Morse Code. High and medium frequency radio transmissions on the high seas often are subject to severe fading and interference due to poor weather and ionospheric disturbances. Delays of many hours in the delivery of messages are discouragingly routine.

MARISAT has opened a new era in maritime communications. Ships and offshore facilities at sea can be linked to the world's telecommunications networks. Fast, modern, reliable communications—voice, record and data via satellite—will be available for the first time.

Telex messages can be printed out automatically aboard ship. Special capability has been built into the system for distress calls.

Signatories (Continued)

facilities is precluded shall be considered on the same basis as international public telecommunications services if the Meeting of Signatories so approves.

The Meeting of Signatories also considered a report from the Board of Governors on INTELSAT activities over the past year and the annual financial statement. As a consequence it decided to express its view that the Board should consider again at an early opportunity its decision not to establish formal relations with the International Telecommunication Union.

Finally, the Meeting of Signatories prepared and adopted its report to the Assembly of Parties and to the Parties on the implementation of general policies, the activities, and the long-term program of INTELSAT. The next ordinary meeting of the Assembly of Parties is scheduled to be held from 27 September to 1 October 1976 in Nairobi, Kenya.

The Fifth Meeting of Signatories is scheduled to take place in April 1977, in Sydney, Australia. The Sixth Meeting of Signatories is tentatively scheduled to be held in Teheran, Iran, in April 1978, at the invitation of that Signatory. The Eighth Meeting of Signatories is tentatively scheduled to be held in 1980 in Washington, D.C., at the invitation of the U.S. Signatory.

EARLY this year an INTELSAT IV-A spacecraft rocketed aloft carrying global antennas with dual circular polarization capability over two of its transponders, establishing a first in satellite communications. The spacecraft was the F-2; the transponders with the dual polarized capacity are Transponders 2 and 4.

The dual-polarized age brought with it the need for new in-orbit test procedures, and gave the Laboratories' Antenna Department the opportunity to join the in-orbit spacecraft acceptance test team in Paumalu, Hawaii.

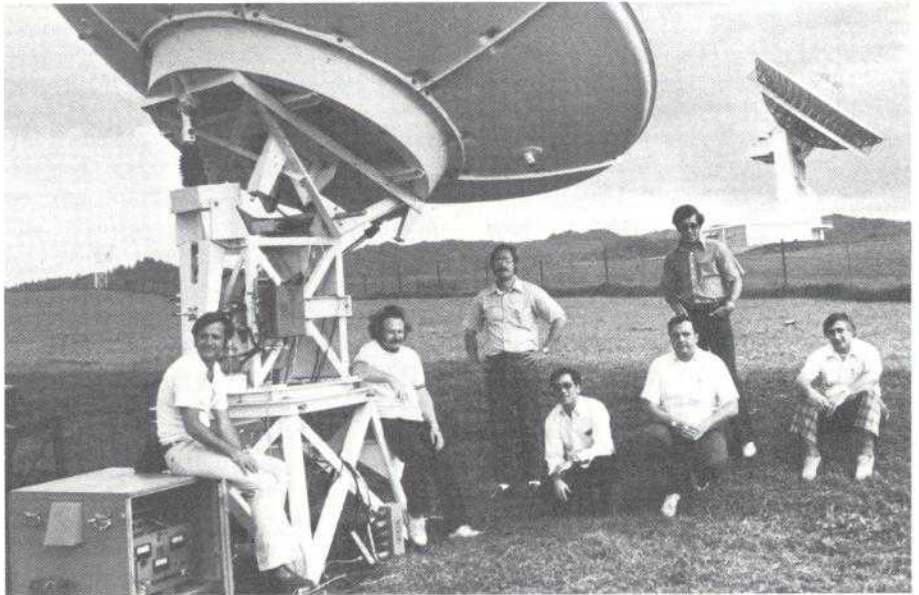
The polarization characteristics of the satellite global antennas were measured using a 15 foot-diameter polarization reference standard antenna system that was developed for INTELSAT by COMSAT Laboratories. This dual-polarized transportable antenna system is capable of radiating or receiving beams having all possible polarizations. To test the satellite antenna, the reference antenna polarization state is adjusted until it is orthogonal to that of the satellite antenna. This produces a null signal response on our monitoring equipment. This iterative adjustment of the polarization response to make the signal vanish has earned the test team members a special nickname, "the SUPERNULL team."

The results of our tests on the dual-polarized globals confirmed the truly excellent polarization quality of these antennas. Credit for successful development of these antennas belongs to Hughes Aircraft Company. The Antenna Department of the Labs provided the basis for the performance and measurement specifications of these dual-polarized global antennas.

To prove its effectiveness, we decided to demonstrate an immediate use for the dual-polarized satellite by using it as a signal source to measure the polarization isolation and patterns of the PAM-1 earth station antenna in Hawaii. A dual frequency/dual-polarized OMT (a device used to couple energy into and out of the feed waveguide) designed by Robert W. Gruner of the Labs was installed in the PAM-1 feed system along with a wideband polarizer that had been developed under INTELSAT

Labs "Supernull Team" completes IV-A dual polarization experiment

By W. J. ENGLISH, D. F. DiFONZO
AND W. TRACHTMAN



Members of the INTELSAT IV-A, F-2, polarization test team shown left to right are Fred Frey, Irv Dostis, Bill English, Ken Yamashita, Dan DiFonzo, Warren Trachtman and Ed Habib.

Contract by Nippon Electric Company, Tokyo, Japan. This hardware is representative of equipment that would be utilized in a dual-polarized frequency reuse earth station antenna system. This first set of historic antenna system measurements utilizing a dual-polarized satellite inaugurated a new era in the global satellite system.

Of course, not all of the trip involved taking data. We found a little time to do part of our "data analysis" on the beach at Waikiki, where Irv and Warren also tried to fend off the flu. Ed Habib managed to find just enough time to buy out the entire island's supply of souvenirs to take home, including several cases of pineapples. On the Sunday before we left, a group of us flew to the island of Hawaii where we took in the awesome beauty of the Volcanoes National Park.

Many people contributed substantially to the success of this program. It would be impossible to list all of them here but we would particularly like to thank the Model Shop, Drafting, and Shipping and Receiving Departments at the Labs. Glenn M.

