



*Happy Holidays*

## 1985: Thanks for the Successes

By Dr. Noel W. Hinners

Seems only yesterday I was summing up our 1984 achievements and looking forward to '85. I conclude that the adage "time flies when you're having fun" must apply. Being busy, and occasionally harried, also reduces potential threats of boredom to zero.

Looking back, a large number of things

stand out: the ICE encounter and results; the first SPARTAN flight; the continuing hard work of the whole TDRSS team; the winning 600 second-generation Space Telescope proposal; Monday staff meetings; Wallops wrestling with balloon problems; retirements of people we'll all miss; contributing good people for the betterment of Ames and Headquarters; Space

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**NASA**

National Aeronautics and  
Space Administration

Goddard Space Flight Center

# Goddard News

Greenbelt, Maryland and Wallops Island, Virginia

Vol. 30 No. 12 December 1985

## Hitchhiker, GAS Bridge to Fly Aboard STS-61 C

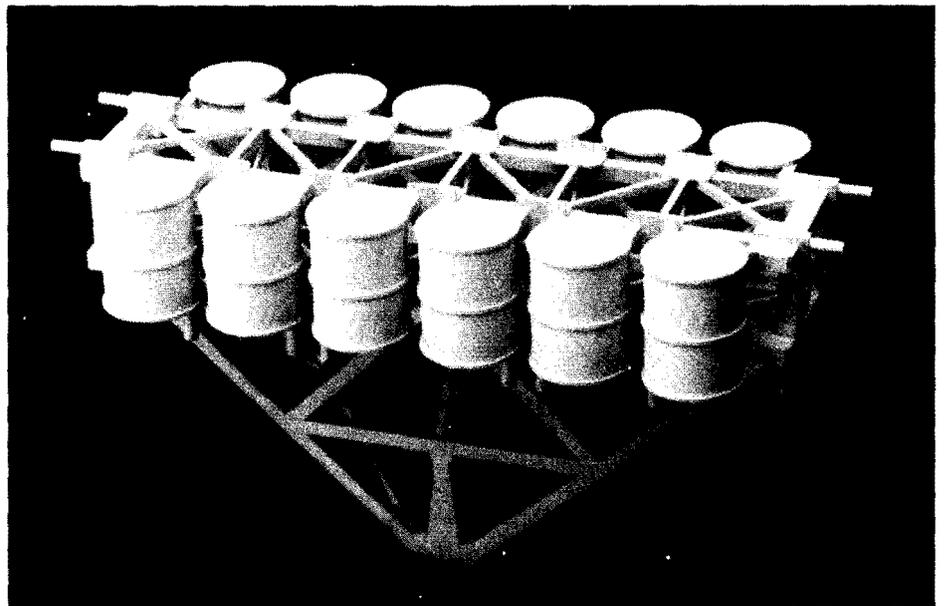
Space Shuttle flight STS-61 C, scheduled for December 18 to 23, will carry two Goddard-managed payloads-carriers, Hitchhiker G-1 and GAS Bridge, into orbit for the first time.

### Hitchhiker G-1

A more sophisticated version of the famous Get Away Special (GAS) concept, the Hitchhiker G-1 consists of a baseplate on which small payloads can be mounted directly or enclosed in canisters. The carrier provides small payloads with access for the first time to the Orbiter's 1400-watt power supply and to ground communications. Ground Control is in Goddard's Building 11 High Bay area.

Hitchhiker G-1 experiments will:

- Study experimental capillary pumped loop heat transport systems. (Goddard's Applied Energy Division)
- Provide film images of the environment around the Shuttle. (Air Force Geophysics Laboratory, Hanscom AFB, MA)
- Study the effect of the Shuttle environment on coated mirrors. (Perkin Elmer Corp., Danbury, CT)



**GAS PAYLOAD**—A GAS Bridge supporting twelve GAS canisters across the Orbiter's cargo bay will fly aboard STS-61 C this month.

