Early ICE Mission Results Confirm Comet Theories

By Carter Dove

The international team of scientists with experiments aboard the Goddard-managed International Cometary Explorer (ICE) has completed preliminary findings from the satellite's September 11 encounter with Comet Giacobini-Zinner. The encounter, which took place 44 million miles from Earth, was the first comet intercept in history.

The scientists' tentative conclusions — summarized by Dr. John C. Brandt, head of Goddard's Laboratory for Astronomy and Solar Physics — both added significantly to and confirmed many predicted features of the scientific portrait of a comet.

One newly-found phenomenon still is puzzling the comet scientists. At least 300,000 miles before ICE reached the comet, the spacecraft detected high-speed, heavy-ion beams (made up of electrified atomic or molecular particles) never before found in space.

Continued on page 2

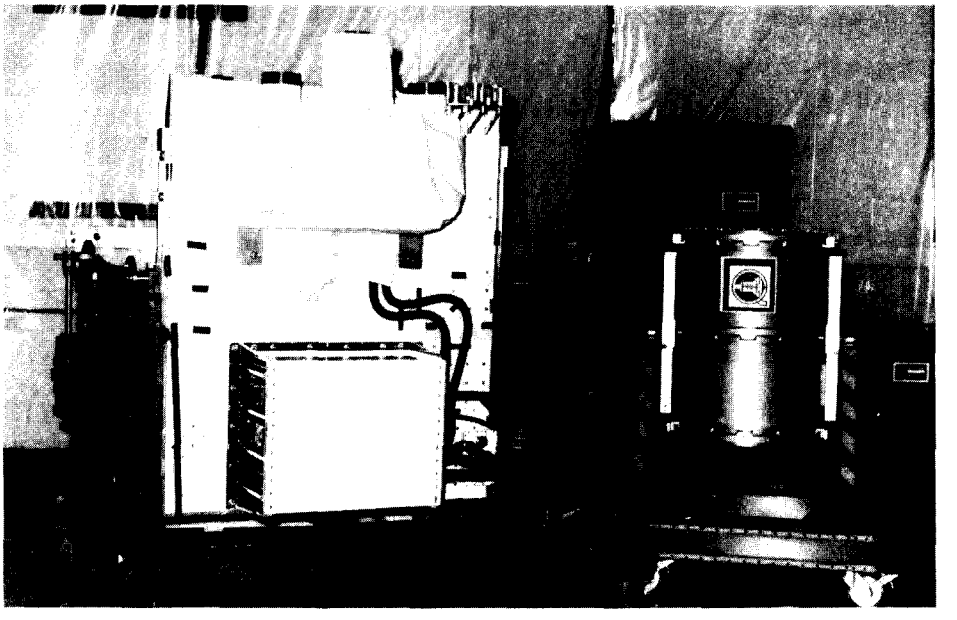
NASA
National Aeronautics and Space Administration
Goddard Space Flight Center

Goddard News

Greenbelt, Maryland and Wallops Island Virginia

Vol. 31 No. 10 October 1985

First Hitchhiker Leaves for Cape



HITCHHIKER G-1—**Goddard's new customer--payload carrier will fly aboard STS-61 C in December with three experiments aboard.**

Goddard's Hitchhiker G-1, the first of a new kind of customer-accommodating Shuttle payload, has left Goddard for launch aboard STS-61 C in December.

The Hitchhiker offers small-payload customers in industry, academia and government their first opportunity to control their instruments from the ground while they take advantage of left-over space in the Orbiter's cargo bay to do scientific experiments in orbit.

An improved version of the already famous Get Away Special (GAS) Program concept, the Hitchhiker system includes a baseplate for mounting payloads and GAS canisters, access to the Orbiter's 1400-watt power supply, plus avionics to return experiment data and to receive ground commands through a new Payload Operations Control Center in Goddard's Building 11.

Hitchhiker G-1, which left here September 23, is being integrated into the Orbiter this month. It carries three experiments, each representing a different kind of payload Hitchhikers can carry.