Vinquist and his staff at Paumalu, particularly Kenneth K. Yamashita, and Joe M. Chow, also deserve special thanks for their invaluable assistance throughout our stay in Hawaii.

The INTELSAT IV-A Dual Polarization Experiment represents an important milestone in the evolution of satellite communications. For several years much of our work has been aimed at developing the antenna technology to make possible reuse of the same frequency bands on orthogonal polarizations. This technique will be used extensively on INTELSAT V and future generation satellites.

The COMSAT Labs test team which inaugurated this new series of tests consisted of team leader Daniel F. DiFonzo, William J. English, Warren Trachtman, and Frederick Frey. Irving Dostis, who has overall responsibility for satellite in-orbit tests, remained with us for our polarization measurements to coordinate activities with the spacecraft control center in Washington, D.C. Edmund J. Habib, who has coordinated various COMSAT efforts related to dual polarization, also joined us.

Joint effort brings news report from Rome for CBS

A recent message to L. W. Covert, Operations Center Manager, from Walt Munro, Director, Satellite TV Operations, Western Union International, is reprinted in its full context as an example of global communications cooperation and efficiency in accommodating worldwide news events.

This morning at approximately 1000 GMT, we were requested by CBS-NY to furnish them with satellite TV service from RAI Rome. We learned that Fucino Earth Station was down for maintenance as far as TV was concerned and tried to get the telecast routed via Raisting on EBU lines from Rome on very short notice. Happily, the telecast went on the air as scheduled and I want to take this opportunity to thank everyone concerned with the telecast for the excellent and professional manner

in which all parties performed.

Gordon Stock of CBS, operating from his home, gave us his instructions in a calm, efficient manner and exhibited extraordinary patience under the circumstances. Joe Kryston at ATT's New York test point took my order for landlines to Andover and local loops here in New York and promised "to do his best." Joe was the last person to hear about the telecast as it was necessary for us to get confirmation from EBU and Raisting that the program was possible. In a matter of minutes he had us patched up to Andover and the lines checked out with our control room.

Meanwhile, Mel Link of COMSAT was working with Raisting to get us lined up with Andover and Mel, as usual, performed his tasks in a very friendly and helpful way which made the job much easier for all concerned.

His advice and information were vital to the successful carrying out of the order. Our TV technician in the WUI TV control room called EBU by telex and received extraordinary cooperation and information from them. I'm sorry that I don't know the man's name who was on duty in Brussels but would like to tell Mr. Van Larebeke, who can probably find out who it was, that WUI thanks him very much for his excellent advice and prompt handling of our request. The same applies to the people at Raisting for their handling and coordinating with EBU.

Lastly, I must compliment our technician, John Mastromarino. When I called John at 1000 GMT, things didn't look too good as far as getting this telecast on the air. While I did a little work from my home, John carried the responsibility of getting to EBU and Servcentral by telex, lining up the audio and video with ATT, and generally keeping everyone informed of our progress. John has always been one of our best men in the TV room and I want his superiors to know that in my opinion his job this morning was above and beyond the responsibilities he is expected to assume.

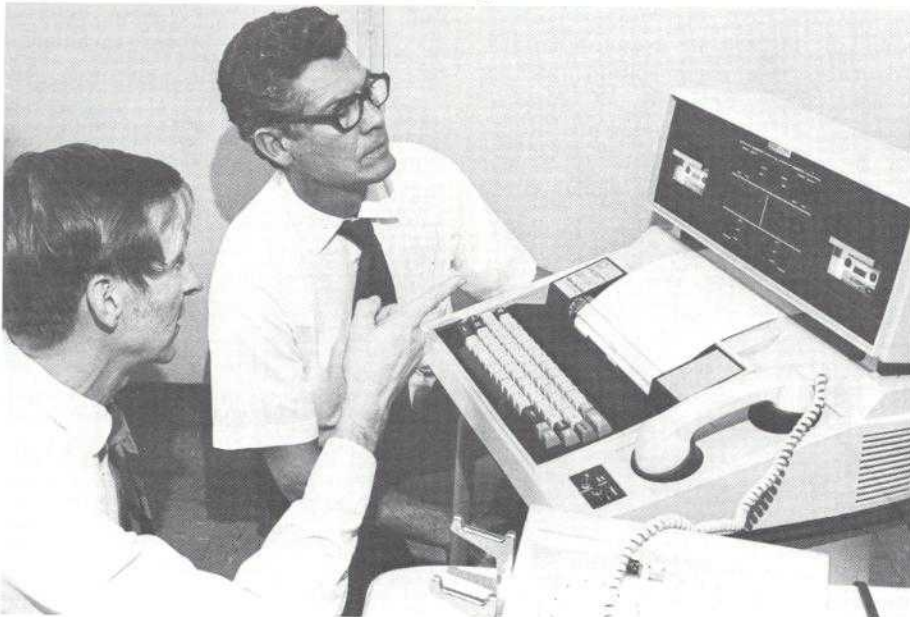
If I have overlooked anyone who had a hand in this event, please let me know. Speaking for WUI, we are extremely grateful for all the assistance we received this morning and it certainly makes working in this industry exciting and rewarding when you can work with real communications professionals.

U.S. earth station engineers attend meeting in Washington

Engineers from the U.S. earth stations were in Washington recently to attend the Earth Stations Engineers Meeting during which lectures scheduled to be given at the Earth Station Performance Seminar in Munich, Germany, were previewed.

Prior to arriving in Washington, the group visited the earth station at Etam, West Virginia, for a look at its new antenna and for discussions on maintenance concepts and problems, digital equipment and two-satellite operation.

Labs and Red Cross conduct experiment.



COMSAT Labs and the American Red Cross cooperate in an experimental hookup utilizing teleprinter and voice transmissions between Clarksburg and Washington over the Canadian Communications Technology Satellite (CTS). Joachim (Kim) Kaiser of the Labs (left) and Milford R. Fink, ARC Disaster Services Chief of Emergency Communications, carry out the test to familiarize Red Cross personnel with the operation of the communications system.



COMSAT Scholarship awarded

David M. Vollrath, 18 (left), son of Paumalu Senior Technician John W. Vollrath (right), accepts the 1976 COMSAT Scholarship from H. William Wood, Vice President, U.S. INTELSAT Division, during Mr. Wood's recent visit to the Hawaiian Earth Station. In accepting the award, David became the first child of a Paumalu station employee to receive the award since the start of the program. He also became the first graduate of the Waialua High School to be chosen by the National Merit Scholarship Corporation for the scholarship.

