NASA News

National Aeronautics and
Space Administration

Washington, D.C. 20546
AC 202-453-8400

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For Release:
July 2, 1990

RELEASE: C90-z

NASA AWARDS CONTRACT FOR SYSTEMS INTEGRATION WORK ON SHUTTLE

NASA's Marshall Space Flight Center (MSFC) in Huntsville, Ala., has awarded a $42.6 million, 2-year contract to Rockwell International, Space Systems Division, Huntsville Operations, to continue providing Space Shuttle systems engineering and integration services.

Terms of the cost-plus-award-fee contract permit the government to exercise up to three 1-year extension options beyond the 2-year basic period.

The major services to be provided under the contract are planning and integration for the Shuttle elements managed by MSFC. More specifically, this contract will provide support for the center's role in Shuttle launch and flight support activities, test verification, operations integration, flight evaluation, engineering analysis, data systems operations and special studies.

The integration services provided under this contract are performed primarily at MSFC, but some of the support effort also is provided at NASA's Kennedy Space Center, Fla., and at the Stennis Space Center near Bay St. Louis, Miss.

The period covered by this effort is July 1, 1990, through June 30, 1992. The contract provides for continuation of work which Rockwell has been performing under previous contracts with MSFC since 1982.

- end -

NASA News

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For Release:
July 2, 1990

N90-48

EDITORS NOTE: STATUS BRIEFING ON SHUTTLE LEAK INVESTIGATION

Associate Administrator for Space Flight Dr. William B. Lenoir and Space Shuttle Director Robert L. Crippen will hold a media briefing in the NASA Headquarters 6th floor auditorium on Tuesday, July 3 to discuss the results to date of the investigation into the hydrogen leaks on Space Shuttles Columbia and Atlantis.

The briefing will begin at 4 p.m. EDT and will be carried live on NASA Select television via Satcom F2R, Transponder 13, at 72 degrees West longitude, frequency 3960.0 MHz.

Status briefings on the efforts to find the leaks on the Space Shuttle system will be held periodically until the problem is resolved.

- end -

NASA News

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For Release
July 2, 1990

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RELEASE: 90-90

CONTROLLED REST PERIODS SHOWN TO IMPROVE PILOT ALERTNESS

Rest during long-haul flights improves pilot alertness. This is the conclusion of a recently completed study at NASA's Ames Research Center, Mountain View, Calif., providing the first concrete evidence that there may be substantial safety benefits from allowing pilots to obtain limited rest in the cockpit during long-haul, international flights.

"These findings confirm our previous studies that showed international flight crews often experience considerable fatigue and sleep loss. We now have direct scientific evidence that short, carefully controlled rest periods can act as a 'safety valve' to reduce fatigue and improve alertness during the most important phases of flight such as descent and landing," said Dr. R. Curtis Graeber, principal investigator of the study and Chief of the Flight Human Factors Branch at Ames.

Incident and accident reports indicate that good flight crew performance is especially important near the end of any flight when workload increases and the crew must often deal with air traffic control problems, uncooperative weather and potentially unfamiliar airports. "Unfortunately, this is also the time when they are most likely to be the most tired after a long trip crossing several time zones," said Graeber. Consequently, measures that can help the crew perform better when the job requires the best performance have significant implications for reducing pilot error and enhancing safety.

- more -

The research project, co-sponsored by the Federal Aviation Administration (FAA), was carried out with the cooperation of Northwest Airlines and United Airlines during regularly scheduled trans-Pacific flights. The scientists examined the levels of alertness in three-person flight crews during long-haul flights, the pilots' ability to obtain quality rest in the cockpit environment and the effectiveness of preplanned, cockpit rest periods to improve pilot alertness and performance.

A total of ten volunteer Boeing-747 crews were placed in one of two groups: a preplanned rest group and a non-rest control group. Crew members in the rest group were allowed to rest one-at-a-time on a preplanned rotation basis during the cruise portion of four successive flights. Two crew members monitored and maintained control of the plane while the other pilot had a 40-minute opportunity to rest. The control group of pilots operated its four flights as usual with no preplanned rest.

To document changes in fatigue and alertness, researchers took a variety of measurements: Laboratory-type performance tests evaluated pilot vigilance and sustained attention; wrist monitors provided a 24-hour measure of activity level; subjective reports of mood and other factors were recorded in a log book. Also, continuous measurement of brain activity (i.e., electroencephalogram -- EEG), by a portable unit adapted especially for NASA, was used to determine physiological levels of alertness.

Two NASA researchers observed and monitored all of the volunteer crews on the flight deck. The researchers found that when given the opportunity to rest in their seats, the pilots generally were able to fall asleep easily and sleep well. Later, these crew members demonstrated significantly higher levels of vigilance than their no-rest counterparts. These differences between the two groups were especially dramatic near the end of the cruise phase of flight, just before the pilot starts the descent for landing. Also, pilots who could rest were less adversely affected by consecutive flight segments and night flights.

This study is a part of an on-going NASA/FAA collaborative research program to study fatigue, sleep loss and circadian rhythm disruptions (i.e., jet lag) in commercial and military aviation and, most recently, the role of these factors in the manned space program.

- more -

Previous research with long-haul crews has shown that repeated time zone crossings often result in poor sleep patterns during hotel layovers, particularly after eastward flights. While pilots sometimes sleep well, their ability to do so varies both among individuals and at different times. Experienced crew members were found to be poor predictors of their own sleepiness when compared with objective measurements. The overall impact of these findings is that there is often at least one crew member who is not optimally rested to perform flight duties.

The current results demonstrate that preplanned rest periods during low workload phases of flight may provide a safety valve for the sleep loss and fatigue experienced by crews during long-haul flights. Planned cockpit rest periods may possibly prevent excessive fatigue and improve alertness and performance during critical phases of flight.

Cockpit rest currently is allowed among military transport crews and among airline crews in some other countries. The FAA is now reviewing the NASA-Ames research results. Collaborators on this study included researchers from Stanford University, the University of Pennsylvania and the University of California, San Diego.

- end -

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NASA FactSheet

National Aeronautics and
Space Administration

Washington, D.C. 20546
AC 202-453-8400

Mark Hess
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July 2, 1990

LH2 LEAK INVESTIGATION

History

During the launch attempt for the STS-35 mission on May 29, 1990, a hydrogen leak, in excess of limits established to maintain safe operating conditions, was detected by onboard hazardous gas detection systems. Leakage was detected both in the aft compartment and external to the liquid hydrogen external tank/orbiter umbilical assembly.

A subsequent tanking test, that incorporated special ground instrumentation, further isolated the leak to the free space between the two halves of the umbilical assembly. The umbilical provides capability to load propellant into the external tank and transfer propellant from the external tank to the Space Shuttle main engines during launch. The umbilical disconnect assembly is the separation point between the orbiter and the external tank after main engine cutoff.

The design of the umbilical disconnect has remained the same throughout the Shuttle flight program except that a safety modification to incorporate a valve latch, which precludes inadvertent closure, was authorized after the Challenger accident. Data from the tanking test determined that the design changes incorporated by this modification did not contribute to the leakage.

Following rollback and orbiter demate, the LH2 External Tank (ET) side of the umbilical was removed and tested at Rockwell International, Downey, Calif. The testing was performed under precisely controlled liquid hydrogen test conditions. No leaks were detected.

On June 29, 1990, NASA conducted a modified propellant loading test of the STS-38 Space Shuttle vehicle to ensure the safety and integrity of the orbiter/ET umbilical. The test revealed a hydrogen leak. The results indicate the leak is in the vicinity of the umbilical mating plates. It appears to be primarily from the 17-inch line but possibly with a contribution from the 4-inch line. The leak is flow rate and temperature dependent. It is not as high as STS-35 but it exhibits many of the same characteristics.

Current Status

An extensive investigation is being performed to isolate the source of the leakage observed on both the STS-35 and STS-38 vehicles.

Columbia is in the Orbiter Processing Facility (OPF). The orbiter side of the LH2 umbilical from Columbia was shipped to Rockwell-Downey on Saturday and is being installed in a test stand which can test the orbiter and ET umbilicals in a mated configuration. Engineers expect to begin cryogenic hydrogen testing of the umbilical on Thursday to further isolate the source of the leak.

In the interest of safety, all potential leak sources, including the very low probability of a parent metal flaw, are being investigated. A detailed investigation of all aspects of the STS-35 and STS-38 component history, including acceptance test procedure requirements and data, and design changes being performed.

Processing of the STS-38 vehicle has been suspended. Engineers are continuing troubleshooting efforts on the Shuttle vehicle at Launch Pad 39-A. Today, the external tank will be pressurized and leak checks conducted in the area of the orbiter-to-external tank umbilical. Another special tanking test is being considered using special leak detection sensors to help pinpoint the leak's location.

Program Team

Leonard Nicholson, Deputy Director, Space Shuttle Program, will lead the NASA/industry team charged with analyzing the cause of the leak and determining corrective actions.

Under Nicholson, four work teams have been formed:

- Design and Analysis Team - to assess the flight hardware and ground support equipment hardware designs, fabrication and test programs, and assess ground processing procedures to ensure compliance with design intent.

- Hardware Processing Team - to review all Kennedy Space Center procedures associated with the ET and orbiter processing, including "as run" data, problem reports, processes, procedures and personnel certification.

- Data Analysis Team - to analyze data from the tanking tests and applicable launches to identify trends, define additional tests and instrumentation needed to understand and isolate the source of the leak and review all tests currently planned for completeness and appropriateness.

- Fault Tree/Test Requirements Team - to develop and provide to the other teams a fault tree identifying failure scenarios, and identify additional tests and data requirements.

An independent team, headed by Wayne Littles, Deputy Director of Marshall Space Flight Center, Huntsville, Ala., also has been formed with senior NASA and contractor representatives who are experts in liquid hydrogen technology. While they will work independently of the investigation teams, they will report to Nicholson, and support the team, as appropriate.

Acceptance Test Procedure (ATP)

The ET/Orbiter umbilical is fully developed and qualified flight hardware that has met all of the functional requirements stipulated by specification.

An acceptance test procedure, which is a screen to verify the manufacturing process for each component delivered, has been developed from performance requirements. The ATP stipulates the use of liquid nitrogen as an acceptable substitute for liquid hydrogen, which is extremely dangerous and volatile to handle.

The disconnect component specification allows a maximum hydrogen leakage of 200 standard cubic inches per minute (scim) for the mated disconnect assembly at cryogenic temperature (150 scim for the ET and 50 scim for the orbiter). The ATP has a more stringent limit on the ET disconnect, which is 50 scims. This allowable leakage rate was established to compensate for the temperature and media differences between liquid nitrogen and liquid hydrogen. The orbiter disconnect underwent ATP testing with liquid hydrogen because there are a limited number of production units.

Future Steps

Until the leak investigation is completed, Shuttle flights have been suspended. Returning the Shuttle fleet to flight status is the highest priority in the Space Flight Office, and every available resource within the Shuttle program is being brought to bear on solving this problem. NASA is confident that the source of the leak can be isolated quickly and the problem fixed with minimum disruption to the Shuttle flight program.

Independent of these events, a component redesign to replace the current umbilical disconnect with a new design has been underway and is well into the preliminary design phase. The new disconnect incorporates significant safety improvements, including redundant seals at all locations.

- end -

NASA News

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For Release:
July 2, 1990

RELEASE: 90-091

HUBBLE BOARD OF INVESTIGATION NAMED

Dr. Lennard A. Fisk, NASA Associate Administrator for Space Science and Applications today appointed a Hubble Space Telescope Optical Systems Board of Investigation to review, analyze and evaluate the facts and circumstances regarding the manufacture, development and testing of the Hubble Space Telescope Optical Telescope Assembly.

The board will be chaired by Dr. Lew Allen, Director, Jet Propulsion Laboratory, Pasadena, Calif. The other members of the board are:

Charles P. Spoelhof
(Retired) Vice President, Eastman Kodak Co.
Pittsford, N.Y.

George A. Rodney
Associate Administrator for Safety and Mission Quality
NASA Headquarters, Washington, D.C.

John D. Mangus
Head, Optics Branch, Space Technology Division
NASA Goddard Space Flight Center, Greenbelt, Md.

Dr. R. (Bob) Shannon
Professor of Astronomy, Optical Sciences Center
University of Arizona, Tucson

Dr. Roger Angel
Professor of Astronomy, Steward Observatory
University of Arizona, Tucson

- more -

Sarah Keegan, NASA Public Affairs Officer, and Gary Tesch, NASA Deputy General Counsel, will support the board as public affairs advisor and counsel, respectively.

- end -

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For Release:
July 3, 1990

RELEASE: 90-92

NASA, ORBITAL SCIENCES CORPORATION SIGN AGREEMENT

NASA and Orbital Sciences Corporation (OSC), Fairfax, Va., have signed an agreement in support of the firm's Pegasus and Taurus commercial launch vehicle programs.

Terms of the 5-year agreement allow OSC to enter into specific sub-agreements with NASA installations wherein NASA will provide, on a cost-reimbursable basis, access to agency launch support property and services.

As part of a continuing effort to foster a strong U.S. commercial launch vehicle industry, government property and services are made available to the private sector, on a reimbursable basis, when such property/services cannot be provided by commercial sources. Similar NASA "umbrella" agreements have been negotiated with four other firms: General Dynamics, McDonnell Douglas, Martin Marietta and LTV Corp. NASA also is conducting discussions with other U.S. expendable launch vehicle firms for possible support agreements. NASA installations which are involved in specific sub-agreements with companies include the Kennedy, Lewis, Goddard and Marshall Centers.

NASA is committed to facilitating and encouraging the commercial use of space by U.S. firms. The Commercial Space Act and its 1988 amendment, as well as the National Space Policy of November 1989, underscore the importance of government support to the emerging American commercial launch vehicle industry.

- end -

NASA News

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For Release:
July 5, 1990

N90-49

STS-35 & STS-38

EDITORS NOTE: 2ND STATUS ~~BRIEFING~~ ON SHUTTLE LEAK INVESTIGATION

Associate Administrator for Space Flight Dr. William B. Lenoir and Space Shuttle Director Robert L. Crippen will hold the next media briefing on the continuing investigation into the hydrogen leaks on Space Shuttles Columbia and Atlantis, on Friday, July 6, in the NASA Headquarters 6th floor auditorium.

The briefing will begin at 3 p.m. EDT and will be carried live on NASA Select television via Satcom F2R, Transponder 13, at 72 degrees West longitude, frequency 3960.0 MHz.

These status briefings on the efforts to find the leaks on the Space Shuttle system will be held periodically until the problem is resolved.

- end -

NASA News

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For Release:
July 6, 1990

RELEASE: 90-93

NASA TO CONDUCT SOUNDING ROCKET CAMPAIGN IN KWAJALEIN

NASA will conduct a sounding rocket campaign in the South Pacific over the summer to better understand the Earth's ionosphere in the equatorial regions and the response of the ionosphere to electric fields and plasma cloud injections. Several of the rocket experiments will complement a satellite launch planned for this month.

From July 10 through Aug. 23, the Wallops Flight Facility (WFF), Wallops Island, Va., of NASA's Goddard Space Flight Center (GSFC), Greenbelt, Md., will launch seven suborbital sounding rockets from the Roi-Namur launch facility in the Kwajalein Atoll in the Republic of the Marshall Islands.

Four of these sounding rocket experiments will complement the science objectives of the Combined Release and Radiation Effects Satellite (CRRES), scheduled for launch from the Cape Canaveral Air Force Station on July 17. CRRES is a joint NASA/U.S. Air Force mission that will study the Earth's magnetic field and the effect of space radiation on advanced electronics. The remaining three sounding rocket experiments comprise the Equatorial Ionospheric Studies (EQUIS) program.

The sounding rockets will carry experiments designed to study a region of the ionosphere from 155 to 372 miles above the Earth. The experiments will aid scientists in understanding the chemistry and spatial structures of the ionosphere and the fundamental physics of ionosphere disturbances and turbulence in the equatorial regions.

- more -

The campaign scientist is Dr. Michael Mendillo of Boston University, and the campaign manager is Jay F. Brown of WFF. Seventy-two people from Wallops and the science community will be involved in the campaign.

The first series of two experiments, involving four rockets, is part of the CRRES program. These rockets will be launched between July 20 and July 23 and between Aug. 10 and Aug. 23 in launch windows that extend from sunset to two hours after sunset. Each experiment will consist of two Taurus-Nike-Tomahawk sounding rocket launches.

In each pair, the first rocket's payload will release 75 pounds of sulfurhexaflouride between 215 and 280 miles altitude. The chemical cloud will not be visible to the eye but will be detectable by low-light-level cameras. The second rocket payload of each pair is instrumented to measure the disturbances produced by the chemical release in the ionosphere. The rocket will be launched eight to 25 minutes after the first rocket, depending on the drift of the chemical cloud. Ground-based radars and optical sensors also will be used from sites on Kwajalein, Wake Island, and Kosrae, Federated States of Micronesia. For the CRRES experiments, Dr. Mendillo is the principal investigator and Brown is the payload manager.

The EQUIS component of the Kwajalein Campaign involves three rocket launches. The first two of these experiments (called "Spread F") will occur between July 25 and Aug. 8. The launch window is from one hour before sunset until midnight. Two Terrier-Malemute sounding rockets will carry these payloads to 300 miles altitude.

The Spread-F payloads are identical and designed to measure the electric fields and spatial structures in the ionosphere. The rockets will launch during ionospheric disturbances that often occur in the equatorial regions. The principal investigators for these experiments are Dr. Robert F. Pfaff, Jr. of GSFC and Professor Michael C. Kelly, Cornell University. The payload manager for both rockets is Geoff Bland of WFF.

The third EQUIS experiment, the Negative Ion and Cation Release Experiment (NICARE) will be launched on a Black Brant IX sounding rocket between Aug. 9 and Aug. 22. The launch window runs for 60 seconds shortly after dusk.

- more -

The NICARE payload will eject 24.5 pounds of a barium-thermite mixture at about 215 miles altitude during its ascent and will release 65 pounds of sulfurhexaflouride at 210 miles during its descent. The barium-thermite mixture will produce a blue-green cloud that may be visible as far as 600 miles from Kwajalein. The second chemical will not be visible to the eye, but will be detectable by sensitive ground-based optical systems.

The NICARE instruments will measure the effects the chemicals have on the ionosphere. Additional data will be obtained from ground-based observation sites within the Marshall Islands. The principal investigator for the experiment is Dr. Paul Bernhardt from the Naval Research Laboratory and the payload manager is Phil Eberspeaker from WFF.

The Kwajalein campaign is part of the overall NASA Sounding Rocket program, which is managed at WFF. The program consists of approximately 30 sounding rockets launched each year from various worldwide locations. The overall CRRES program is managed by the Marshall Space Flight Center, Huntsville, Ala., for NASA's Office of Space Science and Applications.

- end -

EDITORS NOTE: Available to the media only are three photos available in either Color or Black and White of CRRES/EQUIS sounding rocket and payload processing and testing:

WI-90-255-1	Terrier-Malemute nose cone deployment test.
WI-90-279-9	Terrier-Malemute telemetry section assembly.
WI-90-279-4	Black Brant IX spin/balance test.

Material can be obtained by calling Wallops Flight Facility Public Affairs Office, 804/824-1579.

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90-94

COMBINED RELEASE AND RADIATION EFFECTS SATELLITE (CRRES)

ATLAS I (ATLAS/CENTAUR-69) LAUNCH VEHICLE

PRESS KIT

JULY 1990

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RELEASE: 90-94

CRRES LAUNCH SET FOR JULY TO STUDY "EARTHSPACE"

Launch of the Combined Release and Radiation Effects Satellite (CRRES) is currently targeted for no earlier than July 17, 1990, at 3:41 p.m. EDT. Scheduled to be placed into a highly elliptical, geosynchronous transfer orbit of approximately 217 by 22,236 miles, CRRES is to conduct complex scientific research in what is referred to as "Earthspace" -- the space environment just above Earth's atmosphere which, far from being empty, includes the ionosphere and magnetosphere containing a dynamic ocean of invisible magnetic and electrical fields and particles.

Much as a high school physics student spreads iron filings around a magnet to "see" its invisible magnetic field, CRRES will carry 24 canisters of various chemicals into orbit and release the chemicals over a period of time. When released, the chemicals will be ionized by the Sun's ultraviolet light creating large luminous clouds that will elongate along Earth's magnetic field lines, briefly "painting" these invisible structures.

By observing the motion of the clouds, scientists will be able to measure electric fields in space and "see" how they interact with charged particles to form waves and to better understand how the Earth extracts energy from the solar wind. The luminous clouds also will be studied from the ground, from specially equipped aircraft and from CRRES itself. The CRRES releases will be augmented by chemical releases from 10 sounding rockets launched from Puerto Rico and the Marshall Islands.

Under a launch services contract between NASA and General Dynamics, launch of the joint NASA/U.S. Air Force payload is to take place from Complex 36B, Cape Canaveral Air Force Station, Fla., aboard an Atlas I (Atlas/Centaur-69) launch vehicle.

NASA's Marshall Space Flight Center, Huntsville, Ala.; the U.S. Air Force Space Systems Division, Los Angeles; and Ball Aerospace Systems Group, Boulder, Colo. -- prime comtractor of CRRES -- are principal spacecraft participants in the upcoming mission. Atlas I launch services, with technical oversight by NASA's Lewis Research Center, Cleveland, and Kennedy Space Center, Fla., will be provided by General Dynamics Space Systems Division, San Diego, Calif. The Lewis Research Center manages the NASA-General Dynamics launch services contract and is responsible for launch vehicle/spacecraft integration activities.

- end general release; press kit follows -

THE COMBINED RELEASE AND RADIATION EFFECTS SATELLITE

SCIENCE BACKGROUND

The Combined Release and Radiation Effects Satellite (CRRES), a joint NASA/Air Force project, will attempt to learn more about the hostile environment often referred to as "the vacuum of outer space."

Outer space, however, is not empty. It is a dynamic mix of invisible magnetic and electric fields, energetic particle radiation and electrically charged plasmas, collections of negatively charged electrons and positively charged atoms whose interactions are influenced by long-range electric forces, rather than by the atomic collisions that govern the behavior of neutral gases.

Complex interactions involving these fields and particles extract energy from the solar wind, a continual flow of particles from the Sun, and deposit much of this energy into the Earth's upper atmosphere, ionosphere and magnetosphere. The Earth's neutral atmosphere, extending approximately 40 miles above the Earth's surface, is a shell of neutral gases that encompasses the Earth's weather and protects its life. The ionosphere, which extends from above the atmosphere to approximately 620 miles above the Earth, is an electrically charged transition zone between the atmosphere and the magnetosphere.

Beyond the ionosphere lies the magnetosphere, populated with energetic, charged particles. When this magnetosphere is hit by a cloud of energetic particles from a solar flare, a so-called geomagnetic storm can occur that can disrupt power systems and long-distance communications. Today's increasingly complex satellites, carrying sophisticated electronics and sensors such as the Tracking and Data Relay Satellite and other geostationary spacecraft, are susceptible to damage from solar energetic particles that can limit the satellite operational lifespan.

Scientists have been studying the magnetosphere for decades, using a combination of ground-based measurements and satellite observations. Beginning this summer, the CRRES satellite will conduct experiments allowing direct observations of the Earth's magnetic field.

CRRES OBJECTIVES

CRRES will carry 24 canisters containing various chemicals. For each experiment, one or two canisters will be ejected by the spacecraft. Approximately 25 minutes later, after the canister and spacecraft are far enough apart to prevent contamination, the canister will release its chemical vapors. The chemical will be ionized by the Sun's ultraviolet light, creating luminous clouds initially about 60 miles in diameter. The clouds will elongate along Earth's magnetic field lines, briefly "painting" these invisible structures so that they become visible.

By observing the motion of the clouds, scientists will be able measure electric fields in outer space, to "see" how these fields interact with charged particles to form waves and to better understand how the Earth extracts energy from the solar wind. These clouds will be studied by instruments on the ground, in specially equipped aircraft and aboard CRRES itself. The CRRES releases will be augmented by releases from sounding rockets to conduct further experiments.

The CRRES program is the latest in a new generation of space research missions studying earthspace, the space environment just above Earth's atmosphere, through complementary, active experiments and passive observations. CRRES is a joint program of NASA, through its Marshall Space Flight Center, and the Department of Defense's (DOD) Air Force Space Test and Transportation Program. NASA's role in the mission is the release of tracers. The DOD experiments will measure the natural radiation in space and its effects on microelectronics.

The satellite was built by the Ball Aerospace Systems Group, Boulder, Colo. The scientific instruments and investigations are being supplied by scientists from institutions throughout the United Sates, Europe and South America.

CRRES PROGRAM HISTORY

In 1984, the CRRES satellite was designed as a dual-mission spacecraft carrying 48 canisters of chemicals for release. The spacecraft initially was to be deployed from the Space Shuttle in a low-Earth-orbit (LEO) of 215 miles altitude. At LEO it would have performed chemical release experiments for 90 days. Following the LEO mission, a trans-stage motor would have placed CRRES in a geosynchronous transfer orbit (GTO), where additional chemical releases and the primary DOD mission would be carried out.

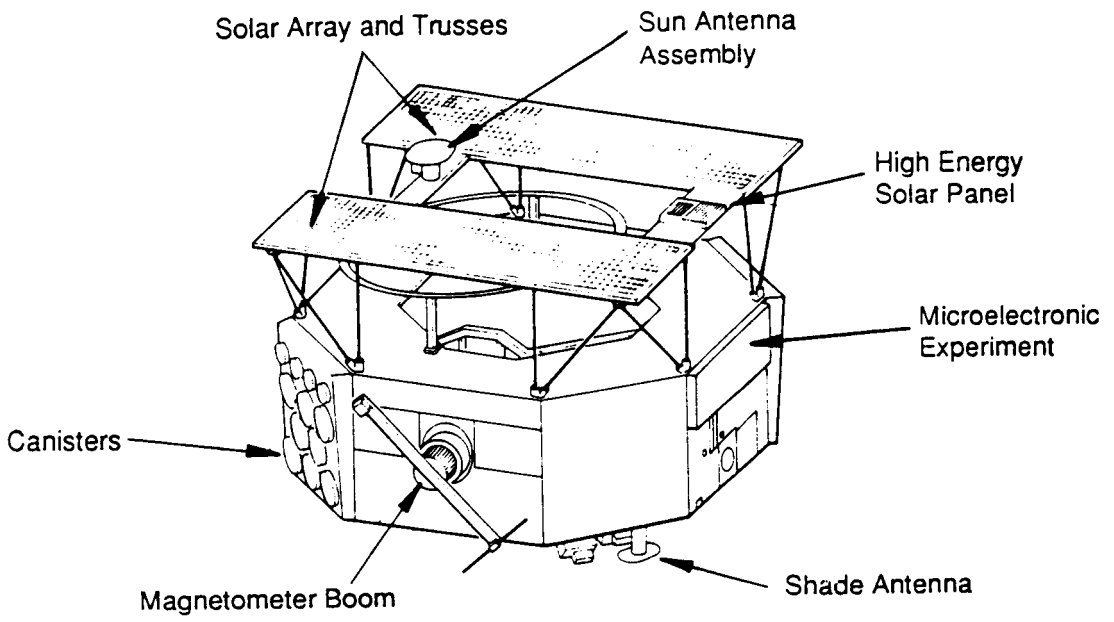
The loss of Challenger in January 1986 forced a major restructuring of the CRRES Program. In June 1987, NASA decided to launch CRRES directly to GTO on an Atlas-Centaur carrying 24 canisters, complemented by a program of sounding rocket launches to perform some of the experiments deleted from the original 48-cannister CRRES mission.

CRRES OPERATIONS

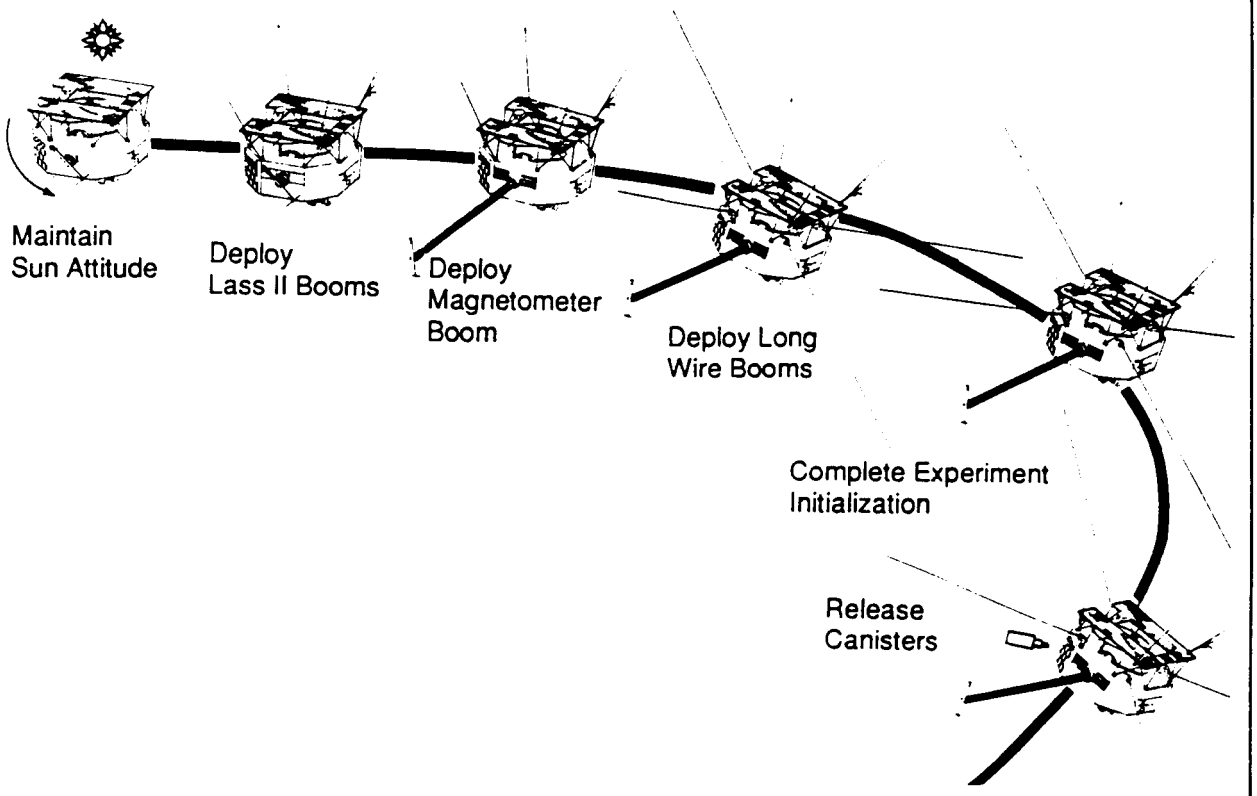
The 24 canisters on the CRRES/GTO mission will perform 14 experiments. Seven of these will be undertaken at altitudes ranging from 1,200 to 21,000 miles (the original GTO releases). The remainder will be undertaken near perigee at altitudes between 240 and 300 miles.

The mission will be complemented by 10 sounding rockets to perform releases that require precise targeting of location, local time and altitude. Six rockets are to be launched from Puerto Rico and four from Kwajalein, Marshall Islands.

Spacecraft Arrangement



On-Orbit Deployments



GROUND-BASED, IN SITU AND AIRCRAFT DIAGNOSTICS

The successful execution of the chemical release experiment demands a wide variety of diagnostics. Principal ground-based facilities that will monitor and track the releases include the Arecibo Incoherent Scatter Radar and the Arecibo HF Ionospheric Heater Facility in Puerto Rico, the Jicamarca (Peru) Radar Facility, the ALTAIR Radar Facility at Kwajalein and the Millstone Hill Radar Facility in Massachusetts.

These facilities will be used to diagnose the state of the ionosphere prior to, during and just after each release. They also will examine in detail the structure of the artificial plasma clouds. The radars can measure the state of the ionosphere and artificial plasma clouds simultaneously over a wide altitude range.

The DOD scientific instruments will complement the CRRES chemical-science mission, measuring the effects of the releases at close range. For releases, the instruments will measure the state of particles and waves in the magnetosphere and assess whether a large magnetic storm is imminent. This will help the scientists determine the best time to conduct a release.

No less important will be an array of ground- and aircraft-based optical diagnostics, including wide-field cameras, high-sensitivity television systems, spectrographs and interferometers. Portable VHF coherent scatter radars will diagnose regions not accessible to the fixed radars, and radio receivers on board aircraft will measure disruptions in signals received from satellites resulting from the ionospheric disturbances.

(See DETAILED EXPERIMENTS DESCRIPTION section of this press kit.)

ATLAS I (ATLAS/CENTAUR) LAUNCH VEHICLE

GENERAL DESCRIPTION

The Atlas I is a derivative of the Atlas/Centaur built by General Dynamics Space Systems Division (GDSSD) for NASA. The Atlas/Centaur previously was used by NASA as its standard launch vehicle for intermediate weight payloads. Atlas I is the first of a new family of launch vehicles that can be used to boost payloads into low-Earth orbit, geosynchronous-Earth orbit and on interplanetary trajectories. Eleven-foot and 14-foot diameter payload fairings are available to accommodate a variety of spacecraft.

The Centaur upper stage was the nation's first high-energy, liquid hydrogen/liquid oxygen propelled rocket. Developed and launched under the direction of NASA's Lewis Research Center, Cleveland, it became operational in 1966 with the launch of Surveyor 1, the first U.S. spacecraft to soft-land on the lunar surface.

Since that time, both the Atlas booster and the Centaur upper stage have undergone many improvements. At present, the Atlas I vehicle/14-foot fairing combination can place 13,000 pounds into low-Earth orbit, 4,950 pounds in a synchronous transfer orbit and 2,400 pounds on Earth escape trajectories. Since the first use of Atlas in the space program in the early 1960s, thrust of the Atlas engines has been increased about 50,000 pounds.

The Atlas I vehicle, approximately 143-feet high, consists of an Atlas I booster and a Centaur I upper stage. The Atlas booster develops 438,922 pounds of thrust at liftoff using two 188,750-pound-thrust booster engines, one 60,500-pound-thrust sustainer engine and two vernier engines developing 461 pounds of thrust each. The two RL-10 engines on Centaur produce a total of 33,000 pounds of thrust. Both the Atlas and Centaur are 10 feet in diameter.

Until early 1974, Centaur was used exclusively in combination with the Atlas booster. Subsequently, it was used with a Titan III booster to launch heavier payloads into Earth orbit and interplanetary trajectories. A new wide-body Centaur will be used as an upper stage on Titan IV launch vehicles.

The Centaur I has an integrated electronic system that performs a major role in checking itself and other vehicle systems before launch and also maintains control of major events after liftoff. The new Centaur system handles navigation and guidance tasks, controls, pressurization and venting, propellent management, telemetry forms and transmission and initiates vehicle events. Most operational needs can be met by changing the computer software.

ATLAS/CENTAUR-69 LAUNCH VEHICLE CHARACTERISTICS

The fueled AC-69 weight, including the 3,735-pound CRRES spacecraft, is 365,374 pounds. Liftoff height is approximately 143 feet. Launch Complex 36 (Pad B) is used for the launch operation.

	ATLAS BOOSTER	CENTAUR STAGE
Fueled Weight:	320,821 lbs.	40,818 lbs.
Height:	Approx. 77 feet	Approx. 67 feet with payload fairing
Thrust:	438,922 lbs. at sea level	33,000 lbs. in vacuum
Propellants:	Liquid oxygen and RP-1	Liquid oxygen/ Liquid hydrogen
Propulsion:	MA-5 system two 188,750 lb. thrust booster engines, one 60,500 lb. thrust sustainer engine, two 461 lb. thrust vernier engines	Two 16,500 pound thrust RL-10 engines, 12 small hydrazine thrusters
Velocity:	6,527 mph at booster engine cutoff (BECO) 9,326 mph at sustainer engine cutoff (SECO)	22,262 mph at spacecraft separation
Guidance	Preprogrammed profile through BECO. Switch to inertial guidance for sustainer phase	Inertial guidance

KENNEDY SPACE CENTER VEHICLE PROCESSING, OPERATIONS

ATLAS/CENTAUR-69 PROCESSING

The Atlas/Centaur-69 vehicle arrived aboard a C-5 Air Force transport plane from the General Dynamics plant, San Diego, on April 3. The Atlas stage was erected on Pad 36-B, Cape Canaveral Air Force Station, on April 4 and the Centaur stage was hoisted atop the Atlas on April 5. The vehicle was powered up to begin prelaunch testing on April 16.

On May 30, during a routine wet dress rehearsal test, a high-pressure helium line failed at the beginning of the test causing minor damage to the interstage adapter and delaying the target launch date until July 9. A second test was conducted on June 19, but due to a ground software problem, the test was halted at the T-31 second mark. The decision was made to conduct another retest, delaying the target launch date until July 17. The retest was accomplished on June 26.

On June 14, a simulated flight test was conducted. This check operated the vehicle's electrical and mechanical systems, verifying that they will perform as designed during the ascent to orbit. This was followed by a full countdown demonstration exercise, including the filling of the vehicle with its full complement of liquid hydrogen, liquid oxygen and RP-1 propellants. All countdown events were performed as they are on launch day up to first stage ignition.

A new payload fairing 14 feet in diameter, four feet wider than previous fairings, underwent final assembly in the Payload Hazardous Servicing Facility (PHSF) in the KSC Industrial Area. Fit checks, electrical tests and a mechanical verification to confirm that the fairing would open and separate from the vehicle properly during the ascent were conducted atop the vehicle at the launch pad. It was returned to the PHSF and prepared for encapsulation with the spacecraft.

CRRES PROCESSING

The CRRES spacecraft arrived at the PHSF on March 23. Electrical checks and functional testing of the spacecraft were completed on April 20. During the first week of May, the canisters, designed for releasing the chemicals in orbit, were loaded with their respective elements and were placed aboard the spacecraft. There are eight small and 16 large canisters which collectively contain the elements barium, lithium, strontium and calcium.

On May 14, 3 days of spacecraft end-to-end compatability tests were performed between the CRRES satellite at KSC and the Air Force Consolidated Satellite Test Center (CSTC) in Sunnyvale, Calif. CSTC will be the control center for the spacecraft during the mission. Spacecraft commands, telemetry and data communications were verified.

The spacecraft was fueled with the hydrazine attitude control propellant on May 21 and transported to Launch Complex 36 for mating to the AC-69 vehicle on July 2.

LAUNCH OPERATIONS

Atlas Centaur launch operations will be conducted from the Complex 36 blockhouse by a launch team from General Dynamics, the vehicle's manufacturer. RP-1, a highly refined kerosene fuel burned by the Atlas, will be loaded aboard the stage 3 days prior to launch. The liquid oxygen used by the Atlas and the Centaur will be loaded aboard during the countdown, beginning at T-75 minutes. The loading of liquid hydrogen aboard the Centaur stage at T-43 minutes, running concurrently with the remainder of the liquid oxygen loading.

Since this is a NASA mission, the agency is accountable for mission success and government technical oversight as well as responsibility for supporting CRRES preflight preparations and testing. The NASA Lewis Research Center Project Manager is responsible for the administration and technical oversight of the Atlas I launch services contract.

A NASA launch manager from the Kennedy Space Center represents NASA interests during the launch vehicle checkout and preparations and serves as NASA's liaison with General Dynamics at the launch site. On launch day, he is located in the Mission Director's Center to monitor the countdown and the launch team activity and will provide a NASA final concurrence for launch to the General Dynamics launch director in the blockhouse.

RANGE SUPPORT

The Eastern Test Range, an arm of the Air Force Eastern Space and Missile Center, will provide tracking support for the mission. Radar and communications will be relayed to NASA's Mission Director's Center and central telemetry facility on Cape Canaveral Air Force Station and to the Air Force CSTC control facility at Sunnyvale.

Tracking stations supporting the mission include the U.S. Air Force Tel-4 facility located at KSC, the Jonathan Dickinson Instrumentation Facility Jupiter Inlet in south Florida, the Antigua station in the Bahamas and the NASA radar at Bermuda. Also, two Advanced Range Instrumentation Aircraft (ARIA) will support over the South Atlantic off the coast of Africa to cover the second burn of the Centaur stage and spacecraft separation.

LAUNCH WEATHER

As with the Space Shuttle, weather observations and forecasting for the launch of AC-69 will be provided by the U.S. Air Force from the Cape Canaveral Forecast Facility. The weather criteria for the launch of expendable vehicles and the Space Shuttle are similar in many respects, but in some areas they are tailored to the unique characteristics of the expendable vehicle being launched.

On launch day, a total of nine upper air weather balloon soundings will be made starting at launch minus 6 hours. A weather reconnaisance aircraft will be deployed at launch minus 90 minutes. It will evaluate the weather downrange in the flight path of the vehicle and also assess any weather areas of concern that may be approaching the Cape.

A detailed weather briefing will be provided to the General Dynamics launch director and the NASA launch manager prior to retracting the gantry, again prior to fueling, and then immediately before launch.

FLIGHT EVENTS SEQUENCE: ATLAS I, CRRES SPACECRAFT

EVENT	TIME AFTER LIFTOFF	ALTITUDE (MILES)	DOWNRANGE (MILES)	SPEED (MPH)
Liftoff	T-0			
Atlas Booster Engine Cutoff	2 min 35 sec	37	54	6,527
Jettison Atlas Booster Engine	2 min 38 sec	38	59	6,590
Jettison Centaur Insulation Panels	3 min 0 sec	50	70	6,967
Jettison Nose Fairing	3 min 36 sec	67	154	7,746
Atlas Sustainer/ Vernier Engines Cutoff	4 min 27 sec	85	258	9,326
Atlas/Centaur Separation	4 min 29 sec	86	266	9,330
First Centaur Main Engine Start	4 min 40 sec	89	286	9,306
Centaur Main Engine Cutoff	9 min 53 sec	94	1,298	17,953
Second Centaur Main Engine Start	24 min 53 sec	212	5,366	17,487
Second Centaur Main Engine Cutoff	26 min 29 sec	241	5,836	22,535
Centaur/Payload Separation	28 min 44 sec	334	6,566	22,262

(These numbers may vary depending on exact launch date, launch time and spacecraft weight)

CRRES SPACECRAFT, SCIENCE MANAGEMENT TEAM

NASA HEADQUARTERS

Dr. Lennard A. Fisk	Associate Administrator for Space Science and Applications
Thomas W. Perry	Deputy Director, Space Physics Div.
Richard J. Howard	CRRES Program Manager
Dr. David S. Evans	CRRES Program Scientist

MARSHALL SPACE FLIGHT CENTER

Thomas J. Lee	Director
Sidney P. Saucier	Manager, Space Systems Projects Office
William A. Swords	CRRES Project Manager
Dr. David L. Reasoner	CRRES Project Scientist

UNITED STATES AIR FORCE

Col. John E. Armstrong	Program Director, Space Transportation And Test Program
Maj. Stanley A. Sneegas	Program Manager, Space Test Program

BALL AEROSPACE SYSTEMS GROUP

Ron Brown	CRRES Program Manager
Brian Pieper	Deputy CRRES Program Manager

ATLAS I (ATLAS/CENTAUR-69) LAUNCH MANAGEMENT TEAM

NASA HEADQUARTERS

Dr. William B. Lenoir	Associate Administrator for Space Flight
Joseph B. Mahon	Deputy Associate Administrator for Space Flight (Flight Systems)
Charles R. Gunn	Director, Unmanned Launch Vehicles and Upper Stages
John P. Castellano	Chief, Intermediate and Large Launch Vehicles

KENNEDY SPACE CENTER

Forrest McCartney	Director
John Conway	Director, Payload Management and Operations
James L. Womack	Director, Expendable Vehicles
Gale Hager	CRRES Launch Site Support Manager
George Looshen	Chief, Launch Operations Division

LEWIS RESEARCH CENTER

Lawrence J. Ross	Director
V.J. Weyers	Director of Space Flight Systems
J.W. Gibb	Manager, Launch Vehicle Program Office
R.E. Orzechowski	CRRES Mission Manager
E. Procasky	Atlas/Centaur-69 Chief Engineer

GENERAL DYNAMICS

B.J. Wier	GDSSD Vice President and Atlas Program Director
B.J. Sherwood	GD/CLS Mission Manager for CRRES
S.K. Baker	GDSSD-CCAFS Engineering Manager, Atlas I/II Launch Operations
J.T. Heffron	GDSSD Atlas Launch Vehicle Program Director

DETAILED EXPERIMENTS DESCRIPTION

NASA EXPERIMENTS

NASA's experiments are divided into four areas:

o **Magnetospheric Ion Cloud Injections:** This group of experiments will artificially seed the magnetosphere with plasma and, working with DOD particle and electromagnetic wave investigators, use ground-based optical and radar diagnostics to observe large-scale changes in the cloud. In-situ CRRES measurements will examine smaller, local phenomena. The CRRES instruments also will determine the state of the magnetosphere, providing valuable data to allow the determination of optimal conditions for releases. (Experiments G-1 through G-7, G-10.)

o **Ionospheric Modifications:** This group of experiments introduces disturbances into the ionosphere to study the friction forces arising from the interaction of high-speed injected plasmas and the ionosphere. Scientists also will inject neutral atoms at orbital velocities to understand why unusually efficient ionization occurs when a fast beam of neutral gas passes through a magnetized plasma. Scientists will compare the observed behavior of the injected plasmas with computer models. (Experiments G-8, G-9, G-13, G-14.)

o **Electric Fields and Ion Transport:** This group of experiments will study the low-latitude electric fields and the movement of ions along magnetic field lines into the ionosphere in response to these electric fields. (Experiments G-11, G-12.)

o **Ionospheric Irregularity Simulators:** These experiments will produce large-scale releases of chemicals to study irregularities in the ionosphere and the effects of the ionosphere on the propagation of high-frequency-waves. (Experiments AA-1 through AA-7.)

DETAILED PLAN: NASA CRRES SATELLITE EXPERIMENTS

Experiments G-1 through G-4: Diamagnetic Cavity, Unstable Velocity Distributions, Plasma Coupling. Principal Investigators: Robert A. Hoffman, Goddard Space Flight Center, G-1, G-2 and G-3; Steven B. Mende, Lockheed Palo Alto Research Labs,G-4.

Magnetic and solar storms inject plasma into the magnetosphere. The reaction of the natural magnetosphere to these injections is important to understanding energy and particle transport. Injections of barium ions will simulate natural plasma injections in a precisely controlled manner. These four injections will be at different altitudes and magnetic field strengths to understand how different regions of space react to the artificial cloud plasmas.

G-5: Stimulated Electron Precipitation to Produce Auroras. Principal Investigators: Gerhard Haerendal, Max Planck Institut; Paul A. Bernhardt, Naval Research Laboratories.

The late Neil Brice proposed in 1970 that injections of artificial ion clouds in the Van Allen radiation belts would cause the high-energy charged particles to "unstick" from the magnetic field and crash into the atmosphere.

This theory will be tested by injecting an artificial lithium plasma in a region of high-energy, trapped electrons. Observers with optical instruments and radars will closely monitor the footprint of the magnetic field line where it enters the atmosphere in Canada and South America to search for artificial auroras created by these particles.

G-6: Stimulation of Ion-Cyclotron Waves and Artificial Ion Precipitation. Principal Investigator: Steven B. Mende, Lockheed Palo Alto Research Labs.

High-energy protons dominate the pre-midnight sector of the high-altitude magnetosphere. Some of these "leak out" of stable trapped orbits and precipitate into the atmosphere to cause a weak aurora. This experiment will inject an artificial lithium plasma cloud into this proton region and measure any increased proton precipitation.

Essentially this experiment has the same objectives as the previous one, except the particles of interest are protons rather than electrons. The enhanced precipitation will be detected by optical instruments at the base of the magnetic field line, as these protons will produce light in the distinct wavelengths of the hydrogen atom. The instruments on CRRES will monitor the state of the magnetosphere and will aid in determining the best time for the release.

G-7: Ion Tracing and Acceleration. Principal Investigators: William K. Peterson, Lockheed Palo Alto Research Laboratories.

The release of tracer lithium ions will be tracked by instruments aboard the NASA Dynamics Explorer 1, CRRES, SCATHA and the Japanese AKEBONO satellites. The previous two lithium releases also can be used for this experiment, but this release will be made when the relative positions of these satellites are especially favorable for observing the artificial tracer ions.

G-8: Gravitational Instability, Field Equipotentiality, Ambipolar Acceleration. Principal Investigator: Gerhard Haerendel, Max Planck Institut.

Space plasmas often become highly irregular and structured. Electric and magnetic fields are known to be important to this process, but less is known about the effects of gravity. For the light protons in the magnetosphere, it is safe to assume that the effect of gravity is negligible compared to electric and magnetic forces. For the heavier ions, such as oxygen and nitrogen, this assumption is questionable. This release will create a heavy barium plasma along a magnetic field line, and the distortions due to the action of gravity will be studied with optical instruments and the radar at Jicamarca, Peru.

G-9: Velocity Distribution Relaxation and Field Equipotentiality. Principal Investigators: Morris B. Pongratz, Los Alamos National Laboratory; Gene M. Wescott, University of Alaska.

The CRRES satellite releases gas at orbital velocity, and the ion clouds that form are moving very rapidly (8 to 10 kilometers per second) relative to the natural ionosphere. This state is common in nature, occurring when beams of electrons enter the auroral zone or when material is pulled into a star. The beams eventually slow down, but not through physical collisions between particles, as is the case with neutral gases. Instead, the physics of beam-plasma interactions are dominated by the long-range electrical and magnetic forces that act on the charged particles. The exact mechanisms of these interactions are not well understood

In this experiment, barium will be released over an extensive network of ground and aircraft observatories in the Caribbean, while instruments on CRRES will measure the electric and magnetic fields resulting from the interactions.