### GAS Bridge

The GAS (Get Away Special) Bridge is a beam supporting 12 GAS canisters which is mounted across the Orbiter cargo bay. The beam consolidates the canisters into a single easy-to-load and unload unit, whereas previously canisters have been placed about the cargo bay as space permitted. Experiments in the GAS canisters will:

- Measure the effect convection has upon heat flow in a liquid. (General Electric/

Penn State University, Philadelphia, PA)

- Determine the behavior and physiological effects of microgravity on brine shrimp cysts. (Booker T. Washington Senior High, Houston, TX)
- Measure the O and O<sub>2</sub> terrestrial nightglow emissions. (National Research Council of Canada, Ottawa)
- Measure the dynamics of a vibrating beam in the zero-gravity environment. (USAF Academy, Dept. of Astro-

*Continued on page 8*

# Milestone Missions Made 1985 a Memorable Year

Here are just a few of the milestones Goddard set in 1985. While the list makes no attempt to be exhaustive, it can make every claim to being exciting.

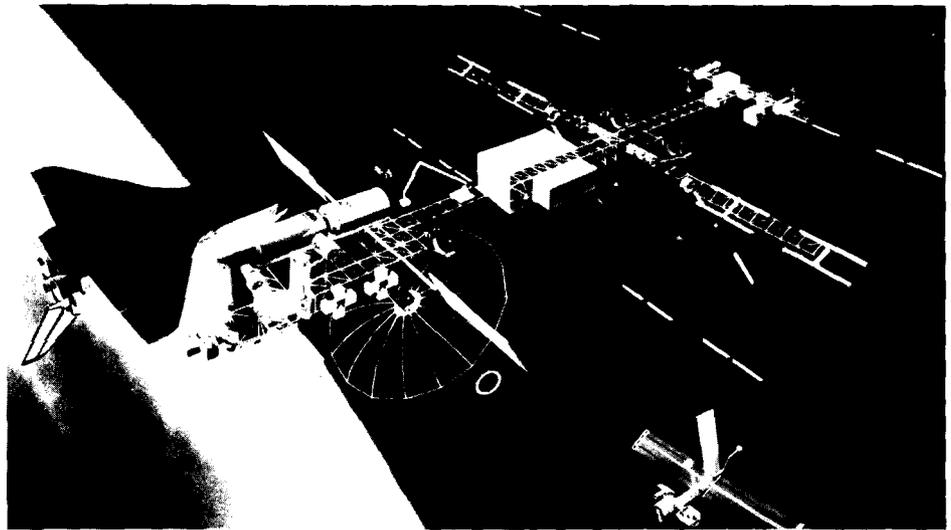
Remember:

## International Cometary Explorer

On September 11 NASA's International Cometary Explorer—known by the acronym ICE—became the first spacecraft ever to intercept a comet.

The comet is Giacobini-Zinner, a deep-space wanderer discovered in 1900 which makes one orbit around the Sun every six and a half years. The ICE, a spacecraft launched in 1978 as ISEE-3 (International Sun-Earth Explorer-3), had two deep space exploratory missions under its "belt" by 1983. Goddard engineer Dr. Robert Farquhar suggested that ISEE-3 could intercept the comet Giacobini-Zinner for \$3 million, rather than the possible \$500 million of designing, building and sending a new spacecraft to study Halley's Comet in 1986.

NASA accepted the Farquhar proposal, redesignated the spacecraft International Cometary Explorer (ICE) and charged it



**NEXT LOGICAL STEP**—An artist's concept depicts the Space Station as it may look in orbit before the end of this century.

with a new mission.

After thousands of Farquhar-masterminded computer simulations—and five swing-bys of the moon in 1983 for orbital adjustment—the ICE was put on track for its historic intercept.

The intercept occurred, as scheduled, at approximately 7 a.m. (EDT), September 11 with the ICE flying through the tail of Giacobini-Zinner 5,000 miles behind its nucleus at a distance of approximately 44 million miles from Earth.

The encounter gave scientists their first close-up look at the make-up and dynamics of a comet's tail.

Another first for the U.S. and NASA.

## Active Magneto-spheric Particle Tracer Explorers

The Active Magnetospheric Particle Tracer Explorers (AMPTE) project was an international experiment to determine how the solar wind interacts with the Earth's magnetosphere.

The U.S. portion of the project was managed by Goddard Space Flight Center.