The first customer payload, from Goddard's Applied Engineering Division (Code 732), is a Capillary Pumped Loop to study experimental heat transport systems.

The second experiment, sponsored by the Air Force Geophysics Laboratory, uses a Particle Analysis Camera to provide film images of the environment around the Shuttle in support of future Department of Defense missions.

The third experiment, from Perkin-Elmer Corporation, will study the effect of the Shuttle environment on coated mirrors.

Ground control for Hitchhiker G-1 will be in Goddard's Building 11 High Bay area. Here the customers (excluding Perkin-Elmer, which has a passive payload) will receive data from their instruments and send up instructions within a mini-computer-based control center. The Control Center will remain in the High Bay area for the first few Hitchhiker flights, then will likely be relocated to a permanent place elsewhere on-Center.

The Hitchhiker program at Goddard is overseen by the Attached Shuttle Payload Office (Code 420). Hitchhiker G-1 mission manager is Ted Goldsmith (700). The payload was developed by the Applied Engineering Division (Code 730).

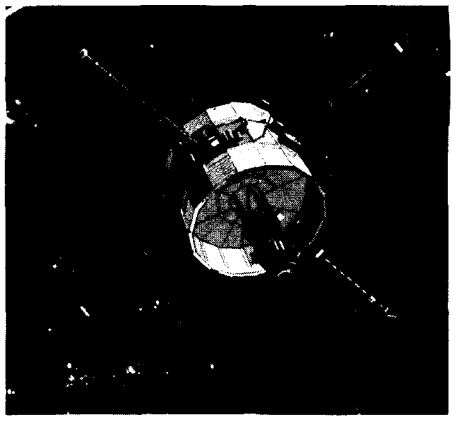
ICE Results

Continued from page 1

ICE scientists are theorizing that these beams were actually low-speed molecules which had escaped from the comet, became ionized by solar ultraviolet light, and then turned around and accelerated back, by the supersonic solar wind, towards the comet as particle beams.

The Comet Giacobini-Zinner did not have a sharply-defined bow shock. Instead, the comet was preceded by a broad, u-shaped, turbulent interaction region as it plowed through the solar wind of interplanetary space.

The ICE-gathered data confirmed what cometary scientists had postulated about the comet's plasma tail — that the tail was threaded by hairpin-shaped, magnetic-field lines captured from the solar wind, with its electrified gases both denser and colder than those of the surrounding solar wind.



ICE CROSSES COMET—**The ICE satellite crosses the tail of Comet Giacobini-Zinner in this artist's conception of the September 11 interception.**

There also was some "touch-up" to the cometary model which the scientists had constructed earlier. The dust hazard of flying through the tail of Comet Giacobini-Zinner was less than originally thought.

In the precedent-setting encounter, the ICE entered the 14,000-mile-wide tail of the comet, 4,900 miles behind the cometary nucleus at approximately 6:50 a.m. EDT, Sept. 11. Traveling at 46,000 miles an hour, ICE emerged from the tail approximately 20 minutes later, apparently none the worse for wear. Midpoint of the tail encounter came at 7:02 a.m., when the spacecraft passed through a narrow region called a neutral sheet.

The encounter was a high point of a seven-year odyssey through space for the ICE, launched in 1978 as the International Sun-Earth Explorer. With two deep space exploratory missions already to its credit, the spacecraft was diverted to fulfill its comet rendezvous destiny at the suggestion of Goddard engineer Dr. Robert Farquhar. Farquhar, after thousands of computer simulations, manuevered the ICE past the Moon five times in 1983, using lunar gravitational assist to give the spacecraft the additional thrust necessary for the comet rendezvous.

The ICE is now underway to its fourth space exploration assignment, this time to record solar wind measurements upstream of Halley's Comet on October 31, 1985 and March 28, 1986.

A more detailed review of the ICE encounter results will be made public at the American Geophysical Union conference on December 10 in San Francisco.