"World of Music" interview



Mr. Mohammad Mili, Secretary General of the International Telecommunication Union (ITU), is interviewed from his office in Geneva, Switzerland, by Washington Radio Station WGMS staff announcer Renee Channey for use on COMSAT's weekly program, "World of Music." Shown in picture with Mr. Mili is Roman I. Ulans, Director, COMSAT European Office.

Battle named Vice Chairman UN Day Committee

Lucius D. Battle, Senior Vice President, Corporate Affairs, has been named Vice Chairman of the 1976 National United Nations Day Committee by this year's UN Day Chairman, Edgar B. Speer, Chairman of the Board of Directors, United States Steel Corporation.

Mr. Speer, who was appointed by President Gerald R. Ford, is forming a committee of prominent American business and labor leaders to help direct this fall's United Nations Day Program across the country. The Program was launched at a dinner in New York City in late June under the chairmanship of John D. deButts, Chairman of the Board, American Telephone and Telegraph Company. UN Day is officially observed on Oc-

tober 24, the anniversary of the United Nations.

The committee was officially inaugurated at the gala dinner attended by approximately 2,000 committeemen and their guests. Prior to the dinner, committee members gathered at the UN for high level briefings by U.S. and UN officials on current international economic issues. A reception hosted by Secretary-General Kurt Waldheim followed.

UN Day is observed by millions of Americans every year under the leadership of the National UN Day Committee. The U.S. observance is designed to create better understanding and support for effective U.S. policies in the United Nations.

U. S. Geological Survey/COMSAT General cooperate in collecting environmental data

COMSAT GENERAL and the Water Resources Division of the U.S. Geological Survey (USGS), Department of Interior, have completed an agreement to conduct a six-month joint evaluation program on the use of satellite communications to transmit data from remote hydrological sensors to a central facility.

An application seeking developmental authority to proceed with the program has been filed with the Federal Communications Commission (FCC).

Under the evaluation program, COMSAT GENERAL will provide 11 small transmitting stations, called data collection platforms (DCPS). These DCPS, equipped with small antennas, will receive hydrological data from numerous USGS sensors and transmit this data in bursts via satellite to a central receive facility.

The remote DCPS, operating unattended on battery power, will be located near USGS sensors in the continental United States: five in the Pacific Northwest, five in Eastern Pennsylvania and one near the USGS Headquarters in Reston, Virginia.

Telesat Canada, which operates the existing ANIK satellite system, will

provide capacity in an ANIK satellite at no cost, and will simultaneously evaluate a similar data collection system using two DCPS supplied by COMSAT GENERAL along with specialized receive equipment to be installed in a Telesat earth station at Alan Park, Ontario.

The central receiving station for the U.S. will be at the existing COMSAT GENERAL earth station at Southbury, Connecticut. Data will be collected here, formatted and stored on magnetic tapes. This information can be accessed on-call by USGS via interconnecting terrestrial lines.

In its application to the FCC, COMSAT GENERAL said the program would provide an opportunity to evaluate collection of environmental data from remote locations by existing satellite facilities under operational conditions.

Subject to FCC approval, the program would begin late this year and be concluded in six months. COMSAT GENERAL and USGS will mutually exchange data with the Canadian participants. Upon completion of the developmental program, a report on results of the demonstration will be submitted to USGS and the FCC.

NOTES FROM PERSONNEL

Some questions and answers on the COMSAT Retirement Plan

BY MEL WILLIAMS

As the result of the recent ERISA memorandum regarding Employee Benefit Plans distributed recently, a number of questions have been raised, some of which I will try to clarify in this column.

How do I become a participant in the Corporation's Retirement Plan?

An employee is automatically enrolled in the Plan the first day of the month following his or her employment date. However, if employed on the first day of the month, participation starts that day.

I have been with COMSAT 10 years. When will I be entitled to vested benefits?

An employee with 10 years of service, regardless of age, is entitled to a minimum of a 50 percent vested interest in his or her accrued benefit in the Corporation's Retirement Plan, and, depending on age, may be as much as 100 percent vested. The table on this page presents a schedule of the vesting procedures for Plan partici-

pants. However, an employee who was a participant in the Plan on January 1, 1976 will be 100 percent vested when he has completed 10 or more years of service and has attained age 40, even if the table shows a lesser percentage.

Can I take an early retirement with less than a 100 percent vested benefit?

No. In order to take an early retirement an employee must have completed 10 years of service and have attained a minimum age of 55.

Why haven't employees been provided information pertaining to the new vesting provision of the Retirement Plan?

The new vesting provisions in the Retirement Plan have been approved by the Board of Directors, but the Internal Revenue Service has not yet ruled on them. Until a ruling is received from the IRS, the change is not official.

Will an employee be able to opt

out of the Retirement Plan to set-up an Individual Retirement Account (IRA)?

No. The Corporation's Retirement Plan does not contain provisions for allowing employees to opt out of the Plan. All employees are automatically enrolled in the Plan as soon as they become eligible.

I am 40 years old and have completed 10 years of service with the Corporation. Under the old Plan I had a 100 percent vested benefit, but under the new Plan, I only have a 50 percent vested benefit. Will I forfeit 50 percent of my vested benefit under the old Plan?

No. Any employee who was a participant in the Plan on January 1, 1975, or January 1, 1976, and whose service terminated before his/her normal retirement date for any reason other than death or early retirement, shall be vested if at the date of termination such employee has attained age 40, and has completed 10 years of service or more.

To Use the Table:

- Determine the number of years of service you have completed with COMSAT/COMSAT GENERAL.

- Add to this your current age, and find the appropriate column in section *b*.

- Read down this column until you are level with your number of years of service in section *a*.

- This number is your percent of vested interest.