Three nations—the U.S., West Germany and the United Kingdom—participated in the series of experiments which saw the West German satellite release canisters of barium and lithium 70,000 miles from Earth into the solar wind outside the Earth's magnetosphere and inside its magnetotail region. The U.S. and United Kingdom satellite analyzed the surrounding space environment to determine the

effect of the artificially-introduced elements.

The visual highlights of the series—conducted from the fall of 1984 to the summer of 1985—were the December, 1984 and July, 1985 releases of barium by the West German satellite. These releases produced barium clouds which were visible to many residents of the southwestern and western U.S. and Hawaii. The December release, the more celebrated of the two, was known as the "Christmas Comet".

## Spartan Deployed From The Shuttle

Among the payloads deployed from the Space Shuttle Discovery (STS 51-G) on its June mission was the Spartan 1 (Shuttle Pointed Autonomous Research Tool for Astronomy), developed by a team of engineers and technicians at Goddard.

Spartan's science purpose was to map and study the structure of two extended sources of x-rays in our sky: the hot (100,000,000 degree C) gas pervading a large cluster of galaxies in the constellation Perseus and the central core of our Milky Way galaxy.

Spartan 1 is the first in a series of low-cost astrophysics experiments planned by NASA to capitalize on the experience and success of the agency's sounding rocket program.

## First Satellite Deployed From Gas Containers

The April-May mission of the Space Shuttle Challenger (STS 51-B) marked the

*Continued on page 3*

## Director's Message

*Continued from page 1*

Station frenzies and detailees to JSC; Wallops responding so well to Gloria; Delta living; Peer Reviews; Space Telescope progress; exciting new hires and SES'ers; COBE progress; 200 improving procurement; travel funds; improving the landscaping; starting strategic planning; etc.!

I suspect I could end up putting something positive down for every branch or section at Goddard and for each of our contractors. When one integrates the activity, it becomes overwhelming and incredibly impressive. I encourage all of you to take stock also and use this holiday season to reflect on the superb colleagues we are blessed with and to be thankful for the opportunity to contribute to a noble human goal. Come back fully charged for 1986—it's going to be a zinger starting with the "Goddard launch" of SPARTAN Halley and TDRS-B on January 22.

Thank you for a most satisfying and gratifying 1985.

## 1985 Milestones

Continued from page 2

first deployment of a satellite from a Get Away Special (GAS) container mounted on the side of the orbiter's payload bay.

The satellite was the Northern Utah Satellite (NUSAT), an air traffic control radar system calibrator. The NUSAT will measure antenna patterns for ground-based radars operated in the United States and in member countries of the International Civil Aviation Organization.

The GAS program, managed by Goddard, is available to anyone who wishes to fly a small scientific experiment aboard the Shuttle.

### COSPAS/SARSAT, Another Life-Saver

Perhaps the most humanitarian satellite project ever conceived is a multilateral cooperative project sponsored by the United States, Canada, France and the Soviet Union known as COSPAS/SARSAT, a satellite-aided search and

**"... the search and rescue system has saved the lives of more than 500 airmen and sailors in distress as of late 1985 ..."**

rescue project.

With as many as five operational satellites, two from the United States and three from the Soviet Union, this search and rescue system had saved the lives of more than 500 airmen and sailors in distress as of late 1985.

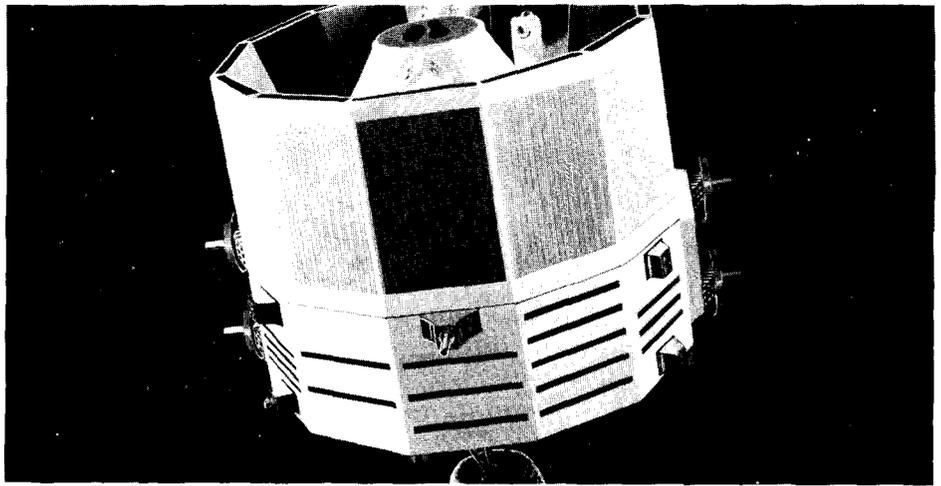
COSPAS/SARSAT uses satellites in low, near-polar orbits "listening" for distress transmissions. The signals received by the satellites are relayed to a network of ground stations where the location of the emergency beacon is determined by measuring the Doppler shift between the satellite (with its precisely known orbit) and the distress signal.