SPARTAN-HALLEY ASTRONAUTS VISIT—**Judith Resnik discusses a point about the Spartan-Halley spacecraft (in rear) with fellow astronauts Ronald E. McNair (left) and Ellison Onizuka during their recent visit to Goddard. The three will be mission specialists for the planned January 22 flight of the Goddard-managed spacecraft. Mission commander will be Dick Scobee and the pilot will be Michael J. Smith. Spartan-Halley is the first and only NASA spacecraft dedicated solely to observations of Comet Halley and will be the only one observing the comet when it is nearest to the Sun. Goddard manager on the project is Morgan Windsor.**

Get Away Special Hosts Symposium for Experimenters

The second annual Get Away Special (GAS) Symposium was held at Goddard October 8-9. Approximately 25 presentations were given by experimenters who have flown or who are slated to fly GAS payloads aboard the Space Shuttle.

The symposium provided a forum for exchanging information within the GAS community on experimental results and plans, as well as on engineering and safety lessons learned during the first three years of payload operations and flight.

More than 200 people from 15 nations attended the symposium, which was open to all users, domestic and foreign. The meeting included a day and a half of presentations, culminating in a panel discussion with technical and administrative personnel from the GAS program.

Excavators Lay Cables For New Goddard ROLM Telephone System

By Randee Exler

Burrowing tillers and mountains of dirt are becoming a familiar sight around Goddard as excavation progresses for the new ROLM Digital Telephone System. The trenching and patching which began in June is scheduled to end in December.

When Goddard switched to the Chesapeake and Potomac (C&P) analog Centrex system in 1979, new cable was not necessary.

"We were able to flashcut from one system to the other because in both cases we were dealing with C&P," according to Ozzie Osvatics, Code 543. "This is a different animal," he added. "We have to lay new cable because we are paralleling our existing service and the new system requires extensive testing prior to cutover and acceptance."

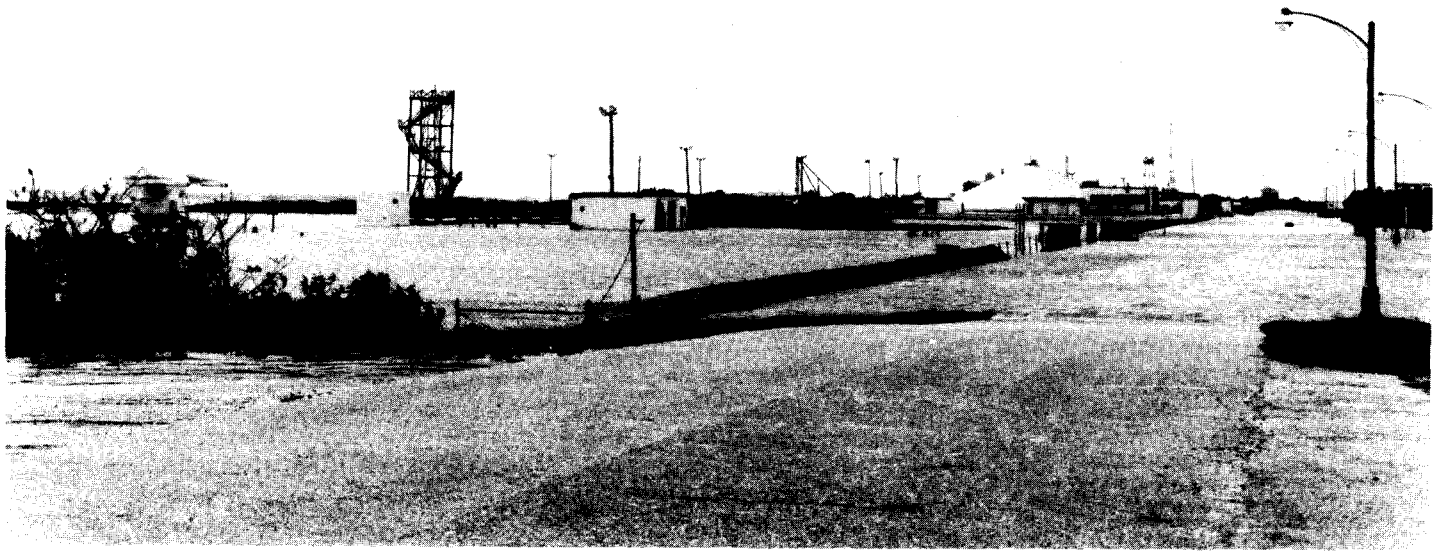
Laying telephone cable requires careful scheduling around NASA activities. To prevent interruptions to electrical power or telecommunications during shuttle missions, certain areas at Goddard cannot be trenched nor can manholes be entered without special approval of the Facilities Implementation Committee.