G-10: Stimulating a Magnetospheric Substorm. Principal Investigator: David J. Simons, Los Alamos National Laboratory.

Sometimes during a magnetospheric substorm a very large number of charged particles reach the atmosphere together, causing a very bright aurora.

This experiment will attempt to create a substorm by injecting an artificial barium plasma at the precise moment which the magnetosphere is unstable, "pushing the magnetosphere over the edge." Since barium ions can be seen glowing in sunlight (the particles normally there cannot), scientists will be able to obtain a clear visual picture of the magnetic substorm creation and its behavior.

G-11, G-12: Mirror Force, Field Equipotentiality, Ambipolar Acceleration. Principal Investigator: Gene M. Wescott, University of Alaska.

As the release of barium ions flows along magnetic field lines, it will be affected by electric fields as well. By tracking the details of the ions' motion, these electric fields can be measured. Such electric fields are important in controlling inter-hemispheric flows of electrons and ions.

The releases over the Caribbean will fill the entire magnetic field line over the equator and down to the other end in South America. Observations from ground and aircraft observatories in the Caribbean and South America will pinpoint the details of the ion motions.

G-13, G-14: Critical Velocity Ionization. Principal Investigator: Gene M. Wescott, University of Alaska.

The objective of these releases is to investigate the critical ionization velocity phenomenon, first proposed by Alfven to explain mass differentiation in planetary formation -- why the inner planets are made of heavy material and the outer planets are mostly hydrogen.

The critical ionization velocity model states that if the relative velocity of electrically neutral chemical species and a magnetized plasma is large enough, ionization of the neutral gas will take place even though the energy available is less than that required for ionization.

Barium, calcium and strontium will be released in these experiments. These materials have a range of critical ionization velocities, allowing study of the effect over a wide range of this parameter.

DETAILED PLAN: NASA CRRES SOUNDING ROCKET EXPERIMENTS

In addition to the releases from the CRRES spacecraft, the CRRES program includes chemical-release experiments from several sounding rockets. Two sounding-rocket campaigns are planned, one from Kwajalein in the Marshall Islands in July and August 1990 and the other from Puerto Rico in June and July 1991:

AA-1: F-Region Irregularity Evolution. Principal Investigators: Herbert C. Carlson, Air Force Geophysics Laboratory; Frank T. Djuth, The Aerospace Corporation.

The reflection of high-frequency (HF) radio waves by a smooth, conducting ionosphere allows reception of AM radio, long-range HF communications and over-the-horizon surveillance radar. When stressed, the ionosphere "fractures" along the direction of the magnetic field and acts like a picket fence to scatter radio waves.

This experiment and a companion, AA-7, will stimulate this plasma fracturing process with large barium releases in the F and E regions of the lower ionosphere over the Arecibo, Puerto Rico, radar site. The radar will diagnose the details of the structuring while airborne instruments monitor fading and disruption of satellite radio signals. Comparing these observations to theoretical predictions will provide an acid test of present understanding of principles of plasma physics with far-reaching implications.

AA-2: HF Ionospheric Modification of Barium Plasma. Principal Investigators: Frank T. Djuth, The Aerospace Corporation; Lewis M. Duncan, Clemson University.

The Arecibo High-Frequency Radio Ionospheric Heater can beam powerful radio waves into the ionosphere. These radio waves, with millions of watts of effective power, can "push the ionosphere around" and create significant perturbations and structures.

In this experiment, a heavy barium plasma will replace the natural light ionosphere plasma (normally hydrogen and oxygen) in the beam of the radio wave heater. The heater beam will be turned on the heavy plasma and scientists can see its response to the perturbations and compare the results to heater experiments with the natural ionosphere.

AA-3: HF-Induced Ionospheric Striations and Differential Ion Expansion. Principal Investigators: Edward P Szczuzcewicz, Science Applications International Corporation; Lewis M. Duncan, Clemson University.

This experiment has two sets of objectives. The first is to release a small tracer amount of barium into an ionospheric region that has been heated and disturbed by the Arecibo transmitter, making the heater-induced perturbations visible. This experiment complements the previous barium plasma heating experiment and enlarges the area under study.

The second objective is a study of multi-ion expansion processes. Since ions are electrically charged, they interact through long-range electrical forces, not just by physical collisions. Many natural processes, such as the population of the magnetosphere with upward flowing ions from the ionosphere and the expansion of the atmospheres of stars, involve ions of more than one type or mass. The presence of one type of ion can have a strong influence on another.

Canisters of lithium (a light ion, mass = 7) and barium (a heavy ion, mass = 137) will be released. As the expanding ion clouds sweep past the rocket, on-board instruments will study the details of the clouds and their complex interactions.

AA-4: Ionospheric Focused Heating. Principal Investigator: Paul A. Bernhardt, Naval Research Laboratory.

The ionosphere bends radio waves just like a lens or prism bends light. A chemical release will create a spherical lens in the ionosphere focusing waves from a high-power ground transmitter into a powerful beam travelling upward. The power density input level is expected to be 10 to 100 times the level it would be without focusing.

The Arecibo radar and instruments will study how the ionosphere is changed by this focused radio beam. This will be important to the understand of how the ionosphere responds to natural energy inputs from magnetic storms and solar flares.

AA-5, AA-6: Equatorial Instability Seeding. Principal Investigator: Michael M. Mendillo, Boston University.

The ionosphere near the Equator, where the magnetic field is horizontal, suffers from natural perturbations known as Spread-F. The normally smooth ionosphere breaks up and radio wave signals are distorted.

These experiments will release sulfur hexafluoride, which will start a "bubble" at the bottom of the ionosphere and trigger artificial Spread-F. This will allow study of the growth and decay of this effect with a controlled experiment. In these experiments, one rocket will deploy the ionospheric depletion chemical, and a second will carry instruments to diagnose the release effects.

AA-7: E-Region Image Formation. Principal Investigator: Herbert C. Carlson, Air Force Geophysics Laboratory.

The ionosphere is divided into layers, designated D, E and F (from lowest to highest). The layers are connected by magnetic field lines, which allow particles to travel between regions.

A large barium release in the F-region will be placed so the connected E-region is directly over the Arecibo radar. The artificial cloud in the F-region will create an image in the E-region that can be mapped by the radar, allowing scientists to study the strength and speed of inter-region ionospheric coupling.

DEPARTMENT OF DEFENSE EXPERIMENTS

More than 50 DOD scientific instruments will be operating aboard CRRES, including a microelectronics package, experimental high-efficiency solar panels and instruments to investigate the effects of solar flares and cosmic rays on the Earth's magnetosphere and radiation belts. Instruments to support the perigee observations include two pulsed plasma probes (a very low frequency wave analyzer with two electric field antennas), a magnetic field loop antenna and a quadrupole ion mass spectrometer.

Some DOD scientific instruments on CRRES will complement the CRRES chemical science mission, measuring the effects of the releases at close range. For some of the releases, the instruments will measure the state of particles and waves in the magnetosphere and assess if a large magnetic storm is imminent. This will help scientists determine the best time to conduct a release. The five main DOD experiments:

o **The High Efficiency Solar Panel (HESP):** This experiment will help determine the performance of experimental gallium arsenide solar panels under the effects of natural radiation and under ambient and heated conditions.

o **Spacerad:** Consisting of approximately 30 instruments, Spacerad will expose microelectronics to space radiation, measuring the ambient environment (magnetic and electric fields, plasma, particles, waves, etc.). The two pairs of long wire booms that extend up to 50 meters from the spacecraft are part of the Spacerad experiments.

o **Solar Flare Isotopes:** This experiment will measure cosmic ray particles and heavy ion composition in the magnetosphere.

o **Energetic Particles and Ion Composition:** This experiment will measure the intensity, energy and pitch angles of low-, medium- and high-energy ambient ions.

o **Low Altitude Scientific Studies on Ionospheric Irregularities (LASSI):** This experiment will conduct a set of observations near the perigee of selected CRRES orbits during chemical releases. These observations will help scientists study and compare natural and artificial ionospheric disturbances and the effects of these disturbances on communications to and from the satellite.

(Detailed description of USAF experiments is available from USAF public information representatives)

CRRES Program Experiments

Experiment	Release no.	Chemical	Location	Altitude	Release Period
SATELLITE EXPERIMENTS					
Critical Velocity					
Critical Velocity Ionization	G-13	Strontium Barium	Am. Samoa	270-360 mi.	Sept. 1990
	G-14	Calcium Barium	Am. Samoa	270-360 mi.	Sept. 1990
High-Altitude Magnetospheric					
Diagmagnetic Cavity, Plasma Coupling	G-1	Barium	N. America	1.3 Re*	Jan-Feb 1991
	G-2	Barium	N. America	1.8 Re	Jan-Feb 1991
	G-3	Barium	N. America	3.5	Jan-Feb 1991
	G-4	Barium	N. America	5.5	Jan-Feb 1991
Stimulated Electron/ Aurora Production	G-5	Lithium	N. America	>6.0 Re	Jan-Feb 1991
Stimulated Ion-Cyclotron Waves and Ion Precip.	G-6	Lithium	N.America	>6.0 Re	Jan-Feb 1991
Ion Tracing and Acceleration	G-7	Lithium	N. America	>6.0 Re	Jan-Feb 1991
Velocity Distribution Relaxation	G-9	Barium	Caribbean		June-July 1991
Caribbean Perigee Grav. Instability Field Equipotentiality	G-8	Barium	Caribbean	270-480 mi.	June-July 1991
Field Line Tracing and Equipotentiality	G-10	Barium	Caribbean	270-480 mi	June-July 1991
	G-11	Barium	Caribbean	270-480 mi	June-July 1991
	G-11A	Barium	Caribbean	270-480 mi	June-July 1991
	G-12	Barium	Caribbean	270-480 mi	June-July 1991
	G-12A	Barium	Caribbean	270-480 mi	June-July 1991

*Re=Earth radii

CRRES PROGRAM EXPERIMENTS

Experiment	Release no.	Chemical	Location	Altitude	Release Period
SOUNDING ROCKET EXPERIMENTS					
Kwajalein					
Equatorial	AA-5	SF6*	Kwajalein	240 mi	Jul.-Aug. 1990
Instability Seeding	AA-6A	SF6	Kwajalein	150 mi	Jul.-Aug. 1990
	AA-6B	SF6	Kwajalein	150 mi	Jul.-Aug. 1990
Puerto Rican Rockets					
F-Region Irregularity Evolution	AA-1	Barium	Puerto Rico	150 mi	June-July 1991
HF Ionospheric Modification of a Barium Plasma	AA-2	Barium	Puerto Rico	150 mi	June-July 1991
E-Region Image Formation	AA-7	Barium	Puerto Rico	150 mi	June-July 1991
HF-Induced Ion Striation/Differential Ion Expansion	AA-3	Barium	Puerto Rico	90-240 mi	June-July 1991
		Barium	Puerto Rico	90-240 mi	June-July 1991
		Barium	Puerto Rico	90-240 mi	June-July 1991
		SF6	Puerto Rico	90-240 mi	June-July 1991
Ionospeheric Focused Heating	AA-4	SF6	Puerto Rico	210-240 mi	June-July 1991

*SF6=Sulfur hexafluoride

- end -

NASA News

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Space Administration

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RELEASE: 90-95

SPACE SHUTTLE ENDEAVOUR POWERED-ON

The new Space Shuttle Endeavour was powered-on for the first time today at Rockwell International Corp.'s Orbiter Assembly Facility in Palmdale, Calif., 10 days ahead of schedule. The event is a major milestone in the vehicle's construction signifying the initial flow of power to Endeavour's on-board electrical systems.

The start of power-on testing marks the beginning of an eight-month test period for Endeavour, the fifth operational orbiter built by Rockwell's Space Systems Division (SSD) for NASA's Space Shuttle program. During the next three months, Endeavour's on-board electrical systems will be functionally energized to verify that the vehicle's instrumentation is operational and that vehicle systems are performing to engineering specifications.

Following completion of the power-on tests, a final acceptance test will be conducted to verify the performance of the total integrated vehicle. Endeavour is scheduled for rollout and delivery to NASA in April 1991 and a first flight in early 1992.

In addition to the power-on tests, work continues on other elements of the vehicle. Technicians are currently performing final structural mate of the wings to the aft fuselage. Installation of a drag chute assembly that will aid in vehicle deceleration and reduce loads on the landing gear and brakes is in progress. Thermal protection system tile and blanket installations are ahead of schedule and approximately 75-80 percent complete. Aft fuselage system installations are continuing.

Major structural components remaining to be mated to the vehicle include its body flap in July; vertical stabilizer, payload pay doors, and elevons in August; and forward reaction control system module in November. Endeavour's orbital maneuvering system pods will be installed at Kennedy Space Center, Fla.

Rockwell received authority to proceed with construction of Endeavour from NASA in August 1987, although production of many of the basic elements necessary for the vehicle was begun in 1983, when NASA awarded Rockwell a contract to build orbiter spare parts. Rockwell SSD manages the Endeavour construction program under the direction of NASA's Johnson Space Center, Houston.

- end -

NASA News

National Aeronautics and
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Washington, D.C. 20546
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For Release:
July 6, 1990

Sarah Keegan
Headquarters, Washington, D.C.
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HST INVESTIGATION BOARD STATUS REPORT #1

The Hubble Space Telescope (HST) Optical Systems Board of Investigation met for the first time July 5-6, 1990, in Washington, D.C. After introductory remarks by Dr. Lennard A. Fisk, Associate Administrator for Space Science and Applications; Dr. Lew Allen, Director, Jet Propulsion Laboratory (JPL), and board chairman; and Gary Tesch, Board Counsel, the board heard presentations from NASA Marshall Space Flight Center (MSFC) and Hughes Danbury Optical Systems (DOS) officials.

The MSFC personnel summarized the current status of HST systems. The Hughes DOS representatives gave an overview of the manufacture and test procedures for the HST primary and secondary mirrors and the Optical Telescope Assemby (OTA). The presentations were general in nature due to the impounment of original pertinent data under the provisions of the HST Contingency Plan.

Hughes DOS officials also proposed some near-term options for further defining and characterizing the spherical aberration. Some of the options which were extensively discussed by the board involve data review; others call for testing of existing back-up and prototype hardware and test equipment.

The board heard by telecon the report from the HST Independent Optical Review Panel, concluding that the panel agrees that there is approximately one-half wave of spherical aberration in the OTA.

The next meeting of the board is tentatively scheduled for July 25-26, 1990, at Hughes DOS, Danbury, Connecticut. In the next two weeks activities will be carried out in three areas:

% examination and analysis of pertinent data.

-more-

% preliminary interviews of knowledgeble individuals.

% design and preparation of appropriate tests.

The board has modified the impoundment procedures sufficiently to permit the activites above to begin while taking active steps, including independent supervision, to ensure the integrity of the pertinent data and hardware.

At the conclusion of the meeting Dr. Allen said, "The board now has a good base of information from which to proceed with its investigation."

-end-

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Washington, D.C. 20546
AC 202-453-8400

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For Release:
July 9, 1990

N90-50

EDITORS NOTE: 3RD STATUS BRIEFING ON SHUTTLE LEAK INVESTIGATION

Associate Administrator for Space Flight Dr. William B. Lenoir and Space Shuttle Director Robert L. Crippen will hold a media briefing on the status of this weekend's test of the hydrogen leak on the Space Shuttle Columbia today in the NASA Headquarters 6th floor auditorium.

The briefing will begin at 3 p.m. EDT and will be carried live on NASA Select television via Satcom F2R, Transponder 13, at 72 degrees West longitude, frequency 3960.0 MHz.

These status briefings on the efforts to find the leaks on the Space Shutle system will be held periodically until the problem is resolved.

- end -

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For Release:
July 9, 1990

N90-51

MEDIA ADVISORY: HUBBLE SPACE TELESCOPE TELECONFERENCE

The next weekly teleconference on the Hubble Space Telescope (HST) will begin Tuesday, July 10, at 3 p.m. EDT. Speakers will include HST program scientist Dr. Edward Weiler and HST deputy project manager Jean Olivier.

To provide a professional, orderly environment for all participants, a NASA public information officer will call participants before the teleconference begins to establish a communications protocol. Apparently, there has been a loss of clarity with a number of people talking or typing. Circuits need to be muted, carry no sound or be active for the clearest communication.

Should you be disconnected during the session, please call NASA's Communications Center at the Marshall Space Flight Center on (205) 544-1771. An operator will request your name, phone number and name of teleconference. Once this information is supplied, you will be reconnected.

If you wish to listen only to the teleconference, the audio will be carried on the NASA Select system. To access NASA Select by phone, dial (407) 867-1220 (or 867-1240 or 867-1260). To receive NASA Select television, downlink from Satcom F-2R satellite, Transponder 13, C-band located at 72 degrees West longitude, frequency 3960.0 MHz, vertical polarization, audio monaural 6.8 MHz.

- end -

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For Release:
July 9, 1990

RELEASE: 90-96

SHUTTLE CREW COMMANDERS REASSIGNED

Two veteran Shuttle crew commanders have been removed from flight assignments for violations of Johnson Space Center, Houston, flight crew operations guidelines. They are Navy Cmdr. Robert L. "Hoot" Gibson and Navy Capt. David M. Walker.

Gibson, crew commander for Shuttle mission STS-46, has been removed from the flight and from T-38 jet trainer flight status for one year for violation of a policy which restricts high risk recreational activities for astronauts named to flight crews.

Director of Flight Crew Operations Donald R. Puddy has announced the action in response to Gibson's participation in an airplane race at a civilian airshow in central Texas, on Saturday.

"Our high risk activity policy defines plain and simple guidelines for astronauts assigned to flight crews. They are intended to preserve our crews as assigned and apply regardless of the time prior to launch," said Puddy.

The policy defines high risk recreational activities as those which involve exposure to major or fatal injury. "The race was a clear violation of the policy," he said.

Gibson has flown aboard the Shuttle as pilot on mission STS-41B in February 1984 and as crew commander on STS-61C in January 1986 and on STS-27 in December 1988. A new crew commander will be named in the near future.

-more-

Air Force Col. Frederick D. Gregory will replace Walker as crew commander on Shuttle flight STS-44, a dedicated Department of Defense mission set for March 1991. Walker has been replaced on the flight and suspended from T-38 flight status for 60 days for infractions of JSC aircraft operating guidelines.

Walker flew as pilot on STS-51A in 1984 and as commander of STS-30 last year. Gregory has flown twice previously, as pilot for Shuttle mission STS-51B in April 1985 and as crew commander for STS-33, also a dedicated Department of Defense flight, in November 1989.

Both Walker and Gibson can become eligible again for Shuttle crew assignment following reinstatement to T-38 flight status.

"Dave and Hoot have each made substantial contributions to the Shuttle and Space Station programs and have performed in an outstanding manner on their respective Shuttle flights," said Chief Astronaut Daniel C. Brandenstein. "These actions are unfortunate, but they're in the best interests of us all. These policies are vitally important and are to be taken seriously."

-end-

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For Release:
July 11, 1990

N90-52

NOTE TO EDITORS

MONTHLY SPACE FLIGHT BRIEFING SET FOR JULY 13

The next monthly Office of Space Flight press briefing will be held from 3-5 p.m. EDT on Friday, July 13. The meeting will be held in the Video Teleconferencing Facility, Room 531, at NASA Headquarters, Building 10-B, 600 Independence Ave, S.W.

Participating in the briefing will be Associate Administrator for Space Flight Dr. William B. Lenoir; Robert Crippen, Director, Space Shuttle; and Richard Kohrs, Director, Space Station. Subjects will include an update on the hydrogen leak investigation on Space Shuttles Columbia and Atlantis and a status of the Space Station Freedom program.

-end-

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For Release:
July 10, 1990

RELEASE: 90-97

CRRES LAUNCH SET FOR JULY TO STUDY "EARTHSPACE"

Launch of the Combined Release and Radiation Effects Satellite (CRRES) is currently targeted for no earlier than July 17, 1990, at 3:41 p.m. EDT. Scheduled to be placed into a highly elliptical, geosynchronous transfer orbit of approximately 217 by 22,236 miles, CRRES is to conduct complex scientific research in what is referred to as "Earthspace" -- the space environment just above Earth's atmosphere which, far from being empty, includes the ionosphere and magnetosphere containing a dynamic ocean of invisible magnetic and electrical fields and particles.

Much as a high school physics student spreads iron filings around a magnet to "see" its invisible magnetic field, CRRES will carry 24 canisters of various chemicals into orbit and release the chemicals over a period of time. When released, the chemicals will be ionized by the Sun's ultraviolet light creating large luminous clouds that will elongate along Earth's magnetic field lines, briefly "painting" these invisible structures.

By observing the motion of the clouds, scientists will be able to measure electric fields in space and "see" how they interact with charged particles to form waves and to better understand how the Earth extracts energy from the solar wind. The luminous clouds also will be studied from the ground, from specially equipped aircraft and from CRRES itself. The CRRES releases will be augmented by chemical releases from 10 sounding rockets launched from Puerto Rico and the Marshall Islands.

- more -

Under a launch services contract between NASA and General Dynamics, launch of the joint NASA/U.S. Air Force payload is to take place from Complex 36B, Cape Canaveral Air Force Station, Fla., aboard an Atlas I (Atlas/Centaur-69) launch vehicle.

NASA's Marshall Space Flight Center, Huntsville, Ala.; the U.S. Air Force Space Systems Division, Los Angeles; and Ball Aerospace Systems Group, Boulder, Colo. -- prime comtractor of CRRES -- are principal spacecraft participants in the upcoming mission. Atlas I launch services, with technical oversight by NASA's Lewis Research Center, Cleveland, and Kennedy Space Center, Fla., will be provided by General Dynamics Space Systems Division, San Diego, Calif. The Lewis Research Center manages the NASA-General Dynamics launch services contract and is responsible for launch vehicle/spacecraft integration activities.

- end -

EDITORS NOTE: CRRES officials will brief the media at a prelaunch news conference in the KSC News Center auditorium on Monday, July 16, at 11 a.m. EDT. Participating in the briefing will be:

Richard Howard, CRRES Program Manager, NASA Headquarters

Sid Saucier, Manager, Space Systems Projects Office, Marshall Space Flight Center

Col. John E. Armstrong, Space Test and Transportation Program Manager, USAF Space Systems Division

Frank Watkins, Director of Base Operations/Launch Director, General Dynamics Space Systems Division

Brian Pieper, Deputy Program Manager, Ball Aerospace

John Weems, Launch Weather Forecaster, Dept. of the Air Force, Cape Canaveral Forecast Facility

The prelaunch news conference will be carried live on NASA Select television, Satcom F2R, transponder 13, located at 72 degrees west longitude. Audio only also will be provided on KSC's V-2 circuits, which may be dialed directly at 407/867-1220, -1240 or -1260.

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For Release:
July 12, 1990

RELEASE: 90-98

CRRES LAUNCH DELAYED ONE TO TWO WEEKS

A computer problem with the spacecraft's command and data processing system will delay the launch of the Combined Release and Radiation Effects Satellite (CRRES) 1 to 2 weeks.

During a spacecraft countdown practice at Cape Canaveral Air Force Station, Fla., Launch Pad 36B, on Wednesday, July 11, an intermittent failure occurred when commands were not properly received and executed by the command and data processing system.

Additional testing indicated that the malfunction probably is within the primary command decoder unit (CDU), which receives and decodes commands from the ground, then formats and distributes the commands through the spacecraft. Tests to pinpoint the location of the failure should be completed by late Thursday.

The spacecraft's backup CDU functioned properly. However, under NASA launch-commit criteria, both CDUs must be fully operational for a launch to take place.

If the problem lies in the CDU, which was tested successfully twice at the Kennedy Space Center (KSC), the box containing both units will be removed from the spacecraft and returned to the manufacturer, Gulton Data Systems Division, to determine the cause of failure and to effect repairs.

- more -

A new launch date will not be set until the CDU has been repaired and returned to KSC. The mission was originally scheduled for launch July 17.

CRRES is a joint NASA/U.S. Air Force Mission to study the effects of chemical releases on the Earth's ionosphere and magnetosphere and to monitor the effects of the space radiation environment on sophisticated electronics. The spacecraft will be launched aboard an Atlas I (Atlas-Centaur 69) vehicle, with launch services provided by General Dynamics Space Systems Division.

- end -

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NASA News

National Aeronautics and
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For Release:
July 18, 1990

RELEASE: 90-99

NASA TO FEATURE AERONAUTICS AND SPACE AT EAA CONVENTION

NASA returns to Oshkosh, Wis., July 27-Aug. 2 for the 38th Annual Experimental Aircraft Association (EAA) International Fly-In Convention and Sport Aviation Exhibition with a new exhibit entitled "NASA: Technology for America's Future." The exhibit will showcase the technologies being developed for future flight vehicles for safer, more efficient flight and for space science and exploration.

A highlight of the exhibit is the NASA/USAF X-29 forward-swept-wing research aircraft, scheduled for one of its first public displays away from its Southern California base. NASA's participation also includes the return of technical forum speakers and the NASA craftsmanship display.

Supporting the NASA exhibit are the agency's aeronautics field centers, Ames Research Center, Mountain View, Calif., Ames-Dryden Flight Research Facility, Edwards, Calif.; Langley Research Center, Hampton, Va.; and Lewis Research Center, Cleveland.

Goddard Space Flight Center, Greenbelt, Md., will provide its SARSAT van, a mobile exhibit that tells the story of the Search And Rescue Satellite System. NASA's AEROVAN traveling aeronautics exhibit also will make an appearance.

Throughout the 7-day convention, visitors to the NASA exhibit will be treated to a wide range of display topics, aircraft and spacecraft models and research hardware.

The first X-29 jet research aircraft will be displayed in front of the NASA exhibit building. Its distinctive wing design and other advanced aerodynamic, structural and avionic technologies were tested during 242 flights over a broad range of speeds. A second X-29 continues to gather data on maneuverability at high angles-of-attack (a nose-high attitude relative to the flight path).

- more -

There will be no aerial demonstration of the X-29 at the air show. Pilots and support staff will be available to answer questions.

Inside the exhibit building, visitors will see new vehicle shapes, materials and propulsion concepts. They will see how advances in supercomputers give NASA researchers breakthrough computational codes that can better predict flight performance.

The exhibit will depict NASA's research on weather-related safety factors such as icing, heavy rain and windshear avoidance, as well as studies involving human interaction in the flight process.

The space science area will highlight NASA's Great Observatories, four missions that may radically alter knowledge about the universe. And because humans will be assisted by robots in performing many tasks associated with the operation of Space Station Freedom, examples of recent achievements in robotics technology will be displayed. Vehicles being developed for short-haul space transportation also will be exhibited.

More than 2 dozen NASA speakers will participate in technical forums during the EAA convention, covering subjects as diverse as "Research Results Using the World's Largest Motion-Base Piloted Simulator", "Environmental Aspects of the High Speed Civil Transport" and "The Dream Continues - Back to the Moon and On to Mars."

Back by popular demand is a NASA craftsmanship exhibition operated by technicians from Langley and Lewis research centers. The presentation spotlights fabrication crafts with displays of selected metal and composite structures, aeronautical models, test equipment and data measurement hardware.

For 75 years, the research centers of NASA and its predecessor agency, the National Advisory Committee for Aeronautics, have led the world in aeronautical research and technology development. Today, NASA scientists and engineers work closely with industry and universities to continue that tradition, developing technology for America's future in aeronautics throughout the speed regime from hover to hypersonic flight.

- end -

NOTES TO EDITORS:

To reach a NASA public affairs representative at the EAA convention, phone 414/235-5424. Background briefings on selected subjects will be conducted at 10 a.m., Friday through Monday.

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For Release:
July 18, 1990

CRRES LAUNCH ADVISORY

The Combined Release and Radiation Effects Satellite has been rescheduled for launch no earlier than Friday, July 20, from Cape Canaveral Air Force Station, Fla.

The CRRES launch window opens at 3:33 p.m. EDT and extends for 13 minutes.

The launch briefing for the press will take place at 11 a.m. EDT Thursday at the Kennedy Space Center, Fla. For a roster of participants, please see NASA Note to Editors N90-98.

A problem with the spacecraft's command and data processing system was determined to have been within the environment of launch pad 36B and ground-support equipment. Outside radio-signal interference and slight distortions from the test equipment were affecting the spacecraft's primary command decoder. Commands sent directly to the spacecraft in its on-orbit configuration were received without problem.

CRRES is a joint NASA/U.S. Air Force Mission to study the effects of chemical releases on the Earth's ionosphere and magnetosphere, and to monitor the effects of the space radiation environment on sophisticated electronics. The spacecraft will be launched aboard an Atlas I (Atlas-Centaur 69) vehicle, with launch services provided by General Dynamics Space Systems Division.

- end -

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For Release:
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RELEASE: 90-100

SPACE SHUTTLE DRAG CHUTE TESTS SET TO BEGIN AT AMES-DRYDEN

Tests of a drag parachute system to improve the landing capabilities of Space Shuttle orbiters are expected to begin later this month at NASA's Ames-Dryden Flight Research Facility, Edwards, Calif.

The tests are part of NASA's continuing program to upgrade operational capabilities and flight safety of the Space Shuttle fleet.

Drag chutes are specially designed parachutes deployed from the aft end of an aircraft or aerospace vehicle to supplement the normal system of brakes and help slow the vehicle's speed after it has landed on a runway. Drag chutes on the orbiters will permit them to land safely in a shorter distance and also help reduce tire and brake wear.

The drag chute tests will be conducted on the same B-52 that Ames-Dryden uses as a "mothership" to take manned and unmanned aircraft to altitudes of up to 40,000 feet where they are air-launched and their research flights begin.

The orbiter drag chute is four feet smaller in diameter than the normal B-52 chute. For these tests, a modified orbiter drag chute compartment has been mounted on the B-52. This results in a difference in the load path of the parachute loads on the aircraft. To handle the new loads, NASA has strengthened the tail section of the B-52 where the drag chute deployment system is located.

- more -

Instrumentation will record loads at various locations in the attachment system and aft-facing cameras will film the deployment of the drag chute during the tests. Data obtained from the tests will be used to validate predicted loads for an operational orbiter.

Eight landing tests with the orbiter chute system are planned at Ames-Dryden with chute deployment at speeds ranging from 140 to 200 knots (160 to 230 mph). Orbiter landing speeds range from 180 to 225 knots (210 to 260 mph).

The B-52 is restricted to a top landing speed of 200 knots in the tests because of tire limitations.

Endeavour, the orbiter being built by Rockwell International, Palmdale, Calif., is expected to become the first Space Shuttle with a built-in drag chute deployment system when it is rolled out of the assembly plant next year. The system will be installed on the three orbiters now in use -- Discovery, Atlantis and Columbia -- as part of the program to continually upgrade and improve the reusable spacecraft.

Piloting the B-52 during the tests will be C. Gordon Fullerton, a former astronaut who flew on two Space Shuttle missions. Fullerton, now a research pilot at Ames-Dryden, was also a member of the NASA flight crews that carried out the Space Shuttle approach and landing tests at Ames-Dryden in 1977 with the prototype orbiter Enterprise.

The NASA B-52 test aircraft, built in 1952, is the oldest B-52 in flying status and also the oldest research aircraft flown by NASA. It was used as the launch aircraft on most of the X-15 research flights in the 1960s and lifting body missions in the 1970s and early 1980s. It was most recently the launch aircraft for the first successful test of the commercially developed Pegasus air-launched space booster.

The orbiter drag chute test program is managed by NASA's Johnson Space Center, Houston. Also participating in the program are Rockwell International, which designed the orbiter drag chute system; Irvin Industries, Santa Ana, Calif., which designed the parachute; and the Boeing Airplane Co., Seattle, which designed the modifications to the B-52 test aircraft.

- end -

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For Release:
July 23, 1990

RELEASE: 90-101

PIONEER STUDIES LIGHTNING ON VENUS

New research indicates that Venus may have lightning similar to that on Earth, according to NASA researcher Dr. Christopher Russell, magnetic fields investigator for the Pioneer Venus spacecraft and a geophysics professor at UCLA.

Dr. Russell said previous studies had indicated lightning on Venus might be related to volcanic activity on the surface of the planet. But in a research report being published this summer in a Dutch research journal, Space Science Reviews, he said new studies now indicate the Venus lightning occurs in the afternoon, just as it does on Earth, and probably is related to cloud activity not volcanic activity on the surface. Venus is 26 million miles closer to the sun than the Earth and completely covered with clouds.

Russell said an analysis of radio signal data shows there appears to be as much or even more lightning within the thick, high cloud layers of the cloud-shrouded planet as there is on Earth. The physical properties of the solid and liquid particles in the Venusian clouds as well as temperatures and atmospheric pressure also appear similar to those in Earth clouds, he said.

Russell said most of the radio signal data he analyzed was obtained during the Pioneer orbiter spacecraft's 4,000 orbits of Venus from 1979 to 1990. The spacecraft is about 90 million miles from Earth. Additional visible light and radio data were obtained from Soviet spacecraft.

Other scientists working on the Venus data are Dr. Robert Strangeway, UCLA; and William Borucki and John Dyer, both of NASA's Ames Research Center, Mountain View, Calif., which manages the spacecraft for NASA's Office of Space Science and Applications.

- more -

There has been disagreement with Russell's findings. Some scientists believe it is possible that Pioneer measured local disturbances in Venus's ionosphere instead of lightning.

"The predominance of the data," Strangeway said, "suggests that what we're seeing on the planet is lightning, though there are events which may not be lightning," he added.

Studies of lightning on Earth also have been made using radio data like that received by Pioneer. Lightning flashes on Earth produce radio waves that circle our planet. Lightning has been reported on planets Earth, Jupiter, Saturn and Uranus.

"It's as if you are driving in the Midwest and you hear loud static on your car radio," Russell said. "Even if you could not see a thunderstorm, you'd know it was there from the heavy static. The Pioneer data showed static regardless of what frequency we checked."

Russell and others made a detailed analysis that took into account Pioneer's continuing changes in orbital altitude, the complex geometry of Venus's ionosphere and local time factors.

The most significant accomplishment, they say, is tying lightning events to the local time of day on Venus and to variations in atmospheric conditions.

Though the planet has very little rotation (one Venusian day equals 243 Earth days), Venus's clouds race completely around the planet once every four Earth days. Hence, cloud particles pass through the planet's day and night sides in time periods roughly comparable to times for clouds on Earth.

Russell's analysis shows that Venus's thunderstorms have a strong pattern of occurrence in the Venusian afternoon and dusk periods. A similar pattern of afternoon heat build-up and resulting thunderstorm activity exists on Earth.

Russell acknowledges that some unknown electromagnetic instability in Venus's ionosphere might produce radio signals. "However," he said, "we know of no possible phenomenon with regular occurrence in local planet time even remotely like what we see. No other known property of the ionosphere varies in this way. All the evidence points to a source in the Venus clouds."

In addition to Pioneer data, the researchers also used a visible-light observation of multiple lightning flashes by the Soviet Venera 9 Orbiter. They also employed electromagnetic radio data, similar to Pioneer's, from the four Venera craft which landed on Venus's surface.

- more -

Unlike Earth's atmosphere, Venus' thick cloud deck is many miles above the planet (about 35 miles). There, temperatures are close to freezing, and atmospheric pressure and cloud movements are similar to those in Earth's cloud regions.

As the clouds rapidly circle the planet, lightning is thought to be produced by build-up of opposite charges in the clouds, followed by discharges between clouds (lightning flashes). As on Earth, different-sized particles (often ice crystals) are believed to pick up opposite electric charges during updrafts. Cosmic ray ionization also electrifies the atmosphere. This is more likely on Venus, which is not shielded by an internally generated magnetic field as is the Earth.

The thousands of Pioneer-measured radio signals exhibit certain properties found in signals from lightning strokes. The radio signals are of short duration. They occur a multitude of times on some days and then seldom on others, much like weather-related storms on Earth.

Researchers currently are trying to convert the observed number of flashes per minute to a planet-wide rate, but the uncertainty as to how far the Pioneer instrument can "see" limits the accuracy of this conversion. It is clear, however, that the rate is high, probably much higher than the rate of lightning flashes on Earth.

Venusian lightning appears to be in the clouds because, at 35 miles up, the clouds are too high for electrical discharges between clouds and surface, Russell said. Even on Earth, two-thirds of lightning strokes are cloud-to-cloud, not cloud-to-surface.

Since the initial orbits of Pioneer Venus, a number of researchers, including the late Fred Scarf of TRW Inc. and UCLA, believed Pioneer was measuring lightning. Dr. Scarf, a principle investigator on numerous NASA missions, reported lightning bolts appeared to come primarily from the region of the planet's enormous volcanos.

At the time of Pioneer's arrival at Venus, there were indications in Venus' atmosphere gases of a huge volcanic eruption, or series of eruptions. Earth volcanos are well known to produce lightning.

Russell's current analyses show no correlation between suspected Venus volcanos or between any other Venus terrain and lightning discharges.

- end -

NASA News

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For Release:
July 23, 1990

EDITORS NOTE: N90-56

MAGELLAN PRESS CONFERENCE SCHEDULED

"How to cover the Magellan mission" will be the subject of a press briefing, Thursday, July 26, 2 p.m. EDT, in the NASA Headquarters 6th floor auditorium, 400 Md. Ave., S.W., Wash., D.C. Principals from NASA's Jet Propulsion Laboratory (JPL) will explain what media can expect during Magellan's arrival at Venus, insertion into the planet's orbit, instrument check-out and subsequent mapping.

On Aug. 10, 1990, Magellan reaches Venus after a 15-1/2 month voyage. Last year on May 4, the spacecraft was deployed from Atlantis on STS-30, the first planetary mission launched from a Space Shuttle. Magellan's primary mission is to map 70 to 90 percent of Venus, with 10 times better resolution than any achieved before.

A 3-1/2 minute, animated videotape of the mapping process will be available.

Conference presenters include:

Dr. Joseph Boyce, NASA Hdqtrs., Magellan Program Scientist
Anthony J. Spear, JPL, Magellan Project Manager
Dr. R. Stephen Saunders, JPL, Magellan Project Scientist
Dr. Gordon Pettengill, Massachusetts Institute of Technology, Principal Investigator, Radar Experiment

This briefing will be carried live on NASA Select television, Satcom F-2R, Transponder 13, C band, at 72 degrees west longitude, frequency 3960.0 MHz.

- end -

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National Aeronautics and
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Washington, D.C. 20546
AC 202-453-8400

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For Release:
July 23, 1990

RELEASE: 90-102

U.S. AND CANADIAN SCIENTISTS COOPERATE IN ATMOSPHERIC STUDY

Scientists from NASA and U.S. universities have joined Canadian researchers in an expedition to study pollution at high northern latitudes and emissions of methane, an important greenhouse gas, from tundra, forests and marshes.

Titled the Atmospheric Boundary Layer Experiment-3B (ABLE), the study will let scientists look at changes in chemical composition that occur when pristine Arctic air masses, which influence air quality and climate over North America, Eurasia and the northern oceans, mix with polluted continental air masses.

Observations of Arctic atmospheric chemistry will be linked to studies by the Canadian Institute for Research in Atmospheric Chemistry (CIRAC) of the soil of lowland marshes near Hudson Bay. The soils under observation are a source of methane, which plays a critical role in atmospheric chemistry and possible global warming. Like carbon dioxide and the other "greenhouse" gases, methane traps heat near the surface of the Earth that otherwise would radiate into space, warming the atmosphere. Over several decades, higher temperatures could prompt other phenomena, such as the melting of light-reflecting sea-ice, that could lead to even more warming.

- more -

The CIRAC Northern Wetlands Project will study the sensitivity of methane emissions to changes in surface temperatures to predict how these emissions may change in a warmer climate. The main NASA sampling platform is the agency's Lockheed Electra aircraft, stationed at the NASA Goddard Space Flight Center's Wallops Flight Facility, Wallops Island, Va. The Electra, a converted turboprop airliner, is scheduled to make 14 flights in the Hudson Bay lowland area and in Quebec. A Canadian DeHaviland Twin Otter aircraft will fly 50 research missions during the same period.

Ground sampling activity will involve towers and surface chambers at a McGill University facility in Schefferville, Quebec. Research activity began July 5 and will conclude Aug. 20, 1990. The air and ground measurements will be complemented by surface-vegetation data from the Landsat and French SPOT satellites.

The ABLE project is managed by Langley's Atmospheric Sciences Division for NASA's Office of Space Science and Applications. The program was established in the early 1980s to study the chemistry of the Earth's atmosphere and its interaction with the land and the oceans. Other principal investigators are from NASA's Ames Research Center, Mountain View, Calif., and Stennis Space Center, Bay St. Louis, Miss., and from numerous U.S. and Canadian institutions.

- end -

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For Release:
July 24, 1990
Noon

RELEASE: 90-103

NEW MOON DISCOVERED ORBITING PLANET SATURN

A new moon orbiting planet Saturn has been discovered by Dr. Mark Showalter, a researcher at NASA's Ames Research Center, Mountain View, Calif. Showalter found the small, bright object while analyzing images taken by the Voyager 2 spacecraft.

"It was very gratifying to see it," he said. Showalter used a computer program he wrote to sort through 30,000 images sent back to Earth during the Voyager/Saturn encounters in 1980-81.

When the discovery is certified by the International Astronomical Union (IAU), it will bring to 18 the number of Saturnian moons. The new moon has a diameter of only 12 miles and is temporarily designated 1981S13. It orbits in the major gap, known as Encke's gap, in Saturn's outermost major ring, the "A" ring.

Now Saturn's smallest known satellite, the moon pushes material away from its orbit and is believed to cause the 200 mile-wide Encke's gap. The same "shepherding effect," Showalter said, produces Saturn's thin, outermost "F" ring, with moons orbiting on either side of the ring, constraining the material.

A wavy pattern in the ring material on both sides of Encke's gap was first noticed by Ames' ring expert Dr. Jeff Cuzzi while studying basic ring structure in the mid-1980s. Adapting a theory from galactic dynamics, he and Dr. Jeffrey Scargle, also at Ames, suggested that the disturbance was caused by an unseen asteroid-sized moon in the gap.

- more -

Showalter further analyzed the disturbance and used this "moonlet wake" pattern, resembling a motorboat wake, to determine the position and mass of the unseen body. The amplitude of the waves, he said, suggested the mass of the unobserved object and the wavelength of the ripples revealed the moon's possible position.

Showalter's computer program combined information on the Voyager spacecraft's position and camera direction with his prediction of the orbit to search through the enormous stock of Voyager imagery and select the frames where the moon would fall in the camera's field of view.

Brian Marsden of the IAU contacted Showalter saying, "I congratulate you on this modern-day repetition of the discovery of Neptune. It's a nice piece of work." Planet Neptune also was first predicted by theorists who observed its gravitational influence on Uranus before sighting it in 1846.

Showalter's research is supported by the Ames Space Science Division under a joint agreement with Stanford University. He is a research affiliate at the Stanford Center for Radar Astronomy.

- end -

NASA News

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For Release:
July 24, 1990

RELEASE: C90-aa

NASA NEGOTIATES FOR ATDRS SYSTEMS ENGINEERING CONTRACT

NASA's Goddard Space Flight Center (GSFC), Greenbelt, Md., has selected Stanford Telecom, Reston, Va., for contract negotiations to provide systems engineering support for the Advanced Tracking and Data Relay Satellite (ATDRS) System and the Advanced Network Control Center.

The 5-year, cost-plus-award-fee, level-of-effort contract, valued at an estimated $30 million, consists of a 3-year basic contract, a 2-year option and incremental options to increase the level-of-effort.

The contractor will provide systems engineering in the areas of telemetry, tracking, command services, return services, video/voice services and control systems. These services shall encompass requirements assessment, impact to existing systems, system enhancement concepts, architectural trade studies, conceptual designs, specification development and maintenance, along with supporting reports, studies and analyses.

Services will be performed at the contractor's off-site location and at GSFC.

- end -

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Special Announcement

NASA
National Aeronautics and Space Administration

Date: JUL 25 1990

Subject: President Bush Comments on NASA

On July 17, President Bush held a press briefing for the Magazine Publishers of America. He was asked about the space program. I believe his extemporaneous remarks are especially noteworthy.

Q Mr. President, Terry McGraw, McGraw-Hill. Since the completion of the Apollo Space Program the U.S. space program has seemingly struggled for a definitive notion of its mission. Could you comment on your priority the space program has in your agenda, and more specifically, what your expectations are in this new investigation of NASA?

THE PRESIDENT: One, I have great confidence in Dick Truly, the Administrator of NASA. And so to lay that part of the question to rest, what we are doing is asking him to form an outside committee of the best minds he can find to look to the future. Not go try to assign blame because a mission is delayed getting off the ground. I mean, these shots are highly complex. We have been the leaders in space and I want to see us continue to be the leaders in space.

So the group that was advertised a couple of days ago or heralded as an investigation of NASA is nothing of the kind. I saw the stories and, once again, went semiballistic, thinking, my heavens, how could somebody write this when that is not what the President intends? But I think the Vice President, who is doing a good job as head of the Space Council, clarified that.

In terms of goals, we've got some broad objectives that go far beyond lunar landings now. But the first one obviously would be this space station, but with continued shots back and forth to do the -- what's almost becoming journeymen's work in space.

I'm confident we can do it. Obviously, we're in tight budget times, so we've set the goals for Mars and beyond out there many, many years. But I have confidence in NASA. And it's a perilous business I guess anytime you put people up there into space. But the record has been very good.

And yet, I think the management is such a complex -- it's such a complex organization that it is appropriate that the Administrator now call on the best minds he can find to see how we're going to meet these next goals and meet them, hopefully, within budget. And I'm talking about the space station; I'm talking about what Sally Ride talked about -- Mission to Planet Earth, where we actually utilize to the fullest extent possible space shots and improving matters on Earth. Obviously, the environment comes to mind and agriculture comes to mind. And then taking that third step, how do we organize NASA to meet this big, tremendous management challenge that will come about for this next quantum leap forward -- and discuss the cooperation with other nations in all of this.

I mean, as the whole world is changing -- and it has dramatically changed -- there may be some real opportunities now to do more with the Soviet Union, for example, or with other countries. So all of this requires a new look. And that's what this story was about.

Sue Richard

Sue Richard
Deputy Associate Administrator
for Public Affairs

NASA News

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Debra J. Rahn
Headquarters, Washington, D.C.
(Phone: 202/453-8455)

For Release:
July 27, 1990

RELEASE: 90-105

U.S. AND U.S.S.R. AGREE ON OZONE MONITORING FROM SPACE

An agreement was signed in Moscow on Wednesday, July 25, to fly NASA's Total Ozone Mapping Spectrometer (TOMS) on a Soviet Meteor-3 spacecraft in 1991. The flight of the TOMS instrument on the Meteor-3 will provide critical environmental data on the yearly variability of the ozone hole over Antarctica.

The agreement was signed by George P. Esenwein, Flight Programs Branch, Earth Science and Applications Division, Office of Space Science and Applications, NASA Headquarters, Washington, D.C. and Dr. N. N. Petrov, Deputy Chief of Main Department, Soviet State Committee for Hydrometeorology, Moscow, following the U.S./U.S.S.R. Earth Sciences Joint Working Group (JWG) meeting.

Since 1978, the TOMS instrument aboard the Nimbus-7 satellite has monitored global ozone concentrations, focusing on the annual depletion of ozone over the southern hemisphere and the development of the Antarctic ozone hole. Since Nimbus-7 has already performed well beyond its design lifetime, the TOMS/Meteor-3 mission will quarantee continuous measurements of the crucial global ozone data set until the next scheduled TOMS flight aboard a U.S. spacecraft in 1993. That flight will be followed in 2 to 3 years by a TOMS instrument flight aboard a Japanese ADEOS satellite. Both missions have been proposed to Congress as part of the new "Earth Probes" program requested in the President's fiscal year 1991 budget.

Global ozone measurements are a key element of the Mission to Planet Earth program to better understand environmental changes on Earth and the nature of global change. TOMS measurements also will be an important complement to the Upper Atmospheric Research Satellite (UARS), planned for launch in 1991 to make extensive observations of the physics and chemistry of the upper atmosphere.

- more -

The Earth Sciences JWG was established under the U.S./U.S.S.R. Space Science Agreement signed in April 1987. The agreement was expanded to allow the exchange of flight opportunities for scientific instruments on each other's spacecraft during the May-June 1988 Reagan/Gorbachev Moscow Summit. TOMS will be the first U.S. instrument to fly on a Soviet spacecraft under this agreement.

- end -

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For Release:

July 27, 1990

RELEASE: 90-106

NASA AND JAPAN AGREE ON NEW AREAS OF SPACE COOPERATION

NASA and Japan's Ministry of State for Science and Technology agreed to new areas of space cooperation during a Senior Standing Liaison Group (SSLG) meeting held in Tokyo, July 26. NASA Administrator Richard H. Truly and Minister Tomoji Oshima, Ministry of State for Science and Technology, co-chaired the meeting.

The following are the new NASA/Japan projects:

o Observation of the Ozone Layer -- NASA will fly a Total Ozone Mapping Spectrometer (TOMS) instrument and the Environment Agency of Japan will fly the Improved Limb Atmospheric Spectrometer and the Retroreflector in Space on Japan's ADEOS spacecraft to measure atmospheric constituents. ADEOS, the Advanced Earth Observation Satellite, is scheduled for launch in 1995. NASA and the Environment Agency of Japan will exchange data between the two agencies' instruments and continue research on a comparison of ground-based and satellite data.

o Space Environment Monitoring -- Data will be exchanged between NASA, NOAA and the Communications Research Laboratory (CRL) of Japan using NASA's Space Physics Analysis Network (SPAN). CRL was connected to SPAN in 1989 and plans to receive real-time solar wind data from future NASA missions.

o Space Station Solar Terrestrial Physics -- NASA and Japan's Institute of Space and Astronautical Science will continue discussions on use of the Neutral Environment with Plasma Interactions Monitoring System and other systems to measure the solar-terrestrial environment from Space Station Freedom.