This information is then relayed to a rescue control center which directs the search and rescue with aircraft and vessels of the U.S. Air Force, Civil Air Patrol, Coast Guard, Coast Guard Auxiliary and state and local police.

Goddard Space Flight Center is responsible for the execution of the research program in the U.S. participation.

### Cosmic Background Explorer

On June 26 one of the subsystems of a satellite designed to study the origin and dynamics of the universe was rolled out at Goddard Space Flight Center.



**STUDYING THE BIG BANG**—COBE, to be launched in late 1987 or early 1988, is designed to challenge or confirm the theory that the universe began explosively.

The satellite was the COBE—Cosmic Background Explorer. The subsystem was the COBE primary structure, a major subsystem assembled at Goddard over a period of nine months.

The COBE spacecraft itself—to be designed, integrated and tested by engineers and scientists at Goddard—is due for Space Shuttle launch in late 1987 or early 1988. The Goddard spacecraft is

designed to challenge or confirm the theory that the universe began about 15 billion years ago with a Big Bang—a cataclysmic explosion—and then expanded.

Producing maps of the sky in 100 microwave and infrared wavelengths, the COBE will show the sky as it appears now and any remaining traces of what has taken place since the first year after the Big Bang.

## Graham Named NASA Acting Head

NASA Deputy Administrator Dr. William Graham has been appointed Acting Administrator by the President while Administrator James Beggs takes a leave of absence to resolve the legal action in which he is involved. Dr. Graham has established a new post of General Manager within NASA and has appointed Phillip Culbertson, present Associate Administrator of the Office of the Space Station, to the position.

Dr. Graham is a founder and executive of an advanced technology corporation, R&D Associates, with a staff of 400 professionals working in the areas of national security, energy systems, communications systems, and related matters. He is an authority on nuclear strategy, nuclear weapons effects, arms control, and arms control compliance, and has pioneered much of the work on the nuclear survivability of electronics systems. In the arms control areas, he has developed the theory of "safeguards", or prepared options to be implemented in the event of arms control non-compliance by a committed party, to serve as a deterrent and as a response to that non-compliance.

Dr. Graham is presently the Chairman of the General Advisory Committee on Arms Control and Disarmament, for which he was nominated by President Reagan in May and confirmed by the Senate in September of 1982. He had previously served as a member of Presidential Candidate Reagan's Defense Policy Advisory Group and the President-elect's Defense Transition Team.

Prior to the forming of R&D Associates, Dr. Graham spent six years on the staff of the RAND Corporation, and before that was for three years



**Dr. William R. Graham**

an active duty officer with the Air Force at the Air Force Weapons Laboratory, where he directed a group that conducted both experimental and theoretical research on the effects of nuclear weapons.

Prior to serving with the Air Force, Dr. Graham received a Bachelor of Science degree, with honors, in Physics from the California Institute of Technology, and a Master and Doctor of Philosophy degree in Engineering Science and Electrical Engineering, respectively, from Stanford University. Dr. Graham has been an invited lecturer on several occasions in computer architecture at the University of Illinois and in national security and arms control at the University of Southern California.