<i>a</i> Complete years of service	<i>b</i> Sum of age at date of termination and complete years of service						
	Under 45	45-46	47-48	49-50	51-52	53-54	55 or over
0-4	0	0	0	0	0	0	0
5	0	50%	50%	50%	50%	50%	50%
6	0	50%	60%	60%	60%	60%	60%
7	0	50%	60%	70%	70%	70%	70%
8	0	50%	60%	70%	80%	80%	80%
9	0	50%	60%	70%	80%	90%	90%
10	50%	50%	60%	70%	80%	90%	100%
11	60%	60%	60%	70%	80%	90%	100%
12	70%	70%	70%	70%	80%	90%	100%
13	80%	80%	80%	80%	80%	90%	100%
14	90%	90%	90%	90%	90%	90%	100%
15 or more	100%	100%	100%	100%	100%	100%	100%

Network Bits

Field Correspondents

Andover

Joanne Witas

Brewster

Dorothy Buckingham

Cayey

John Gonzalez

COMSAT General (Plaza)

Jen Baldwin

Etam

Bev Conner

Fucino

Sandy Tull

Jamesburg

Warren Neu

Labs

Carol Van Der Weele

New York

Stephen Keller

Paumalu

Bob Kumasaka

Plaza

Gloria Lipfert

Santa Paula

Pat Hogan

Southbury

Eileen Jacobsen

ANDOVER. **Kathy Richardson**, a high school senior and daughter of the station's **Barbara Richardson**, and two of her girl friends motored to Washington, D.C., and were joined later by Barbara. They were the guests of the Al Donahoes of U.S. Systems Plant. Barbara brought back a memento from Washington she would just as soon have done without, Poison Oak.

Sharold Nuppula, daughter of **Mr. and Mrs. K. William Nuppula, Jr.**, is a member of the Telstar High School German Class which joined New England area students for a trip to Europe. Most of the time was spent in Munich learning the customs and ways of life in Germany where the students had the opportunity to put their language skills to work. Side trips to Scotland and Ireland were included.

Other student accomplishments included high honors being awarded to Telstar Regional High School Student **Ann Marie Summerton**, daughter of **Mr. and Mrs. Ralph Summerton**; a gold trophy in the Rumford Junior High School Annual Speaking Contest for eighth-grader **Sally Lepage**, daughter of **Mr. and Mrs. Charles Lepage**; first place

among 240 students on an achievement test for Rumford eighth-grader **Lisa Engblom**, daughter of **Mr. and Mrs. Richard Engblom**.

Just must get a plug in for our technicians here at Andover who provided vital support during the May COMSTAR launch. —**Joanne Witas**

ETAM. Our Employees Association sponsored a dinner at the Red Run Inn at Deep Creek Lake, Maryland, recently, featuring roast beef or prime rib. Based on the response, the evening was an outstanding success. Not only was the food good but Red Run offers a spectacular view of the lake and mountain scenery.

Phyllis Loughrie, Advance Industrial Security Guard, discovered that even petting a dog can become complicated these days. Stooping to pet her German Shepherd she was unable to straighten up and had to spend a few days in the hospital. **Andy Thompson** is vacationing for five weeks "out West."

The first two days of the Station Engineers' Meeting was held here early in May. It provided good opportunity for the exchange of operational views. Neither weather nor time allowed for the horseshoes championship between stations and a bowling tournament was substituted. There was much discussion about "300" games but no evidence demonstrated. A championship could not be resolved due to the reluctance on the part of bowlers to disclose scores rolled.

Rick Burrows, son of **Carl and Sonya Cooper**, was married to **Sherry Friend** May 14. The couple will live in Terra Alta, West Virginia. **William Adams**, son of **Bill and Sunny Adams**, and **Deborah Williams** have announced their engagement and plans for a June wedding. Bill is in the Air Force at Sheppard Air Force Base, Texas, receiving technical communications training.

Donna Gaston, daughter of **Don and Gerry Gaston**, was commissioned a Second Lieutenant in the Army following graduation from the University of West Virginia. Donna and another co-ed were the first women to receive commissions from the university's ROTC program.

—**Bev Conner**

LABS. Rockville High School Junior **Margaret "Kathy" Miller**, daughter of **Norman** (Design and Drafting) and **Carol Miller**, was recently inducted into the Robert Joyce Chapter of the National Honor Society. Two years ago she was accepted into the Junior High National Honor Society at Broome Junior High School.

Ann Garza is back at work in the Communications Processing Lab after recent hospitalization. **Burt Collins** of the Mechanical Shop is recuperating from surgery.

Congratulations are in order for **Dan Fischer** on his recent marriage; **Benji** and **Marie Allnutt** on the birth of **John Benjamin Allnutt, III**; **Betsy** (Library) and **John Christie** on the arrival of a new son **Robert Hicks Christie**; and **David** and **Barbara Perlmutter** on the birth of daughter **Deborah Fay**.

The big vacation news is the return of **Holly Pryatel** after a week in Aruba before her postcard arrived. Softball is in full swing at the Labs and our team recently hosted its first tournament in 1976. The bowling teams finished off the season with a banquet at the Montgomery Village (Gaithersburg) Holiday Inn. The Motorcycle Club held its first "Cycle Rally" the first week of June. **Bill Baker** served as Rallymaster.

Ex-Labs employee **Dan Martin**, who left to return to school, recently received his Bachelor of Electronic Technology degree from Pennsylvania State University. Dan previously worked in the Laboratory Services Division, Applied Sciences and Communications Processing Divisions.

—**Carol Van Der Weele**

PLAZA. **Rosemary Davis** with her husband and daughter took a rather extensive vacation visiting Tijuana, Mexico, then along the coast of California and on to Disneyland. A weekend in Reno resulted in no winnings; however, they reported weather and scenery superb.

Pat Irby and family are embarking on a three-week camper trip to the West Coast. **Don Ross** and wife are off to Greece hoping to visit, among other sites, the earth station at Thermopylae. **Harriet Biddle** and **Marion Timmons** have a four-day cruise on the Aegean Sea scheduled

as a part of their trip to Greece.

The Ladies Softball Team "Comstars" won their first two games. Coaches **Ed Mikus**, **Mike Jeffries** and **Wayne Brown** said they have 17 girls on the team captained by **Linda Kortbawi**. The other members of the team include **Linda Astus**, **Tracy Baker**, **Harriet Biddle**, **Evelyn Braswell**, **Joyce Casebeer**, **Roz Declue**, **Jackie Green**, **Karen Liston**, **Jackie Onley**, **Diane Pontti**, **Gail Ricci**, **Peggy Snoots**, **Nancy Stevenson**, **Barbara Smeric**, **Claudia Toy** and **Mabel Vandergriff**.