- more -

o Space Microgravity Experiments -- NASA and the National Space Development Agency of Japan will continue cooperation in microgravity science on Space Shuttle Spacelab missions. The first Japanese payload specialist, Dr. Mamoru Mohri, will fly onboard Spacelab-J in 1991.

During the meeting, Administrator Truly and Minister Oshima also discussed the ongoing cooperation between the two countries on the construction and utilization of Space Station Freedom. They emphasized the importance of adequate funding for the project in both countries and agreed on the importance of Japan's gaining manned spaceflight experience in preparation for it.

Additional areas of discussion included joint projects in X-ray and infrared astronomy, cosmic ray research, the study of ocean dynamics, measurement of cloud height by satellite stereography, reception of Japan's first Marine Observation Satellite data and satellite measurements of tropical rainfall.

The SSLG was established in 1979 by NASA and Japanese government space agencies. Senior-level NASA and Japanese space officials have met in the SSLG on a periodic basis to review cooperative projects. The next meeting of the SSLG will take place in the United States.

- end -

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For Release:

James W. McCulla
Headquarters, Washington, D.C.
(Phone: 202/453-8400)

August 2, 1990

N90-59

NOTE TO EDITORS: ANNOUNCEMENT BY THE OFFICE OF THE VICE PRESIDENT

The attached press release was issued by the Office of the Vice President at 11 a.m. today.

-end-

THE VICE PRESIDENT'S OFFICE

Office of the Press Secretary

FOR IMMEDIATE RELEASE AUGUST 2, 1990

ADVISORY COMMITTEE MEMBERS APPOINTED

Vice President Quayle today announced the names of eleven individuals appointed to serve on the Advisory Committee on the Future of the U.S. Space Program under the Chairmanship of Norman R. Augustine.

The panel members were selected on the joint recommendation of NASA Administrator Admiral Richard H. Truly and Mr. Augustine in consultation with the Vice President.

The Advisory Committee will advise the NASA Administrator on overall approaches NASA management can use to implement the U.S. Space Program for the coming decades. The committee will have a broad charter and will report its findings within approximately four months. The Committee will operate as an independent entity, and will submit its findings to the Administrator of NASA and, with the Administrator, to the Vice President in his capacity as Chairman of the National Space Council.

The members, in addition to the Chairman, are:

Laurel L. Wilkening who will serve as Vice Chairman of the Advisory Committee. Dr. Wilkening is currently the Provost at the University of Washington in Seattle and is a former member of the National Commission on Space.

Edward C. Aldridge Jr. President of McDonnell Douglas Electronics Systems Corp., and a former Secretary of the Air Force.

Joseph P. Allen. President, Space Industries International, Inc., and a former astronaut.

D. James Baker. President, Joint Oceanographic Institutions, Inc. and Distinguished Visiting Scientist, Jet Propulsion Laboratory; California Institute of Technology.

Edward P. Boland. Former Congressman representing Massachusetts' Second Congressional District and former Chairman of the Sub-Committee on Hud-Independent Agencies of the House Committee on Appropriations.

Daniel J. Fink. Former Chairman of the NASA Advisory Committee and retired Senior Vice President, Corporate Planning and Development, General Electric Company.

Don Fuqua. President and General Manager of the Aerospace Industries Association of America, Inc., and former Congressman representing Florida's Second Congressional District. He is a former Chairman of the House Committee on Science and Technology.

Robert T. Herres. Retired Air Force General, former Vice Chairman, Joint Chiefs of Staff, and former Commander in Chief, U.S. Space Command.

David T. Kerns. Chairman of the Board, Xerox Corporation, and a member of the President's Education Policy Advisory Committee.

Louis J. Lanzerotti. Distinguished Member of the Technical Staff, AT&T Bell Laboratories, a member of the National Academy of Engineering, and Chairman of the Space Studies Board of the National Research Council.

Thomas O. Paine. Former Administrator of NASA and Chairman of the National Commission on Space.

For additional information call:

William Sheehan, NASA Public Affairs, 202-453-1898
Sue Mathis Richard, NASA Public Affairs, 202-453-8364
Liz Prestridge, National Space Council, 202-395-6175

# # #

ADVISORY COMMITTEE ON THE FUTURE OF THE U.S. SPACE PROGRAM

Purpose

The purpose of the Advisory Committee on the Future of the U.S. Space Program is to advise the NASA Administrator on overall approaches NASA management can use to implement the U.S. Space Program for the coming decades.

Task Statement

The Committee shall have a broad charter to:

- Review the future of the civil space program, including both management issues and program content.

- Assess alternative approaches and make recommendations for implementing future civil space goals, including such factors as:

  - Appropriateness of planned activities
  - Organizational balance and structure
  - Adequacy of overall skill base of work force
  - Balance between roles of government and private sector
  - Possible contributions by other government agencies
  - The need to maintain a strong R&D capability
  - Assurance of mission success

Schedule

The Committee shall report its findings within 120 days from the date of its inception.

Membership

The Committee shall be comprised of approximately 12 individuals selected for their knowledge of space activities and management expertise. Membership shall provide as broad a set of experience backgrounds as practicable. Ex-officio members may be added to the Committee upon approval of the Administrator of NASA with the concurrence of the Committee's chairperson.

Reporting Procedure

The Committee will operate as an independent entity, reporting to the Administrator of NASA, and will submit its findings to the Administrator of NASA and, with the Administrator, to the Vice President of the United States in his capacity as Chairman of the National Space Council.

NASA News

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Headquarters, Washington, D.C.

(Phone: 202/453-8400)

For Release:
August 2, 1990

RELEASE: 90-107

FINARELLI NAMED ACTING HEAD OF EXTERNAL RELATIONS

NASA Administrator Richard H. Truly has named Margaret G. Finarelli as Acting Associate Administrator for External Relations. Finarelli has served as Deputy Associate Administrator for External Relations since December 1988.

Kenneth S. Pedersen, Associate Administrator for External Relations since November 1988, will be on a 1-year teaching assignment as a Visiting Professor at Georgetown University, Washington, D.C., effective Aug. 6, 1990.

In her new position, Finarelli will be responsible for the agency's intergovernmental, international and industry relations; and educational activities.

Finarelli joined NASA in 1981 as Chief of the International Planning and Programs Office. From 1986 until December 1988, she was Director of the Policy Division in the Office of Space Station. She was NASA's chief negotiator for the international agreements which govern U.S. cooperation with Europe, Japan and Canada in the Space Station Freedom program.

Prior to joining NASA, Finarelli served in a number of positions in other U.S. government agencies including Senior Policy Analyst for International Science and Technology at the White House Office of Science and Technology Policy and Technical Advisor at the Arms Control and Disarmament Agency.

She graduated Magna Cum Laude with Distinction in chemistry from the University of Pennsylvania, Philadelphia, and received a master's degree in physical chemistry from Drexel University, Philadelphia. She is a member of Phi Beta Kappa and has served on the Board of Directors of the International Space University and the Executive Council of the American Institute of Aeronautics and Astronautics National Capitol Section.

- more -

In 1985, Finarelli was awarded NASA's Exceptional Service Medal. In 1988 she was selected for the Presidential Meritorious Rank Award, which recognizes outstanding service by members of the U.S. Senior Executive Service. And in 1989, she received the Women in Aerospace Outstanding Achievement Award.

Pedersen has served in his present position since November 1988. He served as Deputy Associate Administrator from September 1986. During the previous 6-1/2 years, he was director of NASA's International Affairs Division with responsibility for coordinating NASA interface with international organizations and foreign governments.

- end -

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For Release:
August 6, 1990

RELEASE: 90-108

NASA SELECTS MICROGRAVITY MISSION PAYLOAD SPECIALIST CANDIDATES

NASA today announced the selection of four candidates for two payload specialist positions for Space Shuttle STS-53 mission scheduled to carry the U. S. Microgravity Laboratory-1 (USML-1) in March 1992.

Selected for mission training were: Lawrence J. DeLucas, O.D., Ph.D.; Joseph Prahl, Ph.D., Albert Sacco, Jr., Ph.D. and Eugene H. Trinh, Ph.D. Two of the candidates will be selected for flight in March 1991, and the others will serve as alternates.

DeLucas, 40, earned a doctorate in optometry in 1981 and a Ph.D. in biochemistry in 1982 from the University of Alabama at Birmingham. He holds several positions at the University of Alabama at Birmingham including: Associate Director, Center for Macromolecular Crystallography; Professor, Department of Optometry; and Adjunct Professor, Laboratory of Medical Genetics. He resides in Birmingham.

Prahl earned a Ph.D. in engineering from Harvard University in 1968. The 47-year-old Prahl is a professor of engineering at Case Western Reserve University, Cleveland. He resides in East Cleveland.

Sacco, 41, earned a Ph.D. in chemical engineering from the Massachusetts Institute of Technology in 1977. He is a professor and head of the Department of Chemical Engineering at Worcester Polytechnic Institute, Worcester, Mass. He resides in Holden, Mass.

- more -

Trinh, of Culver City, Calif., earned a Ph.D. degree in applied physics from Yale in 1978. He is a scientist at the Jet Propulsion Laboratory, Pasadena, Calif. The 40-year-old Trinh was previously an alternate payload specialist for the Spacelab 3 mission.

During the 13-day USML-1 mission, the payload specialists will conduct more than 30 scientific and technological investigations in materials, fluids and biological processes in the spacelab environment.

- end -

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Jim Cast
Headquarters, Washington, D.C.
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For Release:
August 6, 1990

Release: 90-109

NASA ANNOUNCES 1990 SPIP AWARDS

NASA has announced the 1990 Solid Propulsion Integrity Program (SPIP) awards for outstanding contributions toward improving the nation's engineering capability for solid rocket motors. These awards recognize SPIP contractors, subcontractors or individuals that have made significant accomplishments toward achieving the program's objectives.

This year's awardees: Hercules Aerospace Corporation, Magna, Utah; PDA Engineering, Costa Mesa, Calif.; Southern Research Institute, Birmingham, Ala.; and United Technologies Chemical Systems Division, San Jose, Calif.

The Solid Propulsion Integrity Program originated from joint NASA-Department of Defense-industry studies in 1984 which identified critical shortfalls in the U.S. engineering technology base for solid-fueled rocket motors. The objective of the program is to provide U.S. engineers with the techniques, engineering tools and computer programs to be able to better design, build and verify solid rocket motors.

The Hercules team, under the leadership of Richard M. Herman, performed with outstanding proficiency in the organization of the necessary inter-company infrastructure and implementation and execution of their prime contractor role. They earned an award fee of $52,000.

The PDA team, led by Greg Crose, demonstrated exceptionally innovative approaches to understanding nozzle thermal responses, showing that smaller, less expensive motors can be used to verify full size motor responses. PDA, as a result, was given the freedom to conduct a special research task of their own selection in this area of responsibility, valued at $100,000.

- more -

The Southern Research Institute team, led by John R. Koenig, was recognized for their innovative approaches and highly significant findings that allow measurement of material properties never before demonstrated in laboratory tests. This effort earned them a special research task, also of their own selection, valued at $85,000.

The United Technologies team activities, led by Al Holzman, was recognized for outstanding proficiency, implementation and execution of work leading to improved engineering test tools for motor validation. United Technologies earned a special research task of their own selection, valued at $75,000, to continue their work.

Nominations for SPIP awards are made by participating contractors and government task managers. Final selection and approval is made by a NASA/Army/USAF award committee.

- end -

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For Release:
August 6, 1990

RELEASE: 90-110

NASA, C&P AND STATE OF WEST VIRGINIA SUPPORT PROJECT LASER

In an effort to boost interest in science and math in the state of West Virginia, NASA today received a $125,000 donation from C&P Telephone Company of West Virginia, Bell Atlantic Charitable Foundation, Charleston, W.V., and the West Virginia Department of Education to help fund the development and operation of NASA's project LASER mobile teacher resource center.

LASER (Learning About Science, Engineering and Research) is a tractor-trailer mounted mobile teacher resource center which provides elementary and secondary school lesson materials to teachers who do not have access to the stationary teacher resource centers at NASA's field centers.

The pilot program has been developed by NASA's Marshall Space Flight Center, Huntsville, Ala., with corporate sponsorship. The 48-foot van will travel throughout West Virginia for 1 month per year, for 3 years, visiting two schools per day.

The grant was presented today to Jack Lee, Director of NASA's Marshall Space Flight Center, by David E. Berry, President of C&P, and Dr. Henry Marookie, West Virginia State Superintendent of Schools.

Lee expressed appreciation to Berry and Marookie for their support and confidence in Project LASER and stressed the seriousness of the national problem the program is seeking to address.

- more -

"Fewer American students today are pursuing careers in science and engineering because they develop the false impression as early as third or fourth grade that math and science are dull or too hard," Lee said. "This condition threatens over the next decade to create a national shortage of the new scientists and engineers we'll need to replace those who will retire. However, with the creative efforts of a number of federal agencies and the partnerships of concerned groups like C&P and the West Virginia Department of Education, we hope to turn the tide on this problem."

NASA has designed the interior of the trailer with six teacher work stations, each serving two teachers concurrently. Each work station is equipped with a computer providing access to "NASA Spacelink," an electronic information system with a broad range of information and educational materials for teachers of grades K-12, particularly in the areas of mathematics and science. Each work station is also equipped with a videotape recorder and a monitoring system so teachers can copy from a large library of NASA educational videotapes.

Project LASER will prove beneficial to both teachers and students according to Marookie. "Putting the NASA resources and the NASA technologies at West Virginia's front door is a real and continuing service to the teachers and students of West Virginia."

According to Berry, industry will benefit from the project as well as education. "An increased interest in science and math programs will generate a larger pool of students embarking on technical careers after graduation."

"I am pleased that the state of West Virginia is working with C&P Telephone and Bell Atlantic to develop an opportunity to show our educators that we believe in them and in their ability to affect the future of West Virginia," Governor Gaston Caperton said. "This partnership is an effective coming together, not just a spending program."

Corporate support of project LASER is being coordinated by the Society of Automotive Engineers, Warrendale, Penn. Navistar International Transportation Corp., Chicago, Ill., provided the 22-ton International tractor. Transcontinental Marketing Exhibits, Inc., Lake Bluff, Ill., provided the 48-foot van-style trailer.

- end -

NASA News

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For Release:
August 7, 1990

EDITORS NOTE: N90-60

MAGELLAN VENUS ORBIT INSERTION NASA SELECT SCHEDULE

Magellan at Venus Orbit Insertion (VOI) is Aug. 10. Following an in-orbit checkout period, Magellan will begin mapping the surface of Venus with imaging radar on Sept. 1. The orbit insertion occurs at about 12:45 p.m. EDT on Aug. 10.

Following is a schedule of VOI events that will be carried on NASA Select:

Wednesday August 8

MAGELLAN AT VENUS 2:45 p.m. - 3:00 p.m. (EDT)
Mr. Stephen D. Wall, Head of Misison Operastions Science Support Team
Mr. John B. McNamee, Chief of Navigation Team Magellan Navigation and Targeting

Thursday August 9

PRESS CONFERENCE 1:00 p.m. - 3:00 p.m. (EDT)
Major review of Magellan mission goals, plans and VOI schedule.
Panelists:
Dr. Wesley T. Huntress, SSED Director
Mr. Anthony Spear, MGN Project Manager

- more -

Friday August 10

MAGELLAN AT VENUS 11:00 a.m. - 1:30 p.m. (EDT)
Live coverage of Magellan arrival at Venus from Mission Control.

PRESS CONFERENCE 2:30 p.m. - 3:30 p.m. (EDT)
Initial report of Magellan Venus Orbit Insertion
Panelists:
Dr. Lennard A. Fisk, OSSA Administrator
Mr. Anthony Spear, MGN Project Manager

- end -

NASA News

National Aeronautics and
Space Administration

Washington, D.C. 20546
AC 202-453-8400

Mark Hess/Jim Cast
Headquarters, Washington, D.C.
(Phone: 202/453-8536)

For Release:
August 7, 1990

N90-61

EDITORS NOTE:

SPACE FLIGHT BRIEFING SET FOR AUGUST 7

A press briefing to discuss the status of the Space Shuttle program and preparations for the September launch of STS-35 will be held from 2:30 to 3:30 p.m. EDT on Tuesday, August 7, 1990.

The briefing will originate from the NASA Headquaters Auditorium, 400 Maryland Ave, S.W., and will be carried live on NASA Select television via Satcom F2R, Transponder 13, at 72 degrees west longitude, frequency 3960.0 Mhz.

Participating in the briefing will be Associate Administrator for Space Flight Dr. William B. Lenoir and Robert Crippen, Director, Space Shuttle.

-end-

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202-453-8400

Paula Cleggett-Haleim
Headquarters, Washington, D.C.

(Phone: 202/453-1547)

Randee Exler
Goddard Space Flight Center, Greenbelt, Md.
(Phone 301/286-7277)

For Release:
August 13, 1990

RELEASE: 90-111

HST TAKES FAMILY PORTRAIT OF STARS OUTSIDE MILKY WAY

After only preliminary analysis, NASA'S Hubble Space Telescope (HST) has provided the first detailed views of how massive stars are formed in galaxies unlike our own. Early observations, in support of an engineering test, of 30 Doradus, the most prolific stellar nursery within the Large Magellanic Cloud, revealed new information about our neighboring galaxy.

"To have important science unexpectedly arise from engineering test data came as a pleasant surprise to the HST science team," says Dr. Edward Weiler, HST program scientist.

Hundreds of stars are believed to exist in this region, which is smaller than from here to the nearest star, about 4 light years away. One can easily count 60 stars just with the naked eye. Early computer analyses of this same image suggest that HST may be resolving many more stars. This region was thought to consist of a single star as recently as just 10 years ago.

NASA now has a unique and detailed view of massive stars in the neighborhoods of their birth. Dr. Sally Heap, a NASA astrophysicist remarked, "We now have the finest family portrait of stars outside our galaxy."

Dr. Charles Pellerin, Director of NASA's Astrophysics Division, said, "This now demonstrates HST's ability to conduct crucial and important studies, even with the existing spherical aberration. We will continue to study this region over the next few months, and the best is yet to come."

- more -

HST scientists plan the following activities:

--to use imagery, with the "planetary camera" mode of the Wide Field/Planetary Camera (WF/PC) and the European Space Agency's Faint Object Camera (FOC) to gain another factor of at least two in clarity (the current image was taken in the "wide field" mode).

--to use longer exposure times to image the fainter stars and make signal processing easier -- this image of 30 Doradus was acquired with an exposure of only 40 seconds.

--to produce "color imagery" by using filters to image this region in the near ultraviolet, green, yellow, and near infrared; the current image was taken in one color, violet.

--to use spectroscopy to infer the temperatures, masses and chemical composition on many of the brightest stars, individually.

The HST photograph of 30 Doradus was made on Aug. 3, 1990, with the Wide Field/Planetary Camera (WF/PC) for use as a finding chart in the checkout of another HST instrument, the Goddard High Resolution Spectrograph. The WF/PC produces star images with sharp cores, 0.1 arc-seconds wide. This image quality is sustained over the full field of view, which is 2.7 arc-minutes square.

30 Doradus is readily visible with the naked eye from the Southern Hemisphere of Earth, although it is located in another galaxy, the Large Magellanic Cloud, at a distance of about 160,000 light-years from Earth. The late American astronomer Harlow Shapley stated that 30 Doradus is so bright that if it were put in place of the nearby Orion Nebula, it would cast shadows on the nighttime landscape of Earth. 30 Doradus is located in the constellation Dorado, the swordfish.

HST astronomers studying the WF/PC picture report that they can make out the central stars of the R136 cluster, within the 30 Doradus nebula. They note that because the picture was taken in violet light, at a wavelength of 3680 angstroms, it brings out the hottest, most massive stars in the picture.

Hot stars produce more blue and ultraviolet light than cooler stars. Several of the stars appear to be single objects at the resolution of the WF/PC picture. Given their brightness and the distance to 30 Doradus, this observation strengthens the possibility that they may be more than 100 times as massive as the Sun.

Every HST picture of star clusters should achieve the resolution demonstrated in the photograph of 30 Doradus. Such photographs, when obtained through the different colored filters on the WF/PC and the Faint Object Camera (FOC), are expected to provide detailed information on the masses of stars in the clusters.

Then, knowing the mixtures of masses in a cluster (i.e., how many stars of each mass are present), astrophysicists can deduce basic information on how stars form and how they produce the chemical elements present in space. All massive stars probably become supernovae, spewing out their newly made elements. These elements, especially iron are essential ingredients to life on Earth. By determining how many such stars are present in 30 Doradus and similar star clusters in more distant galaxies, astronomers expect to deduce more accurate information on the enrichment of chemical elements in the universe.

- end -

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Washington, D.C. 20546
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For Release:
August 16, 1990

HUBBLE SPACE TELESCOPE INVESTIGATION BOARD STATUS REPORT 3

Dr. Lew Allen, Chairman of the Hubble Space Telescope Optical Systems Board of Investigation, issued the attached statement at the conclusion of the board's third meeting, held August 15 and 16, 1990 at Hughes Danbury Optical Systems, Danbury, Conn.

- more -

Statement Made by Dr. Lew Allen
Chairman
Hubble Space Telescope Optical Systems Board of Investigation
August 16, 1990
4:00 pm EDT

"The board has concluded that the previously reported spacing error in the reflective null corrector -- an optical reference device used to measure the surface of the HST primary mirror during its manufacture -- is the cause of the spherical aberration.

During our two-day meeting, we've had a number of excellent presentations made by Hughes Danbury Optical Systems. The company has been very responsive.

Measurement data taken with a precision designed to reveal the fairly large spacing errors that would cause the spherical aberration were reviewed. The spacing error is now determined to be about 1.3 millimeters --an amount which, by itself, can account for the entire observed spherical aberration of about 0.5 wave rms.

Other test data, including the data from the refractive null corrector (an alternate test device used to measure the mirror's "vertex radius") and the inverse null corrector (used to verify alignment) are consistent with the spherical aberration of about 0.5 wave rms with a "down-edge" mirror, as NASA has observed on orbit.

Now that we understand the nature of the defect in the reflective null corrector, we have re-analyzed the data taken in 1981, at the end of the primary mirror manufacturing process. Interferograms (mirror "contour maps"), are available from the flawed reflective null corrector and the refractive null corrector. When the spacing error is taken into account, the data from the two devices are entirely consistent. That is, the new analysis of the interferograms from the refractive null corrector does show a primary mirror with about 0.5 wave rms of spherical aberration.

So, several different tests using optical and mechanical measurements are all yielding similar results: a spacing discrepancy of about 1.3 millimeters between the design of the reflective null corrector and the device as it exists explains the observed spherical aberration.

The strategy and process for the original alignment and manufacture of the reflective null corrector were also reviewed by the board. The techniques are extremely sophisticated and precise. Thus the spherical aberration appears to be caused by a single, but costly error.

The board has not yet been able to determine how such an error occurred; this question will be examined over the next several weeks as documentation can be located and reviewed.

It was observed that the field lens assembly appears to have spacer washers in its mounting to the baseplate. These washers appear to be about 50 thousandths of an inch (or approximately 1.3 millimeters in thickness). Therefore, if the washers were inappropriately installed, this could have caused the spacing error. Other possibilities, such as improper use of the metering rods or improper execution of measuring procedures are also under investigation.

The board will continue to probe the details of the testing and verification process. Our next meeting is scheduled for Sept. 12 and 13, here in Danbury."

- end -

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Barbara Selby
Headquarters, Washington, D.C.
(Phone: 703/271-5502)

For Release:
August 20, 1990

RELEASE: 90-112

NASA ESTABLISHES SPACE COMMERCE STEERING GROUP

NASA Administrator Richard H. Truly announced today the establishment of a Space Commerce Steering Group, composed of senior NASA officials, who will provide a high-level overview of commercial applications of space technology.

The steering group will be chaired by NASA Deputy Administrator James R. Thompson Jr., with Assistant Deputy Administrator John E. O'Brien serving as Vice-Chairman. In addition to the Assistant Administrator for Commercial Programs, members include the Associate Administrators for Space Flight; Space Science and Applications; Aeronautics, Exploration and Technology; Space Operations; and External Relations; the Assistant Administrator for Procurement, as well as the Comptroller and the General Counsel.

NASA's Office of Commercial Programs will remain the primary action agent for direct assistance to industry in the development and growth of space enterprise and markets, and will continue to be responsible for the oversight and management of the Centers for the Commercial Development of Space.

In making the announcement, Truly said, "This initiative will provide a coordinating mechanism to deal with the issues surrounding commercial uses of NASA's capabilities. The steering group will focus on future coherent, consistent and predictable NASA policies related to space commerce. Our goal is to stimulate the involvement and investment of U.S. industry in space -- non-aerospace industry and the newer entrepreneurial firms interested in space endeavors as well as the traditional aerospace industry sector."

- more -

The steering group will draw on expertise and support provided by two other groups. The Commercial Programs Advisory Committee, a standing committee of the NASA Advisory Council, will ensure that private sector views and concerns are considered.

A NASA coordinating committee, chaired by the Assistant Deputy Administrator, also will provide support to the steering group. Membership in the coordinating team will be drawn from various NASA offices depending on the nature of the subject matter being addressed.

Truly noted, "The structure I have put in place today will position NASA to cope with the many commercial issues which arise and to formulate strategies addressing the interests of the commercial sector in NASA's ongoing and future activities. NASA, as it develops new technology, must ensure that this technology is transferred to the private sector. The taxpayers' investment in NASA is an investment in the international competitiveness of U.S. industry."

- end -

NASA news releases and other NASA information are available electronically on CompuServe and GEnie, the General Electric Network for Information Exchange. For information on CompuServe, call 1-800-848-8199 and ask for representative 176. For information on GEnie, call 1-800-638-9636.

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202-453-8400

For Release:

August 20, 1990
4:30 p.m. EDT

Ed Campion
Headquarters, Washington, D.C.
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Lisa Malone
Kennedy Space Center, Fla.
(Phone: 407/867-2468)

STS-35 LAUNCH ADVISORY

At the conclusion of the STS-35 Flight Readiness Review today, NASA managers set a target date of Sept. 1, 1990, for the launch of Space Shuttle Columbia and the Astro-1 payload. This date is dependent on successful completion of remaining launch preparation activities.

"Today we conducted a complete review of the STS-35 mission as well as the results of the liquid hydrogen leak investigation," said Associate Administrator for Space Flight William Lenoir. "Based on this review, I believe STS-35 is ready to fly. Both the NASA and contractor launch teams deserve high praise for all their efforts. It is through their hard work that we are now in a position to launch Columbia."

Coverage of the launch of Columbia and the STS-35 mission will be carried on NASA Select Television, which is available on Satcom F-2R, Transponder 13, C-band, located at 72 degrees west longitude, frequency 3960.0 MHz, vertical polarization, audio monaural 6.8 MHz.

- end -

Monday Sept. 3rd is Labor Day holiday!

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202-453-8400

Les Gaver
Headquarters, Washington, D.C.
(Phone: 202/453-8372)

For Release:
August 21, 1990

N90-66

NOTE TO EDITORS: STS-35 TV TRANSMISSIONS

STS-35/ASTRO-1 Space Shuttle mission (currently scheduled for a Sept. 1 launch) television programming will be transmitted daily via the following satellite to accomodate the Alaska and Hawaii audiences:

SPACENET 1
Transponder 17
120 degrees West Longitude
4040.0 MHz (Video)
6.8 MHz (Audio)

Two-hour edited versions of each day's events will be transmitted via SPACENET 1 at:

Sept. 1 and 8 - 1:35 a.m. to 3:35 a.m. EDT
Sept. 2-7 and 9 - 12:01 a.m. to 2 a.m. EDT

The continental United States will continue to receive NASA Select television, 24 hours a day throughout the mission, via:

SATCOM F2R
Transponder 13
72 degrees West Longitude
3960 MHz (Video)
6.8 MHZ (Audio)

-end-

Les Gaver
Headquarters, Washington, D.C.
(Phone: 202/453-8372)

August 21, 1990

N90-66

NOTE TO EDITORS: STS-35 TV TRANSMISSIONS

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Sept. 2-7 and 9 - 12:01 a.m. to 2 a.m. EDT

The continental United States will continue to receive NASA Select television, 24 hours a day throughout the mission, via:

SATCOM F2R
Transponder 13
72 degrees West Longitude
3960 MHz (Video)
6.8 MHZ (Audio)

-end-

Posted: Tue, Aug 21, 1990 1:08 PM EDT Msg: HJJA-2902-3716
From: CREDMOND
To: int.loop,
(C:USA, ADMD:TELEMAIL, PRMD:GSFC, O:GSFCMAIL, UN:JRUFF),
(C:USA, ADMD:TELEMAIL, PRMD:GSFC, O:GSFCMAIL, UN:RVILLARD),
(C:USA, ADMD:TELEMAIL, PRMD:NASAMAIL, O:TMIS,
OU:RESTON.SSFP, SN:GREENFELD, FN:ISRAEL,
SITE:RESTON.SSFP)
Subj: Daily News in Brief 8/21/90

This is DAILY NEWS IN BRIEF for August 21, 1990
It is intended for internal agency use only.

Daily News in Brief is an abstract of media stories

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202-453-8400

Jim Cast
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For Release:
August 22, 1990

RELEASE: 90-113

ADVANCED LAUNCH SYSTEM ROCKET ENGINE DEFINED

A government-industry board has completed a key milestone with its decision defining the type of rocket engine which will be designed and built to power the NASA/U.S. Air Force Advanced Launch System (ALS). The two candidates were the gas generator power cycle, similar to the J-2 engine employed on the second and third stages of the Saturn moon rockets, and the closed expander power cycle, similar to the RL-10 engine used in the Saturn I and the Centaur upper stage. The decision went to the gas generator cycle.

The selection by the ALS Space Transportation Main Engine cycle selection board was based on work accomplished in two phases. First, three ALS engine contractors performed studies defining and evaluating candidate designs. Then, they reported to a joint government-industry engine cycle technical assessment team and joint senior review board. Those panels chose the most promising design features for the engine from reports submitted by the three contractors, providing a comparable basis on which to make the engine cycle decision.

The Advanced Launch System program will provide, by the year 2000, a dependable, reliable, high-capacity national launch capability. It is planned as a family of launch vehicles capable of delivering a wide range of payloads into low Earth orbit with an order-of-magnitude cost reduction from today's launch costs.

In support of these ALS objectives, the board's decision was based on factors such as production cost, reliability, producibility, operations, size, development effort, risk and performance.

- more -

The gas-generator type of engine has been widely used since early in the history of liquid-fueled rocket development and has benefitted from many technology advances over the years. Its basic elements are:

- o A combustion chamber which generates the engine's thrust by exhausting combustion gases at high velocity through the nozzle.
- o Two turbopumps, which take liquid fuel and liquid oxidizer from tanks at rather low pressure, feed the fuel through cooling circuits, and inject both propellants into the combustion chamber at high pressure.
- o Turbines, powered by hot gas, to spin the turbopumps.
- o A gas-generator device to provide the hot gas to the turbine(s). It generates gas by the combustion of a small quantity of liquid fuel and oxidizer, diverted from the main flow.

Definition studies of the Space Transportation Main Engine have determined that such an engine can be developed within the parameters established for the ALS. It will use liquid oxygen and liquid hydrogen as propellants, be approximately 7 feet in diameter and 12.5 feet long, and weigh about 7,000 pounds. Supplying approximately 600,000 pounds of thrust, it will power the ALS core stage and the launch system's booster stage.

The Space Transportation Main Engine selection board consists of top managers from NASA's Lewis Research Center, Cleveland; the Marshall Space Flight Center, Huntsville, Ala.; the Johnson Space Center, Houston, Tex.; and the Stennis Space Center, Bay St. Louis, Miss.; representatives of the Air Force/NASA ALS Joint Program Office; and the presidents and chief operating officers of the three contractors currently conducting definition studies for the engine. The 12-member board is chaired by Marshall Space Flight Center Director Jack Lee.

The engine definition contractors are Aerojet, the aerospace segment of GenCorp; United Technologies' Pratt & Whitney; and the Rocketdyne Division of Rockwell International. They are working under parallel competitive study contracts and have agreed to pursue the formation of a teaming arrangement, which will reduce the cost and risks of the ALS engine development program.

The studies show both engine cycles would provide essentially the same projected cost and reliability, while on many of the detailed points of comparison, the gas generator was favored.

The selection of a gas-generator cycle engine, explained Board Chairman Lee, will pose a lower development risk than the closed expander engine cycle. "That advantage will give us more freedom to concentrate on achieving optimum reliability, producibility and production cost, rather than overcoming development obstacles," Lee said.

Future work on the Space Transportation Main Engine will include preliminary design beginning this fall, detailed design, fabrication, and test of major engine components, and a prototype engine program scheduled to begin in 1992.

- end -

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For Release:
August 22, 1990

RELEASE: 90-114

RESPONSE TO SEI OUTREACH PROGRAM STRONG, NASA SAYS

NASA announced today that response has been strong to its request for ideas on how to return to the Moon permanently and begin human exploration of Mars. The ideas were solicited under NASA's Space Exploration Initiative (SEI) Outreach Program announced by NASA Administrator Richard H. Truly on May 31.

The Outreach Program consists of three primary channels for ideas, which will be provided directly to a Synthesis Group, chaired by Lt. General Thomas P. Stafford, USAF (Ret.). Under the program, the RAND Corporation is analyzing ideas from industry, universities, associations and the public; the American Institute of Aeronautics and Astronautics (AIAA) solicited ideas from its members; and Federal agencies were invited to provide direct input to the Synthesis Group. The Synthesis Group is responsible for synthesizing the inputs from all sources into several architectures for the SEI and for identifying early milestones and promising technologies, as well.

The AIAA has received more than 400 ideas from its members. The ideas will be the focus of a conference on "Innovative Technologies for the Exploration of Space," co-sponsored by NASA and the AIAA on September 5 and 6 at the Ramada Renaissance Techworld, Washington, D.C.

General Stafford will be the keynote speaker at the conference on September 5. He will be followed by Arnold Aldrich, Associate Administrator of NASA's Office of Aeronautics, Exploration and Technology, who will speak on the SEI.

The conference will focus on innovative concepts, systems and technologies submitted by AIAA members. The conference is organized into five sessions to cover Architecture and Systems; Transportation; Human Support Technologies and Systems; Planetary Surface Systems and Technologies; and Infrastructure Technologies.

- more -

As of August 17, the RAND Corporation received more than 10,000 requests for response packets under the SEI Outreach Program and notices of intent to submit 3,302 ideas.

Of the intended responses, 68.7 percent are from individuals, 16.3 percent are from aerospace companies and other for-profit enterprises, and 8.1 percent are from educational institutions. The remainder are in other categories.

Space transportation is the focus of the largest category of intended responses to RAND with 16.7 percent. Other categories include mission concepts (16.5 percent), life support systems (10.3 percent), structures and materials (9.8 percent), space and surface power (7.4 percent), space processing and manufacturing (6.3 percent), system design and analysis (5.7 percent), automation and robotics (4.7 percent), communications (4.1 percent), ground support and simulation (3.4 percent), and information systems (2.3 percent). The remainder are in other categories.

-end-

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NASA News

National Aeronautics and
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Langley Research Center, Hampton, Va.
(Phone: 804/864-6120)

For Release:
August 23, 1990

RELEASE: 90-115

FLIGHT TESTS PROVE CONCEPT FOR JETLINER FUEL ECONOMY

The aerodynamic efficiency of future aircraft may improve sharply due to better-than-expected findings from a joint government-industry flight test program concluded this month. Such improved flight efficiency would result in reduced fuel consumption and lower operational costs for the U.S. airline industry.

Boeing modified a 22-foot section of a Boeing-757's wing outboard of the left engine and performed all the flight tests. Laminar air flow was achieved over the first 65 percent of the upper surface of the modified wing section, measured from the leading edge to the trailing edge of the wing, the first time the suction system was used and on all subsequent flights during the 5-month test period.

If the entire span of both wings was modified, a reduction in total airplane drag of up to 10 percent or more, depending on the application, could be realized. Each percent of drag eliminated by the U.S. transport fleet represents an estimated savings in fuel costs to the U.S. airline industry of $100 million annually.

NASA, Boeing and Air Force officials hailed the flight tests as one of the most significant events in the history of boundary-layer control. "We've known for years that laminar flow could be obtained under ideal conditions," Boeing Program Manager A. L. "Del" Nagel explained. "The real problem has been the difficulty of manufacturing sufficiently smooth permeable wing structure at reasonable cost. Now we've shown that we can do that."

- more -

The research was aimed at preventing much of the turbulence that occurs naturally in the thin boundary layer of air at the surface of an aircraft's wing. Turbulence over the wing increases skin-friction drag, requiring the aircraft to use more fuel. In contrast, a smooth or "laminar" air flow significantly improves aerodynamic efficiency by reducing drag, which results in lower fuel consumption. The program is the first to demonstrate "hybrid laminar flow control" (HLFC) in flight.

Early investigations in the 1930's and 1940's showed that careful shaping of wings could achieve some laminar flow. But this "natural" laminar flow works only under restricted conditions. A more powerful technique, called laminar flow control, pulls a small amount of the boundary layer air through a porous or slotted wing skin by means of a suction system.

Laminar flow control has limitations, too. The holes or slots along major portions of the wing could compromise structural soundness or get clogged by insects or dirt. NASA and Boeing met this challenge by developing a variation called hybrid laminar flow control that limits the air extraction system to the leading edge, followed by a run of natural laminar flow.

The suction surface was a titanium skin with approximately 19 million tiny laser-drilled, closely spaced holes. A leading edge "Krueger" flap was integrated into the wing high-lift system to serve as an insect shield during takeoffs and landings.

The design incorporated innovations from earlier laminar flow projects using a NASA C-140 JetStar and the Air Force's X-21 research airplane. It also used the detailed data base gathered during NASA's F-14 Variable Sweep Transition Flight Experiment and the agency's 757 Natural Laminar Flow and Wing Noise Program.

NASA is considering a possible future flight test that would look at application of hybrid laminar flow at the inboard parts of the wings.

Greater drag reduction is anticipated on new aircraft with hybrid laminar flow incorporated in their initial designs. Government and industry researchers believe that HLFC technology could be introduced in new aircraft designs during this decade.

The program was jointly funded by NASA's Langley Research Center, Hampton, Va., Boeing Commercial Airplane Group, Seattle, and the U.S. Air Force Wright Research and Development Center, Wright-Patterson AFB, Ohio.

- end -

NASA News

National Aeronautics and
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Headquarters, Washington, D.C.
(Phone: 202/453-2907)

Mary Nugent
Synthesis Group, Arlington, Va.
(Phone: 703/557-5518)

For Release:
August 27, 1990

N90-68

NOTE TO EDITORS: SYNTHESIS GROUP PRESS BRIEFING

Lieutenant General Thomas P. Stafford, USAF (Ret.), Chairman of the Synthesis Group, will hold a press briefing on August 29 at 10 a.m. EDT at the National Press Club, 529 14th St., N.W., Washington, D.C. The Synthesis Group is responsible for synthesizing innovative systems, ideas and technologies provided under NASA's Space Exploration Initiative (SEI) Outreach Program into several alternative architectures to return to the moon permanently and begin human exploration of Mars.

General Stafford will announce the Synthesis Group membership and discuss the synthesis process.

The briefing will be carried live on NASA Select television, Satcom F-2R, transponder 13, 72 degrees West longitude, frequency 3960.0 Mhz. No 2-way question and answer via NASA Select TV will be available.

-end-

NASA News

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Jim Cast
Headquarters, Washington, D.C.

(Phone: 202/453-8536)

For Release:
August 27, 1990

RELEASE: 90-116

SPACE FLIGHT'S MAHON TO RETIRE

Joseph B. Mahon, Deputy Associate Administrator for Space Flight (Flight Systems) has announced his retirement effective Sept. 1, 1990 after nearly 30 years with NASA and a total of 44 years of government service. Since 1987, he has been responsible for managing and directing unmanned launch vehicles and upper stages, Shuttle carrier systems including spacelab operations and tether satellite systems as well as advanced programs such as Shuttle-C, the Advanced Launch System, Assured Crew Return Vehicle and orbital debris investigations.

After serving as a systems and project engineer for the U.S. Navy's Polaris and Sparrow missile programs, Mahon joined NASA where he served as the Agena Program Manager. While in this position he received NASA's Exceptional Service Medal for work resulting in the first U.S. spacecraft landing on the Moon.

From 1967-1982, he served as Director of Expendable Launch Vehicles (ELVs) for which he received NASA's Distinguished Service medal. During this 15-year period, over 200 payloads were successfully launched by ELVs, including Earth-orbiting craft such as TIROS, NIMBUS, and Orbiting Solar, Geophysical and Astronomical observatories and communications satellites such as Syncom. Sophisticated probes and interplanetary spacecraft also were boosted toward new and distant targets including Rangers, Surveyors and Lunar Orbiters to the Moon and Mariners, Pioneers, Vikings and Voyagers to the planets.

In 1982, Mahon was named Director, Space Transportation Support Programs. In 1986, he was appointed Acting Deputy Associate Administrator for Space Flight and assumed his present position in March, 1987.

- more -

A native of Sugar Notch, Penn., Mahon holds a B.S. degree in Mechanical Engineering from Catholic University, Washington, D.C. He and his wife, Ellen, reside in Seabrook, Md.

- end -

NASA news releases and other NASA information are available electronically on CompuServe and GEnie, the General Electric Network for Information Exchange. For information on CompuServe, call 1-800-848-8199 and ask for representative 176. For information on GEnie, call 1-800-638-9636.

NASA News

National Aeronautics and
Space Administration

Washington, D.C. 20546
AC 202-453-8400

Paula Cleggett-Haleim
Headquarters, Washington, D.C.
(Phone: 202/453-1549)

Randee Exler
Goddard Space Flight Center, Greenbelt, Md.
(Phone: 202/286-7277)

For Release:
August 28, 1990

EDITORS NOTE: N90-69

HST AND MAGELLAN MEDIA BRIEFINGS SET FOR AUGUST 29

A press conference, outlining recent science results from the Hubble Space Telescope, will be held at the Goddard Space Flight Center Visitor's Information Center, Greenbelt, Md., on Wednesday, August 29, at 1 p.m. EDT.

The conference will be carried live on NASA Select television by way of Satcom F-2R, Transponder 13, C-band, at 72 degrees West Longitude, frequency 3960 MHz, audio 6.8 MHz. Two-way question and answer capability will be available from NASA Headquarters, Washington, D.C. and from various NASA field centers.

Additionally, a Magellan at Venus status report will be aired from the NASA Jet Propulsion Laboratory, Pasadena, Calif., at 2:15 p.m. EDT, on Wednesday, August 29, over NASA Select television.

- end -

NASA News

National Aeronautics and
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John - Did you see this? J.

Paula Cleggett-Haleim
Headquarters, Washington, D.C. 20546
(Phone: 202/453-1547)

For Release:
Aug. 29, 1990

Release 90-90

NASA FORMS BOARD TO LOOK INTO OFFICIAL'S DISAPPEARANCE

Dr. Lennard A. Fisk, NASA's Associate Administrator for Space Science and Applications, announced today that he will form an investigative board to examine why the agency recently could not locate Alphonso V. Diaz, the deputy associate administrator for Space Science and Applications.

The agency lost contact with Diaz for 75 minutes at approximately 8 a.m. on Wednesday, Aug. 15. Space Science officials at first speculated that Diaz, on his way into the office, had been deployed in a useless orbit by his BMW. However, he was found to have entered an anomalous Inter-level Conveyance Assembly (ICA) that interfered with his otherwise flawless trajectory.

"It's comparable to, uh, . . . well, to being stuck in an elevator," said program analogist Dr. Edward Weiler, who described the problem as "vertical aberration." Repeated attempts by NASA to contact Diaz were unsuccessful, but he was finally located by the General Services Administration's Deep Shaft Network (GSADSN).

"We weren't overly dismayed at the original loss of contact," said Dr. Fisk, "because it has happened before. However, we were surprised at how long it took to get back in touch with Al. If he's out of touch with the front office for more than 15 minutes, Al is supposed to point his solar panels to the sun and cone."

Fisk will announce the membership of the investigative board at a press conference at 2 p.m. at NASA Headquarters, provided he can locate a half-dozen people not already serving on NASA investigative boards.

Today's press conference will be carried live on NASA Select, which can be uplinked through District Cable Local Access, Channel 73.

-- 30 --

NASA News

National Aeronautics and
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Washington, D.C. 20546
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Goddard Space Flight Center, Greenbelt, Md.
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Ray Villard
Space Telescope Science Institute, Baltimore, Md.
(Phone: 301/338-4514)

For Release:
August 29, 1990

1 p.m. EDT

RELEASE: 90-117

HUBBLE SPACE TELESCOPE RESOLVES GASEOUS RING AROUND SUPERNOVA

NASA's Hubble Space Telescope, a cooperative program with the European Space Agency, has provided a dramatic new look at the remnants of one of the most spectacular and unexpected astronomical events of this century, the great supernova of 1987.

Observations made with the European Space Agency's Faint Object Camera, on August 23-24, have provided, with unprecedented sharpness and clarity down to .1 arc second, an intriguing view of the supernova and its surrounding shell of stellar material. The image, taken in visible light, reveals the details of the circumstellar shell, whose characteristics previously had been suggested by ground based observations and data from the International Ultraviolet Explorer satellite.

This new image will provide important insights into the evolution of massive stars and their catastrophic deaths as supernova explosions.

The visible light image clearly shows an elliptical, luminescent ring of gas about 1.3 light-years across surrounding the still glowing center of the 1987 explosion. The ring is a relic of the hydrogen-rich stellar envelope that was ejected in the form of a gentle "stellar wind" by the progenitor, which was a red supergiant star that existed an estimated 10,000 years before the explosion took place.

- more -

This diffuse gas was subsequently swept and compressed into a narrow, high-density shell by a high-speed stellar wind ejected from the star when it evolved back to a blue supergiant stage. The image suggests that the star was more efficient at compressing gas along an equatorial plane, to create a ring-like structure. Because the ring is inclined along the line-of-sight, it has an elliptical appearance.

In the first few hours following the supernova blast the ring was fully ionized and heated by a flood of ultraviolet radiation. Three and a half years later, the ring still glows at a temperature of more than 20,000 degrees Kelvin.

The slowly expanding ring is destined to be a relatively short-lived structure. It will be overtaken by the swiftly moving ejecta, travelling at 1/10th the speed of light, from the supernova in a few more years. This collision will heat the ring such that it will brightly glow in X-ray and ultraviolet light. Within a few decades, the ring will be completely engulfed by supernova debris which will be visible for centuries as a bright supernova remnant.

The Space Telescope Science Institute is operated by the Association of Universities for Research in Astronomy, Inc., for NASA, under contract with the Goddard Space Flight Center, Greenbelt, Md.

- end -

NASA news releases and other NASA information are available electronically on CompuServe and GEnie, the General Electric Network for Information Exchange. For information on CompuServe, call 1-800-848-8199 and ask for representative 176. For information on GEnie, call 1-800/638-9636.

Media representatives only can obtain photographs to illustrate this news story by calling 202/453-8375.

Color: 90-HC-515 B & W: 90-H-556

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202-453-8400

Paula Cleggett-Haleim
Headquarters, Washington, D.C.

(Phone: 202/453-1547)

For Release:
August 29, 1990

1 p.m. EDT

Randee Exler
Goddard Space Flight Center, Greenbelt, Md.
(Phone: 301/286-7277)

Ray Villard
Space Telescope Science Institute, Baltimore, Md.
(Phone: 301/338-4514)

RELEASE: 90-118

HUBBLE SPACE TELESCOPE PEERS INTO CORE OF DISTANT GALAXY

NASA's Hubble Space Telescope, a cooperative program with the European Space Agency, has provided a remarkably new detailed view of the core of a galaxy which lies 40 million light-years away, more than half way to the great Virgo cluster of galaxies. These results promise that astronomers will be able to use the Hubble Space Telescope to probe the mysterious centers of galaxies, in a search for massive black holes.

The image, taken with the Wide Field and Planetary Camera on August 17, reveals that stars are much more tightly concentrated at the center of the galaxy than was previously expected. Since the galaxy, cataloged as NGC 7457, is assumed to be a "typical" galaxy, these preliminary findings suggest that the nuclei of normal galaxies may be more densely packed with stars than previously thought.

HST scientists are greatly encouraged by this new observation and emphasize that it demonstrates intriguing science can be routinely accomplished with the spaceborne observatory. "The images of NGC 7457 show emphatically that research on nuclei of galaxies can still be done", says Tod Lauer, of the Wide Field and Planetary Camera imaging team. "We've never been able to study any galaxy outside of our Local Group, our "neighborhood" of about two dozen galaxies, at this resolution before," he said.

- more -

The centers of galaxies are extremely interesting to astronomers because the centers are at the heart of the violent processes that give rise to cosmic jets, quasars, Seyfert galaxies and other mysterious energetic behavior.

NGC 7457 is a quiescent galaxy picked for its "normality" as an early target for assessing the science performance of HST. The resulting images show, to the surprise of astronomers, that an exceptionally bright and compact core is embedded in the diffuse background of the rest of the galaxy. Based on this new image, the stars in the nucleus of NGC 7457 are crowded together at least 30,000 times more densely than those stars seen within our own galactic neighborhood. This extraordinarily high stellar density exceeds earlier estimates from ground-based observation of NGC 7457 by a factor of 400.