# THEY HA



**R. Karas, 291**  
Service Access, Obstructing  
Service Stairs



**V. Odom, 287**  
Procedures Manual, Form



**M. Caraker, 220**  
Safety Window for  
Stairwell Door



**S. Mose**  
Travel Doc



**K. McCoy, 480**  
Handbook



**T. Murphy, 291.3**  
Service Access, Duct Work



**K. Fletcher, 221**  
Overprint of Form



**J. Banisz**  
Han



**W. Burgess, 751.1**  
Wire-Electric Discharge  
Machine Dust Vapor



**R. Herbert, 700**  
Smoking in Elevators



**J. Jew, 202.1**  
Safety, Productivity, Canteen



**J. Sutt**  
Refinishing



**W. Spear, 284.6**  
Division of Duty



**B. Reamy, 200.7**  
Revision Form



**R. Hockensmith, 727**  
Pedestrian Control



**R. Pinc**  
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## \*Employee Sugg

E.S.P. saved Goddard over \$300,000 last year  
Now it is your turn to help make the Center more ef

# D E.S.P.\*



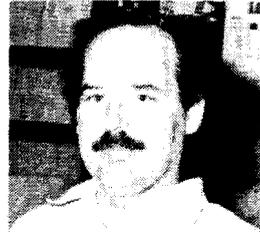
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umentation



**D. Childs, RMS**  
Safety Shields



**S. Green, 250**  
Numerical Indications Near  
Elevators



**M. Desch, 695**  
Unsafe Exit From Building



owski, 285  
book



**D. Geary, 543**  
Labor Saving Device Repair  
Contract



**D. Hinkle, 287**  
Processing Contractor's  
Invoice



**P. Marcotte, 700**  
Alt. Source for Solid Rocket  
Motor Test



on, 220  
g Furniture



**T. Mooney, 290.1**  
Security Warning Lights at  
Parkway Gate



**M. Forman, 513**  
Implement Nimbus 7 Backup  
System



**M. Comberiate, 407**  
Satellite Data Relay Across  
Antarctica

**Not Pictured**

**C. Boyle, 200.7**  
Library Bulletin Boards

**W. Bolster, 470**  
Alt. Source for Solid Rocket  
Motor Test

**D. McCallum, 253.2**  
Locker Room Door

**S. Hammond**  
Service Access



us, 743  
fety



**J. Woolen**  
Sigma Data Services Corp.,  
Computer Performance



**R. Marks, 753.1**  
Station Sanitation



**J. Kerley, 754.1**  
Creative Design Program

## Suggestion Program

and earned suggestors \$15,133 in cash awards.  
efficient. Pick up a suggestion form in either cafeteria.

# Wallops Chemical Release Launch Lights Up Sky

By Joyce B. Milliner

Viewers in the northeast from Maine to North Carolina to Indiana could see a Wallops experiment light up the predawn sky November 20.

The experiment created chemical clouds at high altitudes using a Taurus-Nike-Tomahawk rocket launched from Wallops at 5:19 a.m.

The objective of this experiment was to provide baseline data on expected yields, vapor expansion velocities and other parameters for the chemical release canisters for the Combined Release and Radiation Effects Satellite (CRRES) scheduled to be launched in July 1987 from the Space Shuttle.

Three types of reaction chemistry were tested on the flight: a titanium-boron-

barium mixture, a titanium-boron-lithium mixture and a barium-cupric-oxide mixture. The barium and lithium vapor scattered sunlight at specific optic wavelengths (or colors) and were visible from the ground.

## Visible Chemical Releases

The payload, approximately 2.3 meters (90 inches) long and weighing 68.5 kg (151 pounds), contained three separate chemical canisters. The release altitudes for each canister simulated, as closely as feasible, the CRRES release altitudes.

The flight released the titanium-boron-barium chemical at the 370 km (230 statute miles) point on the upleg, the titanium-boron-lithium chemical at 523 km (325 statute miles) and the barium-cupric-oxide chemical at the 370 km (230 statute miles)

point on the downleg portion of the trajectory. The barium clouds appeared from the ground as greenish-white balls that rapidly expand while ejecting barium ions along the magnetic field to form a visible streak more than 100 km (62 mi) in length. The lithium cloud was red and expanded to a diameter of several hundred kilometers in less than a minute.