Testing for the ROLM system begins in January. Goddard will receive new telephones along with the ROLM service. The old phones and Centrex, will remain in service until the testing and acceptance are completed in March. This means that for a while, two phones will be located where one used to be.

The new cable network will almost duplicate the existing network currently used for Centrex. In addition to approximately 50,000 feet of buried cable, five new manholes have been installed.

CAN YOU DIG IT?—**The trenching and patching will continue until an approximate 50,000 feet of cable is buried under Goddard.**

Hurricane Hits Shore, Wallops Houses Evacuees



The northern launch area on Wallops Island was flooded by Hurricane Gloria September 27. Approximately 1,000 people from lowlying nearby communities sought refuge from the wind and water on the higher ground of the Wallops Flight Facility. A number of buildings were made available to receive people evacuated from the surrounding community. Additionally, some Wallops people brought their families to safety in the building in which they work. The neighboring Army Reserve sheltered approximately 100 evacuees also. Help came from many sources: Greenbelt sent a truck with 500 packages of K-rations, blankets, cots, pillows and disposable pillow cases; many Wallops employees worked around the clock to care for the sick and elderly, feed the multitude, and otherwise support the needs of those evacuated, and to provide emergency services to the facility.

Laser Ranging: Versatile Tool For Space Research

By Randee Exler

The Space Shuttle Discovery on Mission 51-G was not the first NASA orbiter to carry retroreflectors for laser ranging in space. Apollo astronauts placed reflectors on the Moon in the late 1960's, and Lageos, a retroreflector equipped staellite, was launched in 1976.

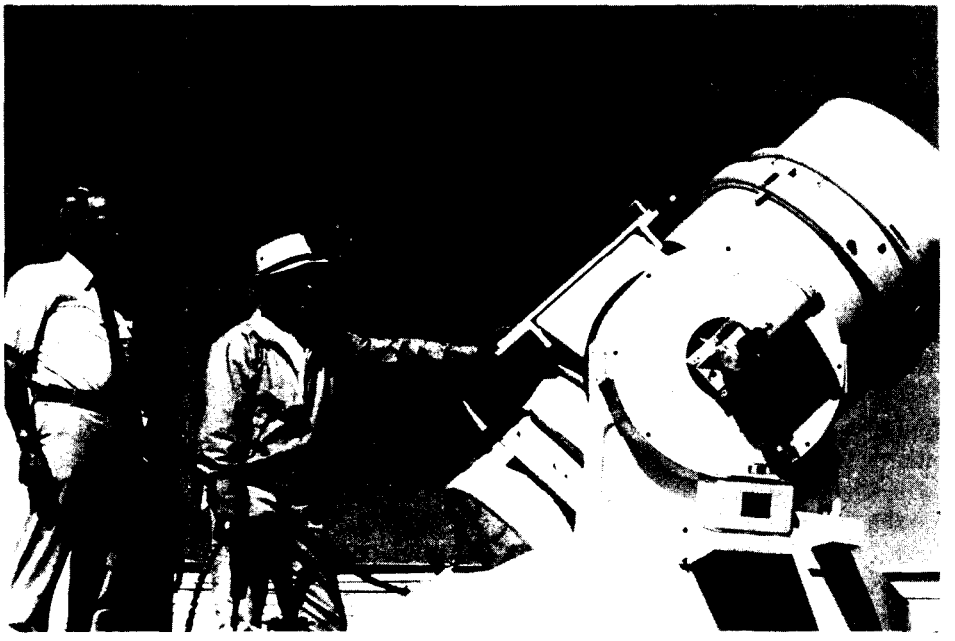
Indeed, laser ranging has become routine in space and is now used for a variety of measurement tasks. Here at Goddard, Crustal Dynamics Project (CDP) scientists analyze data received from Satellite Laser Ranging (SLR) to study the movement and deformation of crustal plates which determine the shape of the Earth. Data received from Lunar Laser Ranging (LLR) are analyzed to study polar motion and Earth rotation which leads to Earth "wobble".