It is far from clear whether or not a massive black hole is at the center of NGC 7457, since the images alone do not provide the answer. But these new data suggest that NGC 7457 is an excellent place to use the HST's spectrographs to measure how much mass is concentrated at the center of the galaxy.

The Space Telescope Science Institute is operated by the Association of Universities for Research in Astronomy, Inc., for NASA, under contract with the Goddard Space Flight Center, Greenbelt, Md.

- end -

NASA news releases and other NASA information is available electronically on CompuServe and GEnie, the General Electric Network for Information Exchange. For information on CompuServe, call 1-800-848-8199 and ask for representative 176. For information on GEnie, call 1-800/638-9636.

Media representatives only can obtain photographs to illustrate this news story by calling 202/453-8375.

B & W: 90-H-555

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202-453-8400

Mark Hess
Headquarters, Washington, D.C.
(Phone: 202/453-4164)

Barbara Schwartz
Johnson Space Center, Houston
(Phone: 713/483-8647)

For Release:
August 29, 1990

RELEASE: 90-119

ASTRONAUT MCCULLEY TO RETIRE FROM THE NAVY AND LEAVE NASA

Astronaut Michael J. McCulley (Captain, USN) is retiring from the Navy and leaving NASA in early October after the STS-41 Ulysses launch.

McCulley has accepted the position of Vice President and Deputy Director, KSC-Launch Site, with Lockheed Space Operations Company. "I am not changing teams with this move, only my position on the team," McCulley said. McCulley will be heavily involved in the day-to-day processing of Space Shuttle vehicles in his new position.

McCulley was the pilot on mission STS-34 during which the crew successfully deployed the Galileo spacecraft for its journey to explore Jupiter. Selected by NASA in May 1984, McCulley has served as the Astronaut Office weather coordinator, the flight crew representative to the Shuttle Program Requirements Control Board, Technical Assistant to the Director of Flight Crew Operations, and currently, as lead of the Astronaut Support Team at the Kennedy Space Center, Fla.

Regarding McCulley's decision to retire, Director of Flight Crew Operations Donald R. Puddy said, "Mike has always been a top-notch performer in every way. Both as a pilot and as a technical expert, he has made significant contributions to the Shuttle Program and to my office. We will miss him here at JSC, but his experience and expertise will be extremely valuable in his new position."

- end -

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202-453-8400

Brian Dunbar
Headquarters, Washington, D.C.

(Phone: 202/453-1547)

Jim Sahli
Marshall Space Flight Center, Huntsville, Ala.
(Phone: 205/544-6528)

For Release:
August 31, 1990

RELEASE: 90-120

NASA TO TEST GAS IONIZATION THEORY OVER SOUTH PACIFIC

A NASA/U.S. Air Force satellite will initiate two chemical release experiments Sept. 10 and 12 to aid scientists studying the processes by which fast-moving neutral gases become ionized. The two chemical releases, part of the Combined Release and Radiation Effects Satellite (CRRES) program, will occur at dusk local time over the South Pacific and above the atmosphere at altitudes between 300 and 360 miles.

CRRES is a joint NASA/U.S. Air Force mission to study the Earth's ionosphere and magnetosphere and to monitor the effects of the space radiation environment on sophisticated electronics.

On each day, two canisters will be ejected from opposite sides of the CRRES spacecraft. After 25 minutes, when the canisters are about 2 miles from the satellite, vaporized chemicals will be released from each canister and expand, initially at a rate of approximately 0.6 miles per second. One pair of canisters will release approximately 12 pounds of barium from one canister and 12 pounds of strontium from the other. The second pair will release 12 pounds of barium and 4 pounds of calcium.

Since the releases will be made below the Sun-Earth terminator (the line that divides the Earth between day and night), the released chemical cloud will not be visible initially. If the vapor cloud becomes ionized by interaction with the background plasma, the newly formed ions will expand upward along lines of the Earth's magnetic field.

- more -

Approximately 42 miles above the release point, the ions will emerge into sunlight, where they will become visible as they scatter sunlight. This ion cloud will appear as a faint purplish streak, elongated along the geomagnetic field, with a brightness similar to a weak aurora's. However, since the releases will be made at dusk, it will be difficult for an observer to see the releases with the naked eye.

The observation of such an ion cloud will confirm the critical velocity ionization hypothesis, which states that if the relative velocity of an electrically neutral gas and a magnetized plasma (ionized, or electrically charged, gas) is large enough, the neutral gas will ionize even though less energy is available than is normally required for ionization.

The Sept. 10 releases will occur at 2:11 a.m. EDT (7:11 p.m. on Sept. 9 local time) approximately halfway between American Samoa and Tahiti, at latitude 17.5 degrees south and longitude 161 degrees west. The Sept. 12 releases will occur at 3:29 a.m. (8:29 p.m. Sept. 11 local time) just east of Fiji, at latitude 18 degrees south and 180 degrees west.

The chemical releases will be observed by scientists aboard two aircraft, a U.S. Air Force KC-135 and a leased Lear-35. Also, scientists on American Samoa will observe the releases with low-light video cameras and telescopes. Instruments aboard the satellite itself also will observe the releases.

CRRES was launched from Cape Canaveral Air Force Station, Fla., on July 25 aboard an Atlas-Centaur vehicle. NASA's portion of the mission is managed by the Marshall Space Flight Center, Huntsville, Ala., for the agency's Office of Space Science and Applications.

- end -

NOTE TO EDITORS: Charts showing the CRRES spacecraft's ground track and the location and approximate time of each release are available from NASA Headquarters Newsroom by calling (202) 453-8400.

NASA news releases and other information are available electronically on CompuServe and GEnie, the General Electric Network for Information Exchange. For information on CompuServe, call 1-800/848-8199 and ask for representative 176. For information on GEnie, call 1-800/638-9636.

NASA News

National Aeronautics and
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Washington, D.C. 20546
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Mary Sandy
Headquarters, Washington, D.C.
(Phone: 202/453-2754)

Jean Drummond Clough
Langley Research Center, Hampton, Va.
(Phone: 804/864-6122)

For Release:
September 5, 1990

RELEASE: C90-cc

NASA SELECTS MASON AND HANGER SERVICES FOR CONTRACT NEGOTIATIONS

NASA Langley Research Center, Hampton, Va., has selected Mason and Hanger Services Inc., Hampton, Va., for negotiation of a contract to support Langley's Consolidated Logistics, Administrative, Security and Scientific Information Contract (CLASSIC) services. The 5-year, cost-plus-award-fee contract, estimated at $97.9 million, will be effective September 28.

Mason and Hanger will perform the majority of the work at Langley. The firm will provide a comprehensive logistics program covering all aspects of supply, transportation and equipment management; general and specialized administrative services such as mail and correspondence records management; clerical support services; and micrographics and engineering drawing files support.

Within the scope of the contract, the company will support Langley's security program including physical, personnel and information services, badge/pass and locksmith services and Langley-sponsored or hosted projects and programs. In addition, the contractor will support the scientific and technical information program with technical editing and documentation; laboratory photography; reproduction; offset duplication, finishing operations and distribution services; graphics support; and selected library services.

-end-

NASA News

National Aeronautics and
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Washington, D.C. 20546
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Mark Hess
Headquarters, Washington, D.C.
(Phone: 202/453-4164)

Steve Nesbitt
Johnson Space Center, Houston
(Phone: 713/483-5111)

For Release:
September 10, 1990

N90-70

NOTE TO EDITORS: STS-41 MEDIA BRIEFINGS

A series of preflight briefings for Space Shuttle mission STS-41, the deployment of the Ulysses spacecraft, will be held Wednesday and Thursday of this week at the Johnson Space Center, Houston and NASA Headquarters, Washington, D.C.

From Houston, Lead Flight Director Milt Heflin will present an overview of the mission beginning at 10 a.m. EDT on Wednesday. The astronaut crew of STS-41 will hold a press conference beginning at 11 a.m., followed in the afternoon by round-robin interviews. Media representatives wishing to participate in the interviews should notify the JSC Newsroom by Tuesday afternoon.

Thursday's briefing from Headquarters begins at 1 p.m. EDT with the Ulysses spacecraft and science objectives, followed by briefings on other payloads and mission objectives from Houston.

All briefings will be carried on NASA Select television (Satcom F2R, transponder 13, 72 degrees west longitude frequency 3960.0 MHz, and audio 6.8MHz) with two-way question and answer capability.

-end-

NASA News

National Aeronautics and
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AC 202-453-8400

Sarah Keegan
Headquarters, Washington, D.C.
(Phone: 202/453-1548)

For Release:
September 11, 1990

N90-71 EDITORS NOTE:

HST INVESTIGATION BOARD STATUS REPORT -- PRESS AVAILABILITY

Dr. Lew Allen, Chairman of the Hubble Space Telescope Optical Systems Board of Investigation, will meet with the press at 4 pm EDT, Thursday, Sept. 13, 1990, at Hughes Danbury Optical Systems (HDOS), Danbury, Conn., at the conclusion of the board's 2-day meeting. Dr. Allen will answer questions on the status of the investigation.

Also, a written status report on the meeting will be released from the NASA Headquarters newsroom in Washington, D.C.

Media representatives planning to attend Dr. Allen's press availability should call Tom Arconti, HDOS, 203/797-5355.

- end -

For further information on KSC's shuttle status call Lisa Malone at 867-2468.

Posted: Wed, Sep 12, 1990 2:14 PM EDT Msg: AJJA-2906-2753
From: HQNEWSROOM
To: PAO.LOOP, P,
(C:USA, ADMD:TELEMAIL, PRMD:GSFC, O:GSFCMAIL, UN:PUBINFO)
Subj: STS-35/41 LAUNCH ADVISORY

Mark Hess/Ed Campion
Headquarters, Washington, D.C.
(Phone: 202/453-8536)

September 12, 1990

Lisa Malone
Kennedy Space Center, Fla.
(Phone: 407/867-2468)

LAUNCH ADVISORY FOR SHUTTLE MISSIONS STS-35 AND STS-41

NASA managers today set Tuesday, Sept. 18, 1990 as the launch date for Space Shuttle Columbia and the STS-35 Astro-1 mission. The decision on the new launch date follows the removal, replacement and testing of the liquid hydrogen recirculation pump package in Columbia's main propulsion system.

Launch of Columbia and the STS-35 mission was scrubbed on Sept. 5 when high concentrations of liquid hydrogen were detected in the aft compartment of the orbiter. Subsequent tests showed the leak came from the vicinity of the recirculation pump package.

During leak check operations following installation of the new recirculation pump package, technicians found a crushed seal on the prevalve of the main propulsion system. The seal is part of a detent cover. The prevalve is the main hydrogen valve which supplies hydrogen to Space Shuttle Main Engine #3. The detent holds the prevalve in place in the open position.

Helium leak checks indicated the seal was within specification, however, this particular detent cover had an order of magnitude greater leak than other detent covers. Alert technicians and

engineers decided to investigate further and discovered the damaged seal.

Engineers believe the location of the seal and the nature of the damage to the seal make it a prime suspect as the cause of the hydrogen concentrations seen in the aft of Columbia during tanking operations.

The seal in question was replaced following Columbia's last flight, STS-32 in January 1990, when an inspection for possible corundum contamination of the main propulsion system was conducted. Engineers believe the seal was damaged during the post-inspection installation and remained undiscovered until yesterday.

- more -

Countdown for the launch of Columbia is scheduled to begin on Saturday, Sept. 15 at 1:00 a.m. EDT at the T minus 43 hour mark. The 1 hour, 39 minute launch window on Sept. 18 opens at 1:28 a.m. EDT and closes at 3:07 a.m.

Space Shuttle Discovery and the STS-41 mission will be launched as early in the launch window (Oct. 5-23, 1990) as possible. Current scheduling indicates a likelihood of launching on Oct. 8 or 9, but a few days either side are possible, depending on actual test and preparation times needed. The actual launch date for Shuttle mission STS-41 will be set at the flight readiness review, currently scheduled for Sept. 24-25.

Discovery's freon cooling loop #1, which has given indications of a small leak since leaving the Orbiter Processing Facility, has undergone special testing. After review of the test data, Shuttle managers have determined that this condition can be safely flown in its present state. Launch preparations will include topping off the freon system of Discovery a few days before launch which will keep the freon level well above the amount needed to support Shuttle operations during the 4-day mission.

- end -

Posted: Wed, Sep 12, 1990 2:28 PM EDT Msg: DJJA-2906-2778
From: LREINERTSON
To: INT.LOOP
CC: EDITOR
Subj: DAILY NEWS IN BRIEF 9/12/90

This is DAILY NEWS IN BRIEF for 9/12/90. It is intended

Paula Cleggett-Haleim
Headquarters, Washington, D.C.
(Phone: 202/453-1547)

September 12, 1990

N90-73 EDITORS NOTE:

NASA RELEASES THREE HUBBLE SPACE TELESCOPE SCIENCE PHOTOGRAPHS

Photographs of the first science images taken by the European Space Agency's Faint Object Camera, onboard the Hubble Space Telescope, are available to media through NASA's audio visual branch.

One photograph shows four images of a very distant quasar which have been "multiple-imaged" by a relatively nearby galaxy acting as a gravitational lens. The quasar is approximately 8 billion light years away, whereas the galaxy, 400 million light years away, is 20 times closer. The light from the quasar is bent in its path by the gravitational field of the galaxy.

For the first time, the exploding outer envelope of SN 1987A has been photographed directly. A close look at the Supernova shows a curious luminescent ring surrounding the exploded star. This ring should help astronomers determine the nature and history of the progenitor of the Supernova.

The most detailed and highest resolution photograph ever taken of the young, compact star cluster R136 also is available. This star cluster is located in the center of the 30 Doradus nebula in the Large Magellanic Cloud, a neighboring galaxy at a distance of 170,000 light years.

The Hubble Space Telescope is a project of international cooperation between NASA and the European Space Agency.

Media representatives only may obtain these photos, free of charge, by writing to or phoning Broadcast & Audio Visual Branch, PMD/NASA Headquarters, Washington, D.C. 20546 (Phone: 202/453-8383).

Photo Numbers:
B & W: 90-H-616, 90-H-617, 90-H-618

- end -

Command?

NASA News

National Aeronautics and
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Headquarters, Washington, D.C.
(Phone: 202/453-8536)

Lisa Malone
Kennedy Space Center, Fla.
(Phone: 407/867-2468)

For Release:
September 12, 1990

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- more -

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- end -

NASA News

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Washington, D.C. 20546
AC 202-453-8400

Les Gaver
Headquarters, Washington, D.C.
(Phone: 202/453-8372)

For Release:
September 13, 1990

N90-72 EDITORS NOTE:

NASA STS-35/ASTRO-1 TELEVISION TRANSMISSIONS TO ALASKA AND HAWAII

NASA Select television coverage of the STS-35/ASTRO-1 Space Shuttle mission, currently scheduled for a Sept. 18 launch at 1:28 a.m. EDT, will be transmitted daily via the following satellite to accomodate the Alaska and Hawaii audiences:

SPACENET 1
Transponder 17
120 degrees West Longitude
4040.0 MHz (Video)
6.8 MHz (Audio)

Two-hour, edited versions summarizing each day's events will be transmitted via SPACENET 1 from Sept. 17 through 27 from 12:01 a.m. to 2 a.m. EDT.

Continental United States will continue to receive NASA Select television, 24 hours a day throughout the mission, via:

SATCOM F2R
Transponder 13
72 degrees West Longitude
3960 MHz (Video)
6.8 MHz (Audio)

- end -

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202-453-8400

For Release:

Paula Cleggett-Haleim
Headquarters, Washington, D.C.
(Phone: 202/453-1547)

September 13, 1990

HUBBLE SPACE TELESCOPE INVESTIGATION BOARD STATUS REPORT 4

Dr. Lew Allen, Chairman of the Hubble Space Telescope Optical Systems Board of Investigation, issued the attached statement at the conclusion of the board's fourth meeting, held September 12 and 13, 1990, at Hughes Danbury Optical Systems, Inc., Danbury, Conn.

- more -

STATEMENT OF DR. LEW ALLEN
CHAIRMAN
HUBBLE SPACE TELESCOPE OPTICAL SYSTEMS
BOARD OF INVESTIGATION
SEPTEMBER 13, 1990
4:00 P.M. EDT

I wish to report that the Board has nearly completed answering the 3 questions of its basic charter -- to ascertain: what happened to result in the Hubble Space Telescope Optical Telescope Assembly problem; how it occurred; and how it escaped notice until after launch. The Board has just concluded its fourth meeting, the third held at Hughes Danbury Optical Systems, Inc., Danbury, Connecticut, previously Perkin Elmer, where the HST mirrors were made.

In terms of the first issue -- what happened -- the Board is confident that most, if not all, of the on-orbit problem can be traced to a spacing error in the reflective null corrector, an optical reference device used in the manufacture of the primary mirror.

With respect to the second point in the Board's charter -- how the mistake occurred -- the Board is fairly confident that it has identified this as well. The process has been greatly facilitated by the fact that almost all of the hardware involved in the fabrication of the primary mirror has been available for examination and analysis by the Board. In addition, many of the individuals originally involved in the construction of the reflective null corrector have come to Danbury where, with Dr. Robert Parks, the Board's representative at HDOS, and current HDOS personnel, they have reconstructed for the Board the events in the assembly of the null corrector.

After its successful use in Perkin Elmer's initial demonstration program, the reflective null corrector required respacing before use with the HST primary mirror. The process of this respacing was done with the most precise means possible -- using metering bars (also called "metering rods") and interferometric measurements relative to optical foci, as opposed to other techniques such as those employing micrometers and mechanical measurements.

The metering bars were used by reflecting a focused beam of light off their ends. To ensure that the beam of light was reflected off the very center of the bar's end, a field stop, or end cap, was used with a "pin-hole" in its center to hold the light beam centered. It appears now that there was a reflective region around the pinhole and that the light beam was reflected off that surface rather than the end of the metering bar, introducing a difference of about 1.3mm.

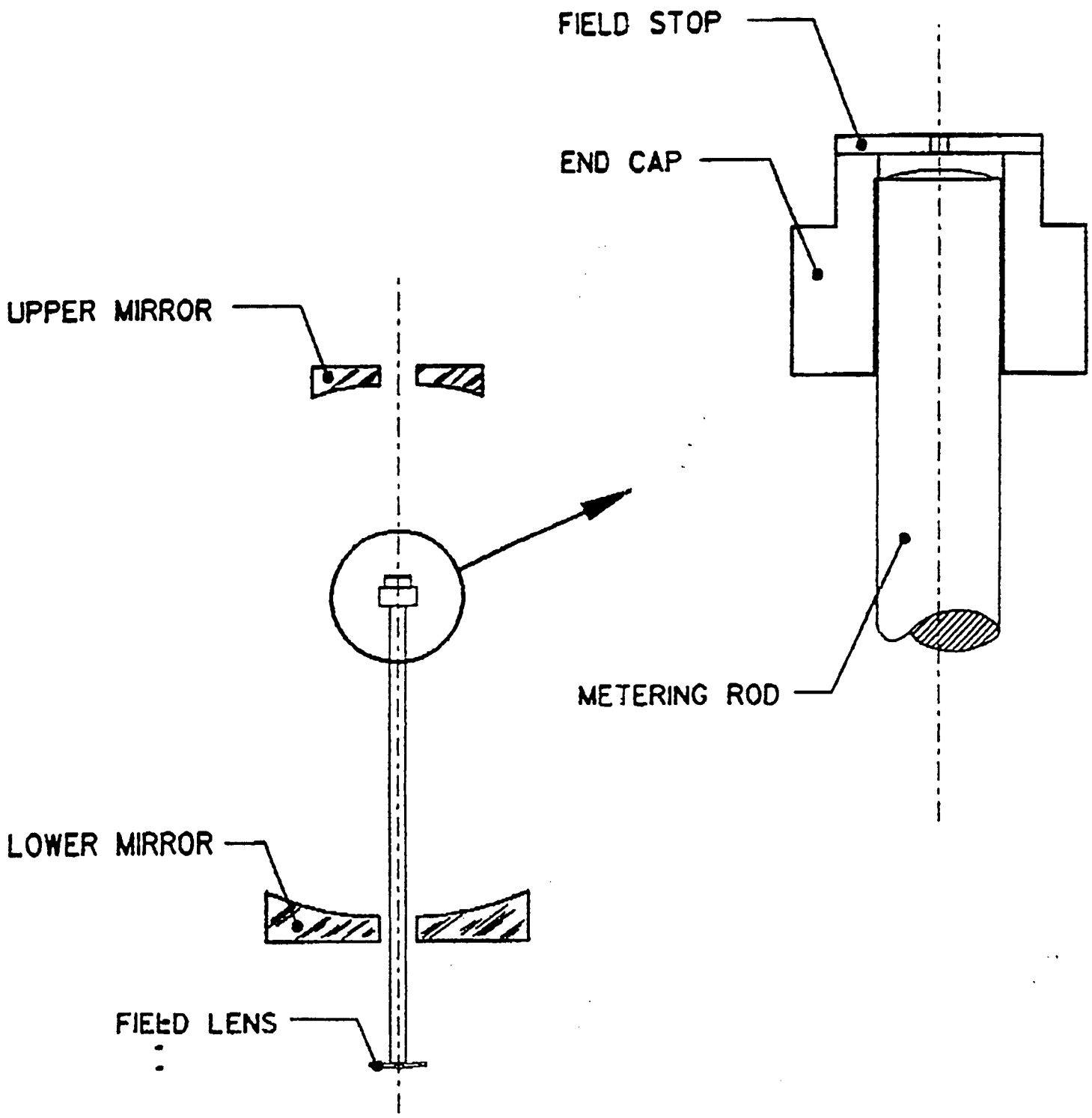
The likelihood of this type of problem causing the null corrector spacing error was increased by the fact that the two ends of the metering bars are slightly different and there is strong evidence that the bar was used in an inverted position.

Aspects of the above scenario have been reproduced with an interferometer and metering bar/end cap simulation, and the results indicate that the scenario as described is probable.

In terms of the Board's third charge -- to determine how the problem with the HST OTA could have gone undetected until after launch -- it must be noted that the assembly of the null corrector involved many precise and subtle steps. Although the process was carried out by highly skilled individuals, it is now apparent that a mistake occurred and was not detected.

As the Board concludes its report, it will address the question of various indications existing during the mirror manufacture process which could have revealed the problem but weren't recognized properly at the time. I expect that the final report now in preparation will be ready as anticipated by the beginning of November.

It appears that the Board has obtained the necessary data to reconstruct the events which led to the manufacturing error.



REFLECTIVE NULL CORRECTOR

90-122

SPACE SHUTTLE MISSION STS-41

PRESS KIT

OCTOBER 1990

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NASA
National Aeronautics and
Space Administration

Washington, D.C.

RELEASE: 90-122

ULYSSES DEPLOYMENT HIGHLIGHTS STS-41 MISSION

Space Shuttle mission STS-41 will be highlighted by deployment of the Ulysses spacecraft on a 5-year journey to become the first probe to explore the polar regions of the sun.

Current scheduling indicates a likelihood of launching on Oct. 8 or 9, but a few days either side are possible, depending on actual test and preparation time needed. The actual launch date will be set at the flight readiness review, scheduled for Sept. 24-25. Landing is planned at Edwards Air Force Base, Calif. The 4-day mission will be Discovery's 11th flight.

After being deployed from Discovery under the oversight of Mission Specialist Thomas D. Akers, a two-stage Inertial Upper Stage and a single-stage Payload Assist Module will boost Ulysses on a trajectory that will take it to Jupiter in 16 months. Upon arrival, in addition to making some scientific studies of the giant planet, the spacecraft will receive a gravity assist from Jupiter into a solar orbit almost perpendicular to the plane in which the planets orbit. Ulysses is scheduled to make its first observations of the sun's southern pole between June and October 1994 and continue on to observe the northern solar pole between June and September 1995.

Also in Discovery's payload bay will be the Airborne Electrical Support Equipment, an electrical generating system mounted on the side of the bay to supply power to Ulysses. The Intelsat Solar Array Coupon, samples of solar array materials mounted on Discovery's Remote Manipulator System, is designed to study the effects of atomic oxygen wear on solar panels in preparation for a future Shuttle mission to rescue the stranded Intelsat satellite. The Shuttle Solar Backscatter Ultraviolet (SSBUV) experiment also will be in Discovery's payload bay, mounted in two Get Away Special containers. SSBUV will help fine tune the atmospheric ozone measurements made by satellites already in orbit by providing a calibration of their backscatter ultraviolet instruments.

- more -

Discovery also will carry the Chromosome and Plant Cell Division in Space experiment, a study of plant root growth patterns in microgravity; the Investigations into Polymer Membrane Processing experiment, a study of materials processing in microgravity; the Physiological Systems Experiment, an investigation of how microgravity affects bone calcium, body mass and immune cell function; the Radiation Monitoring Experiment to record radiation levels in orbit; the Solid Surface Combustion Experiment, a study of flames in microgravity; and the Voice Command System, a development experiment in voice commanding the Shuttle's onboard television cameras.

Commanding Discovery will be Richard N. Richards, Capt., USN. Robert D. Cabana, Lt. Col., USMC, is pilot. Richards will be making his second space flight, after serving as pilot of STS-28. Cabana will be making his first flight.

Mission specialists are William M. Shepherd, Capt., USN; Bruce Melnick, Cmdr., USCG; and Thomas D. Akers, Major, USAF. Shepherd is making his second flight, after being aboard STS-27. STS-41 will be Melnick's and Aker's first space flight.

Built by Dornier GmbH of West Germany, Ulysses is a joint project of the European Space Agency (ESA) and NASA.

(End of general release. Background information follows.)

- more -

GENERAL INFORMATION

NASA Select Television Transmission

NASA Select television is available on Satcom F-2R, Transponder 13, located at 72 degrees west longitude; frequency 3960.0 MHz, audio 6.8 MHz.

The schedule for television transmission from the orbiter and for the change-of-shift briefings from Johnson Space Center, Houston, will be available during the mission at Kennedy Space Center, Fla.; Marshall Space Flight Center, Huntsville, Ala.; Johnson Space Center; and NASA Headquarters, Washington, D.C. The TV schedule will be updated daily to reflect changes dictated by mission operations.

Television schedules also may be obtained by calling COMSTOR, 713/483-5817. COMSTOR is a computer data base service requiring the use of a telephone modem. A voice update of the TV schedule may obtained by dialing 202/755-1788. This service is updated daily at noon EDT.

Status Reports

Status reports on countdown and mission progress, on-orbit activities and landing operations will be produced by the appropriate NASA news center.

Briefings

An STS-41 mission press briefing schedule will be issued prior to launch. During the mission, flight control personnel will be on 8-hour shifts. Change-of-shift briefings by the off-going flight director will occur at approximately 8-hour intervals.

STS-41 QUICK LOOK

Launch Date and Site:
Oct. 5, 1990
Kennedy Space Center, Fla., Pad 39-B

Launch Window: 7:35 a.m. - 9:53 a.m. EDT

Orbiter: Discovery (OV-103)

Orbit: 160 x 160 nautical miles, 28.45 degree inclination

Landing Date/Time: 9:42 a.m. EDT, Oct. 9, 1990

Primary Landing Site: Edwards Air Force Base, Calif.

Abort Landing Sites:
Return to Launch Site - Kennedy Space Center, Fla.
Transoceanic Abort Landing - Ben Guerir, Morocco
Abort Once Around - Edwards Air Force Base, Calif.

Crew:
Richard N. Richards, Commander
Robert D. Cabana, Pilot
Bruce E. Melnick, Mission Specialist 1
William M. Shepherd, Mission Specialist 2
Thomas D. Akers, Mission Specialist 3

Cargo Bay Payloads:
Ulysses/IUS/PAM-S
SSBUV
Intelsat Solar Array Coupon

Middeck Payloads:
Solid Surface Combustion Experiment (SSCE)
Investigations into Polymer Membrane Processing (IPMP)
Chromosome and Plant Cell Division in Space (CHROMEX-2)
Physiological Systems Experiment (PSE)
Voice Command System (VCS)
Radiation Monitoring Experiment-III (RME-III)

VEHICLE AND PAYLOAD WEIGHTS

	Pounds
Orbiter (Discovery) empty	151,265
Remote Manipulator System (payload bay)	1,180
Ulysses/IUS/PAM-S (payload bay)	44,024
Airborne Electrical Support Equipment, RTG cooling system (payload bay)	203
IUS Support Equipment (payload bay)	260
Shuttle Solar Backscatter Ultraviolet Instrument (SSBUV) (payload bay)	1,215
Chromosome and Plant Cell Division in Space (CHROMEX)	85
Investigations into Polymer Membrane Processing (IPMP)	33
Physiological Systems Experiment (PSE)	132
Radiation Monitoring Experiment-III (RME-III)	23
Solid Surface Combustion Experiment (SSCE)	140
Voice Command System (VCS)	45
Orbiter and Cargo at SRB Ignition	256,330
Total Vehicle at SRB Ignition	4,524,982
Orbiter Landing Weight	197,385

TRAJECTORY SEQUENCE OF EVENTS

EVENT	MET (d/h:m:s)	RELATIVE VELOCITY (fps)	MACH	ALTITUDE (ft)
Launch	00/00:00:00			
Begin Roll Maneuver	00/00:00:07	136	.1	400
End Roll Maneuver	00/00:00:19	417	.37	3,483
SSME Throttle Down to 65%	00/00:00:28	665	.6	7,900
Max. Dyn. Pressure (Max Q)	00/00:00:51	1,146	1.11	26,448
SSME Throttle Up to 104%	00/00:00:58	1,325	1.29	33,950
SRB Staging	00/00:02:05	4,144	3.76	156,585
Main Engine Cutoff (MECO)	00/00:08:30	24,455	22.3	361,210
Zero Thrust	00/00:08:38	24,509	22.28	363,225
ET Separation	00/00:08:50			
OMS 2 Burn	00/00:39:55	221 42 sec.		160 x 160 nm
Ulysses/IUS Deploy (orbit 5)	00/06:01:00			
OMS 3 Burn	00/06:16:00	31 16 sec.		160 x 177 nm
OMS 4 Burn	00/22:56:00	35		160 x 156 nm
Deorbit Burn (orbit 65)	04/01:08:00	278		
Landing (orbit 66)	04/02:07:00			

Apogee, Perigee at MECO:	157 x 35
Apogee, Perigee post-OMS 2:	160 x 160
Apogee, Perigee post deploy:	160 x 177

SPACE SHUTTLE ABORT MODES

Space Shuttle launch abort philosophy is to achieve a safe and intact recovery of the flight crew, orbiter and its payload.

Abort modes include:

- **Abort-To-Orbit (ATO)**

  Partial loss of main engine thrust late enough to permit reaching a minimal 105-nautical mile orbit with orbital maneuvering system engines.

- **Abort-Once-Around (AOA)**

  Earlier main engine shutdown with the capability to allow one orbit around before landing at Edwards Air Force Base, Calif.; White Sands Space Harbor (Northrup Strip), N. Mex.; or the Shuttle Landing Facility (SLF) at Kennedy Space Center, Fla..

- **Trans-Atlantic Abort Landing (TAL)**

  Loss of two main engines midway through powered flight would force a landing at Ben Guerir, Morocco; Moron, Spain; or Banjul, The Gambia.

- **Return-To-Launch-Site (RTLS)**

  Early shutdown of one or more engines and without enough energy to reach Ben Guerir, would result in a pitch around and thrust back toward KSC until within gliding distance of the Shuttle Landing Facility.

STS-41 contingency landing sites are Edwards AFB, White Sands, Kennedy Space Center, Ben Guerir, Moron and Banjul.

SUMMARY OF MAJOR ACTIVITIES

Day One
Ascent
Post-insertion checkout
Pre-deploy checkout
Ulysses/IUS deploy
CHROMEX-2
Detailed science objective (DSO)/detailed test objective (DTO)
Physiological systems experiment (PSE)
SSBUV outgassing

Day Two
Air Force Maui Optical Site (AMOS) calibration test
Ulysses/IUS backup deploy opportunity
CHROMEX-2
DSO/DTO
RMS powerup and checkout
SSBUV Earth views
Voice command system (VCS) test #1

Day Three
CHROMEX-2
DTO
SSBUV Earth views
VCS test #2

Day Four
CHROMEX-2
DSO/DTO
SSBUV Earth views
VCS test #3
Flight control system (FCS) checkout
Reaction control system (RCS) hotfire
Cabin stow

Day Five
CHROMEX-2 status
DSO/DTO
PSE status
SSBUV Earth views
SSBUV deactivation
Deorbit preparation
Deorbit burn
Landing at EAFB

ULYSSES MISSION

Ulysses is a joint mission conducted by the European Space Agency (ESA) and NASA to study the polar regions of the sun and the interplanetary space above the poles. The spacecraft will be the first to achieve a flight path nearly perpendicular to the ecliptic, the plane in which Earth and the other planets orbit the sun.

Throughout its 5-year mission, Ulysses will study three general areas of solar physics: the sun itself, magnetic fields and streams of particles generated by the sun and interplanetary space above the sun.

The Ulysses spacecraft, a ground control computer system and a spacecraft operations team are provided by ESA, while Space Shuttle launch, tracking and data collection during the mission are being performed by NASA and the Jet Propulsion Laboratory (JPL). Scientific instruments aboard the craft have been provided by scientific teams in both Europe and the United States.

ULYSSES MISSION SUMMARY

After astronauts release Ulysses from Discovery's payload bay at an altitude of 160 nautical miles, a two-stage engine, the Inertial Upper Stage (IUS), attached to Ulysses will ignite, sending the craft on its initial trajectory.

After the IUS separates, a smaller booster engine, the Payload Assist Module (PAM-S), will fire. Before the PAM-S fires, it will spin Ulysses up to a rate of 70 revolutions per minute (rpm). After the engine burn concludes, the spin rate will slow to about 7 rpm. Boom deployment will further slow the spin rate to about 5 rpm. Ulysses will continue to spin at this rate throughout the remainder of the mission.

The booster engines will send Ulysses first to Jupiter, which the craft will encounter in February 1992. As Ulysses flies past Jupiter at about 30 degrees north Jovian latitude, the gravity of the giant planet will alter the craft's trajectory so Ulysses dives downward and away from the ecliptic plane.

In its orbit around the sun, Ulysses flight path will take it from a maximum distance from the sun of 5.4 astronomical units (AU), or about 500 million miles, to a closest approach of 1.3 AU, or about 120 million miles.

The spacecraft will reach 70 degrees south solar latitude in June 1994, beginning its transit of the sun's south polar regions. The craft will spend about 4 months south of that latitude at a distance of about 200 million miles from the sun.

In February 1995, Ulysses will cross the sun's equator, followed by its 4-month pass of the sun's northern polar region beginning in June 1995. End of mission is scheduled for Sept. 30, 1995.

THE ULYSSES SPACECRAFT

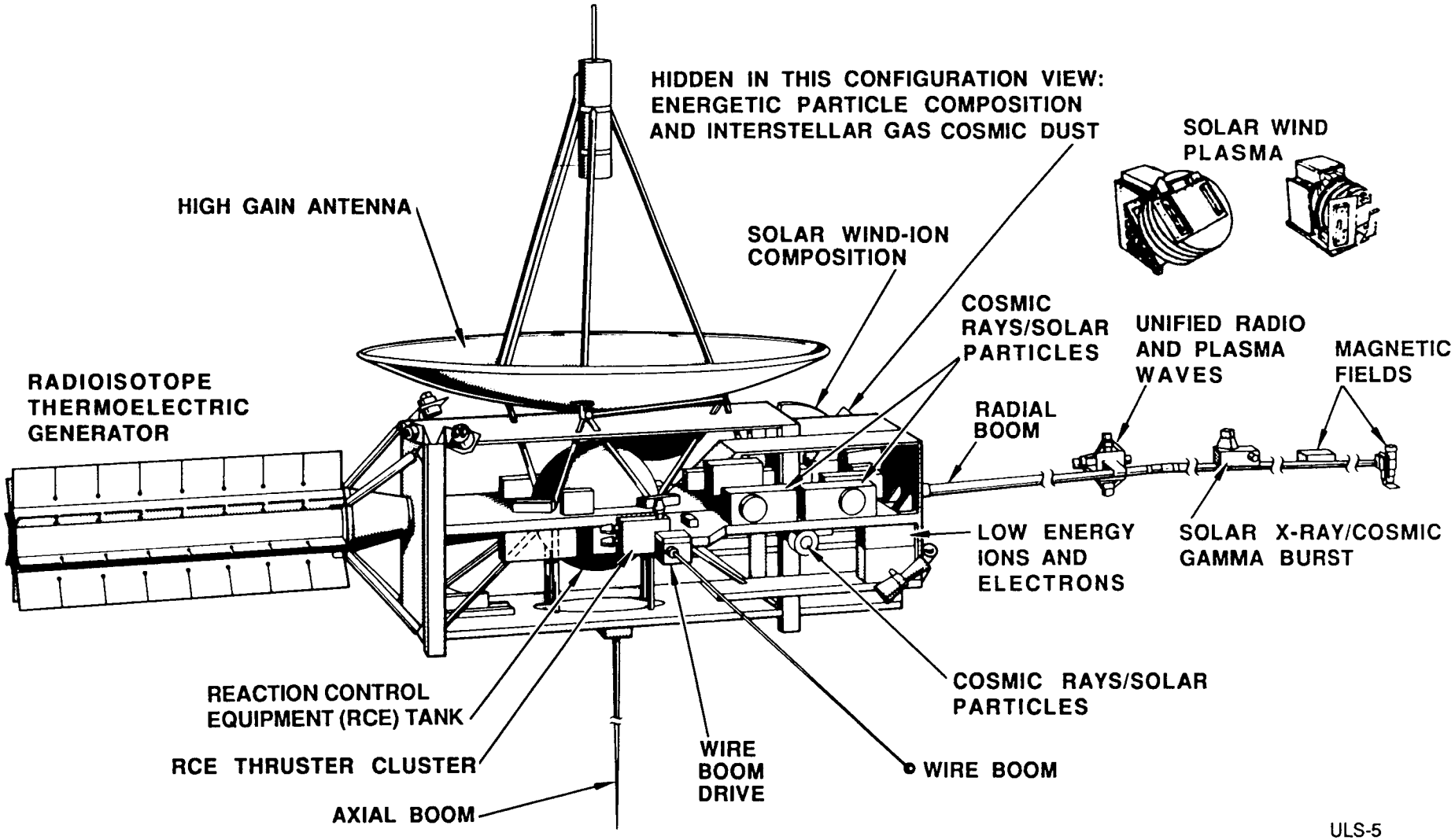
Ulysses' systems and scientific instruments are contained within a main spacecraft bus measuring 10.5 by 10.8 by 6.9 feet. Communication with Earth is maintained via a 5.4-foot-diameter, parabolic high-gain antenna.

After release from Discovery's cargo bay, the 807-pound spacecraft will deploy an 18.2-foot radial boom carrying several experiment sensors, as well as a 238-foot dipole wire boom and a 26.2-foot axial boom, which serve as antennas for a radio wave-plasma wave experiment.

The Ulysses spacecraft's main computer is its onboard data handling system, responsible for processing commands received from the ground as well as managing and passing on all data from each of Ulysses' science instruments. This system includes: a decoder unit, which processes incoming signals from the spacecraft radio and passes on commands to other systems; a central terminal unit, which distributes commands, monitors and collects data on spacecraft systems, and stores and passes on data from Ulysses' science instruments; remote units, which handle input-output to and from spacecraft systems; and the data storage unit, two tape recorders. Each of the tape recorders can store 45.8 million bits of data -- representing 16 to 64 hours of data-taking, depending on how often data are sampled.

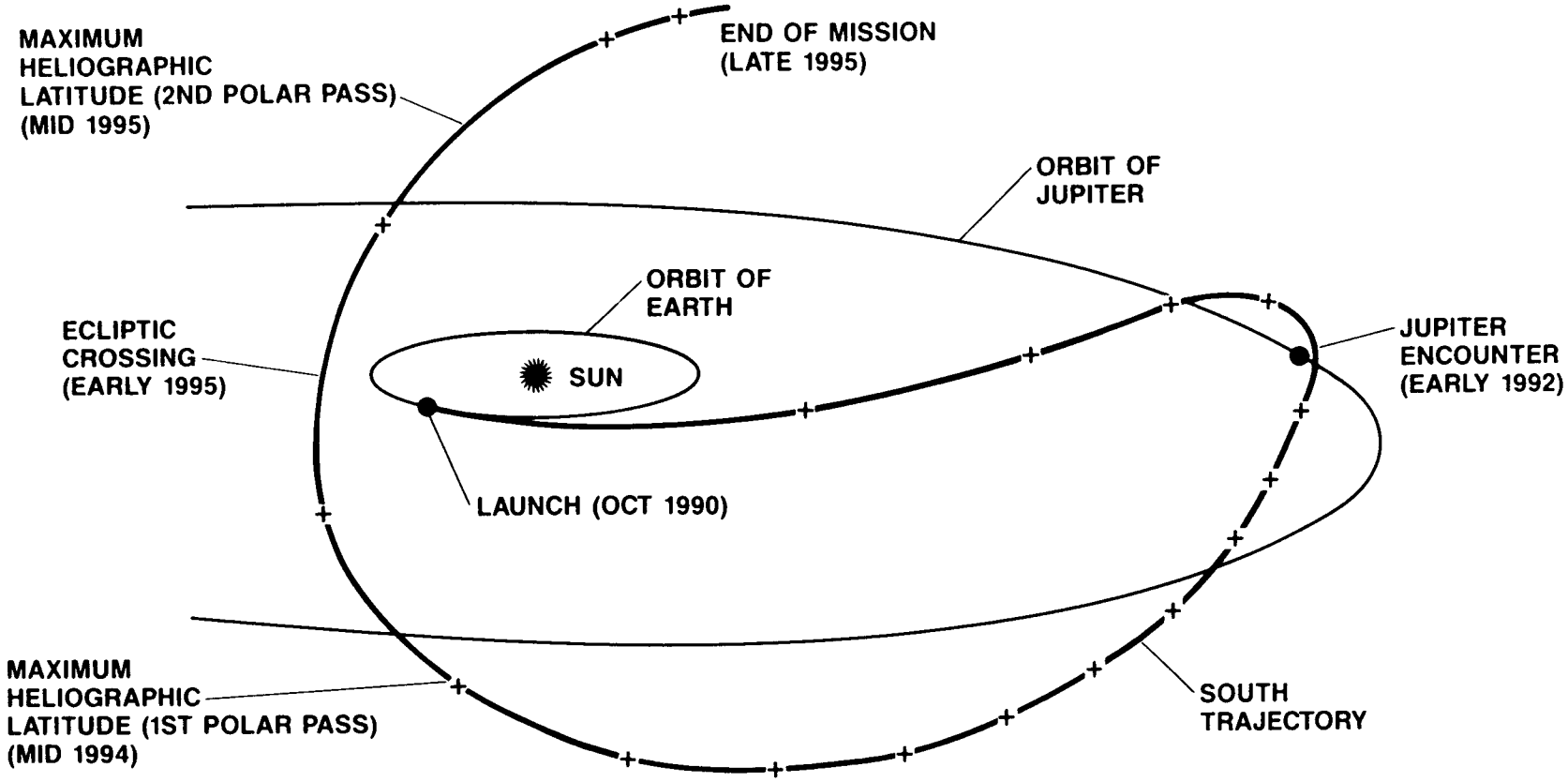
Another system, attitude and orbit control, is responsible for determining the Ulysses craft's attitude in space, as well as firing thrusters to control the attitude and spin rate. This system includes a redundant computer, sun sensors and the reaction control system, including eight thrusters and the hydrazine fuel system. Ulysses' load of 73 pounds of monopropellant hydrazine fuel is stored in a single diaphragm tank mounted on the spacecraft's spin axis.

The spacecraft's telecommunications system includes two S-band receivers, two 5-watt S-band transmitters, two 20-watt X-band transmitters, the high-gain antenna and two smaller low-gain antennas. The high-gain antenna is used to transmit in either S band or X band as well as to receive in S band. The low-gain antennas are used both to transmit and receive in the S band. The spacecraft receives commands from Earth on a frequency of 2111.607 MHz in the S band. The craft can transmit to Earth on 2293.148 MHz in the S band or on 8408.209 MHz in the X band.



200-189

ULS-5
6-1-90


MAXIMUM
HELIOGRAPHIC
LATITUDE (2ND POLAR PASS)
(MID 1995)
END OF MISSION
(LATE 1995)
ORBIT OF
JUPITER
ORBIT OF
EARTH
ECLIPTIC
CROSSING
(EARLY 1995)
SUN
JUPITER
ENCOUNTER
(EARLY 1992)
LAUNCH (OCT 1990)
MAXIMUM
HELIOGRAPHIC
LATITUDE (1ST POLAR PASS)
(MID 1994)
SOUTH
TRAJECTORY

Ulysses' power source is a radioisotope thermo-electric generator (RTG), similar to RTGs flown on previous solar system exploration missions. RTGs are required for these deep-space missions because solar arrays large enough to generate sufficient power so far from the sun would be too large and too heavy to be launched by available means. In the RTG, heat produced by the natural decay of plutonium-238 is converted into electricity by thermocouples.

SCIENTIFIC EXPERIMENTS

Ulysses' scientific payload is composed of nine instruments. In addition, the spacecraft radio will be used to conduct a pair of experiments over and above its function of communicating with Earth, bringing the total number of experiments to 11. Finally, two other investigation teams will conduct interdisciplinary studies.

The experiments are:

-- **Magnetic fields.** This investigation will measure the strength and direction of the sun's polar magnetic fields, which are poorly known because they are difficult to observe from Earth. These measurements will help identify specific regions of the corona, the outer portion of the sun's atmosphere, from which the solar wind originates. They also will be important in understanding the propagation of energetic particles of both solar and galactic origin, which are guided by the magnetic field. Principal investigator of the experiment is Dr. Andre Balogh of Imperial College, London.

-- **Solar-wind plasma.** The solar wind is a fully ionized gas, or "plasma," consisting of electrons and the positively charged atoms (ions) from which the electrons have been removed. This experiment will measure the basic properties of these ions and electrons such as speed, density and temperature. The outflowing solar wind is expected to be different, and possibly simpler, in the sun's polar regions than near the equator. If this is true, it should be easier to relate the observed solar-wind particles to conditions in the region of the sun where they originated. Dr. Samuel J. Bame of Los Alamos National Laboratory is principal investigator.

-- **Solar-wind ion-composition spectrometer (SWICS).** This investigation will detect heavy ions (elements up to and including iron) which exist in the corona and which constitute a minor but important constituent of the solar wind. By measuring the composition, temperature and degree of ionization of this component, it should be possible to infer the temperature of the corona in the source region. This investigation will also detect solar-wind ions that have been accelerated or energized in interplanetary space, possibly including the sun's polar regions. Dr.

George Gloeckler of the University of Maryland and Dr. Johannes Geiss of Universitt Bern, Switzerland, are co-principal investigators.

-- **Heliospheric instrument for spectra, composition and anisotropy at low energies.** This energetic particle detector will measure the composition and properties of low-energy solar-wind ions that have been accelerated to higher energies than those observed by the SWICS. Such particles can be energized at the sun as part of the process that produces solar flares or in interplanetary space. The investigation will determine whether such particles exist in the sun's polar regions. If so, the measurements can be used to further study their origin, storage in the corona and subsequent propagation into space. Dr. Louis J. Lanzerotti of Bell Laboratories, New Jersey, is principal investigator.

-- **Energetic-particle composition and neutral gas.** An array of charged-particle telescopes on Ulysses will detect medium-energy charged particles and determine their composition, relative abundances, energies and direction of travel. Charged particles in this energy range mark a transition between solar particles and cosmic-ray particles which are accelerated elsewhere in the galaxy and travel vast distances to reach the solar system. A separate instrument will detect neutral helium atoms entering the solar system from interstellar space and will determine their speed, direction of arrival, temperature and density. Dr. Erhardt Keppler of the Max-Planck-Institut fuer Aeronomie in Lindau, Germany, is principal investigator.

-- **Cosmic and solar particle investigation.** This experiment covers even higher-energy cosmic rays as well as detecting energetic solar and interplanetary particles. Cosmic rays, which have been studied for many years near the solar equator, are likely to have preferred access to the equatorial zone of the solar system by way of the sun's polar regions. This experiment may measure the properties of the cosmic rays before they are strongly modified by their interaction with the solar-interplanetary magnetic field. At present, the properties of cosmic rays at these energies are not known as they exist in interstellar space. Dr. John A. Simpson of the University of Chicago is principal investigator.

-- **Solar X-rays and cosmic gamma rays.** This experiment will detect X-rays which are emitted sporadically from the vicinity of solar active regions. Although these X-rays have been observed for many years by spacecraft above the Earth's atmosphere, the altitude in the solar atmosphere at which the radiation is emitted and its directivity, which would help identify the source mechanism, are unknown. As Ulysses travels pole-ward, the sun will cut off or "occult" radiation at low altitudes and affect how the intensity varies with direction to the source. Cosmic gamma-ray bursts were detected about 20 years ago but their origin has remained obscure. By accurately timing their arrival at Ulysses and at Earth, their source location can be pinpointed precisely to see what astrophysical objects or bodies give rise to them. Dr. Kevin

Hurley of the University of California, Berkeley, and Dr. Michael Sommer of the Max-Planck-Institut fuer Extraterrestrische Physik in Garching, Germany, are co-principal investigators.