Dr. David L. Reasoner of NASA Marshall Space Flight Center was the principal investigator for the mission. The data were taken by ground-based optical systems provided by Dr. J. Heppner, Goddard; Dr. P. Bernhardt, Los Alamos National Laboratory; Dr. G. Haerendel, Max Planck Institute, Germany; and Dr. S. Mende, Lockheed Palo Alto Research

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## Goddard CFC Surpasses Goals

Goddard's CFC campaign enjoyed one of its most successful years ever thanks to employees' generous contributions. The total collected to date is \$283,247, with time still remaining for additional contributions. Of this amount, \$275,710 goes to the United Way campaign for the National Capital area, (CFC) while \$7,537 was raised for the United Way campaign of the

Baltimore area (Central Maryland). Please note: while Goddard met its goals, the National Capital area as whole is still short of the amount it needs. If you would like to contribute, there is still time. Contributions can be made by contacting Marietta Sturgell, x6087 through January.

Contributions to the CFC by codes this year were as follows:

Code	\$ Contributions	% of Goal	% Participation
100	\$ 4,200	163	84
150	4,516	106	72
200	30,158	115	59
300	11,069	126	94
400	30,823	109	84
500	62,152	143	73
600	65,935	113	62
700	66,857	123	81
Subtotal CFC	\$275,710		
Subtotal Central Maryland	7,537		
TOTAL	\$283,247	122	72



**RAYTHEON CONTRIBUTES TO CFC**—Leslie Warren, Raytheon CFC chairman, presents a \$5,000 check to Goddard's Networks Division Chief Robert Spearling. Left, Stanley Groover, Raytheon; Right, John Daniels, code 530 CFC coordinator.



**BENDIX GIVES TO CFC**—Philip H. Johnson (third from left), vice president for space operations, Bendix Field Engineering Corporation (BFEC), presents the company's corporate contribution check for the 1985 Goddard Combined Federal Campaign (CFC), to Peter A. Bracken, director of Mission Operations and Data Systems Directorate. Attending the presentation are (from left) Betsy Edwards, Code 500 coordinator for CFC; Bracken; Johnson; and Jane F. Dembeck, 1985 United Way co-chairperson, BFEC.

# Around the Center

## SMALL PURCHASING HAS MOVED!

The Small Purchasing Section (Code 247.2) has moved from Building 16W to Building 17 (Rooms N104 through N116). The mail code and telephone numbers remain the same.

The Small Purchasing Section processes all procurements up to \$25,000 other than Automation Data Processing procurements. Presently, approximately 1,300 procurement requests are processed per month.

## GODDARD INVENTORS (below)

(below) whose patents were issued in Fiscal Year 1985 received Certificates of Recognition from Dr. Hinners at the Second Annual Inventors' Luncheon last month. The inventors are: (standing, left to right) Kenneth Young (High Voltage Power Supply); Dr. Jacob Trombka (Mapping the Distribution of Chemical Elements in an Extended Medium); Carroll Clatterbuck (High Voltage Isolation Transformer); David Manges (Rotatable Electric Cable Connecting System); Michael Shui (Diffusely Reflecting Polaris); George E. Alcorn (GaAs Schottky Barrier-Responsive Device); Lo I Yin (Three Dimensional and Tomographic Device for X Ray and Gamma Ray Emitting Objects); (sitting): Phillip Studer (Magnetically Actuated Compressor); John Schutt (Diffusely Reflecting Polaris); Charles Korb (Measuring Temperature and Pressure), with Center Director Dr. Noel Hinners. Not pictured are: James Kalshoven, Jr. (Measuring Temperature and Pressure); Richard Day (Portable Pallet Weighing Apparatus); Leonard Kleinberg (Reactanceless Bandpass Amplifier); and Carl Angulo (Disintegrating Kidney Stones).



DR. HERMAN OBERTH (above) visited Goddard on Wednesday, November 6. To historically-minded space enthusiasts, this 91-year old West German citizen is not only a living legend but also the last of the rocket pioneers.

In 1923, Oberth's book *Die Rakete zu den Planetenraumen* (The Rocket Into Planetary Space) gave the scientific community a vision of man in space. He made spaceflight an engineering problem to be solved. New areas Oberth considered included space food, suits and walks. He also detailed the operation of an orbiting space station with shuttle-like rockets traveling between the station and Earth.