The Music Appreciation Club extends its appreciation to all those who helped make the recent fund-raising drive a success. Congratulations to **Joan Brereton** on her promotion to Corporate Records Secretary.
—**Gloria Lipfert**

SANTA PAULA. The launch, positioning and testing of the first COMSTAR satellite has inaugurated station operation here at Santa Paula. Our station has monitored previous launches but has been given operational responsibility for the first time with COMSTAR. With another COMSTAR and two MARISAT launches scheduled, as well as the inauguration of MARISAT communications, we expect a very busy summer.

We welcome the assistance of our newly-arrived technicians, **John Castorina** from the Jamesburg station, **Frank Garner** from NASA Goldstone, **Chuck Kasper** from Hughes, and **Tom Darter** from the U.S. Navy.

Prior to the very busy schedule there was some time for limited vacation activity: **Dan Geer** participated in the Newport to Ensenada, Mexico, sailboat race; **Gordon Johnson** visited relatives in Imperial Valley; and **Jeff Gnass** acquired some new scar tissue and third place in bicycle racing.
—**Pat Hogan**

SOUTHBURY. Two new technicians have joined Southbury: **Denis Bouchard**, formerly with A.S.C. Systems, Rockville, Connecticut; and **Richard Vasko**, formerly with Aeronutronic Ford at the Manchester, New Hampshire, Satellite Station. In mid-May we welcomed our first MARISAT Communications Operators to the station, **Constance Sarles** and **Dolores**

Labs Closeup

AL BUSCH; first Labs retiree

BY SHIRLEY TAYLOR

April 30, 1976 marked a very special event at the Labs when Albert H. Busch, Technical Specialist in the Semiconductor Technology Department, Applied Sciences Laboratory, became the Lab's first retiree at age 65.

Although leaving COMSAT after only four years, this was not Mr. Busch's first retirement. In 1971 he retired from the U.S. Government after 34 years of service, most recently 10 years at NASA Goddard Space Flight Center, Greenbelt, Md. Reared in Minnesota, Mr. Busch graduated from McKinley-Tech High School in Washington, D.C., and began Government service as an Optical Instrument Maker at the old Naval Weapons Plant in 1934.

In the 1940s, Mr. Busch and his wife, Margaret, bought 140 acres of land on Hawkins Creamery Road in Damascus, Md., and proceeded to build their home. The house sits on what must be the highest point in Montgomery County, from which vantage the Busches can watch July 4th fireworks at the Washington Monument from their front porch. Now the place has become a working beef-cattle farm, which the Busches share with their son, Rick, an airport

Raneri, both residents of Southbury. They have begun training and orientation in preparation for full MARISAT commercial service.

Ronnie Hicks and **Bart Bartlett** have been spending their spare time fishing at nearby Lake Zoar. So far they have caught a few White Perch but the 50-pound Carps have eluded them.

A variety of groups are finding way to our station. In April, RCA conducted a tour of our site for visitors from Peking, China; in May, a group of 38 teenagers from the Carmel High School in New York visited the site; also in May, businessmen and women of the Southbury Business Association were guests of the station.

—**Eileen Jacobsen**



Al Busch, standing, with family and friends at a retirement party given in his honor.

architect planner, and his wife.

Mr. Busch came to COMSAT in 1972 and was one of the team of technologists working on a solar cell development program. He designed the assembly and put together all the violet and non-reflective solar cell panels for flight testing. Just before retirement, according to Dr. E. S. Rittner, Director of the Applied Sciences Laboratory, Mr. Busch was doing some very promising work in the fabrication of a wrap-around contact to minimize the light obstruction loss at the front surface of the solar cell, and to facilitate interconnection of the cells into arrays. James Allison, Manager of the Semiconductor Technology Department, emphasizes Mr. Busch's outstanding mechanical and dexterity skills. He excelled, Allison claimed, in very intricate optical fixture fabrication, and in addition, would "fix" all sorts of broken items his co-workers brought to him, such as watches and pieces of jewelry.

A quiet, modest and unassuming man, Al Busch was extremely well liked by his colleagues. People found him receptive to confidences, compassionate and sensitive to their feelings, with a genuine interest in their welfare. On the occasion of his retirement, 42 of his COMSAT friends gave him a surprise party at the Comus Inn, attended by his wife, son, and daughter-in law, at which he was lauded by his managers and presented with a set of meerscham pipes and an engraved humidior. In addition, he received many "gag" gifts and an album of photos taken by Dr. Richard Arndt, who also took the accompanying pictures.

Al Busch was "one of a kind," and will be greatly missed.

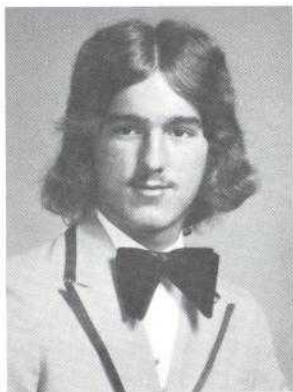
Mrs. Taylor is in the Senior Scientist's Office at the Labs.

COMSAT Graduates

1976



Crystal Michele Ambrose, daughter of Mr. and Mrs. Ralph T. Ambrose (Labs), Brunswick High School, Brunswick, Md.



Ralph Edward Ambrose, son of Mr. and Mrs. Ralph T. Ambrose (Labs), Electronic Technician Degree, James Rumsey Vocational Center, Martinsburg, W. Va.



Constance Marie Ballentine, daughter of Mr. and Mrs. Jay N. Ballentine, Jr. (Labs), Brunswick High School, Brunswick, Md.



Wanda Bartlett, daughter of Mr. and Mrs. Bart Bartlett (Southbury), Nonnewaug High School, Woodbury, Conn.



Teresa Ann Bergamini, daughter of Mr. and Mrs. Anthony A. Bergamini (COMSAT General), Col. Zadok Magruder High School, Rockville, Md.



Belinda Jan Briggs, daughter of Mr. and Mrs. Alden Briggs (Andover), A.A.S., Dental Hygiene, Westbrook College, Portland, Me.



Carole E. Brooks, daughter of Mr. and Mrs. C. K. Brooks (INTELSAT), B.A., Mathematics and Geography, Utah State University.