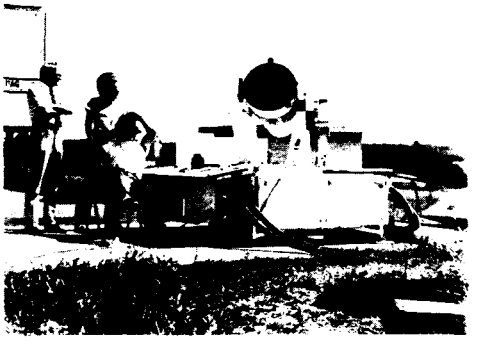
As the Goddard SLR manager, Merrick E. Shawe is responsible for an international system of cooperating laser networks. Usually SLR refers only to man-made satellites, such as Lageos. But in this instance, SLR refers also to the Moon, a natural satellite. All systems, such as the Goddard Laser Tracking Network (GLTN), provide data to the CDP through conventional SLR and lunar laser ranging.

Satellite laser ranging has seen major advances since the inception of the GLTN in 1965. Tracking efficiency has improved from 65 percent in 1981 to 75 percent in 1985, and instrument accuracy has improved from 10 cm to 1 cm, according to Shawe.

The laser transmitter and sensitive photomultiplier receiver are the most essential equipment in any laser tracking system because they provide and process the signals from which the measurements are made. Current laser transmitters shoot short-pulsed beams which last 200 trillionths of a second, the time it takes light to travel about two inches. Light travels at a speed of 186,000 miles per second.

The GLTN consists of a series of transportable and fixed systems throughout the world. The CDP is also supported by other international laser networks.





LASER RANGING — **(Above) At the Goddard Optical Research Facility, Merrick E. Shawe, Satellite Laser Ranging Manager (left), and Ivan Cobo, Bendix Computer Technician (right) look on as the Mobile Laser Ranging System 7 (MOBLAS 7) fires at a passing satellite.**

INTERNATIONAL COOPERATION — **(Left) Merrick E. Shawe, discusses MTLRS 1 with Iloma Nowak and Ludwig Amberg, engineers with the West German Institut fur Angewandte Geodasie in Frankfurt.**

Sprechen Sie Laser Tracking? We Do!

Recent tests performed at Goddard between the Modular Transportation Laser Ranging System 1 (MTLRS 1) and the Mobile Laser Ranging System 7 (MOBLAS 7) proved that Germans and Americans speak a common language: precision laser tracking.

MTLRS 1 is the first transportable laser system to be made by a foreign government and was manufactured in the Netherlands for the Federal Republic of Germany. Goddard was chosen as the host site for pre-operational tests of the system because of the availability of supporting equipment such as MOBLAS 7 as a calibration standard of comparison.

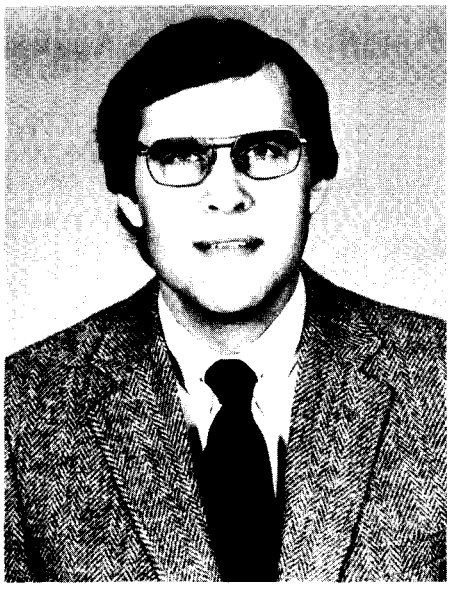
During the daily tests, the two systems tracked the same satellite simultaneously. Success was determined by comparing data obtained from MTLRS 1 to data obtained from MOBLAS 7. The closer the measurements, the better the calibration.