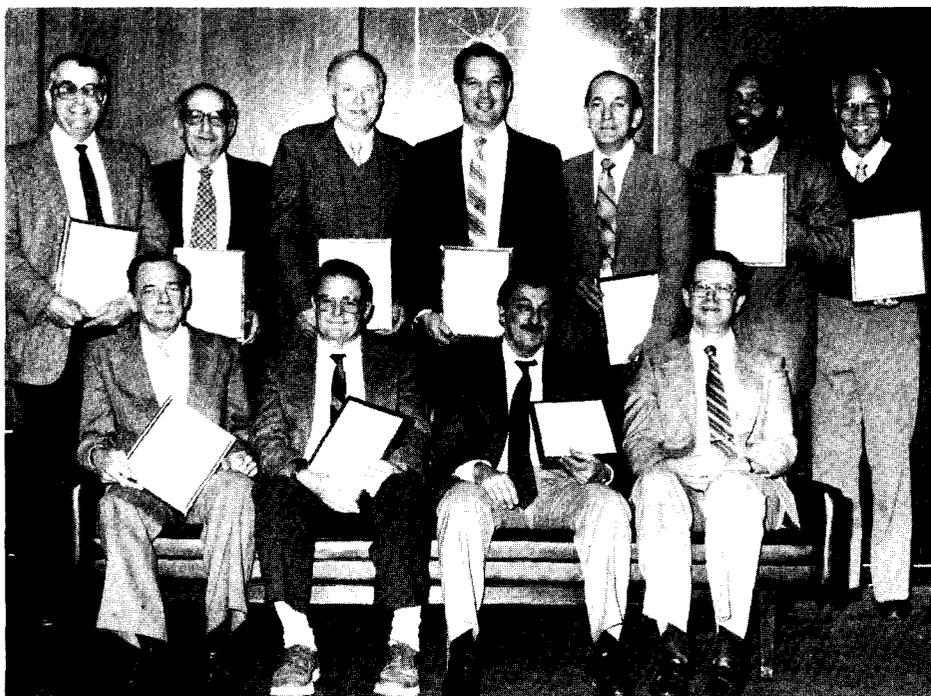
After a Center tour, Oberth viewed the landing of the space shuttle Challenger on TV from the Visitor's Center.

## THE NOAA-8 RECOVERY TEAM

received the American Institute of Aeronautics and Astronautics' Halley Space Flight Award in a ceremony in Houston last month. The award recognized the NOAA/NASA/RCA NOAA 8 Recovery Team for "engineering skill, innovation, dedication to duty, outstanding professionalism, and unyielding tenacity in regaining control—and thus operational use—of the NOAA 8 environmental satellite eleven months after it had been presumed lost. The Goddard awardees are Gay Hilton, Metsat Systems Manager; David Coolidge, Mission Operations Manager, TIROS; Thomas Karras, Advanced Mission Analysis Office; and Barbara Scott, Operations Support Manager for the Satellite Servicing Project. This is the first time the award, which previously has gone to astronauts, test pilots and rocket pioneers, has been received by a Goddard team.

## PETER BRACKEN, Director of Mission Operations and Data Systems Directorate,

was elected a fellow of the American Astronautical Society on November 7 in Los Angeles for "two decades of achievement in the aerospace data systems field." Fellows are the highest members of the Society which was founded in 1899 and is the largest professional society in the United States solely for astronomers.



GODDARD HOSTED its second annual Health Benefits Fair (above) at the building 8 auditorium on Wednesday, November 13. A constant flow of employees filed in and out of the auditorium, from 11:00 a.m. to 2:00 p.m., to obtain information on the various health plans available to federal employees.

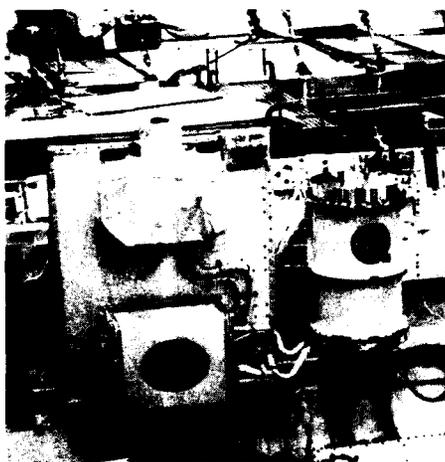
The 21 carriers that represented their plans at the fair thought that this was an excellent opportunity for Goddard personnel to "shop" for the plan that best suits their individual needs. Open season closed December 6.