-- **Unified radio and plasma-wave experiment.** Two sets of long, deployable antennas are used to measure high-frequency radio waves emitted from solar active regions as well as lower-frequency "plasma" waves generated in the solar wind near the spacecraft. The radio-wave observations will be used to diagnose the space medium between the sun's polar regions and Ulysses. Observations of the locally generated waves will provide information about the internal workings of the polar wind, particularly the instabilities that transfer energy between the waves and their constituent particles. Dr. Robert G. Stone of the NASA Goddard Space Flight Center, Greenbelt, Md., is principal investigator.

-- **Cosmic dust.** From the speed and direction of the small particles detected by this experiment, their interplanetary trajectories can be deduced. Mass and charge of the dust particles also will be measured so that competing effects on their motion of solar radiation, gravitation and solar-wind particles can be studied. The distribution of dust and its changing properties from the solar equator to the sun's poles will help distinguish the contributions of three major sources: comets, asteroids and interstellar dust. Dr. Eberhard Gruen of the Max-Planck-Institut fuer Kernphysik in Heidelberg, Germany, is principal investigator.

-- **Coronal sounding.** This experiment uses signals transmitted simultaneously by Ulysses' radio at two frequencies to infer properties of the sun's corona along the path from the spacecraft to the radio receivers on Earth. From subtle shifts in phase of these two signals, the density and directed velocity of coronal electrons can be inferred at the location where the radio waves pass closest to the sun. Of particular scientific interest are these properties of the corona in the sun's polar regions as Ulysses ascends in latitude. Dr. Hans Volland of Universitaet Bonn, Germany, is principal investigator.

-- **Gravitational waves.** This investigation also makes use of the spacecraft radio transmitter for scientific purposes. According to Einstein's theory of relativity, the motion of large masses in the universe -- such as those associated with the formation of black holes -- should cause the radiation of gravitational waves. Although such waves have yet to be detected, they could be observed through their effect on the spacecraft, which is expected to undergo a slight perturbation that might be detectable as a shift in frequency of Ulysses' radio signal. Dr. Bruno Bertotti of Universita di Pavia, Italy, is principal investigator.

In addition to the 11 experiment teams, two investigation teams will study interdisciplinary topics:

-- **Directional discontinuities.** The solar-wind plasma is not homogenous but consists of adjacent regions in which the plasma and magnetic field are different. These regions are separated by thin surfaces, called discontinuities, across which the properties change abruptly. Ulysses measurements will be compared with theoretical models developed by a team led by Dr. Joseph Lemaire of the Institut d'Aeronomie Spatiale de Belgique, Belgium.

-- **Mass loss and ion composition.** This team will combine measurements of the solar wind and magnetic field to study the mass and angular momentum lost by the sun in the equatorial and polar regions. A second problem which will be studied is the dependence of the solar wind composition on solar latitude. This team is led by Dr. Giancarlo Noci of the Istituto di Astronomia, Italy.

TRACKING AND DATA ACQUISITION

Throughout the Ulysses mission, tracking and data acquisition will be performed through NASA's Deep Space Network (DSN).

The DSN includes antenna complexes at Goldstone, in California's Mojave Desert; near Madrid, Spain; and at Tidbinbilla, near Canberra, Australia. The complexes are spaced approximately 120 degrees apart in longitude around the globe so that, as the Earth turns, a given spacecraft will nearly always be in view of one of the DSN complexes.

Each complex is equipped with a 230-foot-diameter antenna; two 112-foot antennas; and an 85-foot antenna. Each antenna transmits and receives. The receiving systems include low-noise amplifiers. Transmitters on the 230-foot antennas are rated at 100 kilowatts of power, while the 112- and 85-foot antennas have 20-kilowatt transmitters. Each antenna station also is equipped with data handling and interstation communication equipment.

During most of the mission, the DSN will be in contact with Ulysses 8 hours per day. The spacecraft will record all its science and engineering data during the 16 hours it is out of touch with Earth; during the 8 hours of DSN contact, the spacecraft will transmit stored data from the craft's tape recorder.

Mission plans call for a 112-foot antenna to be used both to transmit to and receive from Ulysses. To conserve antenna coverage during periods of high demand on the DSN, ground teams can switch to the 230-foot

antennas for communication with Ulysses; the larger antennas permit a higher data rate, so 4 hours of antenna coverage each 48 hours is sufficient.

Data streams received from Ulysses at the DSN station are processed and transmitted to the Mission Control and Computing Center at JPL in Pasadena, Calif. Data are transmitted to Pasadena from the various DSN stations by a combination of land lines, ground microwave links and Earth-orbiting communication satellites.

ULYSSES MANAGEMENT

The Ulysses spacecraft was built for ESA by Dornier GmbH (Inc.) of Germany. Subcontractors included firms in Austria, Belgium, Denmark, France, Italy, The Netherlands, Spain, Sweden, Switzerland, the United Kingdom and the United States. In addition to providing the spacecraft, ESA is responsible for spacecraft operations.

Launch on Space Shuttle Discovery is provided by NASA. In addition, NASA is responsible for the IUS and PAM-S upper-stage engines, built for the U.S. Air Force by Boeing Aerospace & Electronics Co. (IUS) and McDonnell Douglas Space Systems Co. (PAM-S). NASA also provides the radioisotope thermo-electric generator (RTG), built for the U.S. Department of Energy by the General Electric Co.

Tracking through the Deep Space Network and ground operations facilities in Pasadena, Calif., are managed for NASA by JPL. The U.S. portion of the Ulysses mission is managed by JPL for NASA's Office of Space Science and Applications.

CHROMEX-2

The Chromosome and Plant Cell Division (CHROMEX-2) experiment is designed to study some of the most important phenomena associated with plant growth. The CHROMEX-2 experiment aims to determine how the genetic material in the root cells responsible for root growth in flowering plants responds to microgravity.

All plants, in the presence of light, have the unique ability to convert carbon dioxide and water into food and oxygen. Any long expedition or isolated settlement beyond Earth orbit will almost certainly necessitate the use of plants to manufacture food for crew members. In addition, information from space based life sciences research promotes fundamental understanding of the mechanisms responsible for plant growth and development. An improved understanding of plant responses to spaceflight is required for the long-term goal of a controlled ecological life support system for space use.

One of the practical benefits of studying and designing plant growth systems (and eventually agricultural systems) for use in space is the contribution this work may make to developing new intensive farming practices for extreme environments on Earth. Over the last few decades, basic research in the plant sciences has enabled the great increase in crop productivity (the "green revolution") that has transformed modern agriculture. Plant research in space may help provide the necessary fundamental knowledge for the next generation of agricultural biotechnology.

Dr. Abraham D. Krikorian of the State University of New York at Stony Brook is the principal investigator. This experiment has been developed at the Kennedy Space Center and uses the Plant Growth Unit developed by the NASA Ames Research Center.

RESULTS FROM THE FIRST FLIGHT OF CHROMEX

The first flight of CHROMEX in March 1989 showed that spaceflight seems to have a distinct, measurable and negative effect on the structural integrity of chromosomes in root tip cells. The plantlets grew well, but at the cellular level, in the chromosomes in rapidly dividing root tip cells, damage was clearly visible through light microscopy. Damage or aberrations were seen in 3-30% of dividing cell chromosomes. Ground controls were damage-free. The exact cause for the chromosomal aberrations seen on CHROMEX-1 is not known, but data from the radiation measuring devices flown with the plantlets suggest that radiation alone was insufficient to cause the observed damage. The principal investigator has suggested that an interaction of microgravity and radiation may be responsible. This hypothesis cannot be fully tested until an artificial gravity centrifuge is developed to enable additional space biology experiments.

Roots grown in space also were seen to have a higher percentage of cells undergoing division than ground controls. As expected, roots grew in all directions in space, while roots grew normally and downward on the ground controls. More root tissue grew on the space flown plants, but this was probably due to the increased moisture held in the foam used as artificial soil in the Plant Growth Unit. The plants were grown as planned without microbial contamination throughout the flight and ground control experiments.

SOLID SURFACE COMBUSTION EXPERIMENT

The Solid Surface Combustion Experiment (SSCE) will study the basic behavior of fire by examining the spreading of flame over solid fuels without the influence of gravity. This research may lead to improvements in fire prevention or control both on Earth and in spacecraft.

On Earth, spreading flames are strongly affected by gravity. Hot gases, which are less dense than cold gases, ascend from flames in the same way that oil floats on water. This phenomena -- "buoyant convection" -- removes hot gases from the flame and draws in fresh air to take their place. The resulting air motion tends to cool the flame. However, it also provides fresh oxygen, which makes the flame hotter. The heating and cooling effects compete, with the outcome depending upon the speed of the airflow (A campfire, for example, is strengthened by blowing, while a match can be blown out). Scientists quantify the airflow effects on Earth by augmenting buoyant convection with controlled amounts of forced convection. On Earth, gravity prevents observation of airflows slower than buoyant convection speeds, limiting the ability to develop complete models of solid surface combustion.

SSCE will provide observations of flames spreading without buoyant convection. Air motion is eliminated except to the extent that the flame spreads into fresh air and away from the hot gases. Convective cooling and the heating effect of fresh oxygen are simultaneously minimized. The competition between heating and cooling effects will be quantified by performing tests in artificial atmospheres that have different fractional amounts of oxygen (the air we breathe is 21% oxygen).

The SSCE hardware consists of a chamber to house the burning sample, two cameras to record the experiment on film and a computer to control experiment operations. Fuel and air temperatures are recorded during the experiment for comparison with theory. The SSCE test plan calls for eight Shuttle flights over the next 3 years. Five flights will use samples made of a special ashless filter paper and three will use samples of polymethylmethacrylate (PMMA), commonly known as plexiglass. Each test will be conducted in an artificial atmosphere containing oxygen at levels ranging from 35% to 50%.

The SSCE was conceived by the principle investigator, Dr. Robert A. Altenkirch, Dean of Engineering at Mississippi State University; the flight hardware was developed by the NASA Lewis Research Center, Cleveland.

SHUTTLE SOLAR BACKSCATTER ULTRAVIOLET (SSBUV) INSTRUMENT

The Shuttle Solar Backscatter Ultraviolet (SSBUV) instrument was developed by NASA to compare the observations of several ozone measuring instruments aboard the National Oceanic and Atmospheric Administration's TIROS satellites (NOAA-9 and NOAA-11) and NASA's NIMBUS-7 satellite. The SSBUV data is used to calibrate these instruments to insure the most accurate readings possible for the detection of ozone trends.

The SSBUV will help scientists solve the problem of data reliability caused by the calibration drift of the Solar Backscatter Ultraviolet (SBUV) instruments on these satellites. The SSBUV uses the Space Shuttle's

orbital flight path to assess instrument performance by directly comparing data from identical instruments aboard the TIROS spacecraft and NIMBUS-7 as the Shuttle and satellite pass over the same Earth location within an hour. These orbital coincidences can occur 17 times a day.

The satellite-based SBUV instruments estimate the amount and height distribution of ozone in the upper atmosphere by measuring the incident solar ultraviolet radiation and ultraviolet radiation backscattered from the Earth's atmosphere. The SBUV measures these parameters in 12 discrete wavelength channels in the ultraviolet. Because ozone absorbs in the ultraviolet, an ozone measurement can be derived from the ratio of backscattered radiation at different wavelengths, providing an index of the vertical distribution of ozone in the atmosphere.

The SSBUV has been flown once, on STS-34 in October 1989. Its mission successfully completed, the SSBUV was refurbished, recalibrated and reprocessed for flight. NASA plans to fly the SSBUV approximately once a year for the duration of the ozone monitoring program, which is expected to last until the year 2000. As the project continues, the older satellites with which SSBUV works are expected to be replaced to insure continuity of calibration and results.

The SSBUV instrument and its dedicated electronics, power, data and command systems are mounted in the Shuttle's payload bay in two Get Away Special canisters that together weigh 1,200 pounds. The instrument canister holds the SSBUV, its aspect sensors and in-flight calibration system. A motorized door assembly opens the canister to allow the SSBUV to view the sun and Earth and closes during in-flight calibration. The support canister contains the power system, data storage and command decoders. The dedicated power system can operate the SSBUV for approximately 40 hours.

The SSBUV is managed by NASA's Goddard Space Flight Center, Greenbelt, Md., for the Office of Space Science and Applications. Ernest Hilsenrath is the principal investigator. Donald Williams is the experiment manager.

INTELSAT SOLAR ARRAY COUPON

The Intelsat Solar Array Coupon (ISAC) experiment on STS-41 is being flown by NASA for the International Telecommunications Satellite Organization (INTELSAT). The experiment will measure the effects of atomic oxygen in low Earth orbit on the Intelsat satellite's solar arrays, to judge if the stranded satellite's arrays will be seriously damaged by those effects.

Intelsat, launched aboard a commercial expendable launch vehicle earlier this year, is stranded in a low orbit and is, at the request of the

company, being evaluated for a possible Space Shuttle rescue mission in 1992.

ISAC consists of two solar array material samples mounted on Discovery's remote manipulator system (RMS) arm. The arm will be extended to hold the samples perpendicular to the Shuttle payload bay, facing the direction of travel, for at least 23 consecutive hours.

PHYSIOLOGICAL SYSTEMS EXPERIMENT

The Physiological Systems Experiment (PSE) is a middeck payload sponsored by the Pennsylvania State University's Center for Cell Research, a NASA Office of Commercial Programs Center for the Commercial Development of Space. The corporate affiliate leading the PSE investigation is Genentech, Inc., South San Francisco, Calif., with NASA's Ames Research Center, Mountain View, Calif., providing payload and mission integration support.

The goal of the PSE is to investigate whether biological changes caused by near weightlessness mimic Earth-based medical conditions closely enough to facilitate pharmacological evaluation of potential new therapies.

Research previously conducted by investigators at NASA, Penn State and other institutions has revealed that in the process of adapting to near weightlessness, or microgravity, animals and humans experience a variety of physiological changes including loss of bone and lean body tissue, some decreased immune cell function, change in hormone secretion and cardiac deconditioning, among others. These changes occur in space-bound animals and people soon after leaving Earth's gravitational field. Therefore, exposure to conditions of microgravity during the course of space flight might serve as a useful and expedient means of testing potential therapies for bone and muscle wasting, organ tissue regeneration and immune system disorders.

Genentech is a biotechnology company engaged in the research, development, manufacture and marketing of recombinant DNA-based pharmaceuticals. The company replicates natural proteins and evaluates their pharmacological potential to treat a range of medical disorders.

In this experiment, eight healthy rats will receive one of the natural proteins Genentech has developed. An identical group will accompany them during the flight, but will not receive the protein, thereby providing a standard of comparison for the treated group. Both groups will be housed in self-contained animal enclosure modules which provide sophisticated environmental controls and plenty of food and water throughout the flights duration. The experiment's design and intent has received the review and approval of the Animal Care and Use Committees from both NASA and

Genentech. Laboratory animal veterinarians will oversee selection, care and handling of the animals.

Following the flight, the rat tissues will be thoroughly evaluated by teams of scientists from Genentech and the Center for Cell Research in a series of studies which will require several months.

Dr. Wesley Hymer is Director of the Center for Cell Research at Penn State and co-investigator for PSE. Dr. Michael Cronin, Genentech, is principal investigator.

INVESTIGATIONS INTO POLYMER MEMBRANE PROCESSING

The Investigations into Polymer Membrane Processing (IPMP), a middeck payload, will make its second Space Shuttle flight for the Office of Commercial Programs-sponsored Battelle Advanced Materials Center for the Commercial Development of Space (CCDS) in Columbus, Ohio.

The objective of the IPMP research program is to gain a fundamental understanding of the role of convection driven currents in the transport processes which occur during the evaporation casting of polymer membranes and, in particular, to investigate how these transport processes influence membrane morphology.

Polymer membranes have been used in the separations industry for many years for such applications as desalination of water, atmospheric purification, purification of medicines and dialysis of kidneys and blood.

The IPMP payload uses the evaporation casting method to produce polymer membranes. In this process, a polymer membrane is prepared by forming a mixed solution of polymer and solvent into a thin layer; the solution is then evaporated to dryness. The polymer membrane is left with a certain degree of porosity and then can be used for the applications listed above.

The IPMP investigations on STS-41 will seek to determine the importance of the evaporation step in the formation of thin-film membranes by controlling the convective flows. Convective flows are a natural result of the effects of gravity on liquids or gasses that are non-uniform in specific density. The microgravity of space will permit research to study polymer membrane casting in a convection-free environment.

The IPMP program will increase the existing knowledge base regarding the effects of convection in the evaporation process. In turn, industry will use this understanding to improve commercial processing techniques on Earth with the ultimate goal of optimizing membrane properties.

The IPMP payload on STS-41 consists of two experimental units that occupy a single small storage tray (one-half of a middeck locker) which weighs less than 20 pounds.

Early in Flight Day 1, a crew member will turn the valve to the first stop to activate the evaporation process. Turning the valve opens the pathway between the large and sample cylinders causing the solvents in the sample to evaporate into the evacuated larger cylinders. Both flight units are activated at the same time.

The STS-41 experiment will investigate the effects of evaporation time on the resulting membranes by deactivating the two units at different times. The evaporation process will be terminated in the first unit after a period of 5 minutes, by turning the valve to its final position. This causes the process to terminate by flushing the sample with water vapor, and thus setting the membrane structure. After the process is terminated, the resulting membrane then will not be affected by gravitational forces experienced during reentry, landing and post-flight operations. The second unit will be deactivated after a period of 7 hours.

In IPMP's initial flight on STS-31, mixed solvent systems were evaporated in the absence of convection to control the porosity of the polymer membrane. Ground-based control experiments also were performed. Results from STS-31 strongly correlated with previous KC-135 aircraft testing and with a similar experiment flown on the Consort 3 sounding rocket flight in May 1990. The morphology of polymer membranes processed in reduced gravity showed noticeable differences from that of membranes processed on Earth.

However, following post-flight analysis of the STS-31 experiment, it was decided to incorporate a minor modification to the hardware to significantly improve confidence in the analysis by providing additional insight into the problem. In addition, the modification would further remove remaining variables in the experiment.

The two most significant variables remaining in the experiment as originally configured are the time factor and the gravitational forces affecting the samples prior to retrieval of the payload. With the addition of a 75-cc cylinder containing a small quantity of distilled water pressurized with compressed air to greater than 14 psig, Space Shuttle crew members will be able to abruptly terminate (or "quench") the vacuum evaporation process by flushing the sample with water vapor. After the process is terminated, the resulting membrane will not be further affected by gravity variations. The planned modifications will not alter the experimental objectives and, in fact, will further contribute to a better understanding of the transport mechanisms involved in the evaporation casting process.

Subsequent flights of the IPMP payload will use different polymers, solvents and polymer-to-solvent ratios. However, because of the

modification to the hardware, the polymer/solvent combination used on this flight will be the same as that used on the first slight. The polymer, polysulfone, is swollen with a mixture of dimethylacetamide and acetone in the IPMP units. Combinations of polymers and solvents for later experiments will be selected and/or adjusted based on the results of these first flights.

Principal investigators for the IPMP is Dr. Vince McGinness of Battelle. Lisa A. McCauley, Associate Director of the Battelle CCDS, is Program Manager.

VOICE COMMAND SYSTEM

The Voice Command System (VCS) is a flight experiment using technology developed at the Johnson Space Center, Houston, to control the onboard Space Shuttle television cameras using verbal commands.

On STS-41, the VCS will be used by mission specialists William Shepherd and Bruce Melnick. The system allows the astronauts to control the cameras hands-free using simple verbal commands, such as "stop, up, down, zoom in, zoom out, left, right." The VCS unit is installed in Discovery's aft flight deck, in an instrument panel directly below the standard closed circuit television displays and controls.

Shepherd and Melnick will operate the VCS at least three times each during the mission. The original television displays and controls on board Discovery will be used for standard operations during the flight. When the VCS is powered on, the manual controls will remain operational, and the cameras can be controlled using either method.

The VCS displays and controls are a 2- by 10-inch fluorescent display and three switches, a power switch, mode switch and reset switch. Voice commands from Shepherd and Melnick have been recorded prior to the flight and voice templates inside the VCS were made to allow the computer to recognize them. When using the VCS, the mission specialist will wear a special headset with a microphone that feeds the verbal commands into the system.

If successful, the VCS could be incorporated as standard equipment aboard the Shuttle, allowing much simpler television operations. Such simplification could greatly reduce the amount of hands-on work needed for television operations during such times as maneuvers with the Shuttle's remote manipulator system robotic arm. Normally, an astronaut controlling the arm uses two hands for the task and must remove one hand to adjust television coverage. Information from this flight can determine if microgravity affects the user's voice patterns in a way that can inhibit the VCS's ability to recognize them.

RADIATION MONITORING EQUIPMENT-III

The Radiation Monitoring Equipment-III measures ionizing radiation exposure to the crew within the orbiter cabin. RME-III measures gamma ray, electron, neutron and proton radiation and calculates -- in real time -- exposure in RADS-tissue equivalent. The information is stored in memory modules for post-flight analysis.

The hand-held instrument will be stored in a middeck locker during flight except for activation and memory module replacement periods. RME-III will be activated as soon as possible after achieving orbit and will operate throughout the mission. A crew member will enter the correct mission elapsed time upon activation and change memory modules every two days.

RME-III is the current configuration, replacing the earlier RME-I and RME-II units. RME-III last flew on STS-31. The experiment has four zinc-air batteries and five AA batteries in each replaceable memory module.

RME-III is sponsored by the Department of Defense in cooperation with NASA.

STS-41 CREW BIOGRAPHIES

Richard N. Richards, 44, Capt., USN, will serve as commander. Selected as an astronaut in 1980, he considers St. Louis, Mo., his hometown. Richards will be making his second space flight. Richards served as pilot of STS-28, a dedicated Department of Defense mission launched Aug. 8, 1989.

He graduated from Riverview Gardens High School, St. Louis, in 1964. Richards received a bachelor of science degree in chemical engineering from the University of Missouri in 1969 and received a master of science degree in aeronautical systems from the University of West Florida in 1970. Commissioned as a Navy Ensign upon graduation from the University of Missouri, Richards was designated a Naval aviator in August 1970. His flight experience has included more than 4,000 hours in 16 different types of aircraft, including more than 400 aircraft carrier landings.

Robert D. Cabana, 41, Lt. Col., USMC, will serve as pilot. Selected as an astronaut in 1985, Cabana considers Minneapolis, his hometown. He will be making his first space flight.

Cabana graduated from Washburn High School, Minneapolis, in 1967 and received a bachelor of science degree in mathematics from the Naval Academy in 1971. He has logged more than 3,700 flying hours in 32

different types of aircraft, including the AD-1 oblique wing research aircraft.

At NASA, Cabana has worked as the Astronaut Office Space Shuttle flight software coordinator, deputy chief of aircraft operations and lead astronaut in the Shuttle avionics integration laboratory, where the orbiter's flight software is tested.

Bruce E. Melnick, 40, Comdr., USCG, will serve as Mission Specialist 1 (MS1). Selected as an astronaut in 1987, he was born in New York, but considers Clearwater, Fla., his hometown. He will be making his first space flight.

Melnick graduated from Clearwater High School in 1967 and attended Georgia Tech in 1967-68. He received a bachelor of science degree in engineering from the Coast Guard Academy in 1972 and received a master of science in aeronautical systems from the University of West Florida in 1975.

At NASA, Melnick has served on the astronaut support personnel team and currently represents the Astronaut Office in the assembly and checkout of the new Space Shuttle orbiter Endeavour at the contractor facilities in Downey and Palmdale, Ca.

William M. Shepherd, 41, Capt., USN, will serve as Mission Specialist 2 (MS2). Selected by NASA as an astronaut in 1984, he was born in Oak Ridge, Tenn. Sheperd will be making his second space flight.

Shepherd served as Mission Specialist on STS-27, a dedicated Department of Defense flight, launched Dec. 2, 1988.

Shepherd graduated from Arcadia High School, Scottsdale, Ariz., in 1967. He received a bachelor of science degree in aerospace engineering from the Naval Academy in 1971 and received degrees of ocean engineer and master of science in mechanical engineering from the Massachusetts Institute of Technology in 1978.

Thomas D. Akers, 39, Major, USAF, will serve as Mission Specialist 3 (MS3). Selected as an astronaut in 1987, he considers Eminence, Mo., his hometown. This will be Akers first space flight.

Akers currently serves as the Astronaut Office focal point for Space Shuttle software development and the integration of new computer hardware for future Shuttle missions.

Akers graduated from Eminence High School, valedictorian of his class. After graduating from the University of Missouri-Rolla in 1975, he spent 4 years as the high school principal in his hometown of Eminence. He joined the Air Force in 1979 and was serving as executive officer to the Armament Division's deputy commander for research, development and acquisition at Eglin AFB, Fl., when selected for the astronaut program.

MISSION MANAGEMENT TEAM

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Gerald C. Ladner	Manager, External Tank Project
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Joanne H. Morgan	Director, Payload Project Management

NASA News

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For Release:

September 14, 1990

RELEASE: 90-123

MISSION TO PLANET EARTH FEATURED IN EDUCATION VIDEO BROADCAST

NASA's Educational Affairs Division will broadcast via satellite the first in a series of four live, educational video conferences on October 2, launching the 1990-91 series.

The first conference will discuss the Mission to Planet Earth program, a major international effort to study the Earth's atmosphere, resources, oceans, land surface, climate and weather. The goal of the program is to gain a scientific understanding of the Earth as an interactive system, examining such issues as global warming and ozone depletion, to develop a basis for informed decisions on protecting the planet's future.

Dr. Shelby Tilford, Director of NASA's Earth Science and Applications Division, Washington, D.C., will discuss a variety of topics related to global change, Earth Observing System and the Mission to Planet Earth program.

This year more than 30,000 educators in 50 states are expected to participate in the highly successful series, now in its fifth year.

These 1-1/2 hour, interactive video conferences are designed to update teachers on NASA programs, demonstrate aerospace activities for the classroom and announce new programs, products and activities available to classroom teachers. The nation's participating school districts will receive transmissions from 2:30 to 4:00 p.m. Eastern time.

The 1990-91 video conference schedule is:

Mission to Planet Earth - Oct. 2, 1990
Astro-1 Shuttle mission - Nov. 27, 1990
Space Science in the Classroom (SEEDS) - Jan. 29, 1991
Hubble Space Telescope - April 2, 1991

- more -

The Oct. 2 conference will be transmitted on Westar IV, channel 11. There is no charge for registration or participation in the video conference.

The satellite video conference series is produced by NASA's Aerospace Education Services Project from the Oklahoma State University Telecommunications Center.

To register for the series, interested teachers should write to NASA Aerospace Education Services Project, Videoconference Site, 300 North Cordell, Oklahoma State University, Stillwater, Okla., 74078-0422, or call 405/744-7015. Registration ensures that announcements, publications and other materials for teacher-participants are received by the school.

- end -

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NASA News

National Aeronautics and
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AC 202-453-8400

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For Release:
September 17, 1990

NOTE TO EDITORS: N90-74

Three radar images of the surface of Venus from the first three mapping orbits of the Magellan mission are being released today. The spacecraft began normal mapping operations on Saturday, Sept. 15. The black-and-white pictures are available through the audio visual branch of NASA Headquarters, 400 Maryland Ave. S.W., Washington, D.C., 20546, or by calling 202/453-8375.

- end -

Picture Numbers:
90-H-630
90-H-631
90-H-632

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For Release:
September 17, 1990

RELEASE: 90-124

JOINT NASA, USGS AND SOVIET TEAM TO STUDY RUSSIAN VOLCANOES

A joint NASA/U.S. Geological Survey team of American scientists plan this week to join a team of Soviet scientists to study volcanoes along Russia's Kamchatka Peninsula -- one of the most active and least understood volcanic regions in the world.

The joint study marks the first time that Western scientists have been allowed in the Kamchatka region since World War II and signals the start of a new U.S.-Soviet program to better define volcanoes in the Pacific's "Ring of Fire" -- volcanoes and other tectonic features located along the edges of the Pacific Plate. The plate's boundaries include the western coast of North America, the Aleutian Islands, the Kamchatka Peninsula, Japan and New Zealand.

The agreement enabling access for the NASA/USGS team was negotiated as part of NASA's Earth Sciences Joint Working Group with the Soviets. Until this invitation the area has been "off limits" to Western scientists. As a result, "Kamchatka is sort of a missing link in our knowledge of the Pacific Ring of Fire," said Dr. David Pieri, the Jet Propulsion Laboratory (JPL) geologist who heads the American team.

"The volcanoes there are big, they're dangerous, and they do explode," said Pieri. Situated near a major air traffic lane that runs roughly along the northeast coast of Asia, the volcanoes often eject ash into the stratosphere, posing a threat to aircraft. Increased air traffic in the area warrants new studies of the potential volcanic hazard, Pieri said.

- more -

On this trip, the American team is participating in joint field mapping of the region in aircraft supplied by the Soviet side. The Soviet team is from the Institute for Volcanology of the USSR's Academy of Sciences, Far Eastern division, in Petropavlovsk - Kamchatskii. The mapping will identify areas of interest for proposed subsequent joint airborne and orbital mapping of Kamchatka-area volcanoes and volcanically active regions in the United States.

Participants from JPL are Pieri and Dr. Anne Kahle. From the U.S. Geological Survey are Dr. Jack Lockwood of the Hawaii Volcanoes Observatory; Dr. Dan Miller of the Cascade Volcanoes Observatory, Vancouver, Washington; and Dr. Tom Miller, Alaska Volcanoes Observatory, Anchorage.

Plans call for the Soviet team to visit the U.S. early next year for similar field work in Hawaii or Oregon, to be followed by more extensive joint field work in Kamchatka in late summer of 1991.

- end -

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NASA News

National Aeronautics and
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For Release:
September 18, 1990

RELEASE: 90-125

PIONEER 10 MARKS NEW EPOCH IN SOLAR SYSTEM EXPLORATION

NASA's Pioneer 10 spacecraft, the first to leave the solar system, will reach another milestone on Saturday, Sept. 22, 1990. At 4:19 p.m. EDT, Pioneer 10 will be 50 times farther from the sun than the sun is from planet Earth.

Reaching the 50 astronomical unit (AU) distance "marks a new epoch in exploration of the outer solar system," according to Pioneer experimenter James Van Allen of the University of Iowa.

Van Allen, discoverer of the radiation belts around the Earth which bear his name, said reaching the 50 AU distance "has been a goal of physicists for many decades." When Pioneer 10 reaches that mark, it will be 4,647,809,899 miles from Earth. Pioneer already has travelled farther than any human-made object.

The AU -- the average distance (93 million miles) between the sun and Earth -- is the primary unit used to measure distance within the solar system.

Launched on March 2, 1972, Pioneer continues to make discoveries about the limits of the sun's atmosphere, called heliosphere. The spacecraft is seeking the boundary between the solar heliosphere and the true interstellar gas. Pioneer also continues to search for the first gravity waves to be detected and for data on the location of a possible 10th solar system planet.

Pioneer left the solar system planets behind on June 13, 1983. Communication with Pioneer is expected to continue until the year 2000, when Pioneer will be 6.9 billion miles from the sun.

- more -

The spacecraft's tiny 8-watt radio signal now has fallen to a signal strength of four billionths of a trillionth of a watt when it finally reaches the football-field-sized antennas of NASA's Deep Space Network. Round-trip transmission time for radio signals to the spacecraft and back to Earth is 13 hours, 47 minutes, travelling at the speed of light (186,000 miles per second). Pioneer's current speed along its flight path is about 28,900 mph.

Pioneer was the first spacecraft to cross the asteroid belt, fly by Jupiter and return pictures and a description of the planet's magnetic field, interior structure and atmosphere and the mass of its moons. Pioneer's most important finding about the outer solar system is the extent of the sun's heliosphere, originally thought to have ended at the orbit of Jupiter. Pioneer is now almost 10 times farther away and still within the solar heliosphere.

Pioneer carries a plaque for communication with any intelligent species which may find the spacecraft. The plaque shows a man and a woman, the Earth, a map of the solar system and location of the solar system in the galaxy. In the vacuum of space, Pioneer is expected to survive for millions of years, perhaps as long as the Earth itself.

Pioneer 10 is managed by NASA's Ames Research Center, Monutain View, Calif. It was built by TRW Inc., Redondo Beach, Calif.

- end -

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NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202-453-8400

Terri Sindelar
Headquarters, Washington, D.C.
(Phone: 202/453-8400)

For Release:
September 19, 1990

RELEASE: 90-126

NASA AWARDS EDUCATION RESEARCH GRANTS

NASA today awarded research grants to two universities to develop teacher training courses that will enable teachers to incorporate aerospace topics and concepts into their classrooms and to create new and imaginative practices in learning.

The new education initiative, the Teacher Training Pre-Service Program, is a 2-year pilot program. Bethune-Cookman College, Daytona Beach, Fla., and Rensselaer Polytechnic Institute, Troy, N.Y., were selected from responses to a solicitation of proposals. Each will receive a $75,000 grant and are expected to provide matching, non-Federal funds. The Rensselaer program will be developed and implemented jointly with Russell Sage College, Troy, N.Y.

The institutions will create programs to integrate aerospace concepts into K-12 subjects, including math, science, arts, language, history and social studies. By better preparing graduating teachers with these skills, tools and knowledge, it is hoped that the program will help stimulate student interest and learning, foster science literacy and encourage performance in math and science.

"Good science, math and technology education is essential to get students ready for the 21st Century. Space is a strong catalyst for learning because it provides real-life mysteries, adventure and discovery. NASA is committed to using our unique missions and facilities to equip and inspire teachers, to capture student interest in math, science and technology and to help channel young Americans into these career fields. We are doing our part to help achieve the national education goals set by the President and the Governors," said NASA Administrator Richard H. Truly.

- more -

All proposers agreed to an innovative requirement for the pilot program, a "proof of concept" approach that the product 1) be offered as a catalog-listed course for undergraduate credit, 2) be adapted and used in an accredited summer workshop for experienced teachers, and 3) be offered, with guidance, for national replication.

Bethune-Cookman College, an historically black college, plans to develop six modules for integrating aerospace information into the classroom curricula for children's literature, language, arts, mathematics, music, science and social science. In addition to developing the modules, they will provide workshops for practicing teachers, monitor student teachers instruction of aerospace concepts, and evaluate students and teachers knowledge and attitude toward aerospace and careers in science and technology.

Rensselaer Polytechnic Institute hopes to enhance teacher preparation by increasing the scientific literacy of pre-service teachers in the upper elementary grades. It plans to develop at least five aerospace-related instructional modules for integrating hands-on and problem solving activities into existing methods courses in social studies, science, reading and writing. The modules, when combined, also will serve as the basis for a new interdisciplinary course to develop skills in applying aerospace topics to the teaching of various subjects at the elementary level. The program also will provide in-service experiences for current teachers of grades 7-9, develop science enrichment materials for grades 3-6, and disseminate information to encourage replication of the program and its materials.

- end -

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For Release:
September 19, 1990

RELEASE: 90-127

NASA NAMES SPACE SHUTTLE HYDROGEN LEAK INVESTIGATION TEAM

Robert L. Crippen, Director, Space Shuttle, announced today he has formed a Hydrogen Leak Investigation Team to locate and solve the hydrogen leak problem on the orbiter Columbia which forced the postponement of the STS-35 mission.

Crippen has named Robert Schwinghamer, Deputy Director for Space Transportation Systems, Science and Engineering Directorate at the Marshall Space Flight Center, Huntsville, Ala., to lead the team. Other members include:

A. L. Worlund, Deputy Director, Propulsion Laboratory, Marshall Space Flight Center

Chester Vaughan, Chief, Propulsion and Power Division, Johnson Space Center, Houston

Warren Wiley, Deputy Director, Vehicle Engineering, Kennedy Space Center, Fla.

Horace Lamberth, Chief Engineer, Lockheed Space Operations Co., Kennedy Space Center

Steve Cavanaugh, Director of Propulsion/Fluid Systems, Space Systems Division, Rockwell International, Downey, Calif.

Paul F. Seitz, Deputy Chief Program Engineer, Space Shuttle Main Engine, Rocketdyne Division, Rockwell International, Canoga Park, Calif.

John R. Cool, Manager, Pressurization Systems, Martin Marietta Manned Space Systems, New Orleans, La.

Dr. Michael Greenfield, Director, Systems Assessment Division, Office of Safety and Mission Quality, NASA Headquarters, Washington, D.C.

- more -

"The team will be based out of the Kennedy Space Center and will devote full time to solving this problem," Crippen said. "They will report directly to me, and I've asked the Space Shuttle program to provide Mr. Schwinghamer and his team every available assistance to aid in solving this critical problem."

- end -

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For Release:

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(Phone: 202/453-1547)

September 21, 1990

Bob MacMillin
Jet Propulsion Laboratory, Pasadena, Calif.
(Phone: 818/354-5011)

EDITORS NOTE: N90-76

MAGELLAN MEDIA BRIEFING SET FOR SEPTEMBER 25 AT JPL

A Magellan news conference will be held at the NASA Jet Propulsion Laboratory's von Karman Auditorium, Pasadena, Calif., at 1 p.m. EDT, Tuesday, September 25.

New radar images of the surface of Venus will be released and a video tape of a computer-processed series of images will be shown.

Project officials will discuss the status of the spacecraft and members of the science team will interpret Venus surface features seen in the radar images.

The news conference will be carried live on NASA Select television, Satcom F-2R, C-band, 72 degrees West Longitude, frequency 3960.0 MHz and audio 6.8 MHz.

- end -

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For Release:
September 21, 1990

NOTE TO EDITORS: N90-77

NASA TO HONOR 1990 NASA EXCELLENCE AWARD FINALISTS

NASA will honor the nine 1990 NASA Excellence Award finalists at a reception at Bolling Air Force Base Officers' Club, Washington, D.C. on Sept. 26 at 6:00 p.m.

NASA Administrator Richard H. Truly Truly will present each organization with a plaque in recognition of being a finalist for the prestigious NASA Excellence Award. The nine finalists are:

- Barrios Technology, Inc., Houston, Texas
- Bendix Field Engineering Corp., Seabrook, Md.
- Boeing Computer Support Services (PSC), Huntsville, Ala.
- EG&G Florida, Inc., Kennedy Space Center, Fla.
- Grumman Technical Services Division, Titusville, Fla.
- Honeywell Space & Strategic Systems Operation, Clearwater, Fla.
- Marotta Scientific Controls, Inc., Montville, N.J.
- Rockwell Space Systems Division, Downey, Calif.
- Unisys Defense Systems-Houston Operations, Houston, Texas

The reception will be attended by representatives from the nine finalists companies, members of Congress and their staffs, NASA astronaut David Walker and senior officials from NASA Headquarters and field centers.

The NASA Excellence Award, administered jointly by NASA and the American Society for Quality Control, Milwaukee, Wisc., recognizes NASA's aerospace industry contractors, subcontractors and vendors that consistently demonstrate continuous excellence in improving the quality of their products and services.

This is the first year a small business category has been established. Both Barrios Technology, Inc., and Marotta Scientific Controls, Inc., are small businesses.

The 1990 award recipient(s) will be announced on Oct. 24, 1990, at the 7th Annual NASA Contractors Conference in Grenelefe, Fla.

-end-

NASA News

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For Release:
September 21, 1990

RELEASE: 90-128

HOT EARLY EARTH EVIDENCE MAY CHANGE LIFE EVOLUTION THEORIES

The early Earth may have been much hotter when life first appeared on the planet than has been believed, NASA scientists report. Evidence for a hot early Earth has been growing in recent years, and these conclusions may require major changes in theories of how life began on Earth.

During the first several hundred million years of the Earth's history, scientists at NASA Ames Research Center, Mountain View, Calif., believe massive amounts of carbon monoxide and carbon dioxide were released into the primitive atmosphere through volcanic eruptions and the impact of meteorites and comets. Because carbon dioxide, a "greenhouse gas," traps heat radiating from the Earth's surface, temperatures soared to 190 degrees Fahrenheit (22 degrees below the boiling point of water).

These searing temperatures may have destroyed the large organic molecules that are the building blocks of life. In light of these conclusions, a number of scientists are looking at sites other than the Earth's surface for places where life could have originated, said Dr. James Kasting, leader of the NASA group.

One possible location is the mid-ocean ridges, huge underwater mountain chains located about a mile beneath the surface. Massive underwater pressure at this depth could have prevented the large biological molecules from breaking down in the intense heat.

In 1982, primitive bacteria, not dependent on photosynthesis, were discovered in ocean waters circulating around volcanic vents along the ridges. The bacteria not only thrive in hot temperatures, they also metabolize sulfur and are able to live in an acidic environment.

- more -

This would be characteristic of an ocean containing large amounts of carbon dioxide dissolved out of the atmosphere. Genetic evidence indicated these organisms are of ancient lineage, perhaps descendants of very early life forms that began at the ridges, Kasting said.

The environment postulated by the Ames group is different from theories favored by other scientists. According to Kasting, stellar evolution theory indicates that during Earth's early history 3.9 billion years ago, a less-bright young sun probably delivered 25 percent less heat to the planet's surface. While most scientists believe plentiful carbon dioxide maintained at least the temperatures found on Earth today, the Ames researchers and others believe there was far more carbon dioxide present.

Work by James Walker, a geochemist at the University of Michigan, indicates the early Earth's atmosphere may have had pressures 12 times those of today and contained 80 percent carbon dioxide, much more than previously had been suggested.

"The simplest assumption is that Earth's outgassing of carbon dioxide is proportional to the heat flux from the interior," Kasting says. Using the first accurate measurements of the amount of gas coming out of the Earth's interior today, made by Ames' David Des Marais, Kasting speculates that the three times hotter interior of the early Earth might have spewed three times more carbon dioxide into the atmosphere.

Over billions of years, says Des Marais, the Earth's interior has produced more carbon dioxide than actually found at the surface today. Most has been stored in shales and carbonate rocks, part of which appear to have been recycled into the Earth's interior by plate tectonics.

Since the ocean-covered young planet probably lacked land mass to absorb carbon dioxide and store it as carbonate rocks, more of the volcanic gas accumulated in the atmosphere than does today. Based on these conditions, proposed amounts of carbon dioxide would have been about 10 times the atmospheric pressure of the Earth today.

Despite the high temperatures, the carbon dioxide atmosphere might have been able to protect life once it formed. The Ames scientists recently showed that a sulfur-based screen that could have blocked lethal ultraviolet radiation could have existed in the dense carbon dioxide atmosphere. The sulfur molecules would have protected organisms much as the ozone layer does today.

Another possibility advanced is that the complex molecules of life may have arrived from space, carried by incoming comets, meteorites or larger bodies. Collisions by many sizes of celestial objects were commonplace in the early solar system.

Scientists have discovered many of the building-block molecules of life in space. They have found amino acids, the basic ingredients of proteins, in meteorites from the asteroid belt. Some scientists believe all the water and organic carbon now in the Earth's biosphere could have arrived via comets and asteroid fragments, Kasting said.

The idea of an extraterrestrial source of life also is strengthened by the occurrence of frequent meteorite impacts during Earth's early history. When these celestial bodies, very rich in carbon and other elements, slammed into the planet, they may have sparked formation of complex biological molecules. Continual bombardment may have resulted in a cycle of creation and destruction of chemical building blocks of life or even life itself, until the impacts subsided and primitive life forms gained a foothold.

Similar formation theories for Mars and Earth and recent Mars exploration data offer further support for the hot early Earth thesis. The river valleys and other evidence of flowing and standing water on the Red Planet require a far warmer epoch than is found on Mars today. For reasons like those just given for Earth, virtually all experts propose an intense greenhouse produced by a dense carbon dioxide atmosphere to warm the frozen planet enough to get liquid water.

Mars is 48 million miles farther from the sun than the Earth, and hence gets less than half as much solar heat. This calls for even more carbon dioxide on Mars to produce the same temperatures as Earth. Amounts of carbon dioxide on Earth, equal to those on Mars, would have produced a far hotter Earth.

Kasting has reported his most recent findings in a paper on the role of meteor impacts on the formation of life, to be published this fall in Origins of Life. Other participants in the work at NASA's Ames Research Center include Drs. James Pollack, David Des Marais and Kevin Zahnle. Kasting, now at Pennsylvania State University, is an investigator in NASA's exobiology program managed by the Office of Space Science and Applications.

- end -

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For Release:

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September 21, 1990

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RELEASE: 90-129

COBE ENTERS NEW PHASE OF OPERATIONS AFTER HELIUM DEPLETION

With the depletion of its liquid helium supply this morning, NASA's Cosmic Background Explorer (COBE) is beginning a new phase of operations, extending its search for structure in the early universe.

The liquid helium was housed inside a dewar, a vacuum insulated "thermos", that provided a stable, low temperature environment for two instruments -- the Far Infrared Absolute Spectrophotometer (FIRAS) and the Diffuse Infrared Background Experiment (DIRBE). The dewar contained 600 liters of liquid helium.

Launched last November 18 into a polar orbit approximately 555 statute miles high, COBE was designed specifically to measure the remnant of the Big Bang, the primeval explosion that started the expanding universe. It completed one full-sky survey in mid-June and continued with a second survey before helium depletion.

Both FIRAS and DIRBE require cooling to less than 2 degrees Kelvin (K) (two degrees above absolute zero), for full sensitivity. On the Kelvin scale, room temperature is 300 degrees K.

During the next few months, the inside of the dewar which held the cryogen, is expected to rise to approximately 80 degrees K. The near infrared bands in the DIRBE will continue to function at these higher temperatures.

Another instrument, the Differential Microwave Radiometer (DMR), consists of six separate receivers at three different frequencies located outside the dewar. The DMR does not require cryogenic cooling and will continue re-mapping the sky to further increase the sensitivity of its measurements.

-more-

Of the three instruments, only the FIRAS will no longer take data, since it requires a very low operating temperature. FIRAS, as well as the other instruments, has observed each part of the sky multiple times during the course of the year. The FIRAS already has produced the most sensitive, accurate measurements of the spectrum ever achieved, according to project officials.

Even at this early stage of data processing, the COBE data have made enormous contributions to the field of observational cosmology. The first peer-reviewed article on the spectrum results was called by referees "one of the most important cosmological experiments of this century."

Just eight weeks after launch, preliminary results were presented that revealed the first definitive spectrum of the cosmic background radiation. The spectrum showed that the Big Bang theory was confirmed with textbook perfect agreement with predictions, but further analysis may well reveal small and very important differences. DMR maps confirmed that the universe was extremely homogeneous (or smooth) at this early stage, also in accordance with the Big Bang theory. DIRBE maps have provided unprecedented new views of our local cosmic environment, the solar system and the Milky Way Galaxy. These maps could provide the first definitive search for the elusive cosmic infrared background to reveal the glow from the first generation of objects in the universe.

The complex COBE satellite represents a major advancement in scientific technology, and carries the first cryogenic scientific instruments with moving parts to fly in a satellite. This also is the first time that cryogenic instruments carried their own absolute calibrators. All systems met or exceeded their design specifications.

The COBE mission now has a great quantity of data that must undergo extensive processing. The "quick-look" data show that the data are of very high quality, and indicate that COBE's instruments have good sensitivity, stability and linearity.

The challenge ahead is to reduce and analyze the data carefully to understand the conditions in the early universe. Calibration and interpretation of signals from nearby regions that confuse our view of the Big Bang must be examined and understood. The great mystery still remains: how did the universe split itself into the great objects that exist today, including galaxies, clusters of galaxies and huge empty areas between them? The COBE data are expected to hold the basic evidence of this process when the analysis is complete.

The Goddard Space Flight Center is responsible for the COBE development, operation and data processing.

-end-

NASA News

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For Release:
September 25, 1990

LAUNCH ADVISORY: STS-41/ULYSSES LAUNCH DATE SELECTED

NASA managers today selected Oct. 6, 1990, as the launch date for Space Shuttle mission STS-41 to deploy the European Space Agency's Ulysses probe on a 5-year journey to study the sun.

"This date is a little success oriented and is dependent on not encountering any unusual problems," said Space Shuttle Director Robert L. Crippen. "But I think the Shuttle team has a good chance of making the 6th."

The launch window for Oct. 6th extends from 7:35 a.m. to 10:05 a.m. EDT.

NASA received Office of Science and Technology Policy nuclear launch safety approval for the Ulysses mission on Monday, Sept. 24, 1990.

STS-41 will be the 36th Space Shuttle mission and the 11th of the orbiter Discovery. The mission is slated to last just over 4 days with a planned landing at Edwards Air Force Base, Calif.

The flight crew for STS-41 is Commander Richard N. Richards, Pilot Robert D. Cabana and Mission Specialists William M. Shepherd, Bruce E. Melnick and Thomas D. Akers.

- end -

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For Release:
September 25, 1990

RELEASE: 90-130

U.S. AND U.S.S.R. CONTINUE SPACE BIOLOGY AND MEDICINE COOPERATION

American and Soviet scientists made significant progress in standardizing methods and procedures used in ground and flight experiments at the fourth meeting of the U.S.-U.S.S.R Joint Working Group (JWG) on Space Biology and Medicine, held in San Mateo, Calif., Sept. 17-22.

Both countries exchanged biomedical data resulting from prior year, space missions. In addition, specialists of both countries began to analyze data obtained from short- and long-duration missions dealing with bone, muscle and cardiovascular physiology. Some of these data were collected by Soviets using equipment provided by NASA.

Results of the recent Soviet Biosatellite missions also were discussed and plans were made for joint publication. Both countries agreed to expand cooperation in areas of immunology and hematology. These experiments will be conducted jointly on the ground, on the Mir, on the Space Shuttle during Spacelab Life Sciences missions and on Soviet Cosmos flights in 1992.

Discussions were initiated on standardizing the format and inputs to the data base on physiological changes associated with spaceflight.

In telemedicine, the JWG agreed to investigate implementing an 18-month demonstration project linking U.S. and Soviet medical facilities to study possible applications of telemedicine to space medical emergencies and disaster-stricken or remote areas on Earth.