Test results were "excellent," according to Shawe. "MTLRS 1 measured within one centimeter of our system," he said.

Germany is a member of the Cooperating Foreign Laser Network (CFLN) which supports the Crustal Dynamics Project (CDP). Data received from laser ranging systems, such as MTLRS 1, enable CDP scientists to study the movement of the Earth's crustal plates.

After a return trip to Germany, MTLRS 1 will participate with other European and American systems to perform satellite laser ranging in Germany, Italy, Greece, Egypt, Israel and Turkey.

Around the Center



RICHARD A. REEVES, Goddard's Deputy Director of Management Operations, has been named Associate Director of NASA's Ames Research Center, Mountain View, California. He will assume his new duties as Ames Associate Director at the end of this month. Reeves began his NASA career at Marshall Space Flight Center, Huntsville, Alabama, in 1974. In 1977, he left Huntsville to accept a position in the Office of General Counsel at NASA Headquarters.

Reeves came to Goddard in 1980 as Deputy Chief Counsel. From June 1984 to June this year, he was Acting Director of the Management Operations Directorate.

EDWARD FRANKLE, Goddard's Chief Counsel, has been named Deputy General Counsel

for NASA. He will assume his new position at NASA Headquarters October 28.

Frankle came to Goddard in September of 1982 from the Selective Service System.

DR. ROBERT W. "BOB" FARQUHAR, the Goddard "celestial mechanician" who conceived and directed the encounter of the International Cometary Explorer (ICE) with Comet Giacobini-Zinner September 11 will be honored for that achievement in ceremonies in Los Angeles November 7. The American Astronautical society will present the Dirk Brouwer Award "in honor of your outstanding contributions to space flight mechanics and astrodynamics" at a luncheon at the Los Angeles Airport Hilton. Center Director Dr. Noel Hinners will be the featured speaker. Farquhar is the second person to receive both major awards in this field. The other award, the AIAA Mechanics and Control of Flight Award was given him in 1981. Ironically, the only other person to receive these same two awards was John Breakwell of Stanford University. Breakwell was the Ph.D. thesis advisor for Farquhar.

RON PARISE, a CSC contractor in Goddard's Laboratory for Astronomy and Solar Physics, will fly aboard the Shuttle with the first Astro 1 payload, scheduled for STS 61 E on March 6, 1986. Parise, who was selected as a payload specialist last year, has been working on one of the Astro 1 instruments, the Goddard-managed Ultraviolet Imaging Telescope (UIT) since January 1980. He will operate the Astro 1 payload for one

of two 12-hour daily shifts aboard the Shuttle. The other shift will be taken by Payload Specialist Sam Durrance, project scientist for the Astro 1's Johns Hopkins ultraviolet telescope instrument. The Astro-1 mission scientist is Dr. Theodore R. Gull of Goddard.

SPARTAN-1 is on display at the National Air and Space Museum in downtown Washington, D.C. The Goddard Shuttle payload, which flew aboard STS 51-G in June, went on display October 18 and will remain through the end of the year. The exhibit opened with a reception at the Museum which included recognition of the Spartan NASA/industry team by NASA Administrator James Beggs and Goddard Director Dr. Noel Hinners. The exhibit recognizes SPARTAN-1 as the pioneer of a new concept of experimental platforms that can be deployed by the Shuttle, operate autonomously in orbit, and then be retrieved by the Shuttle before it is returned to Earth.