Corinne E. Brooks, daughter of Mr. and Mrs. C. K. Brooks (INTELSAT), B.A., Mathematics and French, Utah State University.



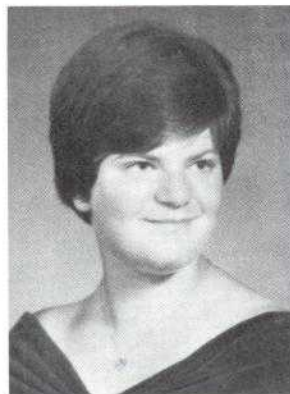
Scott Mitchell Browning, son of Mr. and Mrs. Darold Browning (Brewster), Brewster High School, Brewster, Wash.



David E. Burks, Jr., son of Mr. and Mrs. D. E. Burks (Labs), Lake Braddock Secondary School, Burke, Va.



Jeffrey Allen Cooper, son of Mr. and Mrs. Dennis B. Cooper (Headquarters), Bowie High School, Bowie, Md.



Melissa B. Cox, daughter of Mr. and Mrs. William A. Cox (Labs), Frederick Sr. High School, Frederick, Md.



Shirley E. Ebelink, daughter of Mr. and Mrs. John E. Ebelink (COMSAT General), B.S., Personnel and Labor Relations, U. of Maryland, College Park, Md.



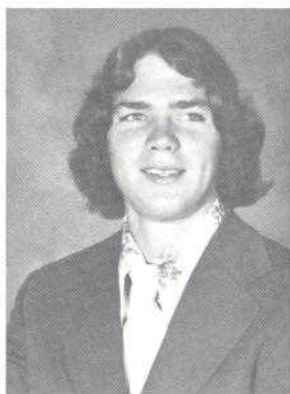
John G. Edelson, son of Dr. and Mrs. Burton I. Edelson (Labs), Bethesda-Chevy Chase High School, Bethesda, Md.



Adrienne Lee Eichberg, daughter of Mr. and Mrs. Robert L. Eichberg (COMSAT General), B.A., Industrial Psychology, University of Richmond, Richmond, Va.



Barbara Anne Ewing, daughter of Mr. and Mrs. Alvin Ewing (Labs), B.A., History, Lehigh University, Bethlehem, Pa.



Christopher Lawrence Fleming, son of Mr. and Mrs. Paul L. Fleming (Labs), Thomas S. Wootton High School, Rockville, Md.



Tara Maureen Fleming, daughter of Mr. and Mrs. Paul L. Fleming (Labs), B.A., Chemistry and Biology, Frostburg State College, Frostburg, Md.



Linda M. Formella, daughter of Mr. and Mrs. John R. Formella (Etam), Valley High School, Masontown, W. Va.



Barbara Hook, daughter of Mr. and Mrs. Fred J. Hook (Headquarters), Charles W. Woodward High School, Rockville, Md.



Susan Elaine Keck, daughter of Mr. and Mrs. William J. Keck (Headquarters), McLean High School, McLean, Va.



Ann Kilcoyne, daughter of Mr. and Mrs. James H. Kilcoyne (COMSAT General), B.S., Nursing, University of North Carolina, Greensboro



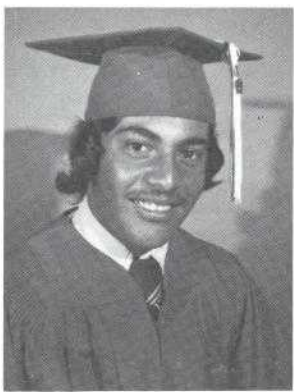
Ellen Kilcoyne, daughter of Mr. and Mrs. James H. Kilcoyne, Jr. (COMSAT General), Georgetown Visitation Preparatory School, Washington, D.C.



JoAnn Landesberg, daughter of Viola Newhouse (Headquarters), B.S., Nursing, Cornell University, N.Y.



Monica Anne McRorie, daughter of Mr. and Mrs. James P. McRorie (Labs), Frederick High School, Frederick, Md.



Elier Medina-Rosario, son of Mr. and Mrs. Luis Medina (Cayey), Miguel Melendez Munoz School, Cayey, P. R.



Anne Montgomery, daughter of Mr. and Mrs. Hale Montgomery (COMSAT General), Washington-Lee High School, Arlington, Va.



Betty J. Nelson, daughter of Mr. and Mrs. Jim Nelson (Southbury), Pomperaug High School, Southbury, Conn.



Sharold Nuppula, daughter of Mr. and Mrs. K. William Nuppula, Jr. (Andover), Telstar Regional High School, Bethel, Me.



Donna L. Gaston, daughter of Mr. and Mrs. Don C. Gaston (Etam), Sociology Degree, West Virginia University, Morgantown, W. Va.



Aaron Goldsmith (Headquarters), B.S., Business Administration, Federal City College, Washington, D.C.



Donald P. Gordon, son of Dr. and Mrs. Gary Gordon (Labs), Gaithersburg High School, Gaithersburg, Md.



Van J. Hanson, son of Mr. and Mrs. William L. Hanson (COMSAT General), Severna Park High School, Severna Park, Md.



William N. Hays, Jr., son of Mr. and Mrs. Wm. N. Hayes (Headquarters), Friendly High School, Friendly, Md.



Thomas Leland Lane, son of Mr. and Mrs. Leland E. Lane (Headquarters), B.A., U. of Maryland, College Park, Md.



Cheryl M. Levatich, daughter of Mr. and Mrs. J. L. Levatich (COMSAT General), T. S. Wootton High School, Rockville, Md.



Jeanne Frances Lipfert, daughter of Mr. and Mrs. Ralph Lipfert (Headquarters), B.A., Business Administration, College of William and Mary, Williamsburg, Va.



Diane F. Lowe, daughter of Mr. and Mrs. William Lowe (Headquarters), B.S., U. of Maryland, College Park, Md.



Walter S. McKee III, son of Mr. and Mrs. Walter S. McKee, (COMSAT General), Wootton High School, Rockville, Md.



Emiko Ortega, daughter of Mr. and Mrs. Louis C. Ortega (Labs), Franklin Sr. High School, Pikesville, Md.



Louis Ortega (Labs), B.S., Mathematics, Johns Hopkins University.