- more -

The U.S. has participated in the Soviet Cosmos Biosatellite program since 1975 and will continue to fly experiments on the next mission in 1992. The U.S. will reciprocate for these flight opportunities by flying Soviet experiments on Spacelab Life Sciences-1, -2, and -3 and a Shuttle middeck flight in 1993. Both countries will exchange tissue samples from different experiments flown in space.

The JWG's exobiology cooperation continues to focus on the study of life on Mars, planetary protection procedures and various activities pertaining to remote observations important to exobiology. In the area of life support, the JWG agreed to begin discussions on standardizing requirements for spacecraft environmental parameters on manned missions and to conduct precursor inflight experiments as biologically based life support systems.

During the upcoming year, the JWG will work on the second edition of Foundations of Space Biology and Medicine, scheduled to be published in 1992.

The U.S. delegation was headed by Samuel W. Keller, NASA Associate Deputy Administrator, and Dr. Arnauld Nicogossian, Director of Life Sciences. The Soviet delegation was headed by Eugene B. Shulzhenko, of the Ministry of Health, and Anatolyi I. Grigoriev, Director of the Institute of Biomedical Problems.

The next meeting of the JWG is scheduled for the second half of 1991 in the U.S.S.R. The JWG was established by the U.S.-U.S.S.R. Civil Space Agreement signed in April 1987.

- end -

NASA News

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For Release:
September 27, 1990

RELEASE: 90-131A

NASA SELECTS CONTRACTOR FOR ADVANCED VIDEO SYSTEMS R&D

NASA Headquarter's Television Development Division, Washington, D.C., has selected the Imaging Systems Laboratory of Florida Atlantic University for the award of a contract for research and development in advanced video systems for space and terrestrial applications.

Researchers will place special emphasis on digital methods for processing, storing and transporting television signals based on their findings concerning the performance of the human visual system. The ultimate objective is the fabrication of a breadboard digital television system for NASA that delivers a high definition signal faithfully rendering color and motion in real time, free of apparent impairments or artifacts, at a minimum transmission bit rate.

The work will be performed on the campus of Florida Atlantic University in Boca Raton, Fla., under the management of William E. Glenn, Ph.D., director of the laboratory. Dr. Glenn is a former Vice President and Director of Research for CBS Laboratories.

The term of the contract is for one 1 beginning on Sept. 27, 1990. It may be renewed for four 1-year priced option periods at NASA's discretion. The contract has a potential value of $3,050,000.

-end-

NASA News

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For Release:
September 27, 1990

RELEASE: 90-131

NASA AND FAA SIGN AVIATION RESEARCH AGREEMENTS

The Federal Aviation Administration (FAA) and NASA have signed memoranda of understanding under which they will jointly seek solutions to problems of mutual concern in aviation, including ways to better understand and reduce aircraft noise.

The research areas covered by the memoranda are environmental compatibility, human factors, severe weather, integration of cockpit and air traffic control operations, and airworthiness.

The memoranda of understanding were made possible by a cooperative research agreement signed earlier this year by FAA Administrator James B. Busey and NASA Administrator Richard H. Truly. The agreement represents renewed emphasis on continued coordination and cooperation between the FAA and NASA.

"This new agreement," said Busey, "allows the FAA to once again tap NASA's vast reservoir of talent and expertise in a search for research solutions in these important technical areas."

"We are looking forward to working even more closely with the FAA in addressing the long-term challenges facing air transportation," stated Truly.

Specific research on the environmental impact of engine emissions and aircraft noise, including sonic boom, is covered under the Memorandum of Understanding on Environmental Compatibility. The effort will focus on technology to further reduce noise, better understanding of noise effects and development of noise reduction standards for newly designed aircraft.

- more -

Cooperation between the FAA and NASA in the past has produced dramatic reductions in aircraft noise. Today's quietest commercial aircraft, called Stage 3, are only 25 percent as loud as the Stage 1 aircraft that made up the majority of the fleet 15 years ago.

These quieter aircraft use technology developed in a similar NASA/FAA program. Now, further research is necessary to lay the foundation for development of future aircraft noise standards.

The research on engine emissions will be aimed at updating existing International Civil Aviation Organization guidelines on acceptable emission levels.

The goal of the sonic boom program is to develop technology that will reduce the noise associated with sonic booms to an acceptable level for overland supersonic flight.

Earlier NASA/FAA cooperative efforts have dealt with the unique noise problems associated with helicopters, the effect of the time of day on human response to aircraft noise and the measurement and prediction of building vibrations resulting from low frequency noise generated by supersonic aircraft.

- end -

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For Release:
September 27, 1990

RELEASE: 90-132

NASA TO COSPONSOR SMALL BUSINESS PROCUREMENT CONFERENCE

Small businesses seeking information on doing business with the Federal government, as well as state and local governments and large contractors, can find answers at the Contract Opportunities Conference October 30-31 at the Saginaw Civic Center and International Centre, Saginaw, Mich.

The Conference is jointly sponsored by the National Aeronautics and Space Administration, the Small Business Administration, U.S. Dept. of Agriculture, Dept. of Defense, the Tri-Counties of Saginaw, Bay and Midland, and the Michigan Small Business Development Center of Detroit. The conference is designed primarily for small businesses, including minority-owned, women-owned and handicapped businesses that want to market their services or products to government agencies or major contractors.

In addition to 25 government agencies, about 50 corporations with major contracts with NASA and other agencies will be represented at the conference. NASA Deputy Administrator J. R. Thompson will be the luncheon speaker.

Two major activities are planned for the conference. A Networking Marketplace will put small businesses in touch with government and contractor representatives, and eight seminars will be held to provide current information and procedures about contracting legislation and regulations. The seminar topics are:

- How to prepare a winning bid and proposal
- Small and small disadvantaged business programs
- How to do business with NASA and other governmental agencies
- How to do business with government contractors
- Government quality standards & preparing for a pre-award survey

- more -

- Technology transfer
- The Small Business Innovation Research program
- How to do business with the city, county, and state government

For additional information on agenda, seminar topics and registration, contact Michigan NASA Conference, P.O. Box 7, University Center, Auburn, Mich., 48661, or call (517) 686-5151. Registration for the conference costs $75.

- end -

NASA News

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For Release:
October 1, 1990

RELEASE 90-133

NASA ROSAT IMAGER RETURNS SUCCESSFUL FIRST LIGHT PICTURES

The NASA High Resolution Imager (HRI) instrument aboard the German Roentgen Satellite (ROSAT) has demonstrated its successful operation by sending back to Earth impressive first light pictures, according to NASA officials.

ROSAT, a cooperative program between the United States, West Germany and Great Britain, was launched June 1, 1990 to study cosmic X-ray emissions. X-rays are the signature of high energy processes (greater than about one million degrees). Scientists are interested in X-ray images because they specifically highlight regions in celestial systems where high energy phenomena exist.

The joint international team responsible for ROSAT are excited about the images received at a ground station near Munich, Germany during the satellite's orbital calibration and verification phase which occurred last June and July. The team reports that the spacecraft is functioning well, the scientific instruments are functioning better than expected and the image quality from the X-ray mirror is as good or better than previously indicated by ground testing. This adds up to what scientists expect will be very promising scientific results and discoveries.

The HRI images are representative of those to be obtained during the pointing phase of the mission. The images represent X-rays in the energy range of 0.4 to 2.5 kilo electron volts.

One photograph is of Cygnus X-2, believed to be a neutron star orbiting a normal stellar companion, about 3,000 light years from Earth.

- more -

A second photograph shows the supernova remnant Cas A, in the constellation Cassiopea. The remnant is the result of a supernova explosion which occurred in the Milky Way galaxy about 320 years ago. The X-ray images represent emissions from a hot plasma cloud of several million degrees produced by the interaction of the blast wave from the supernova with the surrounding interstellar material. The remnant is located about 9,000-10,000 light years from Earth.

The third photograph shows a cluster of galaxies known as Abell 2256. Galaxy clusters are traditionally strong X-ray emitters. The emission originates in the hot gas which is swept out of colliding galaxies and accumulates between the galaxies. These gasses are typically tens of million degrees in temperature.

The spacecraft is currently in a circular orbit at an altitude of about 358 miles, at an inclination of 53 degrees. It was launched from the Cape Canaveral Air Force Station, Fla., aboard a Delta expendable launch vehicle.

Within NASA, the ROSAT program is managed by the Goddard Space Flight Center, Greenbelt, Md.

- end -

Photographs to illustrate this story are available free to media representatives by calling 202/453-8383.

Color:	B&W:
90-HC-573	90-H-637
90-HC-574	90-H-638
90-HC 575	90-H-639

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National Aeronautics and
Space Administration

Washington, D.C. 20546
AC 202-453-8400

Vera Hirschberg
Headquarters, Washington, D.C.

(Phone: 202/453-2907)

For Release:
October 2, 1990

RELEASE: 90-134

ALDRICH NAMED OUTSTANDING ALUMNUS BY NORTHEASTERN UNIVERSITY

Arnold D. Aldrich, Associate Administrator for NASA'S Office of Aeronautics, Exploration and Technology, has received Northeastern University's Outstanding Alumni Award in the field of Science and Technology.

Aldrich received the award, one of the University's most prestigious honors, as part of the annual recognition program sponsored by the the President of the University. The current President of Northeastern, located in Boston, is Dr. John A. Curry.

The award was established in 1978 by the Northeastern Alumni Association for those whose professional attainments bring honor on themselves and upon the university. Science and Technology is one of six categories of the award, which also is given for achievements in the Arts and Humanities; Business and Industry; Health Sciences; Education and Public Service.

Aldrich graduated from Northeastern in 1959 with a Bachelor of Science in Electrical Engineering. He joined NASA in 1959 and has held a number of prominent project/program management and flight operations positions at the Johnson Space Center (and its predecessor organizations) during the Mercury, Gemini, Apollo, Skylab, Apollo-Soyuz and Space Shuttle programs.

Aldrich also has held a number of key positions at NASA Headquarters in Washington, D.C. In his present job, he directs NASA's aeronautics and space technology programs and program planning and technology development for President Bush's Space Exploration Initiative to return to the Moon and send humans to explore Mars. Prior to his present appointment, he directed the Space Shuttle Program, including recovery efforts following the Challenger accident.

-end-

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Washington, D.C. 20546
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For Release:
October 3, 1990

RELEASE: 90-135

NASA SELECTS CENTERS FOR LIFE SCIENCES RESEARCH

Today, NASA selected three institutions that will serve as Specialized Centers of Research and Training, establishing a new program dedicated to space life sciences. The centers are located at Kansas State University, Manhattan; University of Rochester, New York; and Purdue University, West Lafayette, Ind. NASA plans to award each center approximately $1 million a year for 5 years.

Dr. Arnauld Nicogossian, Director of NASA's Life Sciences Division, made the selections based on peer reviews conducted under the auspices of the American Institute of Biological Sciences, site visits and comprehensive documentation reviews.

The program will be an integral part of the division's research and analysis activities to advance basic knowledge and create effective ways for solving specific problems in space life sciences.

Chosen from 47 applicants, each institution will address one of three research areas, including gravitational biology, environmental health and bioregenerative life support. The program is established exclusively for ground research and analysis.

The directors, the institutions selected and the area of research are:

- Gravitational Biology
  Dr. Brian S. Spooner, Kansas State University

- Environmental Health
  Dr. Thomas W. Clarkson, University of Rochester

- Bioregenerative Life Support
  Dr. Cary A. Mitchell, Purdue University

- end -

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202-453-8400

For Release:

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Headquarters, Washington, D.C.

(Phone: 202/453-2754)

Don Haley
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(Phone: 805/258-8381)

October 4, 1990

RELEASE: 90-136

NASA TO CONDUCT THRUST VECTORING RESEARCH FLIGHTS

An upcoming series of research flights with an F/A-18 aircraft at NASA's Ames-Dryden Flight Research Facility, Edwards, Calif., may make it easier to control future jet fighters at very high angles-of-attack. Angle-of-attack or "alpha" is an engineering term for the angle of an aircraft's body and wings relative to its actual flight path.

A set of spoon-shaped paddles has been installed around the exhaust nozzles of the research aircraft's two engines. The paddles can be moved, much like the rudder on a boat, to deflect or vector engine thrust in different directions, giving the plane better controllability at nose-high attitudes up to 70 degrees.

Each paddle, made of Inconel steel and able to withstand nearly 2,000 degrees F., rotates 25 degrees into the engine exhaust stream to vector the thrust. When not in use, the paddles are positioned out of the exhaust streams where they will not interfere with normal engine operations. The aircraft's flight control system governs the location of the paddles using special research software developed for the thrust vectoring studies.

The flights are part of a continuing NASA program to help aircraft designers increase the maneuverability and safety of future high-performance aircraft at high angles-of-attack. When angle-of-attack increases during tight turns and maneuvers, an aircraft's control surfaces may not generate enough lift for the pilot to maintain aircraft stability and control.

- more -

The vectored thrust modification to NASA's F/A-18 High-Alpha Research Vehicle will let Ames-Dryden pilots obtain data about the behavior of air over the aircraft's body and wings at higher angles-of-attack than previously attempted in the research program. Earlier flights took the same aircraft to a 55-degree angle-of-attack without using thrust vectoring.

The first checkout flight following installation and ground testing of the thrust vectoring system is scheduled for November. Research flights with the new system operating will begin early in 1991 and should continue through most of 1993.

NASA program officials stress that the thrust vectoring system is designed solely to provide test capabilities for low-speed high-alpha research and is not a prototype or a production model being tested for operational use on the F/A-18 or any other aircraft. Results of the aerodynamic studies will be used to validate computer predictions and wind tunnel results. The unique flight control system also will be used to investigate new flight control laws for high angle-of-attack maneuvering.

Flights with vectored thrust are the second phase of NASA's three-part high-alpha program. The first phase, using the F/A-18's conventional flight control system, ended late last year after 101 flights.

A planned third phase would use narrow hinged strakes at the aircraft's nose as another way to obtain yaw (left and right) control at high angles-of-attack. The wing-like strakes, folded down along the side of the fuselage when not in use, would be raised on one side or the other to interact with strong vortices of air generated by the nose to produce side forces to move the nose left or right.

The F/A-18 flights are part of an integrated high angle-of-attack research and technology program jointly conducted by NASA's Langley Research Center, Hampton, Va., Ames Research Center, Mountain View, Calif., and Lewis Research Center, Cleveland. The Ames-Dryden high-alpha project pilot is Edward R. Schneider.

The thrust vectoring system and control laws were designed and built by McDonnell Aircraft Co., St. Louis. The software and hardware for the flight control system was developed by General Electric Corporation's Aircraft Control System Division, Binghamton, N.Y.

- end -

NASA News

National Aeronautics and
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Washington, D.C. 20546
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For Release:
October 11, 1990

RELEASE: 90-137

1990 ANTARCTIC OZONE HOLE EQUALS LOWEST PREVIOUS LEVELS

Preliminary data indicate that depletion of stratospheric ozone over Antarctica is matching levels observed in 1987 and 1989, the lowest ozone years recorded, NASA scientists said.

Research by Dr. Arlin Krueger, Dr. Mark Schoeberl and Dr. Richard Stolarski of NASA's Goddard Space Flight Center, Greenbelt, Md., indicates the Antarctic "ozone hole" began developing in the last week of August when the normal, winter polar ozone levels started decreasing. This was about one week earlier than the beginning of depletion in 1987 and 1989, though the timing of the start of the depletion has shown significant variability over the years.

Ozone, a molecule made up of three atoms of oxygen, comprises a thin layer of the upper atmosphere that acts as a shield against harmful ultraviolet radiation from the Sun. In the presence of sunlight, atoms of chlorine and other chemicals can strip an oxygen atom from an ozone molecule, leaving behind an oxygen molecule, which does not absorb the radiation. Because of the catalytic nature of the reactions, each chlorine atom can destroy thousands of ozone molecules.

The ozone hole is a large area of intense ozone depletion over the Antarctic continent that typically occurs between late August and early October. The ozone hole has been monitored since 1979 using the Total Ozone Mapping Spectrometer (TOMS), an instrument on the Goddard-managed NIMBUS-7 spacecraft.

- more -

Not only has the 1990 ozone hole matched the lowest levels previously observed, but ozone levels throughout the Southern Hemisphere has been as low as any previously recorded year. Scientists have observed previously that the ozone hole has followed a roughly biennial cycle, in which ozone depletion has been less severe in even-numbered years than in odd-numbered years. The implications of such severe depletion in 1990 are uncertain, said Dr. Robert Watson, Chief of NASA's Upper Atmosphere Research/Tropospheric Chemistry Branch. Year-to-year variability in ozone depletion appears to be related to the interplay of meteorological conditions and atmospheric chemistry, but the exact process is not definitively understood by scientists.

NASA's programs for studying ozone depletion, managed by the Office of Space Science and Applications, will expand in 1991 with the launch of another TOMS instrument aboard a Soviet Meteor Satellite and the deployment of the Upper Atmosphere Research Satellite by the Space Shuttle. The just completed Space Shuttle mission, STS-41, carried the Shuttle Solar Backscatter Ultraviolet instrument (SSBUV), a device similar to TOMS that estimates ozone levels by measuring reflected ultraviolet light. SSBUV collects data that are used to calibrate the TOMS instrument.

- end -

NOTE TO EDITORS: A print of satellite images of the ozone hole for the years 1987-1990 will be available free to media representatives at NASA Headquarters Audio-Visual Branch (202/453-8383). The print numbers are 90-HC-602 for color and 90-H-667 for black and white. Also, a 4 1/2 minute videotape of NASA ozone hole research is available by phoning the same number.

NASA news releases and other NASA information are available electronically on CompuServe and GEnie, the General Electric Network for Information Exchange. For information on CompuServe, call 1-800-848-8199 and ask for representative 176. For information on GEnie, call 1-800-638-9636.

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202-453-8400

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For Release:

October 12, 1990
4:00 p.m. EDT

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(Phone: 301/286-5565)

RELEASE: C90-dd

NASA SELECTS ST SYSTEMS FOR NSSDC SUPPORT CONTRACT

NASA has selected the ST Systems Corporation, Lanham, MD., to negotiate a cost-plus-award-fee contract for operation and analysis support for the National Space Science Data Center (NSSDC) at Goddard Space Flight Center, Greenbelt, Md.

The contract, expected to take effect Dec. 15, will run for 5 years. Under the contract, 102 people will be housed on-site and 26 people will be housed off-site at the contractor's facilities. The total proposed estimated cost and fees for the five year period is $37 million.

The contractor will provide qualified personnel to support the six basic functions of NSSDC: to provide special on-line information and data systems; to serve as NASA's data archive; to publish a variety of newsletters and paper catalogs; to provide value-added services; to conduct computer science research and development and implement mass storage technologies; and to provide system support for the NSSDC computer facility and networks.

Four other companies submitted proposals for the contract: Bendix Field Engineering, Columbia, Md.; Telos Corporation, Chantilly, Va.; Computer Sciences Corporation, Calverton, Md.; and Space Science Data Services, Seabrook, Md.

- end -

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National Aeronautics and
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For Release:
October 12, 1990

RELEASE: 90-138

U.S./U.S.S.R. SPACE MEETINGS TO BE HELD

United States and Soviet space and aeronautics officials will hold three separate meetings next week. Richard H. Truly, NASA's Administrator, will lead a U.S. Government delegation to the Soviet Union for general discussions on U.S./U.S.S.R. civil space programs and for visits to Soviet space facilities, October 15-19, 1990.

In addition, the fourth U.S./U.S.S.R. Solar System Exploration Joint Working Group (JWG) meeting will be held October 15-22, in Crystal City, Virginia. A Soviet aeronautics team will also visit NASA's aeronautics centers to be briefed on our aeronautics programs, October 15-25.

The U.S. Government delegation's visit to Moscow is in response to long-standing invitations to visit senior Soviet space officials and installations.

The group will visit a number of Soviet organizations and facilities, including, tentatively, the Ministry of General Machine Building; the Ministry of Foreign Affairs; the U.S.S.R. Academy of Sciences; the Space Research Institute; Star City, the cosmonaut training center; the Ministry of Health's Institute of Biomedical Problems; NPO Energia; and the Flight Control Center in Kaliningrad.

In addition to Admiral Truly, members of the U.S. delegation are NASA officials Samuel W. Keller, Associate Deputy Administrator; Margaret G. Finarelli, Acting Associate Administrator for External Relations; and Arnauld Nicogossian, Director of Life Sciences; John Boright, Deputy Assistant Secretary for Science and Technology Affairs, Department of State; Raymond Walters, Director of Policy and International Coordination, National Space Council; and John Thomas, Special Assistant for Soviet Affairs, Defense Technology Security Administration.

- more -

Discussions during the Solar System Exploration JWG will include the status of planned cooperation on the Mars Balloon Relay mission; the Antaractic Balloon Flight Program; coordination of the Soviet Vesta (Mars '94) and U.S. Mars Observer missions and the exchange of scientific data; exchange of U.S. and Soviet scientists on the Magellan, U.S. Mars Observer and Soviet Mars '94 missions; and possible cross-support of the Mars Observer and Mars '94 missions.

The U.S.S.R. Ministry of Aviation Industry (MAI) hosted a NASA aeronautics team in Moscow last May and arranged visits to its facilities conducting aeronautical research. NASA will host a reciprocal visit by a Soviet aeronautics team in October. The Soviet team will be led by Deputy Minister V. M. Chuiko. They will visit NASA's Dryden Flight Research Facility, Edwards, Calif., Ames Research Center, Mountain View, Calif., Langley Research Center, Hampton, Virginia, Lewis Research Center, Cleveland, Ohio, and NASA Headquarters. The exchange of visits will give both sides an opportunity to become acquainted with their ongoing aeronautical research programs.

Space cooperation between the two nations was established by the U.S./U.S.S.R. Civil Space Agreement signed in April 1987.

- end -

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NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202 453-8400

For Release

October 16, 1990

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Jeff Carr
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N90-81

NOTE TO EDITORS: STS-41 POSTFLIGHT CREW PRESS CONFERENCE

The STS-41 postflight crew press conference will be held Thursday, Oct. 18, at 2:00 p.m. EDT at the Johnson Space Center, Houston. News media are invited to participate on location at JSC or by two-way audio from other NASA centers and Headquarters.

The crew members will describe their recent flight which included the successful deployment of Ulysses, an interplanetary spacecraft designed to study the Sun. They will show and narrate film highlights of the mission activities.

The press conference will be broadcast live on NASA Select television carried on RCA SATCOM F2R, transponder 13, located at 72 degrees west longitude.

- end -

National Aeronautics and
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Washington, D.C. 20546
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For Release:

October 17, 1990

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RELEASE: 90-139

LUNAR MINING COULD PROVIDE FUTURE ENERGY SOURCE FOR EARTH

What will 21st century powerplants look like? Will they derive their energy from the burning of fossil fuels like 90 percent of their 20th century predecessors? Or will they operate on a new, cleaner, more efficient fuel source?

Researchers at the University of Wisconsin's Center for Space Automation and Robotics, one of 16 NASA Centers for the Commercial Development of Space, are betting on the latter.

They believe the future lies with helium-3, a rare element on Earth that potentially exists in large amounts on the Moon. One ton of this so-called Astrofuel could supply the electrical needs of a city of 10 million people when combined in a fusion reactor with a form of hydrogen, they said. In fact, lunar samples collected by Apollo astronauts show the resource is so plentiful that the Earth's energy needs could be accommodated for at least 1,000 years, researchers added.

However, a great deal of work needs to be done before helium-3-powered fusion plants become a reality. Although the university began its fusion program in 1963 and has since granted some 186 Ph.D.s in the field, no one has yet built a fusion reactor that releases more energy than it consumes. According to theory, fusion reactors operating with deuterium helium-3 are superior to fission reactors because they do not generate high-level radioactive waste.

- more -

But a major stumbling block has been the unavailability of a large source of helium-3 on Earth, said Gerald Kulcinski, a nuclear engineering professor and technical director of the center's Astrofuel project. However, once it was discovered that lunar samples contained the crucial ingredient, "people started looking at it," Kulcinski said. "It had a tremendous effect on fusion studies."

One major step was the establishment of the center, which received seed money from NASA's Office of Commercial Programs to develop technology that eventually can be developed commercially by the private sector. The center also sponsors unrelated projects in the fields of automation, robotics and space-grown food.

In a study finished last year, the center determined that lunar helium-3, which originated from the sun and was deposited on the Moon by the solar wind, could be mined and transported to Earth. Some early estimates place the value of helium-3 equivalent to buying oil at $7 a barrel.

Researchers also have studied possible mining sites. Based on U.S. experience during the Apollo 11 mission, they determined that the Sea of Tranquility was the prime target for initial investigations because it appeared to contain the potential for many tons of helium-3 below the surface. Backup targets include the vicinity of Mare Serenitatis sampled during Apollo 17.

Although models are yet to be built, there are many ideas for lunar mining technology. Center researchers designed solar-powered robotic equipment that would scoop up the top layer of lunar soil and place it into a robotic unit. The soil would be heated, thus separating the helium-3 from other lunar material. The spent material then would be dropped off the back of the moving robotic miner. Because the Moon has one-sixth the Earth's gravity, relatively little energy would be required to lift the material.

In addition, the center's environmental studies show that this method would have minimal impact on the moon. No tracks would be left by the miner because the soil would be smoothed and slightly fluffed up as the spent material was redeposited on the surface. Through this process, other products also would be produced, including nitrogen, methane, helium, water, carbon-oxygen compounds, hydrogen -- all of which are vital to human existence in space, scientists said.

Kulcinski estimates there is enough helium-3 on Earth to demonstrate the first powerplant. By the year 2010 or 2015, however, a larger source will have to be tapped. The question isn't whether the supply is available, he said, but whether the Department of Energy can develop a fusion reactor in time.

- end -

NOTE TO EDITORS AND NEWS DIRECTORS:

The following audiovisual items for this release are available free to media representatives by calling 202/453-8383:

- o Photograph:
  Color: 90-HC-637 B&W: 90-H-703
- o 2 video graphics provided by WCSAR
- o NASA Aeronautics and Space Report (3:28 min. TV feature)

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NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202 453-8400

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For Release

October 17, 1990

RELEASE: 90-140

COBE SPACECRAFT TAKES FIRST IMAGE OF INTERSTELLAR DUST

NASA's Cosmic Background Explorer (COBE) has taken its first image of the entire Milky Way Galaxy in a wavelength that reveals the dust from which planets and galaxies are formed.

COBE investigators presented the images and their latest findings today at an international workshop on cosmology at the University of Maryland, College Park. Instruments aboard the spacecraft measure cosmic background radiation, believed to be the remnant of the "Big Bang," with a precision never before achieved.

Today's image of the Milky Way, taken in far infrared wavelength by the Diffuse Infrared Background Experiment, shows radiation from cold interstellar dust. Last April, COBE scientists released an image taken by the same instrument in the near infrared wavelength, which revealed millions of stars in this galaxy. A comparison of these images shows the difference in the spatial distribution of the galaxy's stellar and interstellar components.

Scientists will continue to study these data in determining the content, energetics and large scale structure of the Milky Way, as well as the nature and distribution of the dust within the Solar System.

In addition, the data will be studied for evidence of a faint, uniform infrared background, the residual radiation from the first stars and galaxies formed following the Big Bang.

- more -

COBE data taken from another instrument, the Differential Microwave Radiometer (DMR), deepen the mystery of how the early universe could have been so smooth, yet split itself into the vast structures now seen. Since last January, results accumulated from the DMR show that the early universe was very smooth; that is, no deviation has been detected in the brightness of the cosmic background radiation down to one part in 25,000.

The three COBE investigators and their research subjects are: Dr. John C. Mather, cosmic microwave background spectrum from the Far Infrared Absolute Spectrometer; Dr. George F. Smoot, data from the Differential Microwave Radiometer; and Dr. Michael G. Hauser, results from the Diffuse Infrared Background Experiment. Dr. Mather and Dr. Hauser are from the Goddard Space Flight Center, Greenbelt, Md., and Dr. Smoot is from the University of California, Berkeley.

COBE was launched November 1989 from Vandenberg Air Force Base, Calif., aboard a Delta launch vehicle. COBE is managed by the Goddard Space Flight Center for the Office of Space Science and Applications.

- end -

EDITOR'S NOTE: Five photographs to illustrate this release is available free to media representatives by calling 202/453-8383.

Color Transparancies	B & W
90-HC-638	90-H-704
90-HC-639	90-H-705
90-HC-640	90-H-706
90-HC-641	90-H-707
90-HC-642	90-H-708

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NASA News

National Aeronautics and
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Washington, D.C. 20546
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For Release

October 19, 1990

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RELEASE: C90-ee

CBI SERVICES, INC. RECEIVES WIND TUNNEL CONTRACT

NASA's Ames Research Center, Mountain View, Calif., will award a $28.2 million contract to CBI Services Inc., Fremont, Calif., for work on the center's 12-foot Pressure Wind Tunnel.

CBI will fabricate, supply and erect the tunnel's external steel shell. The pressure shell is part of the approximately $100 million renovation of the wind tunnel, used to test aircraft models in a variable-density, low-turbulence environment at subsonic speeds up to Mach 0.6, about 60 percent the speed of sound. The wind tunnel restoration, which also involves other contracts, is scheduled for completion in mid-1994.

-end-

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202 453-8400

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For Release
October 19, 1990

RELEASE: 90-141

MAGELLAN TO TEMPORARILY HALT RADAR MAPPING OF VENUS

Nature will force Magellan Project flight controllers at NASA's Jet Propulsion Laboratory, Pasadena, Calif., to temporarily halt radar mapping of the surface of Venus in early November as Venus and Earth near their maximum distance with the sun in between.

The maximum distance between the planets, called superior conjunction, occurs Nov. 1. The sun and Venus will be less than 1 degree apart. While Venus will not actually go behind the disc of the sun, its nearness to the sun from Earth's point of view will cause radio signals passing close to the sun to degrade. JPL controllers will still be able to communicate with Magellan periodically.

The time of superior conjunction was known and planned for early in the Magellan mission planning.

Loss of the radio link at the S-band frequency, which transmits telemetry to Earth stations through the high-gain antenna at 1200 bits per second (bps), is predicted for Saturday when the angle between Venus and the sun, measured from Earth, narrows to 3.4 degrees.

But another Magellan radio frequency, called X-band, is degraded less by the hot plasma around the sun, and controllers said they expect to be able to command the spacecraft by X-band each day through more than a week of superior conjunction.

Use of X-band for the uplink started on Saturday, Oct. 13. Its use both to and from the spacecraft is predicted to last until Oct. 27. The radio downlink rate is 268 kilobits per second (kbps).

- more -

Solar activity will determine how much the radio signals degrade and how long mapping will be halted. Magellan project officials will make go or no-go decisions on mapping on a day by day basis.

On Oct. 29, the spacecraft's computer automatically will halt mapping for at least 9 days. The mapping could be halted for as long as 2 weeks, however, depending on solar activity. If solar activity is very heavy, fight controllers will switch earlier into the spacecraft's computer sequence by ground command.

The first standard mapping sequence at 268 kbps, with telemetry communication with Earth at 1200 bps, is scheduled to resume on Nov. 21.

Magellan is managed by JPL for the Office of Space Science and Applications, Wash., D.C.

- end -

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NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202 453-8400

For Release

Dwayne C. Brown
Headquarters, Washington, D.C.
(Phone: 202/453-8956)

October 22, 1990

N90-82
NOTE TO EDITORS

NASA/CONTRACTORS CONFERENCE SCHEDULED FOR OCT. 24-25

The seventh annual NASA/Contractors Conference on Quality and Productivity will take place at the Grenelefe Resort and Conference Center, Grenelefe, Fla.(near Orlando) on Oct.24-25, 1990. The conference will feature various panel discussions on the importance of commitment and leadership in implementing Total Quality Management (TQM) within the NASA team and the aerospace industry.

NASA Administrator Richard H. Truly will give the opening keynote address and chair a "Top Leadership" panel consisting of Lockheed chairman of the board and CEO Daniel Tellep and Deputy Secretary of Commerce Thomas Murrin. A highlight of the conference will occur when NASA Deputy Administrator J. R. Thompson announces the 1990 Excellence Award recipient(s) at a banquet that evening.

The 1990 finalists are:
Barrios Technology, Inc., Houston, Texas
Bendix Field Engineering Corp., Seabrook, Md.
Boeing Computer Support Services, Integrated Information Services, Marshall Space Flight Center, Huntsville, Ala.
EG&G Florida, Inc., Kennedy Space Center, Fla.
Grumman Technical Services Division, Titusville, Fla.
Honeywell Inc., Space & Strategic Systems Operation, Clearwater, Fla.
Marotta Scientific Controls, Inc. Montville, N.J.
Rockwell International Corp. Space Systems Div., Downey, Calif.
Unisys Defense Systems, Houston Operations, Texas

Media interested in covering the event or requesting interviews should contact the Kennedy Space Center Public Affairs Office (407) 867-2468.

-end-

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202 453-8400

For Release

October 22, 1990

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Linda S. Ellis
Lewis Research Center, Cleveland
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RELEASE: 90-142

NASA TECHNOLOGIES BENEFIT MEDICAL ORTHOPEDIC SCIENCE

NASA's expertise in structural mechanics, design optimization and computer codes is finding application in medical orthopedic science.

NASA Lewis Research Center scientists and Case Western Reserve University medical specialists and scientists are working together in Cleveland to increase the life of surgically replaced human joints by providing the capability to custom design prosthetic joint implants.

The objective of the program is to develop a computer code to design orthopedic implants to provide a custom fit of the prosthetic joint for each patient to ensure a prosthetic joint life span of some 20 years and a corresponding minimum of discomfort to the patient. Using today's orthopedic procedures, a prosthetic joint may provide a serviceable life of as little as 4 years, with an average life of about 7 years.

Today's orthopedic joint replacement practice is to fit the patient to the prothesis rather than, ideally, fitting the prothesis to the patient. Because the fit by today's practice is often less than perfect, the bone immediately surrounding the prothesis often deteriorates from uneven loading causing the prothesis to loosen. That results in the need to replace the prothesis.

- more -

Using computer programs developed for aerospace technology and modified for prothesis design, the prothesis will be able to be designed for each patient. With an optimally designed fit, the patient's weight and joint movements would be more evenly distributed on the supporting bone, eliminating bone deterioration and prothesis loosening.

NASA Lewis Research Center is providing expertise in computational mechanics and has developed a pilot computer code through the adaptation of modules from presently existing Lewis computer codes.

The university is providing the expertise in the area of orthopedic biomechanics. Pertinent areas under study include implant material and bone/tissue compatibility; correct implant placement and alignment; joint configuration and implant mating surfaces; joint mobility; joint durability; preservation of bone in and near the implant regions; and minimization of discomfort and cost to the patient.

According to Dr. Christos Chamis, senior aerospace scientist in the Lewis Research Center's Structures Division, "Our approach focuses on assembling many structural analyses and design modules along with defining the problem parameters to produce a computer code for optimizing prosthetic knee joints. After the study for knee joints is complete, we will begin studies for other prosthetic body joints."

By Congressional mandate, NASA is charged with stimulating the widest possible use of the large storehouse of technology built over more than a quarter century of space exploration and 6 decades of aeronautical research.

Through its Technology Utilization Program, NASA seeks to encourage greater use of the knowledge bank by providing a link between the technology and those that might put it to an advantageous secondary use. The aim is to accelerate and broaden the technology transfer process and to gain national benefit in terms of new products, new processes, new jobs and a bonus return on the funds invested in aerospace research.

- end -

A photograph is available free to media representatives to illustrate this release by calling 202/453-8383. **B&W:** 90-H-709

NASA news releases and other information are available electronically on CompuServe and GEnie, the General Electric Network for Information Exchange. For information on CompuServe, call 1-800/848-8199 and ask for representative 176. For information on GEnie, call 1-800/638-9636.

NASA News

National Aeronautics and
Space Administration

Washington, D.C. 20546
AC 202 453-8400

For Release

Dwayne C. Brown
Headquarters, Washington, D.C.
(Phone: 202/453-8956)

October 24, 1990

RELEASE: 90-143

NASA RENAMES EXCELLENCE AWARD FOR GEORGE M. LOW

NASA Administrator Richard H. Truly today announced that the NASA Excellence Award has been renamed the George M. Low Trophy. It is NASA's quality and excellence award to honor one of America's outstanding space pioneers.

"George Low represented quality and excellence like few others....If NASA is synonymous with excellence, George Low is synonymous with NASA", Truly said. He added that during Low's nearly three decades of service to NASA, he was "involved in every success the American space program had."

Truly's remarks came in his keynote address opening the Seventh Annual NASA/Contractors Conference in Grenelefe, Fla. The two-day conference features panel discussions on implementing Total Quality Management (TQM) within NASA and the aerospace industry.

Truly said that the American space program today "stands at a crossroad. We are entering a new age of space exploration where we will find countless doors of opportunity...to learn more about this precious planet we live on, about our neighboring planets and about what lies beyond the solar system. We have the opportunity to establish a permanent presence in Earth orbit, colonize the Moon and explore the planet Mars."

NASA Deputy Administrator J.R. Thompson will announce the 1990 recipient(s) of the George M. Low Trophy tonight. The award recognizes NASA prime contractors, subcontractors and suppliers for outstanding achievement in quality and productivity improvement and TQM.

-end-

NASA News

National Aeronautics and
Space Administration

Washington, D.C. 20546
AC 202 453-8400

Barbara Selby
Headquarters, Washington, D.C.
(Phone: 703/557-5609)

For Release

October 25, 1990

NTE-83 EDITORS NOTE: TECHNOLOGY 2000 BRIEFING SCHEDULED

A press briefing on Technology 2000, the first industrial exposition and conference to showcase the transfer of NASA's technology to American business, will take place on Tuesday, Oct. 30 at 2 p.m. EST, in the 6th floor auditorium, NASA Headquarters, 400 Maryland Ave., S.W., Washington, D.C.

Participants will include James T. Rose, NASA Assistant Administrator for Commercial Programs; Leonard A. Ault, Deputy Director, Technology Utilization Division; and Bill Schnirring, Publisher and Editor-in-Chief, NASA Tech Briefs.

The briefing will be carried on NASA Select television, Satcom F2R, transponder 13, frequency 3960 MHz, 72 degrees west longitude.

- end -

NASA news releases and other information are available electronically on CompuServe and GEnie, the General Electric Network for Information Exchange. For information on CompuServe, call 1-800/848-8199 and ask for representative 176. For information on GEnie, call 1-800/638-9636.

NASA News

National Aeronautics and
Space Administration

Washington, D.C. 20546
AC 202 453-8400

Barbara Selby
Headquarters, Washington, D.C.
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For Release
October 25, 1990

RELEASE: 90-144

NASA SELECTS SMALL BUSINESS INNOVATION RESEARCH PROPOSALS

NASA announced today the selection of 280 research proposals for immediate negotiation of Phase I contracts in NASA's 1990 Small Business Innovation Research Program (SBIR). Proposals selected were submitted by 229 small, high technology firms located in 30 states.

SBIR objectives are to stimulate technological innovation in the United States by using small business, including minority and disadvantaged firms, to help meet federal research and development needs and to encourage commercial applications of federally supported research innovations.

These SBIR awards were selected competitively from 2148 proposals received in response to the SBIR solicitation which closed July 16, 1990. Selections were made on the basis of scientific and technical merit, capabilities of the firm and value of the proposed research innovations to NASA.

This is the 8th year of the NASA SBIR program, which is conducted in accordance with Public Law 97-219, the Small Business Innovation Development Act of 1982 as amended by Public Law 99-443.

Phase I projects are 6-month, fixed-price contract efforts, normally not exceeding $50,000, to establish the feasiblity of innovative research concepts proposed by the contractor to meet agency R&D needs or opportunities described in the SBIR program solicitation.

Firms successfully completing Phase I may compete for Phase II contracts for further development. Approximately one-half of the Phase I projects proceed into Phase II, depending on availability of funds. Phase II contracts do not normally exceed 2-years duration and $500,000 value.

- more -

Phase III activities may be commercial-development funded by the private sector or may be procurement or continued development for government use funded outside the SBIR program by NASA or other agencies.

As required by law, NASA allocates 1.25 percent of its annual research and development budget for SBIR. Approximately $14 million of NASA's 1991 SBIR budget will fund these 280 Phase I projects.

The program is managed by NASA's Office of Commercial Programs, NASA Headquarters, Washington, D.C., and all individual SBIR projects are managed by 9 NASA field centers.

- end -

EDITOR'S NOTE: A listing of companies selected for this program is available at NASA Headquarters (Phone: 202/453-8400) and all NASA field centers.

NASA 90-1 PHASE I AWARD DISTRIBUTIONS
October 25, 1990

STATE	AWARDS	FIRMS
Alabama	11	8
Arizona	4	3
California	72	61
Colorado	11	10
Connecticut	6	5
Florida	7	7
Georgia	6	6
Hawaii	3	1
Illinois	3	3
Indiana	1	1
Louisiana	1	1
Maryland	10	10
Massachusetts	47	30
Michigan	9	5
Minnesota	4	4
Mississippi	1	1
Nevada	3	3
New Hampshire	4	1
New Jersey	6	5
New Mexico	4	3
New York	13	13
Ohio	9	8
Oregon	4	2
Pennsylvania	7	6
Tennessee	4	4
Texas	10	10
Utah	4	4
Virginia	4	4
Washington	9	7
Wisconsin	3	3

- end -

NASA News

National Aeronautics and
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Washington, D.C. 20546
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Dwayne C. Brown
Headquarters, Washington, D.C.
(Phone: 202/453-8956)

For Release
October 25, 1990

RELEASE: 90-145

NASA PRESENTS EXCELLENCE AWARD TO ROCKWELL AND MAROTTA

The Rockwell International, Space Systems Division, Downey, Calif., and Marotta Scientific Controls, Inc., Montville, N.J., have been named recipients of the 1990 George M. Low Trophy.

The excellence award, renamed the George M. Low Trophy by NASA Administrator Richard H. Truly, recognizes NASA prime contractors, subcontractors and suppliers for outstanding achievement in quality and productivity improvement and total quality management.

NASA Deputy Administrator J. R. Thompson, Jr., announced the selection last night at the Seventh Annual NASA/Contractors Conference, Grenelefe, Fla. "These two firms have demonstrated exceptional performance in attaining a level of quality and productivity that commands our respect and deep appreciation", said Thompson.

Rockwell's Space Systems Division provides a diverse base of products and services ranging from production of the fifth Space Shuttle orbiter to existing orbiter refurbishment and a variety of specialized studies in support of space operations.

Marotta provides critical valves and systems for NASA flight vehicles, launch pads and engine test facilities. Marotta also is the first recipient of the award in the newly established small business category.

The seven other finalists for the 1990 award were:
- o Barrios Technology, Inc., Houston
- o Bendix Field Engineering Corp., Seabrook, Md.
- o Boeing Computer Support Services, Huntsville, Ala.
- o EG&G Florida, Inc., Fla.
- o Grumman Technical Services Division, Titusville, Fla.
- o Honeywell, Inc., Clearwater, Fla.
- o Unisys Corp., Space Systems Division, Houston

- more -

Award criteria, developed by NASA in conjunction with the American Society for Quality Control, Milwaukee, were used to judge nominees on performance achievements and improvements in customer satisfaction, quality and productivity levels. Emphasis was placed on management commitment, goals and measures, communication, health and safety, work force training, award recognition and subcontractor involvement.

"Since NASA established the award in 1984, hundreds of NASA's contractor partners have participated in the rigorous and valuable evaluation process . . . a process which measures sustained and demonstrated achievement in a broad range of criteria", said George A. Rodney, NASA Associate Administrator for Safety and Mission Quality.

Key goals of the award are to institutionalize quality and productivity practices, not only throughout NASA and the agency's contractors, but also the rest of the industrial world.

Information on the 1991 award program can be obtained by contacting NASA Headquarters, Mail Code QB, 600 Independence Ave., S.W., Washington, D.C. 20546 (phone: 202/453-8415), or by writing to the American Society for Quality Control, 310 West Wisconsin Ave., Milwaukee 53203 (414/272-8575).

-end-

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202 453-8400

Paula Cleggett-Haleim
Headquarters, Washington, D.C.
(Phone: 202/453-1547)

For Release

October 25, 1990

RELEASE: 90-146

HUBBLE TO OBSERVE SATURN'S GREAT WHITE SPOT

NASA's Hubble Space Telescope (HST) is now scheduled to observe Saturn's newly discovered white spot in early November. The "Great White Spot," now termed the "Wilber Spot" after amateur astronomer Steuart Wilber from Las Cruces, N.M., was discovered September 24.

According to the Central Bureau for Astronomical Telegrams, the Wilber Spot was over 10,000 miles across, larger than the Earth, on October 1. Twenty-one hours later it had grown an additional 2,000 miles. Currently, the spot has a diameter of over 50,000 miles, is larger than the famous "Great Red Spot" on Jupiter and covers much of one hemisphere of Saturn.

Also in the last few weeks, the spot has become even more complex. New spots have been seen within the main feature and two separate white, round spots have formed. One side of the main spot seems darkened, as if the Wilber Spot is a raised feature casting a shadow.

Dan Green of the International Astronomical Union's Central Bureau for Astronomical Telegrams, Cambridge, Mass., has said that the Wilber Spot seems "almost fluorescent" in appearance.

In 1933, astronomers reported a phenomenon similar to the present disturbance. Since that time, no other Saturnian event has approached this magnitude. As seen from Earth, Saturn is in the evening sky and sets before midnight in late October.

HST's Wide Field Planetary Camera will record several images per orbit, for two orbits per day, on 3 days. The images will be recorded in two colors, blue and near infrared.

Observing times have been chosen with considerable care because Saturn rotates rapdily - a "day" on Saturn lasts about 10 hours. An added complication is that, over time, the angle between Saturn and the Sun, from HST, is becoming smaller, making observations progressively more difficult.

- end -

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202 453-8400

Mark Hess
Headquarters, Washington, D.C.
(Phone: 202/453-4164)

For Release
October 30, 1990

EDITORS NOTE: N90-85

MONTHLY SPACE FLIGHT BRIEFING CHANGED TO NOVEMBER 7

The Office of Space Flight has changed the date of the next monthly press briefing to Wednesday, November 7, from 3:00 p.m. to 5:00 p.m. EST. The briefing was originally planned for November 1 (as announced by Editor's Note N90-84 on October 29).

Participating in the briefings will be Dr. William Lenoir, Associate Administrator For Space Flight; Robert Crippen, Director, Space Shuttle; and Richard Kohrs, Director, Space Station Freedom. The briefing will be held in the video teleconference facility, Room 531, in NASA Bldg. 10-B, 600 Independence Ave., S.W.

- end -

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202 453-8400

For Release

October 30, 1990

Jim Cast
Headquarters, Washington, D.C.
(Phone: 202/453-8536)

Dick Young
Kennedy Space Center, Fla.
(Phone: 407/867-2468)

N90-86: STS-38 LAUNCH SET, STS-35 TANKING BRIEFING SCHEDULED

NASA and DoD managers today established Nov. 9th as the target date for the launch of STS-38 Space Shuttle Atlantis. The 4-hour launch period for this classified DoD flight begins at 6:30 p.m. EST.

Additionally, a press briefing will be held today following completion of the STS-35 Columbia tanking test at Kennedy Space Center, Fla. The briefing, time to be determined, will be carried live on NASA Select television with 2-way question and answer capability.

The decision to launch Atlantis on the 9th was made following the STS-38 Flight Readiness Review at NASA's Kennedy Space Center. On October 24, Atlantis successfully passed a special tanking test designed to assure the absence of significant liquid propellant leaks, both hydrogen and oxygen. No major obstacles have surfaced since that time which would preclude launch on the targeted date.

The five-man crew for this 37th Space Shuttle mission is commanded by 44-year-old Richard O. Covey, an Air Force Colonel. Sitting in the right seat will be Pilot Frank L. Culbertson, Jr., 41, a Navy Commander. Three STS-38 Mission Specialists will be flying aboard Atlantis: Air Force Lt. Colonel Carl J. Meade, 39; Marine Corps Colonel Robert C. Springer,48; and 35-year-old Army Captain Charles D. (Sam) Gemar. Both Covey (twice) and Springer (once) have flown in space before aboard the Shuttle.

- end -

NASA News

National Aeronautics and
Space Administration

Washington, D.C. 20546
AC 202 453-8400

Barbara Selby
Headquarters, Washington, D.C.
(Phone: 703/557-5609)

For Release

October 30, 1990

RELEASE: 90-147

TECHNOLOGY 2000: NASA OUTREACH TO AMERICAN BUSINESS

TECHNOLOGY 2000, the first industrial exposition and conference to showcase the transfer of NASA technology to American business, will take place on Nov. 27-28 at the Washington Hilton Hotel, Washington, D.C. Dr. D. Allan Bromley, Assistant to the President for Science and Technology, will present the keynote address at 8:45 a.m. on Nov. 27.

This premier national event also will feature speakers and exhibitors from NASA and its contractors, who will address prior and potential spinoffs of the agency's research. Additionally, current and planned research and development innovations now coming on line from the Earth Observation System, the National Aero-Space Plane and moon-Mars studies will be spotlighted.

During the 2-day symposium, more than 100 presentations by NASA and industry leaders will address the following topics: artificial intelligence; computer technology and software engineering; environmental science; human factors engineering and life sciences; information and data management; manufacturing and fabrication technology; materials science; optics and communications; power, energy and control systems; robotics; sensors and measurement technology and superconductivity.