THE GROUNDS OF GODDARD echoed with the tramping of happy feet recently during the 5th Annual Global Volksmarch. Almost 800 persons participated over the weekend of September 14th and 15th, sponsored by the U.S. Air Force, Electronic Security Squadron from Ft. Meade, the Freestate Happy Wanderers Volksmarching Society, and hosted by the Goddard Visitors Center. Volksporting is an idea from Germany which provides an organized but non-competitive way of encouraging physical fitness. The only goal is to finish the course, and the concept of being "first" has no meaning. In the Goddard event, entrants chose to walk either a 10 or 20 km course through the backwoods areas at Goddard. The finishing participants could then receive a handsome bronze or silver medallion.

In Memorium

SHERNAZ CONTRACTOR, 25, died from injuries sustained in a skydiving mishap on October 6 in Ridgely, Maryland. Contractor joined the Space Data and Computing Division in 1980 as a student trainee. Since 1983, she worked as an Electronics Engineer developing complex software systems in the Image Analysis Facility, Code 635.

George Rumney, one of Contractor's co-workers said that some of the employees who worked closely with her have started a fund in her name and will donate the money to USA for Africa, her favorite charity.

Planning The Combined Federal Campaign

Goddard's 1986 CFC Employees' Committee plans this year's campaign kickoff. The theme: "Give Somebody a Chance." The Committee's 1986 fundraising goal is $226,000, a figure that improves upon last year's goal by five percent. Left to right, Committee members include: (standing) Dwaine Kronser (200), Kathy Bayer (100), Betsy Edwards (500), Sharon Moser (150), Michelle Marrie (653), standing in for Martha Robey (600), Marietta Sturgell (300), Winslow Womack, chairman (300), Clay Magee (700); (sitting) Darla Swanson (400), Silvia Parker (231), Betty Gasch (231) and William Cooper (231).

ATS-3 Satellite Aids Mexico City

The chaos following Mexico City's devastating earthquake could have been worse without the services of a Goddard communications satellite developed 18 years ago.

The ATS-3 (Applications Technology Satellite) communications satellite, located at 105 degrees west longitude (in the Pacific south of California), through its control center at Malabar, Fla., provided critical communications support for the international rescue and relief efforts of the American Red Cross and the Pan American World Health Organization.

The voice communications link with the outside world was crucial since the earthquake disrupted all other forms of communications in Mexico City.

Speaking at the height of the crisis in Mexico City, George Manno, director of media relations for the Red Cross, said, "the ATS-3 satellite is providing us with the most critical communications link to the rest of the world. The ham radio operators have been doing a swell job but, at present, they are serving as our backup communications system, while we rely primarily on the ATS as our main communications vehicle."

In addition to the American Red Cross and the Pan American World Health Organization, the CBS network also used the ATS-3 satellite for communications between its U.S. operations center and reporters on the scene.

The ATS control center at Malabar is managed by Paul Eden, and is operated by the University of Miami, under contract to NASA's Goddard Space Flight Center, Greenbelt, Md.

NASA Now Accepting Astronaut Applications

NASA recently announced that it has a need for Pilot Astronaut Candidates and Mission Specialist Astronaut Candidates to support the Space Shuttle Program. The agency is now accepting applications and plans to select astronaut candidates as needed. Persons from both the civilian sector and the military services will be considered.

For further information or application materials, write:

NASA, Johnson Space Center
Astronaut Selection Office
ATTN: AHX
Houston, TX 77058

NASA
National Aeronautics and Space Administration
Goddard Space Flight Center

Goddard News

Greenbelt, Maryland and Wallops Island, Virginia

The GODDARD NEWS is published monthly by the Office of Public Affairs, Goddard Space Flight Center, Greenbelt, Md. 20771. Deadline for submitted material is the first of each month. For additional information, contact Charles Rechnagel 344-5565. The GODDARD NEWS staff is:

Executive Editor ..... James C. Elliott
Managing Editor ..... Charles Recknagel
Senior Editors ..... Carter Dove and Joyce Milliner

Retirees

Good luck to the following employees who left Goddard in September. We wish them a happy retirement after a job well done.

SEPTEMBER

Name	Code	Service
Larkin, Robert D.	735.2	36 years
Jones, Harry S.	273.1	26 years
Holt, Richard G.	673	37 years
Weinley, Eugene F.	411	22 years