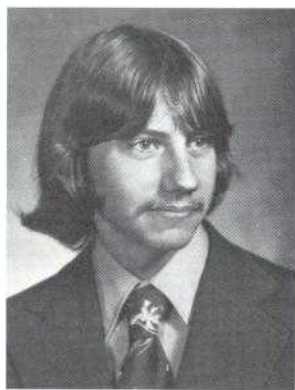
Lawrence Paul Pollack, son of Mr. and Mrs. Louis Pollack (Labs), Col. Zadok Magruder High School, Rockville, Md.



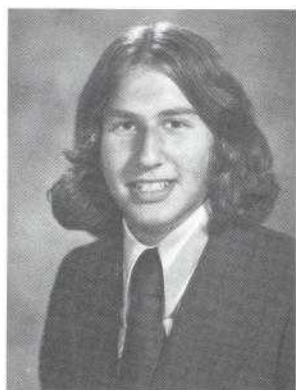
John F. Richardson, Jr., son of Mr. and Mrs. John F. Richardson (Andover), A.A., Wildlife and Law Enforcement, Unity College, Unity, Me.



Kathy A. Richardson, daughter of Mr. and Mrs. John F. Richardson (Andover), Telstar Regional High School, Bethel, Me.



Lester F. Richardson, son of Mr. and Mrs. John F. Richardson (Andover), Telstar Regional High School, Bethel, Me.



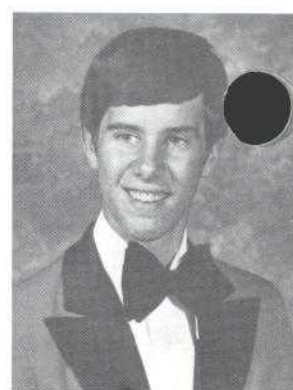
Barry Rowe, son of Mr. and Mrs. Irwin Rowe (Headquarters), High Point High School, Beltsville, Md.



Thomas M. Scroggs, son of Mr. and Mrs. John P. Scroggs (Jamesburg), B.A., Biology, Westmont College, Santa Barbara, Calif.



Donna F. Sederquist, daughter of Mr. and Mrs. Carl A. Sederquist (Headquarters), Largo High School, Largo, Md.



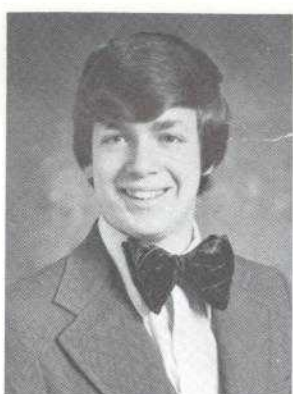
Michael B. Shatzer, son of Mr. and Mrs. Blaine T. Shatzer (Labs), Middletown High School, Middletown, Md.



Kerry Diane Briggs Shemorry, daughter of Mr. and Mrs. Don S. Briggs (Brewster), Bridgeport High School, Bridgeport, Wash.



Alan Lewis Smith, son of Mr. and Mrs. Lewis S. Smith (Headquarters), Winston Churchill High School, Potomac, Md.



Michael K. Tilford, son of Mr. and Mrs. Thomas Tilford, Jr. (Headquarters), Stonewall Jackson High School, Manassas, Va.



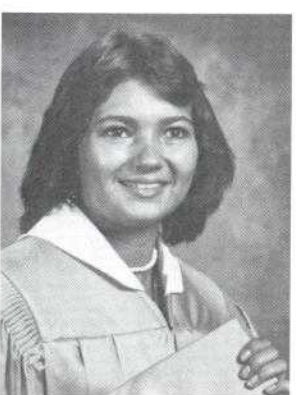
Julia E. Ulans, daughter of Mr. and Mrs. Roman I. Ulans (Geneva), B.S., Nutrition, U. of California, Davis, Calif.



Patricia Van Trees, daughter of Dr. and Mrs. Harry L. Van Trees (Headquarters), McLean High School, McLean, Va.



David M. Vollrath, son of Mr. and Mrs. John W. Vollrath (Paumalu), Waialua High School, Waialua, Hawaii



Heather D. Wabnitz, daughter of Mr. and Mrs. Edwin W. Wabnitz, Jr. (Headquarters), Wheaton High School, Wheaton, Md.



A. C. Walle (Headquarters), M.S., Telecommunications Operations, The George Washington University, Washington, D.C.



Deborah G. Wentworth, daughter of Donald L. Wentworth (Labs), B.S., Home Economics/Consumer Science, Hood College, Frederick, Md.



Kenneth R. Wurtzel, son of Priscilla E. Ruddiman (Labs), B.S., Electrical Engineering, Rensselaer Polytechnic Institute, Troy, N.Y.

GOVERNORS

(Continued from page 12)

•Approved an agreement with France for the lease on a preemptible basis of one half transponder, beginning August 1, 1976, to provide domestic public telecommunications between the mainland and the island of Saint Denis de la Reunion via the Indian Ocean spare satellite.

•Requested the Management Services Contractor to study the possibility of using the Ariane launch vehicle for later INTELSAT V launches, including direct contact with the European Space Agency, and report to the Board.

Organizational and Administrative Matters

•Unanimously elected Richard R. Colino of the U.S. as Chairman and José Mtz.-Villarejo of Spain as Vice Chairman of the Board.

•Reappointed the current officers of the Advisory Committees: Advisory

Committee on Finance Chairman Mr. Langlois (Canada), Vice Chairman Mr. Binet (France); Advisory Committee on Planning Chairman Mr. Meulman (Australia), Vice Chairman Mr. Steffen (Switzerland); and Advisory Committee on Technical Matters Chairman Mr. Quaglione (Italy) and Vice Chairman Mr. Da Costa (Brazil).

•Considered all nominations received for the position of Director General of INTELSAT and selected Mr. Santiago Astrain, nominated by the Signatory of Chile, Mr. Philip Okundi, nominated by the Signatory of Kenya, and Mr. C. R. Subramanian, nominated by the Signatory of India, for further consideration. The three candidates were interviewed on May 27.

•Decided that the Working Group on Permanent Management Arrangements for INTELSAT will meet in Mexico City from June 28 to July 2.

•Noted reports on actions taken by the Meeting of Signatories and

decided to discuss in July the question of relations with the ITU.

•Approved a revision to the terms for Signatory nominees working on the staff of the Management Services Contractor, which provides that nominees will be reimbursed for educational expenses at local schools, where the nominee's language is not English.