The show will feature more than 150 exhibitors representing the space agency's field centers, major contractors, spinoff companies, non-aerospace high-tech firms, state technology transfer offices, university research centers, Small Business Innovation Research program contract recipients and NASA Centers for the Commercial Development of Space.

In a special session, information will be presented on how industry can gain access to new and emerging technologies through the NASA Technology Utilization Division.

- more -

A highlight of TECHNOLOGY 2000 will be an awards dinner to celebrate NASA achievements in technology transfer and to honor the agency and its contractor contributors to "NASA Tech Briefs." The awards will be presented by the Technology Utilization and Associated Business Publications, Inc., publisher of the agency periodical which now reaches more than 200,000 subscribers in U.S. industry.

The exposition and conference are sponsored by NASA, the Technology Utilization Foundation non-profit organization and "NASA Tech Briefs" monthly magazine devoted to transferring technical innovations to private industry. The event seeks to increase the level of technology transfer to non-aerospace firms.

- end -

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NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202 453-8400

For Release
November 1, 1990
11:00 a.m. EST

STATEMENT BY SHUTTLE DIRECTOR ROBERT CRIPPEN ON STS-38 & STS-35 MISSION STATUS

"NASA is working with the Air Force to help resolve the anomalies discovered during cargo testing. Due to the classified nature of the payload, details of the work being conducted can not be discussed. I am confident that the launch team will resolve the problems so that Atlantis and the STS-38 mission can be launched. At this time, we are continuing to proceed with the schedule to fly STS-38 before STS-35."

"With regard to Shuttle Mission STS-35, data from the tanking test on Columbia confirmed that the problem of excess hydrogen in the aft of the orbiter has been resolved. Columbia and the Astro/BBXRT payload are now being prepared for flight. I am optimistic about flying the STS-35 mission sometime in December. A specific target launch date for the mission will not be determined until after the Flight Readiness Review has been conducted and performance data from the STS-38 mission has been analyzed."

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202 453-8400

Barbara Selby
Headquarters, Washington, D.C.

(Phone: 703/557-5609)

For Release
November 2, 1990

RELEASE: 90-148

NASA, TADCORPS SIGN INFORMATION EXCHANGE AGREEMENT

The National Aeronautics and Space Administration and the Technical and Administrative Services Corp. (TADCORPS), Washington, D.C., have signed a memorandum of understanding which will provide a forum for the exchange of research information associated with closed environment systems related to food production both on Earth and in space.

NASA and TADCORPS have mutual interests in the development of hydroponic technology for possible microgravity and partial gravity life sciences support. NASA is interested in exploring controlled environment systems and hydroponics technology to develop the food production systems necessary to sustain crewmembers on long-duration space missions such as establishment of lunar communities or an expedition to Mars. The agency also is interested in chemical processes associated with waste recycling and management.

TADCORPS is exploring development research concepts for test facilities which could provide technology applications for domestic farm crop enrichment in hostile environments in remote regions of the world.

The 2-year agreement, which involves no exchange of funds, provides for NASA and TADCORPS to share information generated from studies in three areas:

* Potential development of hydroponic systems and agricultural experiments and uses aboard the Space Shuttle and Space Station Freedom;

* Potential chemical processing technology in support of life support and hydroponic systems; and

- more -

* Possible terrestrial applications of closed environment systems and hydroponic technology through fixed and deployable hydroponic test facilities.

TADCORPS will provide a summary report to NASA prior to the conclusion of the agreement.

- end -

NASA news releases and other information are available electronically on CompuServe and GEnie, the General Electric Network for Information Exchange. For information on CompuServe, call 1-800/848-8199 and ask for representative 176. For information on GEnie, call 1-800/636-9636.

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202 453-8400

For Release

Barbara Selby
Headquarters, Washington, D.C.
(Phone: 703/557-5609)

November 2, 1990

N90-87
NOTE TO EDITORS:

NEWS MEDIA REGISTRATION FOR TECHNOLOGY 2000

News media representatives are invited to attend Technology 2000, NASA's first national technology transfer conference scheduled for Nov. 27-28 at the Washington Hilton Hotel, Washington, D.C.

This premiere national event will feature speakers and exhibitors from NASA and its contractors who will address prior and potential spinoffs of the agency's research.

In addition to attending the symposia and visiting the exhibit hall, news media are invited to attend a press reception on Monday evening, Nov. 26.

Members of the press will receive complimentary registration. However, to ensure receipt of your badge prior to the conference, advance registration is requested by Nov. 9. Please complete the attached form and mail or FAX to:

Technology Utilization Foundation
41 East 42nd Street - Suite 921
New York, NY 10017
FAX 212/986-7864

-end-

MEDIA PREREGISTRATION FORM

Technology 2000
November 27-28, 1990
Washington Hilton Hotel, Washington, D.C.

Please print or type:

NAME _____

ORGANIZATION _____

ADDRESS _____

CITY/STATE/ZIP/POSTAL CODE _____

COUNTRY _____

TELEPHONE _____

I plan to attend the meeting on:

Tuesday, November 27 ___
Wednesday, November 28 ___

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202 453-8400

Sarah Keegan
NASA Headquarters, Washington, D.C.
Phone: 202/453-2754)

For Release

November 5, 1990
4 P.M. EST

Del Harding
Ames Research Center, Mountain View, Calif.
(Phone: 415/604-9000)

Nancy Lovato
Ames-Dryden Flight Research Facility, Edwards, Calif.
(Phone: 805/258-3448)

RELEASE: 90-149

NEW AMES RESEARCH CENTER DEPUTY DIRECTOR TO HEAD AMES-DRYDEN

Arnold D. Aldrich, NASA Associate Administrator for Aeronautics, Exploration and Technology, today announced an organizational change at NASA's Ames Research Center, Mountain View, Calif., designed to reinforce and strengthen national flight research capabilities at the Ames-Dryden Flight Research Facility (DFRF), Edwards, Calif. A new Ames Deputy Center Director position will be located at Dryden and will serve as the Director of the Dryden facility. All administrative and operational organizational elements of Dryden will report to this individual.

In announcing the change, Aldrich said "This updated management structure at Ames will take advantage of Ames' institutional capability to conduct research along a full continuum, ranging from computation through validation flight test. It simultaneously will provide enhanced recognition for the unique capabilities of Dryden for conceiving and executing national flight-test programs."

Kenneth J. Szalai has been selected as the Ames Deputy Director who, under the new Ames' management organization, will be located at Dryden and will direct Dryden's research and operations, effective Dec. 3, 1990. The appointment was announced today by Dr. Dale Compton, Ames Director.

- more -

"This appointment recognizes the importance of flight research to the nation's aeronautics program and underscores Dryden's importance as a national asset for conducting this research," said Compton. "Szalai is an internationally recognized expert on flight control and flight systems and has extensive experience with flight research. He is particularly well qualified to take this leadership position."

Martin A. Knutson, Director of the Flight Operations and Research Directorate, will return to the Ames Mountain View site to direct flight operations there. "Knutson has done an excellent job at Dryden and the additional experience he has gained will add to the already close coordination between the two sites," Compton said.

Szalai, 48, previously served as Chief of the Research Engineering Division at Dryden. He joined NASA in 1964 and held various research and systems engineering positions of increasing responsibility before moving into management as a branch chief. He also was principal investigator on the first digital fly-by-wire aircraft.

Szalai has authored over 25 technical papers and reports. He is a fellow of the American Institute of Aeronautics and Astronautics. Szalai has received numerous awards including the NASA Exceptional Service Medal, the NASA Outstanding Leadership Medal and the Presidential Rank of Meritorious Executive.

Szalai received a bachelor's degree in electrical engineering from the University of Wisconsin in 1964 and a master's degree in mechanical engineering from the University of Southern California in 1970.

He and his wife reside in Lancaster, Calif., with their three children.

-end-

NASA news releases and other information are available electronically on CompuServe and GEnie, the General Electric Network for Information Exchange. For information on CompuServe, call 1-800/848-8199 and ask for representative 176. For information on GEnie, call 1-800/638-9636.

NASA News

National Aeronautics and
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Washington, D.C. 20546
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Paula Cleggett-Haleim
Headquarters, Washington, D.C.
(Phone: 202/453-1547)

Jim Elliott
Goddard Space Flight Center, Greenbelt, Md.
(Phone: 301/286-6256)

For Release
November 6, 1990

N90-88

NOTE TO EDITORS: HUBBLE IMAGES OF ORION NEBULA AVAILABLE

Two images of the Orion Nebula taken by the Wide Field/Planetary Camera on NASA's Hubble Space Telescope will be available to the media this afternoon at NASA Headquarters, Goddard Space Flight Center and the Jet Propulsion Laboratory.

-end-

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202 453-8400

Mark Hess/Ed Campion
Headquarters, Washington, D.C.
(Phone: 202/453-8536)

Lisa Malone
Kennedy Space Center, Fla.
(Phone: 407/867-2468)

For Release

November 7, 1990
2 P.M. EST

LAUNCH ADVISORY FOR SHUTTLE MISSIONS STS-38 AND STS-35

NASA managers today set Nov. 15, 1990 as the new target launch date for Shuttle mission STS-38, a dedicated Department of Defense mission. Launch of Atlantis and the STS-38 mission was delayed from its original target date of Nov. 9, 1990, due to payload problems.

Start of the 4-hour launch opportunity period remains the same at 6:30 p.m. EST. This will be the 7th flight of Space Shuttle Atlantis and the 37th Space Shuttle mission.

Preparations for the launch of Space Shuttle Columbia and the STS-35/Astro-1 mission continue on schedule at Pad 39-B. The flight readiness review (FRR) for STS-35 is currently scheduled for Nov. 26-27, 1990. Following analysis of performance data from STS-38 and the standard review of mission status at the FRR, a target date for the Astro-1 mission will be announced.

"Processing of Atlantis for the STS-38 mission is going well", said Space Shuttle Director Robert Crippen. "If the remaining scheduled work for STS-38 goes as planned and no unexpected obstacles arise, I'm confident that we will launch on Nov. 15th and that we'll be flying Columbia sometime in early December."

- end -

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202 453-8400

For Release

Paula Cleggett-Haleim
Headquarters, Washington, D.C.

(Phone: 202/453-1547)

November 13, 1990

RELEASE: 90-150

NASA SELECTS INVESTIGATIONS FOR CASSINI SATURN ORBITER MISSION

NASA has selected the principal investigators and science teams for the Saturn Orbiter portion of the Cassini mission, scheduled for launch in 1996. The investigators come from 11 U.S. universities, 3 NASA centers and 3 other U.S. laboratories as well as 13 foreign countries.

The Saturn Orbiter will include 62 investigations encompassing analysis of the structure and composition of Saturn's atmosphere, the physical properties of ring particles, a survey of moonlets within the rings and a close look at several moons. The Cassini Saturn Orbiter also will deploy the Huygens Probe, supplied by the European Space Agency (ESA), which will descend through the atmosphere to the surface of Saturn's moon Titan.

The Cassini mission is named after the 17th century astronomer Jean Dominique Cassini who discovered several of Saturn's moons and the major divisions of its rings. The first spacecraft to visit Saturn since the 1981 flyby by Voyager 2, Cassini will stay within the Saturnian system for 4 years and pass within a few hundred kilometers of several of Saturn's moons. Cassini's onboard cameras will take detailed pictures of the intensely cratered surfaces of the icy moons, map their topography with high-resolution radar and determine the surface composition with spectroscopic instruments.

Onboard radar also will map a large portion of Titan's cloud-shrouded surface, much like the Magellan mission at Venus. Instruments on both the Orbiter and the Probe will investigate the chemical processes that produce the large moon's unique atmosphere. These processes may resemble the prebiological chemical evolution which took place on the primitive Earth.

- more -

The Probe, named for the 17th century scientist Christian Huygens who discovered the true shape of Saturn's rings, will examine the atmosphere and clouds and takes pictures of the surface during its 3-hour descent. If it survives the landing, the Huygens Probe will continue to make measurements and relay data to the Saturn Orbiter until it loses radio contact. One intriguing question that scientists hope Cassini will answer is whether there are oceans of liquid hydrocarbons on the moon's surface resulting from photochemical processes in Titan's upper atmosphere. ESA recently announced the selection of investigations to be conducted by the Cassini Huygens Probe.

The investigators also will examine the interactions of Saturn's magnetosphere with dust and moonlets in the rings and with Titan's atmosphere. This study will enable scientists to gain an understanding of the processes involving interaction of plasma, dust and radiation which were important during the formation of planets in the early solar system.

Cassini's trajectory to Saturn takes it through the asteroid belt and close to Jupiter for a gravity-assist flyby. This trajectory will allow investigators to study an asteroid and make observations of the Jovian system in addition to its planned study of the Saturnian system, complementing the missions of two other spacecraft, the Comet Rendezvous Asteroid Flyby (CRAF) and the Galileo mission to Jupiter.

The CRAF and Cassini missions have been programmatically combined into a single effort by NASA to enhance their ability to pursue common scientific objectives and reduce the overall development cost. Both spacecraft are based on the Mariner Mark II design with much of the flight hardware identical except for minor modifications for unique science investigations.

Cassini is a joint project of NASA and ESA. Cassini mission development and operations will be conducted by NASA's Jet Propulsion Laboratory in Pasadena, Calif. John Casani is the Project Manager and Dr. Dennis Matson is the Project Scientist. The CRAF/Cassini Program is managed by the Office of Space Science and Applications, NASA Headquarters, Washington, D.C.

- end -

EDITOR'S NOTE: A listing of the selected Cassini Saturn Orbiter principal investigators and teams accompanies this release. A description of the instruments on the Cassini Orbiter is available to media representatives by calling (202) 453-8400.

INVESTIGATIONS SELECTED FOR THE CASSINI SATURN ORBITER INVESTIGATION ACCOMMODATION PHASE

PRINCIPAL INVESTIGATOR, INSTRUMENT PAYLOAD

Virgil G. Kunde, Infrared Fourier Spectrometer, NASA Goddard Space Flight Center

Eberhard Grun, Cosmic Dust Analyzer, Max-Planck-Institut fuer Kernphysik, Federal Republic of Germany

Donald A. Gurnett, Plasma and Radio Wave System, University of Iowa

David T. Young, Plasma Spectrometer, Southwest Research Institute

Larry W. Esposito, Ultraviolet Spectrometer and Imager, University of Colorado

Stamatios M. Krimigis, Magnetospheric Imaging Instrument, Johns Hopkins University

David J. Southwood, Dual Technique Magnetometer, Imperial College, United Kingdom

INTERDISCIPLINARY SCIENTISTS

Tobias C. Owen, Atmospheres, University of Hawaii

Jeffrey N. Cuzzi, Rings and Dust, NASA Ames Research Center

Laurence A. Soderblom, Satellites and Asteriods, U.S. Geological Survey

Michel Blanc, Magnetosphere and Plasma, Observatoire Midi-Pyrenees, France

Tamas I. Gombosi, Magnetosphere and Plasma, University of Michigan

James B. Pollack, Origin and Evolution, NASA Ames Research Center

Darrell F. Strobel, Aeronomy and Solar Wind Interaction, Johns Hopkins University

FACILITY INSTRUMENT TEAMS

Titan Radar Mapper:

Charles Elachi, NASA Jet Propulsion Laboratory, Team Leader

Randolph L. Kirk, U.S. Geological Survey

Chris G. Rapley, University College, United Kingdom

Giovanni Picardi, Universita di Roma, Italy

Charles A. Wood, University of North Dakota

Steven J. Ostro, NASA Jet Propulsion Laboratory

Howard A. Zebker, NASA Jet Propulsion Laboratory

Imaging Science Subsystem:

Carolyn C. Porco, University of Arizona, Team Leader

Gerhard Neukum, Deutsche Agentur fuer Raumfahrtangelegenheiten GmbH, Federal Republic of Germany

Steven W. Squyres, Cornell University

Peter C. Thomas, Cornell University

Alfred S. McEwen, U.S. Geological Survey

Torrence V. Johnson, NASA Jet Propulsion Laboratory

Joseph Veverka, Cornell University

Henry C. Dones, Jr., University of Toronto, Canada

Carl D. Murray, University of London, United Kingdom

Joseph A. Burns, Cornell University

Andre Brahic, Observatoire de Paris-Meudon, France

Anthony D. Del Genio, NASA Goddard Institute for Space Studies

Andrew P. Ingersoll, California Institute of Technology

Robert A. West, NASA Jet Propulsion Laboratory

Radio Science Subsystem:

Arvydas J. Kliore, NASA Jet Propulsion Laboratory, Team Leader

Andrew F. Nagy, University of Michigan

F. Michael Flasar, NASA Goddard Space Flight Center

Richard G. French, Wellesley College

Essam A. Marouf, Stanford University

John D. Anderson, NASA Jet Propulsion Laboratory

Nicole Borderies, Observatoire Midi-Pyrenees, France

Hugo D. Wahlquist, NASA Jet Propulsion Laboratory

Bruno Bertotti, Universita di Pavia, Italy

Luciano Iess, Istituto di Fisica dello Spazio Interplanetario, Italy

Ion and Neutral Mass Spectrometer:

A Facility Instrument Definition Team is to be appointed. A Science Team will be solicited through a separate announcement of opportunity.

Visual and Infrared Mapping Spectrometer:

Facility Instrument approved for Investigation Accommodation Phase; to be included in payload only if resources permit.

Robert H. Brown, NASA Jet Propulsion Laboratory, Team Leader

Dale P. Cruikshank, NASA Ames Research Center

Roger N. Clark, U.S. Geological Survey

Andrea Carusi, Istituto di Astrofisica Spaziale, Italy

Angioletta Coradini, Istituto di Astrofisica Spaziale, Italy

Jean-Pierre Bibring, Universite de Paris Sud-Orsay, France

Christophe Sotin, Universite de Paris Sud-Orsay, France

Yves Langevin, Universite de Paris Sud-Orsay, France

Robert M. Nelson, NASA Jet Propulsion Laboratory

Ralf Jaumann, Deutsche Agentur fuer Raumfahrtangelegenheiten GmbH, Federal Republic of Germany

Dennis L. Matson, NASA Jet Propulsion Laboratory

Kevin H. Baines, NASA Jet Propulsion Laboratory

Vittorio Formisano, Istituto Fisica Plasma Interplanetario, Italy

Michael Combes, Observatoire de Paris-Meudon France

Pierre Drossart, Observatoire de Paris-Meudon, France

Bruno Sicardy, Observatoire de Paris-Meudon, France

- end -

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NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202 453-8400

Paula Cleggett-Haleim
Headquarters, Washington, D.C.
(Phone: 202/453-1547)

Bob MacMillin
Jet Propulsion Laboratory, Pasadena, Calif.
(Phone: 818/354-5011)

For Release

November 14, 1990

N90-89 EDITOR'S NOTE: MAGELLAN NEWS CONFERENCE SCHEDULED

There will be a Magellan mission news conference at the Jet Propulsion Laboratory's von Karman Auditorium at 1 p.m. EST, Friday, Nov. 16. Speakers will discuss spacecraft status and recent science results.

Speakers will include Magellan Project Manager Anthony Spear, Project Scientist Dr. Stephen Saunders, Drs. Gordon Pettengill and Sean Solomon of the Massachusetts Institute of Technology and Dr. Ray Arvidson of Washington University, St. Louis. New radar images of the Venus surface and a new 3-D video will be shown.

The news conference will be carried on NASA Select TV, Satcom F2R, transponder 13, at 72 degrees west longitude, 3960.0 MHz, audio 6.8 MHz, with two-way question and answer capability.

- end -

NASA News

National Aeronautics and
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Sarah Keegan

Headquarters, Washington, D.C.
(Phone: 202/453-2754)

For Release
November 14, 1990

RELEASE: 90-151

NASA TO USE WORLD'S FASTEST SUPERCOMPUTER

NASA researchers will have access to the world's fastest supercomputer as a member of the Concurrent Supercomputing Consortium, a newly-formed group of the nation's premier research organizations.

Consortium members will be able to access Intel Corporation's Touchstone DELTA supercomputer system, slated for installation at the California Institute of Technology (Caltech), Pasadena, Calif., next spring. The DELTA system has a peak speed of 32 billion floating point operations per second, making it the world's fastest computer.

The consortium will tackle some of today's most demanding computational and scientific challenges, such as global climate modeling, space science data analysis and pattern recognition of DNA sequences in the human genetic makeup.

NASA will use the DELTA system as part of the agency's High-Performance Computing Initiative (HPCI), an ambitious program to accelerate the computing research capabilities required to maintain U.S. aeronautical and space science leadership in the 21st century. For example, DELTA will dramatically improve NASA's capability to simulate the performance of integrated aerospace vehicle systems throughout their flight regimes and mission profiles and will greatly enhance multidisciplinary research in global climate change and astrophysics.

NASA will begin to use the DELTA system for research soon after it becomes available at Caltech. In addition, NASA researchers working on HPCI also will evaluate how much of an increase in computational performance DELTA offers over the agency's present systems.

- more -

Lee B. Holcomb, Director of the Information Sciences and Human Factors Division in NASA's Office of Aeronautics, Exploration and Technology (OAET), is the agency's representative on the Concurrent Supercomputing Consortium's Policy Board. The board is headed by Caltech astronomer Thomas A. Prince. Paul Messina, also of Caltech, is Executive Director of the Consortium.

Other members of the consortium are Argonne National Laboratory, Argonne, Ill.; California Institute of Technology; NASA's Jet Propulsion Laboratory, Pasadena, Calif.; Center for Research in Parallel Computation (lead center, Rice University, Houston); Defense Advanced Research Projects Agency, Arlington, Va.; Intel Corporation's Supercomputer Systems Division, Beaverton, Ore.; National Science Foundation, Washington, D.C.; Pacific Northwest Laboratory, Richland, Wash.; Lawrence Livermore National Laboratory, Berkeley, Calif.; Los Alamos National Laboratory, Los Alamos, N. Mex.; Oak Ridge National Laboratory, Oak Ridge, Tenn.; Purdue University, West Lafayette, Ind. and Sandia National Laboratories, Albuquerque, N. Mex.

-end-

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NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202 453-8400

Mark Hess
Headquarters, Washington, D.C.
(Phone: 202/453-4164)

Barbara Schwartz
Johnson Space Center, Houston
(Phone: 713/483-5111)

For Release
November 16, 1990

EDITORS NOTE: N90-90

SHUTTLE CARRIER AIRCRAFT DELIVERY CEREMONY SCHEDULED

NASA Johnson Space Center, Houston, will take delivery of the second Shuttle Carrier Aircraft (SCA), at Boeing Military Airplanes facilities in Wichita, Kan., on Tuesday, November 20.

Following delivery ceremonies in Wichita, the SCA will be flown to Ellington Field in Houston, Hangar 990, for a 1:30 p.m. EST ceremony. News media are invited to attend the ceremony and to tour the aircraft escorted by members of the flight crew.

Boeing Military Airplanes will provide video tapes of the refurbishing process. A CSA fact sheet is available.

- end -

SHUTTLE CARRIER AIRCRAFT (SCA)FACT SHEET
NASA 911 - BOEING 747-100SR

Aircraft Type: The SCA is a highly modified Boeing 747-100SR aircraft which is capable of ferrying the Shuttle Orbiters.

Description: The Boeing 747 SCA is a heavy wide-bodied swept wing turbo jet which is powered by four Pratt & Whitney JT9D-7J engines. Some features which distinguish this aircraft from a standard Boeing 747 are:

1. Three struts with associated interior structural beef-up protruding from the top of the fuselage (2 aft, 1 forward) for mating the orbiter.

2. Two additional vertical stabilizers, one on each end of the standard horizontal stabilizer to enhance directional stability.

3. Removal of all interior furnishings and equipment aft of the forward number one doors.

Dimensions:

Wingspan: 195 feet 8 inches

Length: 231 feet 10 inches

Height to top of vertical stabilizer: 63 feet 5 inches

Height to top of cockpit area: 32 feet 1 inch

Weight: Maximum taxi weight: 713,000 pounds
Maximum brake release weight: 710,000 pounds
Maximum landing weight: 600,000 pounds
Maximum zero-fuel weight: orbiter variable

Airspeed Limits: 250 KIAS or 0.6 Mach number

Altitude: Maximum mated 15oF (-9oC) or 8 psi ambient pressure
Typical cruise mated: 13,000-15,000 ft MSL
Typical cruise unmated: 24,000-26,000 ft MSL

Range: Typical mated: 1000 N.M. (with reserves)
Maximum unmated: 5500 N.M.

Fuel: 47,210 gallons or 316,307 pounds of jet fuel

Crew: Minimum for flight: two pilots and one flight engineer
Minimum mated: two pilots and two flight engineers

Ground Support Equipment: None required

- end -

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202 453-8400

Edward Campion
Headquarters, Washington, D.C.
(Phone: 202/453-8536)

Lisa Malone
Kennedy Space Center, Fla.
(Phone: 407/867-2468)

For Release
November 20, 1990

MISSION ADVISORY: STS-38 SPACE SHUTTLE LANDING

Shuttle managers have decided to use Kennedy Space Center as the primary landing site for today's landing of Shuttle Mission STS-38. Landing is scheduled to take place at approximately 4:43 p.m. EST.

This will be the sixth landing at KSC for the Shuttle program and the first since return to flight.

Coverage of the landing will be carried on NASA Select television. Live commentary of the mission will begin at 3 p.m. EST. News media in the KSC area should plan to be at the Launch Complex 39 Press Site no later than 3 p.m. in order to be escorted to the Shuttle Landing Facility

- end -

NASA News

National Aeronautics and
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AC 202 453-8400

For Release

Sarah Keegan
Headquarters, Washington, D.C.
(Phone: 202/453-2754)

November 21, 1990

N90-92

NOTE TO EDITORS: **PRESS AVAILABILITY OF AEROSPACE PIONEERS**

On Wednesday, Nov. 28, 1990, some significant figures in the history of U.S. aerospace endeavors will be available for press interviews at approximately 2:30 p.m. EST in Room 6004 of the NASA building at 400 Maryland Ave., S.W., Washington, D.C. The individuals will gather in Washington to mark the 75th anniversary of the National Advisory Committee for Aeronautics (NACA)/National Aeronautics and Space Administration (NASA) at a celebration jointly sponsored by NASA and the American Institute of Aeronautics and Astronautics (AIAA).

Participants in the interview opportunity may include Dean Chapman, Scott Crossfield, Bernard Schriever and John Swihart, although final availability has not yet been determined.

Media representatives wishing to participate should contact Sarah Keegan on 202/453-2754 or Gayle Armstrong (AIAA) on 202/646-7432.

- end -

NASA News

National Aeronautics and
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For Release

Sarah Keegan
Headquarters, Washington, D.C.
(Phone: 202/453-2754)

November 21, 1990

N90-93

NOTE TO EDITORS: HUBBLE INVESTIGATION REPORT TO BE RELEASED

Dr. Lew Allen, Chairman, Hubble Space Telescope Optical Systems Board of Investigation, will brief the press on the board's findings at 2:30 p.m. EST, Tuesday, Nov. 27, 1990, at the NASA Headquarters sixth floor auditorium, 400 Maryland Avenue, SW, Washington, D.C. Copies of the board's final report to NASA will be available at the briefing.

Also participating with Dr. Allen will be Dr. Lennard Fisk, NASA Associate Administrator for Space Science and Applications, and those members of the board whose schedules permit.

The briefing will be carried on NASA Select television, Satcom F2R, transponder 13, 72 degrees West longitude, frequency 3960 MHz, audio 6.8 MHz.

-end-

NASA News

National Aeronautics and
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AC 202 453-8400

Terri Sindelar
Headquarters, Washington, D.C.
(Phone: 202/453-8400)

For Release

November 23, 1990

EDITORS NOTE N90-94

ASTRO-1 AND "SPACE CLASSROOM" FEATURED IN EDUCATION CONFERENCE

NASA's Educational Affairs Division will transmit via satellite an educational video conference on Nov. 27 to discuss the Astro-1 mission and the first live lesson to be taught from space. "Space Classroom, Assignment: The Stars" will capitalize on the early-December flight of Astro-1, a Space Shuttle astronomy mission.

Dr. Ted Gull, Astro Mission Scientist, Goddard Space Flight Center, Greenbelt, Md., will discuss the Astro-1 mission and science objectives from the Payload Operations Control Center, Marshall Space Flight Center, Huntsville, Ala. Also, a 6-minute, pre-taped message by Mission Specialist Jeff Hoffman will be shown.

In addition, Karen Widenhofer, an educator, and Pam Bacon, Education Programs Manager at NASA Headquarters, will discuss the various educational components of "Space Classroom" during the broadcast.

"Space Classroom" is designed to use the excitement of space exploration to spark the interest of middle school students, encouraging them to pursue studies in math, science and technology. It will offer educators an alternative approach to teaching about the electromagnetic spectrum - a fundamental aspect of physics that is required instruction in many classrooms in the United States.

More than 30,000 educators in 50 states are expected to participate in this broadcast. These 1-1/2 hour, interactive video conferences are designed to update teachers on NASA programs, demonstrate aerospace activities for the classroom and announce new programs, products and activities available to classroom teachers. Participating school districts will receive transmissions from 2:30 to 4 p.m. EST.

- more -

The Nov. 27 conference, which is the second in a series of four, will be transmitted on Westar IV, channel 19. There is no charge for registration or participation in the video conference.

- end -

NASA news releases and other NASA information are available electronically on CompuServe and GEnie, the General Electric Network for Information Exchange. For information on CompuServe, call 1-800-848-8199 and ask for representative 176. For information on GEnie, call 1-800-638-9636.

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202 453-8400

For Release
November 26, 1990

Paula Cleggett-Haleim
Headquarters, Washington, D.C.
(Phone: 202/453-1547)

N90-95

NOTE TO EDITORS: GALILEO NEWS CONFERENCE

A news conference is scheduled at the Jet Propulsion Laboratory, Pasadena, Calif., on Thursday, Nov. 29 at 1:00 p.m. EST to discuss recently returned data from the Galileo spacecraft's Venus flyby last February. Present spacecraft and mission status will be described and plans for the Earth gravity-assist flyby Dec. 8 and associated scientific observations will be outlined.

Participants include Project Manager William J. O'Neil, Project Scientist Torrance V. Johnson and key members of the Galileo science team.

The conference will be aired on NASA Select television, Satcom F2R, Transponder 13, 72 degrees West longitude, with two-way question and answer capability.

-end-

NASA News

National Aeronautics and
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For Release

Barbara Selby
Headquarters, Washington, D.C.
(Phone: 703/557-5609)

November 26, 1990

RELEASE: 90-152

NASA SELECTS SMALL BUSINESS INNOVATION RESEARCH PROJECTS

NASA announced today the selection of 84 research proposals for immediate negotiation of Phase II contracts in NASA's Small Business Innovation Research Program (SBIR). Proposals selected were submitted by 79 small, high technology firms located in 25 states.

Selections were chosen competitively from 201 proposals submitted for Phase II continuations of SBIR Phase I projects initiated in 1989. Total value of awards will be about $42 million.

SBIR objectives are to stimulate technological innovation in the United States by using small business, including minority and disadvantaged firms, to help meet Federal research and development needs and to encourage commercial applications of federally supported research innovations.

SBIR Phase II continues the most promising Phase I projects, those which have demonstrated technical feasibility and the highest potential value to NASA as research innovations. Selection criteria include technical merit and innovation, Phase I results, value to NASA, commercial potential and company capabilities. Funding for Phase II contracts may be up to $500,000 for up to a 2-year period.

Additional Phase II selections, to be announced in January 1991, are expected to bring the total number of selections to more than 120 and the total procurement value to about $60 million.

The SBIR program is managed by NASA's Office of Commercial Programs, NASA Headquarters, Washington, D.C., and all individual SBIR projects are managed by nine NASA field centers.

- end -

EDITOR'S NOTE: A listing of companies selected for this program is available at NASA Headquarters (Phone: 202/453-8400) and all NASA field centers.

NASA 89-1 PHASE II AWARD DISTRIBUTIONS
November 21, 1990

STATE	AWARDS	FIRMS
Alabama	5	5
Arizona	2	2
California	15	15
Colorado	4	4
Connecticut	2	1
Florida	3	3
Georgia	1	1
Iowa	2	2
Illinois	1	1
Maryland	2	2
Massachusetts	20	16
Michigan	1	1
New Hampshire	1	1
New Jersey	3	3
New Mexico	1	1
New York	5	5
Oregon	1	1
Pennsylvania	1	1
Tennessee	1	1
Texas	4	4
Utah	1	1
Virginia	5	5
Washington	1	1
Wisconsin	1	1
West Virginia	1	1

AWARDS DISTRIBUTION BY NASA FIELD CENTER

NASA CENTER	AWARDS	FIRMS
Ames Research Center Moffett Field, CA	7	7
Goddard Space Flight Center Greenbelt, MD	7	7

Jet Propulsion Laboratory Pasadena, CA	4	4
Johnson Space Center Houston, TX	15	15
Kennedy Space Center Kennedy Space Center, FL	5	5
Langley Research Center Hampton, VA	16	14
Lewis Research Center Cleveland, OH	14	14
Marshall Space Flight Center Marshall Space Flight Ctr, AL	16	16

National Aeronautics and Space Administration
Small Business Innovation Research (SBIR) Program

89-1 Phase II Step 1
Proposals Selected for Negotiation of SBIR Phase II Contracts
Sorted by State, Company and Proposal Number
November 26, 1990

Alabama

AZ Technology, Inc.
3322 Memorial Pkwy. SW, Suite 93
Huntsville, AL 35801
Donald R. Wilkes 205-880-7481
90-1-04.08-6381 (MSFC)
Portable Spectroreflectometer

Alabama Cryogenic Engineering, Inc.
P.O. Box 2470
Huntsville, AL 35804
Mary T. Hendricks 205-536-8629
90-1-11.03-8629C (MSFC)
Demonstration of an Innovative Ortho-Para Conversion Catalyst System

Engineering Analysis, Inc.
715 Arcadia Circle
Huntsville, AL 35801-5909
Frank B. Tatom 205-533-9391
90-1-02.03-9391 (MSFC)
Calculation of Surface Pressure Fluctuations Based on Time-Averaged, Turbulent Flow Computations

Huntsville Sciences Corporation
3315 Bob Wallace Avenue, Suite 107
Huntsville, AL 35805
Lawrence W. Spradley 205-536-8122
90-1-09.13-8122 (MSFC)
Finite-Element and Adaptive-Grid Thermal Analyzer with Enhanced Graphics Capability

Seca, Inc.
3311 Bob Wallace Avenue, Suite 203
Huntsville, AL 35805
Richard C. Farmer 205-534-2008
90-1-11.02-2008 (MSFC)
Heat Transfer in Rocket Engine Combustion Chambers and Regeneratively Cooled Nozzles

5 Selection(s) from Alabama

Arizona

Materials and Electrochemical Research
7960 S Kolb Road
Tucson, AZ 85706
R. O. Loutfy 602-574-1980
90-1-04.15-1980 (JSC)
Very High Temperature Structural Insulation Materials

Photometrics Limited
3440 E. Britannia Drive, Suite 110
Tucson, AZ 85706-5006
Gary R. Sims 602-294-1265
90-1-12.06-8961 (JSC)
CCDS Suitable for Electronic Still Photography

2 Selection(s) from Arizona

California

Aerometrics, Inc.
894 Ross Drive, Unit #105
Sunnyvale, CA 94089
William D. Bachalo 408-745-0321
90-1-11.01-0321A (LeRC)
Simultaneous Measurement of Temperature, Size, and Velocity of Drops in Sprays

Continuum
3150 Central Expressway
Santa Clara, CA 95051
Nestor Clough 408-727-3240
90-1-08.02-3240 (GSFC)
Diode-Pumped, Short-Pulse Laser Transmitter for Ranging and Altimetry

Demografx
10720 Hepburn Circle
Culver City, CA 90232
Gary Demos 213-837-2985
90-1-06.06-2985 (ARC)
Application of High-Performance Helical Digital ID-1 Tape to Computer Storage

Eidetics International, Inc.
3415 Lomita Boulevard
Torrance, CA 90505
Andrew M. Skow 213-326-8228
90-1-02.06-8228A (ARC)
Aerodynamic Control of the F/A-18 Using Forebody Vortex Blowing

Electro-Optics Technology, Inc.
4057 Clipper Court
Fremont, CA 94538
Kim Robert Mack 415-651-4022
90-1-08.08-4022 (MSFC)
Multiple-Diode-Pumped TM:YAG Planar Ring Laser

Electroformed Nickel, Inc.
283 Winfield Circle
Corona, CA 91720
Rich Edwards 714-371-4704
90-1-11.01-4707 (LeRC)
High-Temperature, Oxidation-Barrier Coatings for Refractory Metals

Energy Science Laboratories, Inc.
P.O. Box 85608
San Diego, CA 92186
Timothy R. Knowles 619-455-4688
90-1-10.01-4688 (LeRC)
Composite Regeneration for Stirling Engine

ISM Technologies, Inc.
9965 Carroll Canyon Road
San Diego, CA 92131
Robert J. Stinner 619-530-2332
90-1-04.12-2332 (JPL)
Miniature, Thin-Film Deposition System

ISX Corporation
501 Marin Street, Suite 214
Thousand Oaks, CA 91360
Robert A. Bassett 805-495-8265
90-1-06.04-8265 (ARC)
Knowledge-Based Decision-Support for Space System Engineering Managers

Kestrel Development Corporation
3260 Hillview Avenue
Palo Alto, CA 94304
Carol Lei 415-493-6871
90-1-06.04-6871 (ARC)
Rapid Modification of Reliable and Efficient Software

Lightwave Electronics Corporation
1161 San Antonio Road
Mountain View, CA 94043
James Francis 415-962-0755
90-1-14.06-0755 (JPL)
All Solid State High Power Pulsed Visible Laser

Microwave Monolithics, Inc.
465 East Easy Street, Unit F
Simi Valley, CA 93065
Daniel R. Ch'En 805-584-6642
90-1-14.01-6642 (JSC)
Monolithic, Gallium-Arsenide, UHF-IF, Switch Matrix for Space Station Applications

Photon Research Associates, Inc.
9393 Towne Centre Drive, Suite 200
San Diego, CA 92121
Keto Soosaar 617-354-1522
90-1-05.03-1522 (GSFC)
Human-Machine-Task Computer Aided Design Software

Physical Optics Corporation
20600 Gramercy Place, Suite 103
Torrance, CA 90501
Patty Shaw 213-320-3088
90-1-09.04-3088 (JSC)
Dynamic, Coherently Coupled, Holographic Optical Elements Using Liquid Crystals

Togai Infralogic, Inc.
30 Corporate Park, Suite 107
Irvine, CA 92714
Masaki Togai 714-975-8522
90-1-06.05-8522 (JSC)
Fuzzy-Clips-The C-Language Integrated Production System with Fuzzy Logic Capabability

15 Selection(s) from California

Colorado

Aptek, Inc.
1257 Lake Plaza Drive
Colorado Springs, CO 80906-3578
Alberta Meagher 719-599-5730
90-1-12.06-8100 (JSC)
Automation of Stowage

Colorado Research Development Corp.
1727 Conestoga Street
Boulder, CO 80301
Jack E. Deeter 303-441-2241
90-1-06.01-8633 (LaRC)
Parallel, Multilevel, Adaptive Methods for Flows in Transition

Ophir Corporation
3190 S. Wadsworth Boulevard, Suite 100
Lakewood, CO 80227
James Miller 303-986-1512
90-1-13.03-1512 (KSC)
A Laser Lightning Triggering System for Forecasting

Unique Mobility, Inc.
3700 South Jason Street
Englewood, CO 80110
William Anderson 303-761-2137
90-1-05.07-2137 (LeRC)
Robotic Actuator Optimization

4 Selection(s) from Colorado

Connecticut

Scientific Research Associates, Inc.
P.O. Box 1058
Glastonbury, CT 06033
Stephen J. Shamroth 203-659-0333
90-1-01.01-0333B (LeRC)
Flow in Turbine Blade Passages

Scientific Research Associates, Inc.
50 Nye Road, P.O. Box 1058
Glastonbury, CT 06033
Stephen T. Shamroth 203-659-0333
90-1-11.02-0333 (MSFC)
An Eulerian-Lagrangian Analysis for Liquid Flows with Vapor Bubbles

2 Selection(s) from Connecticut

Florida

Photonic Systems, Inc.
1900 South Harbor City Boulevard
Melbourne, FL 32901
Dennis R. Pape 407-984-8181
90-1-07.05-8181 (GSFC)
Multichannel Acousto-Optic Spectrometer

Schwartz Electro-Optics, Inc.
3404 N. Orange Blossom Trail
Orlando, FL 32804
Zelma Slusser 407-298-1802
90-1-08.04-1802 (LaRC)
Novel CO:MGF2 Lidar for Aerosol Profiler

Software Productivity Solutions, Inc.
P.O. Box 361697
Melbourne, FL 32936-1697
Edward R. Comer 407-984-3370
90-1-06.05-3370 (JSC)
Passive Knowledge Acquisition System

3 Selection(s) from Florida

Georgia

Search Technology, Inc.
4725 Peachtree Corners Circle, Suite 200
Norcross, GA 30092
Ruston M. Hunt 404-441-1457
90-1-03.09-1457B (LaRC)
Methods and Tools for Assessing Limits of System Intelligence

1 Selection(s) from Georgia

Illinois

Bio-Imaging Research, Inc.
425 Barclay Boulevard
Lincolnshire, IL 60069
J. F. Moore 312-634-6425
90-1-11.04-6425 (MSFC)
Slit Scan Radiography System for Intermediate Sized Rocket Motors

1 Selection(s) from Illinois

Iowa

Accel Catalysis, Inc.
Technology Innovation Center
Iowa City, IA 52242
Darrell P. Eyman 319-335-1359
90-1-11.01-4577 (LeRC)
A Catalytic, Thermal Management System for Hydrogen-Fueled Injection Vehicles

Iowa Thin Film Technologies, Inc.
Suite 607, ISIS - I.S.U. Research Park
Ames, IA 50010
Derrick Grimmer 515-294-3203
90-1-10.01-3203 (LeRC)
Flexible, Lightweight, Amorphous-Silicon Solar Cells Tuned for AM0 Spectrum

2 Selection(s) from Iowa

Maryland

New Horizons Diagnostics
9110 Red Branch Rd
Columbia, MD 21045
Larry Loomis 301-992-9357
90-1-12.08-9357 (JSC)
Device for Sample Collection and Rapid Immunological Identification of Biological Specimens

Science & Engineering Services, Inc.
17 Serpentine Ct.
Silver Spring, MD 20904
Hyo Sang Lee 301-236-4161
90-1-08.06-4161 (GSFC)
Development of Systems for Continuous Tuning and Single-Mode Operation of Solid-State Lasers

2 Selection(s) from Maryland

Massachusetts

Automatix, Inc.
755 Middlesex Turnpike
Billerica, MA 01821
Ofer Gneezy 508-667-7900
90-1-04.10-7900 (MSFC)
Macro- and Task-Level Programming of Arc Welding Robots for Aerospace Applications

Axiomatics Corp.
60 Rogers Street
Cambridge, MA 02142
Craig R. Davis 617-497-6700
90-1-12.12-6700 (KSC)
Shunting Dielectric Sensing System for Nutrient Delivery

Barrett Technology, Inc.
545 Concord Avenue
Cambridge, MA 02138-1105
William T. Townsend 617-868-7730
90-1-05.04-3909 (JSC)
Design of a Wrist Using New Mechanism Technology Invented for Whole- Arm Manipulation

Boston Advanced Technologies, Inc.
656 Beacon Street
Boston, MA 02215
Sharon Cunningham 617-267-1545
90-1-12.09-0966 (MSFC)
Chemical Sensor System for the Detection and Identification of Organic Contaminants in Water

Charles River Analytics, Inc.
55 Wheeler Street
Cambridge, MA 02138
Alper K. Caglayan 617-491-3474
90-1-09.02-3474 (LaRC)
A Neural Approach to Space Vehicle Guidance

Foster-Miller, Inc.
350 Second Avenue
Waltham, MA 02154-1196
Adi R. Guzdar 617-890-3200
90-1-04.03-3200 (LaRC)
Polyimide/LCP Blends

Foster-Miller, Inc.
350 Second Avenue
Waltham, MA 02154-1196
Adi R. Guzdar 617-890-3200
90-1-05.08-3200 (KSC)
Self-Contained, Deployable, Serpentine Truss for Prelaunch

MOCO, Inc.
P.O. Box A
Scituate, MA 02055-0974
Richard H. Eckhouse 617-545-2040
90-1-12.05-2040 (JSC)
Optimal Workspace Design

Millitech Corporation
P.O. Box 109
South Deerfield, MA 01373
Willie S. Day 413-665-8551
90-1-08.09-8551 (MSFC)
A Broadband, Multichannel, Precipitation Sensor with a Gaussian Optics Frequency Multiplexer

Physical Sciences, Inc.
20 New England Business Center
Andover, MA 01810
George E. Caledonia 508-689-0003
90-1-01.03-0003 (LeRC)
Instantaneous Velocity Field Imaging Instrument for Supersonic Reacting Flows

Radiation Monitoring Devices, Inc.
44 Hunt Street
Watertown, MA 02172
Gerald Entine 617-926-1167
90-1-04.17-1167 (LaRC)
High-Field, High-Tc Superconducting Magnets

Radiation Monitoring Devices, Inc.
44 Hunt Street
Watertown, MA 02172
Gerald Entine 617-926-1167
90-1-12.01-1167 (JSC)
Solid-State Neutron Dosimeter for Space Applications

Satcon Technology Corporation
12 Emily Street
Cambridge, MA 02139-4507
David B. Eisenhaure 617-661-0540
90-1-10.01-0540 (MSFC)
Integrated Power and Attitude Control System for the Space Station and Other Applications

Schwartz Electro-Optics, Inc.
45 Winthrop Street
Concord, MA 01742
Peter F. Moulton 508-371-2299
90-1-08.07-2299 (LaRC)
Development of Lasers Optimized for Pumping TI:AL2O3

Scientific Systems, Inc.
500 West Cummings Park Suite 3950
Woburn, MA 01801
H. J. McLoud 617-933-5355
90-1-03.05-5355 (ARC)
Aircraft On-Line Flutter Parameter Identification

Spire Corporation
Patriots Park
Bedford, MA 01730
Robert D. Evans 617-275-6000
90-1-08.07-6000A (LaRC)
Development of 780 NM and 792 NM Diode Laser Pumps for Solid State Lasers

Spire Corporation
Patriots Park
Bedford, MA 01730
Robert D. Evans 617-275-6000
90-1-10.04-6000 (LaRC)
Vertical, Multijunction, Photovoltaic Cells with Buried Silicide Interconnections

Spire Corporation
Patriots Park
Bedford, MA 01730
Robert D. Evans 617-275-6000
90-1-14.05-6000A (LeRC)
High-IN-Content Psuedomorphic HEMTS for Advanced Satellite Communications

Technology Integration & Dev. Group
One Progress Road
Billerica, MA 01821
Richard E. Hayden 508-667-3779
90-1-15.05-3779 (MSFC)
SSME Automatic Bearing Fault Detection

Tracer Technologies, Inc.
20 Assembly Square Drive
Somerville, MA 02145
Alfred Ajami 617-776-6410
90-1-09.07-6410 (GSFC)
A Low-Thermal-Conductivity Connector

20 Selection(s) from Massachusetts

Michigan

KMS Fusion, Inc.
P.O. Box 1567
Ann Arbor, MI 48106-1567
Robert F. McCarthy 313-769-8500
90-1-05.06-8500 (JPL)
Global-Local Environment Telerobotic Simulator

1 Selection(s) from Michigan

New Hampshire

Creare X, Inc.
P.O. Box A-219
Hanover, NH 03755
Linda Spencer-Green 603-643-3800
90-1-02.01-3800 (LaRC)
Advanced Modeling of Combustion Systems

1 Selection(s) from New Hampshire

New Jersey

Aerochem Research Laboratories, Inc.
P.O. Box 12
Princeton, NJ 08542
Hartwell F. Calcote 609-921-7070
90-1-02.10-7070 (LeRC)
Numerical Simulation of Three-Dimensional Jet Flow and Noise

Continuum Dynamics, Inc.
P.O. Box 3073
Princeton, NJ 08543
Barbara A. Hawk 609-734-9282
90-1-02.09-9282 (LaRC)
Aeroacoustic Analysis of Rotor/Rotor Wake Interactions

Neocera, Inc.
100 Jersey Avenue, Box D-12
New Brunswick, NJ 08901
T. Venkatesan 908-220-9149
90-1-04.17-2694 (LeRC)
Microwave-Compatible, High-Tc Superconducting Films on Sapphire Substrates

3 Selection(s) from New Jersey

New Mexico

Southwest Sciences, Inc.
1570 Pacheco Street #E-11
Santa Fe, NM 87501
Alan C. Stanton 505-984-1322
90-1-15.02-1322A (LeRC)
Combustion Diagnostics for Microgravity Research Using Near-Infrared Diode Lasers

1 Selection(s) from New Mexico

New York

Dimension Technologies, Inc.
176 Anderson Avenue
Rochester, NY 14607
Arnold D. Lagergren 716-442-7450
90-1-06.06-7450 (ARC)
A Real Time, Full Color, Full-Resolution Autostereoscopic Display

High Technology Services, Inc.
250 Jordan Rd Suite 210
Troy, NY 12180-8344
Milton L. Evans 518-283-8072
90-1-04.03-8072 (LaRC)
Advanced Product, Process and Application Development Programs for Polymide Sulfone and Polyamic Acid Power Technology

Innovative Dynamics
244 Langmuir Lab, Cornell Research Park
Ithaca, NY 14850-1296
David W. Gerardi 607-257-0534
90-1-04.06-0533 (LaRC)
Demonstration of a Structural Health Monitoring System for Aging Aircraft

Program Development Corp. of Scarsdale
300 Hamilton Avenue, Suite 409
White Plains, NY 10601
Peter R. Eiseman 914-761-1732
90-1-01.01-1732A (LeRC)
Turbo with Automatic Zoning

Wilson Greatbatch Ltd.
10000 Wehrle Drive
Clarence, NY 14031
Curtis F. Holmes 716-759-6901
90-1-10.02-6901 (JPL)
Rechargeable Lithium/Titanium-Disulfide Cells with Long Cycle-Life

5 Selection(s) from New York

Oregon

Umpqua Research Company
P.O. Box 791
Myrtle Creek, OR 97457
Gerald V. Colombo 503-863-5201
90-1-12.03-5201 (JSC)
Electrochemical Water Recovery Process for Treatment of Urine and Other Biological Waste Streams

1 Selection(s) from Oregon

Pennsylvania

EMEC Consultants
R.D. 3, Roundtop Road
Export, PA 15632
Rudolf Keller 412-325-3260
90-1-04.18-3260A (JSC)
Production of Oxygen by Electrolysis of Lunar Soil in Molten Salt

1 Selection(s) from Pennsylvania

Tennessee

Accurate Automation Corporation
1548 Riverside Drive, Suite B
Chattanooga, TN 37406
Robert M. Pap 615-622-4642
90-1-05.09-5959A (MSFC)
Advanced Telerobotic Control Using Neural Networks

1 Selection(s) from Tennessee

Texas

Galaxy Microsystems, Inc.
8140 N. Mopac Expressway, Bldg. 3 #115
Austin, TX 78759
Robert E. Fosdick 512-794-9694
90-1-14.02-9694 (GSFC)
High-Speed, Digital Data Transmission

Lynntech, Inc.
111 E. 27th Street, #204
Bryan, TX 77803
William B. Craven 409-822-3149
90-1-12.03-4131 (JSC)
Electrochemical/UV-Based System for Water Reclamation Post-Treatment

Micon Engineering
100 Graham Road
College Station, TX 77845
R. Page Heller 409-690-8911
90-1-10.06-8911 (MSFC)
Intelligent Protection System for Space Power Applications

Systems & Processes Engineering Corp.
1406 Smith Road Suite A
Austin, TX 78721
Clayton A. T. Nyberg 512-385-0081
90-1-04.06-0318 (LaRC)
Digital, Optical Phase-Lock-Loop

4 Selection(s) from Texas

Utah

Sarcos Research Corporation
261 East 300 South, Suite 150
Salt Lake City, UT 84111
Stephen C. Jacobsen 801-531-0559
90-1-12.07-0559A (JSC)
Using Robots in the Testing of NASA EVA Space Suits

1 Selection(s) from Utah

Virginia

American Research Corp. of Virginia
P.O. Box 3406
Radford, VA 24143-3406
Anne Churchill 703-731-0655
90-1-02.08-0655 (LaRC)
Correlation-Based Optical Strain Sensor for Hostile Environment Wind Tunnel Test Instrumentation

Analytical Services & Materials, Inc.
107 Research Drive
Hampton, VA 23666
J. Unnam 804-865-7093
90-1-03.05-7093 (ARC)
Flight Instrumentation for Simultaneous Detection of Flow Separation and Transition

Digital Signal Corporation
8003 Forbes Place
Springfield, VA 22151
Richard L. Sebastian 703-321-9200
90-1-05.01-9200 (LaRC)
Fiber Coupled Coherent Laser Radar Measurement System

ENSCO, Inc.
5400 Port Royal Road
Springfield, VA 22151
Barbara A. Brown 703-321-9000
90-1-13.03-4122 (KSC)
Meterological Monitoring System

REI Systems
P.O. Box 9183
McLean, VA 22102-0183
Nandita Bhaskar 703-281-1745
90-1-07.08-1745 (GSFC)
A Distributed, Object-Type Management System for Heterogeneous Environments

5 Selection(s) from Virginia

Washington

Electroimpact, Inc.
2721 N.E. Blakeley Street
Seattle, WA 98105
Samuel O. Smith 206-525-2403
90-1-03.01-2403 (LeRC)
Eddy Current Repulsion De-Icing Strip

1 Selection(s) from Washington

West Virginia

Resource Technologies Group, Inc.
400 Mississippi Street
Morgantown, WV 26505-6751
Nancy T. Newbold 304-291-6706
90-1-12.02-6706 (MSFC)
Thin Membrane Sensors

1 Selection(s) from West Virginia

Wisconsin

Biotronics Technologies, Inc.
12020 West Ripley Avenue
Wauwatosa, WI 53226
Charles G. Terrizzi 414-567-1112
90-1-12.12-7653 (KSC)
Spectrometry for On-Line Chemical Analysis of Nutrient Solutions

1 Selection(s) from Wisconsin

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Washington, D.C. 20546
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Sarah Keegan
Headquarters, Washington, D.C.
(Phone: 202/453-2754)

H. Keith Henry
Langley Research Center, Hampton, Va.
(Phone: 804/864-6120)

For Release

November 26, 1990

RELEASE: 90-153

NASA AND HONEYWELL CONDUCT AUTOMATED LANDING RESEARCH

NASA's Langley Research Center, Hampton, Va., and Honeywell's Space Systems Group, Clearwater, Fla., have successfully concluded a joint flight research project that may improve automated landing capabilities in spacecraft and aircraft.