# STS—61 C

Continued from page 1

nautics, Colorado Springs, Co.)

- Determine how unprimed canvas, prepared linen canvas, and portions of painted canvas react to space travel. (Vertical Horizons, Flushing, NY)
- Determine the biological effects of neodymium (Nd) and helium-neon (HeNe) laser light upon desiccated human tissue undergoing cosmic radiation bombardment; determine cosmic radiation effects upon medications and medical/surgical materials; perform analysis of contingencies that develop due to zero gravity in blood typing; and evaluate laser optical protective eyewear materials which have been exposed to cosmic radiation. (St. Mary's Hospital, Laser Laboratory, Milwaukee, WI)
- Measure galactic and extragalactic contributions to the diffuse ultraviolet background radiation; and develop and demonstrate an advanced Get Away Special carrier system capable of providing data and power services to shuttle attached sounding rocket class instruments. (GSFC/NASA Headquarters Code E)
- Effect of gravity on particle dispersion of packing materials in HPLC analytical columns. (All Tech Associates, Inc., Deerfield, IL)
- Study the solidification of alloys for lead-antimony and an aluminum-copper combination; study the comparative morphology and anatomy of the primary root system of radish seeds; study crystal growth of metallic-appearing needle crystals in an aqueous



**HITCHING A RIDE**—Hitchhiker G connects low-cost payloads to Shuttle's power and communications.

solution of potassium tetracyanoplatinate; and provide information on the "project-explorer-payload-elapsed-time" and the operational status of experiments during flight to all amateur radio stations and short-wave listeners around the world. (Alabama Space and Rocket Center, Huntsville, AL)

- Expose wild and lab research gypsy moth eggs and engorged female American dog ticks to weightlessness in a shuttle mission. (Goddard/U.S. Department of Agriculture)
- Measure the response of the GAS Bridge to the shuttle environment during lift-off, orbit and landing.

Mail your story to the Goddard News (Code 130), or call the Editor at 344-5565.

# Wallops Launch

Continued from page 5

Laboratory, from four optical sites in North Carolina, Virginia, Maryland and West Virginia. Ground observations also were conducted with the Millstone Hill Radar at MIT and two portable radars in the Bahamas.

### Other Scientists Participate

Other scientists who participated in the observations included Dr. M. Mendillo, Boston University and Dr. H. Carlson, Air Force Geophysics Laboratory.

Jay F. Brown was the Wallops Payload Manager, and Debbie Frostrom was the Wallops Project Engineer for this flight.

# Blood Donors

Following is a list of Goddard donors recently cited by the American Red Cross with gallon pins at the bloodmobile of December 4, 1985.

NAME	CODE	NO. OF GALLONS
Tobin Anthony	554.1	1
Joe Bourne	562.8	4
Michael Forman	513	7
Larry Hilliard	311	1
Patrick Kilroy	311	1
Jacques Knox	290	7
Aivin Lamb	539	1
Michael Prokopchak	513	7
Kenneth Reed	724	1
Tom Russell	285	2
Richard Starr	682	6
Andrew Szymkowiak	666	2
John Tomimovich	287	10
Barbara Vargo	152	1
Tom Wilheit	675	3

A great big THANK YOU is extended to all who visited the recent bloodmobile. The next mobile is scheduled for Wednesday, February 5, 1986 in the bldg. 8 auditorium from 8:30 a.m. to 2:30 p.m. Watch flyers for details!

# Retirees

Our best wishes go with the following people who retired from Goddard at the end of this year. Happy Holidays!

November		
Shawe, Merrick	540.1	30 years
Lang, William	712	33 years
Woods, Tom	234.2	36 years
Fisher, Elise	742.2	35 years
Alphin, William	291.4	26 years
Kapinsky, Abe	727.1	43 years
Allison, Calvin	751	44 years
December		
Kolb, Frederick	303	31 years
Millis, Jim	200	32 years



# Goddard News

Greenbelt, Maryland and Wallops Island, Virginia

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- Managing Editor ..... Charles Rechnagel
- Senior Editors ..... Carter Dove and Joyce Milliner