•Approved a one year term for Mr. K. Matarajan, a nominee of the Indian Signatory, to work on the Management Services Contractor staff at the Laboratories.

Financial Matters

•Agreed in principle to establish a Special Committee on Financial Policies and Procedures, and to consider specific terms of reference at its next meeting.

The Twenty-second Meeting of the Board will be held at INTELSAT headquarters in Washington, D.C., beginning July 21.

Labs Bill Kerns succumbs after long illness.

On June 19, 1976, Bill Kerns, of the Communications Processing Laboratory, died at home after a long illness. He is survived by his widow, Dorothy, and five children aged 11 through 20.

William R. Kerns was born in Cumberland, Md. on April 7, 1928. He grew up in Cumberland and graduated from Fort Sill High School there



MAY-JUNE 1976

At Presstime

in June 1946. He joined the Marine Corps upon graduation and made the Marines his first career. He rose to the rank of Master Sergeant, with a specialty in Electronics, and served several years in Vietnam. He retired from the Marine Corps in June 1969 and, in the same month, joined COMSAT Labs.

As a Lab Technician in the Communications Processing Laboratory, he functioned as coordinator and expeditor on numerous projects, and participated in team efforts devoted to the development of advanced satellite communication technologies. He was promoted to Senior Lab Technician in 1973, and his work activities included the field trials of SPADE, TDMA, SPEC, DITEC and the Echo Cancellor System. He was also a member of the Labs Medical Team for two years.

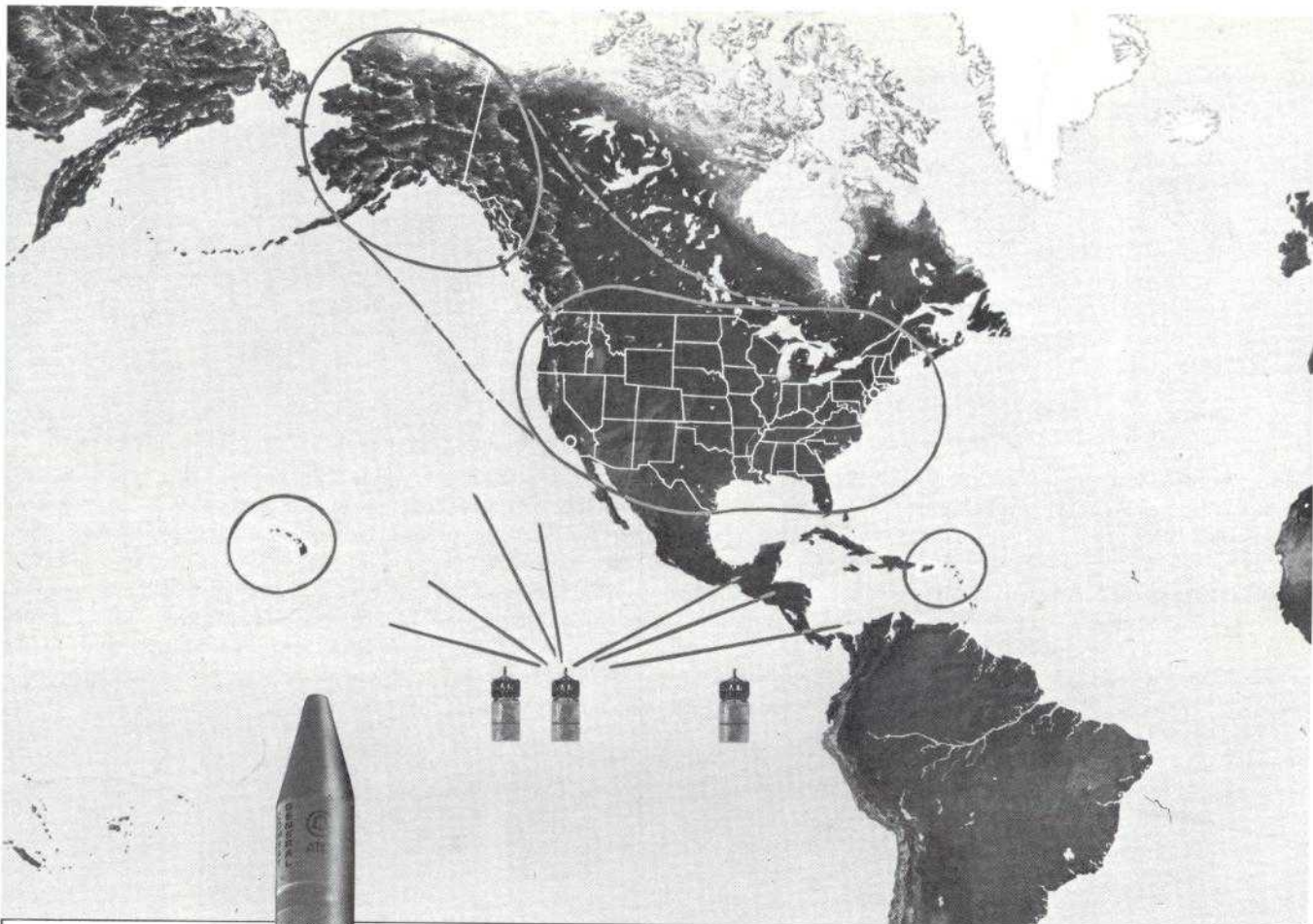
On Monday, June 21, a memorial Mass at Our Lady of Mt. Carmel Church in Thurmont, Md., was attended by family, friends and co-workers. Burial took place in Frostburg, Md., the following day.

Court grants stay in COMSAT rate case

COMSAT has been notified that the United States Court of Appeals for the District of Columbia Circuit has granted COMSAT's request for a stay of the Federal Communications Commission's rate decision of December 4, 1975.

The Commission's decision had required COMSAT to restructure and substantially reduce its rates for international service through the INTELSAT system. Following the Commission's decision, COMSAT asked the Court to review the case and also filed with the Court a motion to stay the decision pending the completion of judicial review.

As part of its Order of June 16 postponing the effectiveness of the Commission's decision, the Court directed the Commission to enter an accounting order. Under such an order, which COMSAT had proposed, records would be kept of charges collected until the completion of judicial review so that, if any refunds should ultimately be required, they could be made.



6726



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