During the flight tests performed over the last 2 months, NASA's Boeing 737 research airplane made 36 automated landings using a Honeywell integrated differential navigation system linked to the Global Positioning System (GPS). GPS is a worldwide constellation of U.S. satellites that provides precision navigation information.

The test data will form the basis for design of such systems in future spacecraft and will help researchers assess how risk can be reduced in automatic landings. The results also will help determine the accuracy of GPS-aided navigation systems that could ensure safe automatic landings under various weather conditions.

Currently there are 15 GPS satellites, four to eight of which were in view during the NASA/Honeywell flight tests. There will be 24 satellites in the GPS constellation when it is complete in 1993.

Six days of flight tests from Oct. 23 to Nov. 14 accumulated 25 hours of flight time. Langley's Boeing 737 Transport Systems Research Vehicle (TSRV) was fitted with Honeywell's integrated Global Positioning Inertial Reference System/GPS Sensor Unit (GPSSU). A ground station with a second GPSSU receiver located at Wallops Flight Facility, Wallops Island, Va., provided differential GPS corrections to the aircraft via VHF radio. During the tests, the TSRV made 111 landings, including 36 GPS-aided automatic touchdowns.

- more -

There are many potential space and commercial applications of this advanced technology. In the space arena, the technology could provide an automatic landing capability to the next-generation manned space transport vehicles that will be less demanding on the crew and require less training than the current Shuttle auto-landing system. Unmanned space vehicles could return expensive engines and avionics that otherwise would be expended after a single mission.

In commercial aviation, an automatic landing system based on differential GPS offers the potential for complete guidance: precision approaches from a variety of air traffic patterns, landing rollout and taxiing to the gate in poor visibility conditions.

This research and development effort is a cooperative project between Langley Research Center and Honeywell, Inc. Honeywell's efforts are led by its Space Systems Group with engineering support from its Systems and Research Center in Minneapolis and system hardware from its Commercial Flight Systems Group in Phoenix.

- end -

EDITORS NOTE: A video clip of the flight test activities is available to media representatives by calling 804/864-6120.

Honeywell media contact: Mary Babin, 813/539-5022

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202 453-8400

David Garrett
Headquarters, Washington, D.C.
(Phone: 202/453-8400)

For Release
November 26, 1990

RELEASE: 90-154

NASA RECEIVES AWARD FOR MINORITY BUSINESS DEVELOPMENT PROGRAM

NASA Administrator Richard H. Truly today accepted the "Government Agency of the Year Award" from the Black Business Association of Los Angeles for NASA's participation in minority business development.

The award, given annually in conjunction with the association's trade mission to Washington, D.C., is presented to the government agency which has the most successful program designed to encourage minority business development.

"NASA has earned this award for its aggressive and innovative approach to the small and disadvantaged business program. Our members currently hold contracts with NASA locations in excess of $50 million across the country, compared to $16 million 3 years ago," said Association Chairman Gene Hall. "We would like NASA to keep up the good work."

Upon receiving the award, Truly acknowledged pride in being recognized for NASA's program to encourage development of small and disadvantaged businesses. He also pledged that NASA would continue to be a leader in this area as it looked for new ways to increase the participation of minority businesses in the nation's civil space program.

Eugene Rosen, Director of NASA's Small and Disadvantaged Business Utilization Office, said, "our outreach efforts are increasing nationwide to small disadvantaged businesses to inform them of the possibilities of contracting with NASA. We also are in the process of installing a mentor program to encourage major corporations to assist small, disadvantaged businesses in becoming viable."

- more -

The association, the second largest of its kind in the nation, has 450 members, 75 of them located outside of the Los Angeles area.

- end -

NASA news releases and other NASA information are available electronically on CompuServe and GEnie, the General Electric Network for Information Exchange. For information on CompuServe, call 1-800-848-8199 and ask for representative 176. For information on GEnie, call 1-800-638-9636.

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202 453-8400

For Release

November 27, 1990
2:00 p.m.

Edward Campion
Headquarters, Washington, D.C.
(Phone: 202/453-8536)

Lisa Malone
Kennedy Space Center, Fla.
(Phone: 407/867-2468)

LAUNCH ADVISORY: STS-35 LAUNCH DATE ANNOUNCED

NASA managers today announced Dec. 2, 1990, as the launch date for Shuttle Mission STS-35 which will involve Space Shuttle Columbia carrying the Astro-1 payload. The launch window on Dec. 2 extends from 1:28 a.m. EST to 3:58 EST.

The launch date announcement follows completion of the Flight Readiness Review held today at Kennedy Space Center during which all Shuttle support elements stated they were ready to proceed with the launch of Columbia and the STS-35 mission.

"The Shuttle team has worked very hard to get Columbia ready to fly," said Space Shuttle Director Robert Crippen. "With the hydrogen leak resolved, we are ready to end the year with the ASTRO-1 mission which will extend our knowledge of the universe".

Coverage of the STS-35 mission will be carried on NASA Select, Satcom F2R, Transponder 13, C-band located at 72 degrees west longitude, frequency 3960.0 Mhz, vertical polarization, audio monaural 6.8 MHz.

-end-

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AC 202 453-8400

Les Gaver
Headquarters, Washington, D.C.
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For Release

November 29, 1990

N90-96

NOTE TO EDITORS: STS-35 TV TRANSMISSIONS

STS-35/ASTRO-1 Space Shuttle mission (currently scheduled for a Dec. 2 launch) television programming will be transmitted daily via the following satellite to accomodate the Alaska and Hawaii audiences:

SPACENET 1
Transponder 17
120 degrees West Longitude
4040.0 MHz (Video)
6.8 MHz (Audio)

Two-hour edited versions of each day's events will be transmitted via SPACENET 1 at:

Dec. 1 and 8 - 1:35 a.m. to 3:35 a.m. EST
Dec. 2-7 and 9-11 - 12 midnight to 2 a.m. EST

The continental United States will continue to receive NASA Select television, 24 hours a day throughout the mission, via:

SATCOM F2R
Transponder 13
72 degrees West Longitude
3960 MHz (Video)
6.8 MHZ (Audio)

-end-

NASA News

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Washington, D.C. 20546
AC 202 453-8400

Michael Braukus
Headquarters, Washington, D.C.
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Kari Fluegel
Johnson Space Center, Houston
(Phone: 713/483-5111)

For Release
November 29, 1990

RELEASE: 90-155

NEW TREATMENT EASES EFFECTS OF SPACE MOTION SICKNESS

Physicians at NASA's Johnson Space Center (JSC), Houston, have instituted a new treatment for space motion sickness that has markedly decreased the severity of the illness in crewmembers.

Promethezine, an intramuscular treatment administered after the onset of symptoms, has helped decrease the symptoms of space motion sickness on 14 occasions since NASA's return to flight in September 1988, according to Dr. Sam Pool, Chief of the Medical Sciences Division at JSC.

Medical researchers believe changes in the body's vestibular system contribute significantly to space motion sickness. The vestibular system regulates the body's sense of balance and, when the tiny stones in the inner ear called otoliths no longer have weight in a microgravity environment, the brain may misinterpret the sensations an individual may feel while moving around in microgravity. The unusual visual cues experienced during floating in the Shuttle orbiter cabin may further confuse the brain's perceptions and produce symptoms.

Since the early days of space flight, many space travelers have experienced this space motion sickness. Symptoms resemble those of Earth-based motion sickness and may include headache, malaise, lethargy, stomach awareness, loss of appetite, nausea and/or episodic vomiting. Symptoms tend to worsen during body movement, especially movements of the head.

- more -

In the first 24 missions of the Space Shuttle program, about 67 percent of the 85 crew members making their first flight reported symptoms of space motion sickness. About 30 percent reported mild symptoms; 24 percent, moderate symptoms; and 13 percent severe symptoms. Most recovered by the end of the third day in space. In one extreme case in the Soviet Salyut 6 mission, however, one crewmember was ill for 14 days. The incidence of space motion sickness among those making a second flight dropped to 46 percent.

During the first 24 Shuttle missions, scopolamine and a combination of scopolamine and dextroamphetamine, given orally, were used to treat space motion sickness. Recent studies at the JSC Biomedical Operations and Research Branch by Drs. Nitza Cintron and Lakshmi Putcha, however, have shown that the oral absorption of scopolamine and other medications in weightlessness is unpredictable.

Since the initiation of intramuscular promethazine therapy, Shuttle crewmembers have not experienced severe cases of space motion sickness and almost all have been essentially symptom free by the end of the second flight day. Crewmembers now receive training in administering the medication should space motion sickness develop during Shuttle flights. Research for space motion sickness is sponsored by NASA's Office of Space Science and Applications.

-end-

NASA News

National Aeronautics and
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Debra J. Rahn
Headquarters, Washington, D.C.
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For Release
November 29, 1990

RELEASE: 90-156

REVIEW OF U.S./JAPAN SPACE COOPERATION

NASA and the Space Activities Commission of Japan (SAC) held a series of meetings in Arlington, Va., during the week of Nov. 26, culminating in the fourth meeting of the NASA/SAC Cooperative Space Activities Planning Group on Nov. 29.

The Cooperative Space Activities Planning Group meets annually to review ongoing space cooperation between the U.S. and Japan. Discussions focused on a number of collaborative projects in the fields of astrophysics, solar system science, microgravity science, life science and Earth observation. The meeting was co-chaired by Dr. Lennard Fisk, NASA Associate Administrator for Space Science and Applications, and Mr. Katsuhisa Ida, Director-General, Research and Development Bureau, Science and Technology Agency (STA) of Japan.

During the week, Ida met with senior NASA officials, including Richard H. Truly, NASA Administrator. During these meetings, the following cooperative proposals were discussed:

o NASA Associate Administrator for Space Flight Dr. William B. Lenoir affirmed to Ida that two Japanese candidates are invited to join the next NASA Mission Specialist training class, beginning in July 1992. The Japanese Mission Specialist candidates will participate in training on the same basis as U.S. Mission Specialist candidates at NASA's Johnson Space Center, Houston. It is NASA's intent to offer a Space Shuttle flight assignment to one or both of the Japanese Mission Specialist candidates in the years following the successful completion of the training program.

o NASA and STA are actively reviewing options for flying Japanese Experiment Module (JEM) hardware on a Space Shuttle mission in the mid-1990s. The JEM is Japan's contribution to the Space Station Freedom program. The purpose of such a Shuttle flight would be to demonstrate in space a key element of the JEM.

- more -

o NASA also offered Japan an opportunity to send Japanese engineers to work and train in the Mission Operations Directorate at the Johnson Space Center during mission preparation and operations activities for the Spacelab-J mission. This will enable Japan to obtain additional flight operations experience prior to the Space Station era.

The next meeting of the Cooperative Space Activities Planning Group will be next fall in Japan.

- end -

NASA News

National Aeronautics and
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Washington, D.C. 20546
AC 202 453-8400

For Release

December 3, 1990

Barbara Selby
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Billie Deason
Johnson Space Center, Houston
(Phone: 713/483-5111)

RELEASE: 90-157

NASA AWARDS COMMERCIAL MIDDECK AUGMENTATION MODULE CONTRACT

NASA has awarded a contract to SPACEHAB, Inc., Washington, D.C., to provide the services of a commercial middeck augmentation module (CMAN).

The firm-fixed-price contract covers a 5-year period, November 1990 through December 1995. The total amount of the negotiated contract is $184,236,000. At the time of contract award, NASA will fund $7,959,000.

The first SPACEHAB module is slated for flight aboard the Space Shuttle in December 1992. The leased module will ride in the payload bay when carried, be accessible through the air lock and add the volume equivalent of about 50 middeck lockers to the orbiters' capacity.

Under the contract, SPACEHAB will provide for the physical and operational integration of the module and the experiments, power, cooling, data management and crew training spread over six flights which will occur at intervals of about 6 months.

In support of private sector research initiatives, NASA is leasing two-thirds of the available module volume, over a six-flight profile. This volume will be used for flight research opportunities for NASA's Centers for the Commercial Development of Space and for Joint Endeavor Agreements. SPACEHAB will market to commercial users the remaining one-third of the module space.

The SPACEHAB lease will be managed by the CMAM Project Office in the New Initiatives Office at Johnson Space Center, Houston, on behalf of the NASA Headquarters Office of Commercial Programs. SPACEHAB submitted the only proposal received in response to NASA's request for proposals.

- end -

NASA News

National Aeronautics and
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Washington, D.C. 20546
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Robert MacMillin
Jet Propulsion Laboratory, Pasadena, Calif.
(Phone: 818/354-5011)

For Release
December 5, 1990

N90-97

NOTE TO EDITORS: GALILEO EARTH FLYBY NEWS CONFERENCE

Scientists from NASA's Jet Propulsion Laboratory will hold a news conference at 4:30 p.m. EST on Saturday, Dec. 8, to discuss the Galileo spacecraft's flyby of Earth, report on the spacecraft and misison status, and outline ongoing scientific observations of the Earth.

Galileo will fly by the Earth as part of its gravity-assisted path to Jupiter on Dec. 8. It will be closest to Earth (about 590 nautical miles) at 3:35 p.m. EST.

Press conference participants will include Project Manager William J. O'Neil, Mission Director Neal E. Ausman Jr., Project Scientist Torrence V. Johnson, and Science and Mission Design Manager Clayne M. Yeats.

The conference will be carried live on NASA Select television, Satcom F2R, Transponder 13, C-Band.

- end -

NASA News

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For Release

Mark Hess
Headquarters, Washington, D.C.
(Phone: 202/453-4164)

December 5, 1990

RELEASE: 90-158

NASA RELEASES DECEMBER 1990 MIXED FLEET MANIFEST

NASA today issued a December 1990 Mixed Fleet Manifest for both the Space Shuttle and expendable launch vehicles (ELV). Of the 27 Space Shuttle flights planned over the next 3 years, 19 missions will be for NASA payloads or joint NASA/international payloads with the Shuttle focusing on the performance of a variety of space science activities supporting life sciences, materials science and astrophysics investigations.

The remainder of the flights during that time frame will support 2 international Spacelab missions, 2 flights of the commercially-provided Spacehab module and the retrieval and reboost of a stranded commercial communications satellite. On a calendar year basis, there are 7 Space Shuttle launches planned in 1991, 8 in 1992 and 12 in 1993.

The Mixed Fleet Manifest shows 13 launches of expendable vehicles over the next 3 years; 3 launches in the small vehicle class, 7 in the medium category and 3 in the intermediate class. Among the NASA payloads planned for launch on ELVs are the Extreme Ultraviolet Explorer and Geotail on Delta II vehicles in August 1991 and July 1992, respectively, and the Mars Observer on a Titan III in September 1992.

NASA plans 7 Space Shuttle launches in 1991, the first being STS-39 which is an unclassified, dedicated Defense Department mission carrying payloads belonging to the Air Force and the Stategic Defense Initiative Organization. NASA's Gamma Ray Observatory is planned for launch in April and the first Spacelab Life Sciences mission is planned in May. Following that flight, Columbia will be returned to the Rockwell International facility in Palmdale, Calif., for an extensive inspection and modification period during which changes will be made to accommodate the extended duration orbiter pallet.

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The final 4 flights for 1991 are to carry the following primary payloads, respectively: the fifth Tracking and Data Relay Satellite (July); a DOD Defense Support Program (DSP) satellite (August); NASA's Upper Atmospheric Research Satellite (November) and the first International Microgravity Laboratory Spacelab mission (December).

Space Shuttle highlights in 1992 will include the first flight of a new space-age tool, called the Tethered Satellite System (TSS)-1, a joint U.S./Italian project. The European Space Agency's European Retrievable Carrier (EURECA) also will be deployed. An Italian Payload Specialist and Mission Specialist Claude Nicollier of Switzerland will both fly for the first time on this mission. The first Japanese Payload Specialist to fly with NASA, Dr. Mamoru Mohri, will be on the Spacelab-J mission in September.

Also making its debut in 1992 will be the orbiter Endeavour. On its maiden flight, STS-49, astronauts will attach a new perigee kick motor to a stranded INTELSAT communications satellite which failed to reach its proper orbit after launch on a Titan rocket earlier this year. Columbia will return to flight status in mid 1992 carrying the first U.S. Microgravity Laboratory.

A major milestone in the 1993 launch year is the first revisit to the Hubble Space Telescope, planned for STS-60 during the summer.

Throughout this 3-year period a variety of activities in support of Space Station Freedom development will be performed. These include a demonstration test flight for the Flight Telerobotic Servicer, two flights with planned space walks to test planned Space Station equipment and techniques, two zero-gravity thermal system tests and two tests of environmental control system concepts.

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NASA news releases and other NASA information are available electronically on CompuServe and GEnie, the General Electric Network for Information Exchange. For information on CompuServe, call 1-800-848-8199 and ask for representative 176. For information on GEnie, Call 1-800-638-9636.

NASA News

National Aeronautics and
Space Administration

Washington, D.C. 20546
AC 202 453-8400

For Release

Ken Atchison
Headquarters, Washington, D.C.
(Phone: 202/453-8400)

December 7, 1990

N90-98 EDITORS NOTE

PRESS BRIEFING ON AUGUSTINE COMMITTEE FINAL REPORT

The final report of the Advisory Committee on the Future of the U.S. Space Program will be the topic of a press briefing on Monday, Dec. 10, at 11 a.m. EST, Room 450, Old Executive Office Building.

Participants will include Vice President Dan Quayle, NASA Administrator Richard H. Truly and Norman R. Augustine, Chairman of the committee.

Media representatives wishing to attend the briefing who do not hold White House press credentials should contact the Vice President's press office with date of birth and social security number (Ethel Sappington at 202/456-7034).

The briefing will be carried live on NASA Select television, Satcom F2R, Transponder 13, C-band, at 72 Degrees West Longitude, Frequency 3960.0 MHz, Audio 6.8 MHz. There will not be a two-way question and answer capability.

-end-

NASA News

National Aeronautics and
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For Release

Mark Hess/Ed Campion
Headquarters, Washington, D.C.
(Phone: 202/453-8536)

December 10, 1990

Editors Note: N90-100

MONTHLY SPACE FLIGHT BRIEFING SET FOR DECEMBER 13

The Office of Space Flight monthly press briefing will be held Thursday, Dec. 13, from 3 to 5 p.m. EST. Participating in the briefing will be Dr. William Lenoir, Associate Administrator for Space Flight; Robert Crippen, Space Shuttle Director; and Richard Kohrs, Director, Space Station Freedom.

This briefing will be local only and will not be carried on NASA Select or the NASA video teleconfrence network. Members of the news media who wish to attend the briefing should come to NASA Headquarters, 600 Independence Ave., S.W., Room 425.

- end -

NASA News

National Aeronautics and
Space Administration

Washington, D.C. 20546
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For Release

December 11, 1990

RELEASE: C90-gg

NASA GODDARD SELECTS CONSTRUCTION CONTRACTOR

NASA's Goddard Space Flight Center (GSFC), Greenbelt, Md., has selected Centennial Contractors, Inc., Vienna, Va., to conduct minor construction, modifications and rehabilitions at the center.

The contruction services to be provided include the management, planning and execution of a broad variety of smaller projects for existing GSFC facilities. The facilities to be modified include office buildings, automated data processing areas, workshops, laboratories, storage areas, utility buildings, utility systems and site improvements.

The proposed firm fixed-price, indefinite quantity, award-fee contract covers a basic 1-year period with four 1-year options. The maximum value of the contract during the basic contract period is $5 million, with a $25 million maximum for the 5-year period.

- end -

NASA News

National Aeronautics and
Space Administration

Washington, D.C. 20546
AC 202 453-8400

For Release

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December 12, 1990

RELEASE: 90-159

ASTRONAUT SPRINGER RETIRES FROM NASA, MARINE CORPS

Col. Robert C. Springer, selected as an astronaut in 1980 and a mission specialist on two Space Shuttle flights, has retired from NASA and the U.S. Marine Corps.

During his first space flight, STS-29 in March 1989, Springer and his crewmates deployed a NASA Tracking and Data Relay Satellite and performed numerous secondary experiments, including a Space Station "heat pipe" radiator experiment, two student experiments, a protein crystal growth experiment and a chromosome and plant cell division experiment. Additionally, the crew took more than 4,000 photographs of the Earth using several types of cameras, including the IMAX 70-mm movie camera.

Springer also flew on STS-38, a Department of Defense flight, which was launched on Nov. 15, 1990.

Springer's technical assignments have included serving as a member of the support crew for STS-3, concept development studies for the Space Operations Center and the coordination of various aspects of the final development of the Remote Manipulator System for operational use. He also worked in the Mission Control Center, Johnson Space Center, as spacecraft communicator for seven flights in 1984 and 1985.

Springer announced he will work for Boeing Aerospace and Electronics Division in Huntsville, Ala., as the manager of the Space Station Freedom's element integration.

- end -

NASA News

National Aeronautics and
Space Administration

Washington, D.C. 20546
AC 202 453-8400

For Release

David W. Garrett
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December 17, 1990

RELEASE: 90-160

NASA HIGHLIGHTS OF 1990

The year 1990 for NASA was filled with major scientific achievements and several disappointments.

In April, the Hubble Space Telescope (HST) was successfully deployed from the Shuttle Discovery. Several weeks later, the telescope's large mirror was found to have a spherical abberration which would prevent certain visible light observations. However, the HST has begun unprecendented scientific work in spectroscopy, photometry, astrometry and ultraviolet wavelength imaging not possible from the ground. And by using computer image processing, several visible light observations have been made of Orion's nebula and a giant storm on Saturn.

The Magellan spacecraft began detailed radar mapping of the planet Venus in August; the European Space Agency's Ulysses spacecraft, launched in October by the Space Shuttle, is on its way to study the poles of the Sun; and the Galileo spacecraft, launched last year, made its first of 2 gravitational assist passes by Earth in its journey to the planet Jupiter.

NASA Administrator Richard H. Truly launched an effort to collect the best ideas on how to return to the Moon and go on to Mars. Former astronaut Tom Stafford was named to head the group which will analyze the ideas and report to Truly in February.

Despite a stand-down of 5 months due to hydrogen leaks, 6 successful Shuttle missions were flown. Two dedicated Department of Defense paylods, deployment of the SYNCOM IV communications satellite and the Long Duration Exposure Facility retrieval, the Hubble and Ulysses deployments and the Astro-1 astronomy mission comprised the 1990 manifest.

- more -

In December, the Advisory Committee on the Future of the U.S. Space Program (the Augustine Committee) issued its final report recommending that primary emphasis be placed on science; obtaining exclusions for a portion of NASA's employees from civil service rules; redesigning Space Station Freedom; a mission from planet Earth to complement the mission to planet Earth; and reducing dependence on the Space Shuttle by developing a new unmanned heavy-lift launch vehicle.

END GENERAL RELEASE
BACKGROUND INFORMATION FOLLOWS

OFFICE OF SPACE SCIENCE AND APPLICATIONS

For NASA's Office of Space Science and Applications, 1990 was a very successful year, punctuated by substantial challenges. The space science programs initiated this year, despite some setbacks, will continue to expand and provide scientists with rich returns of data that scientists will be studying well into the next century.

The Hubble Space Telescope (HST) epitomized 1990's highs and lows before finishing the year on an optimistic note. After years of anticipation, HST was launched aboard the Space Shuttle Discovery in April. By orbiting above the Earth's atmosphere which distorts astronomers' observations, Hubble would see more clearly than any other telescope ever had, gathering data on the beginning of the universe. Its very first optical-engineering test returned a valuable science observation, resolving the star cluster 30 Doradus three to four times better than the best ground-based observation.

The elation over Hubble was deflated by the discovery in June that the telescope's optical system is affected by a spherical aberration, a misshaping of the primary mirror that prevents the telescope from focusing light to a single, precise point. As a result, the telescope cannot see very faint objects or distinguish faint objects in a crowded field.

Dr. Lennard A. Fisk, Associate Administrator for Space Science and Applications, appointed a review board chaired by Dr. Lew Allen, former Director of the Jet Propulsion Laboratory, to investigate how the aberration had occurred and why it had not been detected before launch. After 5 months, the Board concluded that a key device used to test the shape of the primary mirror had been assembled incorrectly. As a result, the mirror was improperly ground by 2 to 3 microns (thousandths of a millimeter) at its edge.

The Board's report faulted the contractor, Perkin-Elmer (now Hughes Danbury Optical Systems) and NASA for quality-control practices that allowed the error to remain uncorrected. The Board also concluded that mechanisms are in place to prevent similar problems from affecting future systems such as the Advanced X-Ray Astrophysics Facility.

Spherical aberration notwithstanding, Hubble is proving itself an exemplary observatory, still capable of seeing objects in visible light much more clearly than ground-based telescopes and making extraordinary observations in the ultraviolet wavelengths, which are blocked from the surface by the Earth's atmosphere.

The Wide Field/Planetary Camera (WFPC) observed a jet of material streaming away from the Orion Nebula with unprecedented clarity, offering insights into this region of young stars. The

Faint Object Camera, built by the European Space Agency, returned the clearest image yet of Pluto, and its moon, Charon. Most dramatically, the WFPC took several hundred pictures as the white spots on Saturn grew into an immense storm that spread around the planet's equator.

The discovery of the spherical aberration gave new emphasis to the previously planned HST servicing mission in 1993, when astronauts will replace the WFPC with its backup unit, WFPC-2, which will be modified to compensate for the spherical aberration. Once that is accomplished, NASA astronomers are confident HST will accomplish most of its major scientific objectives.

Another NASA astrophysics project, the Cosmic Background Explorer (COBE), completed its survey of the entire sky in infrared and microwave radiation and made unprecedented measurements of background radiation that support the Big Bang theory of the origin of the Universe. In April, COBE sent back to Earth a clear infrared view of the center of the galaxy, which is usually obscured from view in visible light by interstellar dust.

In December, astronomers used three ultraviolet telescopes and the Broad-Band X-Ray Telescope in the ASTRO-1 payload aboard the Space Shuttle Columbia to study the high-energy Universe. They made 394 observations of 135 objects, including Jupiter and its moon Io, a comet, exploding stars, galaxies and quasars. ASTRO-1 also marked the return to flight of the Spacelab payload systems, which last flew in 1985.

By the end of the year, NASA's 1989 planetary missions, Magellan and Galileo, were returning data, and the Ulysses spacecraft had been launched toward the Sun.

After Magellan's controllers worked through some early technical problems, the spacecraft returned radar images of Venus that showed geological features unlike anything seen on Earth. One area sported what scientists called crater farms; another was covered by a checkered pattern of closely spaced fault lines running at right angles. Most intriguing were indications that Venus still may be geologically active, though much less so than Earth. Scientists hope to map the entire surface of Venus and observe evidence of a volcanic eruption during Magellan's mission, which will continue into 1991.

Galileo flew by Venus in February, conducting the first infrared imagery and spectroscopy below the planet's cloud deck. In December, Galileo used the Earth's gravity to pick up speed on its way to its ultimate rendezvous with Jupiter in 1995. In October, the Space Shuttle Discovery launched Ulysses on its mission to study the Sun's polar regions, areas that never had been studied closely.

Planetary missions from the past continued to make news in 1990 on their way into deep space. Voyager 1 turned its camera toward the Sun and took a family portrait of six of the nine planets, the first time such a perspective had ever been seen. Pioneer 11 left the solar system for interstellar space, while Pioneer 10 set an unworldly distance record by passing the 50 astronomical-unit milestone, 4.6 billion miles from Earth.

NASA explored the space closer to Earth in 1990 as well. July saw the launch of the Combined Release and Radiation Effects Satellite (CRRES), which uses chemical releases to study the Earth's magnetic fields and the plasmas, or ionized gases, that travel through them. A sounding-rocket campaign in the South Pacific made sub-orbital studies in conjunction with the CRRES satellite. Releases from a similar mission, PEGSAT, were seen in the spring over parts of Northern Canada.

The agency also expanded its commitment to study the Earth, receiving approval from Congress to begin the Earth Observing System, a series of satellites that will use the perspective from space to observe the Earth as a global environmental system beginning in 1998. More immediately, NASA scientists analyzed global temperatures from the 1980s to offer insights into potential global warming. Though no net trend could be seen within the last decade, observations indicated that the 1980s were warmer than the 1970s.

Ozone depletion studies, an ongoing program within NASA, showed that the 1990 ozone hole over Antarctica opened as rapidly and covered as wide an area as the record 1987 hole. Papers stemming from a 1989 airborne expedition co-sponsored by NASA showed that local areas of ozone depletion also had been observed over the Arctic. In October, the Space Shuttle flew the Shuttle Solar Backscatter Ultraviolet instrument used to calibrate other ozone-detection instruments. To continue global ozone monitoring through the end of the decade, NASA agreed with the Soviet Union to place a Total Ozone Mapping Spectrometer aboard a Soviet Meteor satellite in 1991.

U.S.-Soviet cooperation extended into the life sciences as well as the two nations exchanged biomedical data from 1989 space flights at a September meeting. In addition, specialists from both countries began to analyze data obtained from short- and long-duration missions dealing with bone, muscle and cardiovascular physiology.

Space science research extended into other areas as well. Space Shuttle middeck payloads included experiments to investigate how protein crystals and how flames spread in the absence of the Earth's gravity. NASA aircraft took measurements that ultimately will be used to build instruments to study global winds and tropical rainfall and studied the chemistry of the lower atmosphere over Canada. Balloon flights observed atmospheric processes and tested balloon designs. In all, NASA

conducted approximately 30 suborbital rocket flights and 25 balloon flights in support of space science.

OFFICE OF SPACE FLIGHT

Space Station

A 1991 fiscal year budget shortfall of more than $550 million, along with a Congressional mandate to significantly reduce out-year spending, prompted NASA to begin a 3-month assessment of the Space Station Freedom program. This action will be worked within the existing program structure.

"We will conduct a 3-month assessment to determine what deletions or deferrals in content and what adjustments in schedule will be necessary," said Richard H. Kohrs, Director, Space Station Freedom.

Recommendations on the restructuring of the Freedom program are planned to be forwarded to Space Flight Associate Administrator Dr. William B. Lenoir and NASA Administrator Richard H. Truly about the end of January. Ground rules given to the program to aid in this assessment were developed from Congressional language in NASA's FY 1991 Appropriations Bill.

Congress told NASA to expect no more than 8 to 10 percent growth over the next 5 years (FY 1992-1996), with peak spending for Freedom not to exceed $2.5-2.6 billion. The budgetary ground rules, including the cut for FY 1991, represent a $5.7 billion shortfall from what NASA had planned to spend for Freedom over that same time period.

Other ground rules to be followed in conducting the restructuring include: developing a phased approach with quasi-independent phases; protect life and materials science; maintain international capability; limit assembly flights to no more than four annually; and achieve first element launch, man-tended capability and permanently manned capability as early as possible. At least one option will be developed which holds first element launch at its current date of March 1995.

The Freedom program is on track to complete a major milestone in 1990, the Integrated System Preliminary Design Review. The review is the culmination of the preliminary design reviews completed by all the NASA centers and their prime contractors with responsibility for Freedom hardware. In all, over 80 separate design reviews were conducted over the course of the year focusing on a review of the preliminary design of nearly every major component, subsystem and system which together comprise the space station -- from Freedom's laboratory module to its data management system to the photovoltaic arrays which furnish power to the station.

The integrated systems preliminary design review is a comprehensive review of Freedom's preliminary design. Program officials review the design to make sure it meets requirements for safety and operational adequacy, physical and functional relationship and that the design can be built, integrated and successfully checked out.

While the restructuring will have an impact on the design, program officials expect to use the results of the integrated systems preliminary design review as a baseline for design changes. "We do not want to walk away from the time and resources invested in this program to date," said Kohrs, "and I expect we will be able to use the configuration that comes out of this review as a solid baseline to work from during the restructuring study."

The Freedom program came to grips with several major resource issues in 1990, including the successful reduction of weight and power increases that surfaced from the various preliminary design reviews. Preliminary figures for Freedom's weight as of June 1990 were 143,000 pounds higher than the allocated limit of 512,000 pounds for the total space station, and housekeeping power exceeded the maximum 45 kw available by nearly 15 kw. An intensive summer-long resources scrub reduced weight estimates by 130,000 pounds and reduced the housekeeping power by 13 kw. Users will receive 30 kw of power to conduct their experiments.

Another issue resolved during FY 1990 was the extra vehicular activity maintenance estimates to repair, replace and maintain Freedom's external hardware. A detailed 7-month long assessment by Johnson Space Center's Dr. William F. Fisher and Charles R. Price, co-chairman of the External Maintenance Task Team, showed that external maintenance would total about 3200 hours of EVA if nothing were done to change current plans. However, they estimated that annual EVA hours could be brought down to a manageable 500 hours if NASA followed their recommendations. A "Solutions Team" headed by JSC's William E. Simon arrived at similar conclusions, indicating annual EVA man-hours per year could be reduced from about 3500 hours to about 485 hours annually by implementing their solutions.

Management of the polar platform was transferred to the Office of Space Science and Applications in 1990. OSSA has responsibility for the Earth Observing System, and the space station platform was to be the first in a series of polar-orbiting spacecraft to be developed for the EOS program. The move was accomplished to put the development and operation of the platform closer to the scientists who would use it.

Also in 1990, a new Chief Scientist was named for the Freedom program, Dr. William W. L. Taylor, of TRW. Taylor serves as the principal advocate for the space science community in the space station program.

Space Shuttle

1991 proved to be a year filled with significant accomplishments for the Space Shuttle with six successful missions being flown, an unexpected challenge as a troublesome hydrogen leak temporarily grounded the orbiters Columbia and Atlantis and a major milestone for the new Space Shuttle Endeavour as it was powered on for the first time.

Current capabilities of the Shuttle system were expanded during the year with two extended duration missions flown by Shuttle Columbia on missions STS-32 in January and STS-35 in December. The STS-32 mission set a new record as the longest Shuttle mission ever flown with 261 hours logged. The Shuttle Discovery carried two long awaited payloads into orbit on missions STS-31 in April which deployed the Hubble Space Telescope and STS-41 in October which deployed the Ulysses spacecraft. Atlantis also made two flights during the year for the Department of Defense on missions STS-36 in February and STS-38 in November.

Shuttle launches were interrupted for 5 months after hydrogen leaks were detected on Columbia and Atlantis during external tank loading operations. The problem on Atlantis was isolated to the seals associated with the 17-inch disconnect area. After replacing the disconnect, Atlantis passed a tanking test and returned to flight in November.

Shuttle Columbia also suffered from a leak in the 17-inch disconnect area which was replaced, but a separate leak in the main propulsion system remained elusive. A special leak team headed by Robert Schwinghammer of MSFC isolated the problem to a seal in a prevalve of the main propulsion system which had been damaged during installation after Columiba's January mission. A tanking test on Oct. 30 verified that all problems with Columbia had been resolved and the final Shuttle mission of 1990 was flown by Columbia, Dec. 2-10.

With a NASA eye to the future of the Space Shuttle system, the University Corporation for Atmospheric Research (UCAR), Boulder, Colo., and Global Outpost, Inc., Alexandria, Va., signed agreements with NASA to explore the feasibility of using Shuttle external tanks as research, storage or manufacturing facilities in low-Earth orbit.

On May 11, the Marshall Space Flight Center awarded a 5 year contract to Lockheed Missiles & Space Co. for the design development, test and evaluation of the Space Shuttle Advanced Solid Rocket Motor. NASA and Rockwell International signed a memorandum of agreement in April for a cryogenic pallet which will allow Shuttle missions of up to 16 days in duration. In late July, tests of a drag chute system to improve the landing capabilities of the Space Shuttle began at Ames-Dryden Flight Research Facility.

There were many changes in the astronaut corps in 1991. In what will become standard biennial selections, 23 new astronauts candidates, including the first woman to be named as a pilot candidate and the first Hispanic woman to be chosen, were named and reported for training at Johnson Space Center in July. Five veteran astronauts, Bruce McCandless (STS 41-B, STS-31), Michael J. McCulley (STS-34), Donald E. Williams (STS 51-D, STS-34), Richard M. Mullane (STS 41-D, STS-27) and Robert C. Springer (STS-29, STS-38) retired from the agency.

o March 27: An agreement was signed with General Dynamics to provide Atlas IIAS launch services for the 1995 joint NASA/ESA Solar and Heliospheric Observatory mission.

o May 9: Scout/Multiple Access Communications Satellite was launched for DoD.

o May 11: Contract awarded to Lockheed Missiles and Space Co. for design, development, test and evaluation of the Space Shuttle Advanced Solid Rocket Motor (ASRM). A companion contract was awarded to Lockheed on May 25 for the design and construction of ASRM facilities.

o June 1: Delta II launched the joint NASA/Germany Roentgen Satellite.

o June 7: NASA announced termination of its Orbital Maneuvering Vehicle program.

o June 13: The Board of Governors of Intelsat approved a Space Shuttle rescue mission for the stranded INTELSAT VI satellite.

o July 3: Umbrella agreement signed with Orbital Sciences Corporation in support of the company's Pegasus and Taurus commercial launch vehicle programs.

o July 25: Atlas I (Atlas/Centaur-69) launched the Combined Release and Radiation Effects Satellite.

o Aug. 22: A government/industry board selected the type of rocket engine which will be designed to power the NASA/USAF Advanced Launch System.

OFFICE OF COMMERCIAL PROGRAMS

NASA initiated a new method of outreach to American business by sponsoring "Technology 2000," the first industrial exposition and conference to showcase the transfer of NASA technology to the private sector. Aimed primarily at non-aerospace business, Technology 2000 attracted more than 2,400 people and featured presentations by NASA and industry leaders who addressed prior and potential spinoffs of the agency's research.

To support its increasing commercial payload flight requirements, OCP is sponsoring the development of the Commercial Experiment Transporter (COMET), a system for launching and recovering commercial spaceborne experiments. Carried aloft by an expendable launch vehicle, the COMET free-flyer will contain both a service module and a recovery system. The two components will separate prior to reentering the atmosphere so that others not requiring retrieval, can continue their mission aboard the service module. Current plans call for a mid-1991 launch of the new system into an equatorial orbit.

Additionally, to expand private sector experiment capability aboard the Space Shuttle, NASA awarded a contract to Spacehab, Inc., Washington, D.C., for a Commercial Middeck Augmentation Module. This commercially-developed and owned module will ride in the Shuttle cargo bay, be accessible through the airlock and will add the volume equivalent of about 50 middeck lockers to the orbiters' capacity.

Commercial space flight activity in 1990 included six middeck experiments carried on the Space Shuttle, as well as the launch of Consort 3 aboard a Starfire sounding rocket from White Sands Missile Range, N.M., on May 16. The half-ton Consort payload was carried to an altitude of 200 miles and provided approximately 7 minutes of microgravity for 12 experiments developed by a consortium of NASA Centers for the Commercial Development of Space (CCDS). The flight was the third in the continuing sounding rocket program managed by the Consortium for Materials Development in Space, a CCDS located at the University of Alabama-Huntsville.

Commercial experiments flown aboard the Shuttle in 1990 include:

o Protein crystal Growth (PCG), an experiment package provided by the NASA-sponsored Center for Macromolecular Crystallography (CMC) located at the University of Alabama-Birmingham, carried aboard STS-32 in January.

o Fluids Experiment Apparatus (FEA), a modular, microgravity chemistry and physics laboratory, flown on STS-32 under a NASA-Rockwell International Corp. joint endeavor in the field of floating zone crystal growth and purification research. The FEA included a Microgravity Disturbances Experiment designed to quantify how orbiter and crew-induced disturbances affect sensitive microgravity experiments.

o The PCG payload was flown again on STS-31 in April for CMC. Researchers reported that this flight experiment resulted in more high-quality crystals, including some of the largest ever grown.

o The STS-31 mission also carried the Investigations into Polymer Membrane Processing (IPMP) developed by the Battelle

Advanced Materials Center, Columbus, Ohio. Polymer membranes are used in the separations industry for desalination, filtering drugs and serums, atmospheric purification, electrolyses and dialysis. Post-flight analysis revealed major structural differences from ground-processed membranes.

o Physiological Systems Experiment on STS-41 in October, flown for the Center for Cell Research at Pennsylvania State University and its industry affiliate, Genentech, Inc., to investigate whether microgravity-induced conditions mimick medical problems on Earth.

o Also carried aboard the STS-41 mission was the second flight of the Battelle IPMP experiment to study polymer membrane casting in a convection-free environment.

Other key commercial program activities included:

o Establishment of a Space Commerce Steering Group composed of senior NASA officials. This group, chaired by NASA Deputy Administrator James R. Thompson Jr., will provide a high-level overview of commercial applications of space technology.

o An agreement between NASA and Orbital Sciences Corp., Fairfax, Va., in support of the firm's Pegasus and Taurus commercial launch vehicle programs, through which NASA will provide, on a cost-reimbursable basis, access to agency launch support property and services.

o A memorandum of understanding between NASA and the Technical and Administrative Services Corps., Washington, D.C., which provides a forum for the exchange of research information associated with closed environment systems related to food production both on Earth and in space.

o The Small Business Innovation Research Division awarded 280 Phase 1 and 84 Phase 2 contracts to small, high technology firms. Additional Phase 2 awards, to be made in early 1991, are expected to bring the total number of selections to more than 120.

SPACE EXPLORATION

NASA made significant advances this year in organizing and developing an approach to carry out President Bush's Space Exploration Initiative (SEI) to return to the Moon permanently and send humans to explore Mars.

In February, NASA Administrator Richard H. Truly announced the merger of the Office of Exploration, which laid the foundation for the SEI, with NASA's Office of Aeronautics and Space Technology to form the Office of Aeronautics, Exploration and Technology.

Reconfirming Administration support for the SEI, the White House issued two policy statements. The first named NASA as the principal implementing agency, with the Departments of Defense and Energy playing major roles in technology development and concept definition, and the National Space Council coordinating implementation strategy. The second dealt with an exploratory dialogue on international participation in SEI. This dialogue, with Europe, Japan, Canada, the Soviet Union and others, is expected to occur in 1991.

In May, President Bush announced a goal to land humans on Mars no later than 2019. Shortly after that, Truly announced that NASA will launch an SEI Outreach effort to collect new and innovative concepts and technologies from across the nation to carry out SEI. Truly appointed a committee, known as the Synthesis Group and headed by Lt. Gen. Tom Stafford, USAF, (Ret.), to analyze the ideas submitted from academia, industry and government sources. The group will synthesize inputs from the outreach program into several significantly different architectures and will identify promising technologies to be pursued and near-term milestones, as well. It will report to Administrator Truly in late February or early March 1991.

Meanwhile, NASA and the Department of Energy signed a memorandum of understanding to cooperate on SEI. At year's end, discussions on cooperative SEI agreements between NASA and the Department of Defense and the National Science Foundation were nearing completion.

AERONAUTICS AND SPACE TECHNOLOGY

Aeronautics

NASA aeronautics celebrated 75 years of excellence in 1990. It was on March 3, 1915 that Congress created the National Advisory Committee for Aeronautics (NACA) with an appropriation of just $5,000. From that modest beginning, the NACA grew into the world's premier aeronautics research organization, pushing back the frontiers of flight for more than 4 decades. When NASA was established in October 1958, NACA centers and personnel formed the nucleus of the fledgling aerospace agency.

NASA remained true to its NACA heritage during the past year, conducting a broad range of fundamental and applied aeronautical research programs. High-speed civil transport studies commissioned by NASA have led to a focused High-Speed Research Program that emphasizes the environmental compatibility of a next-generation supersonic transport.

The preliminary results of emissions research show promise that acceptable emission levels can be achieved. Similarly, research indicates that compliance with noise reduction standards is possible.

NASA's Langley Research Center, Hampton, Va., the U.S. Air Force and Boeing Commercial Aircraft Group, Seattle, jointly flight tested a "hybrid" laminar (smooth) air flow control system on a Boeing 757 airliner from March through August. The plane mounted a porous experimental section on the leading edge of the left wing, followed by a run of natural laminar airflow. The results -- laminar flow was achieved over the forward 65 percent of the wing surface -- could lead to significantly reduced fuel consumption and lower operating costs for future U.S. subsonic transports.

Ames-Dryden Flight Research Center, Edwards, Calif., completed military utility evaluations of the X-29 research aircraft in high angle-of-attack flight at speeds up to 0.6 times the speed of sound. Researchers discovered that small variations in key aerodynamic parameters can yield significant variations in total aircraft characteristics at high flight-angles-of-attack. The result was that the X-29 had better flying qualities than expected, allowing the design of flight control system software overlays to improve roll performance. Predictions show that roll performance near maximum lift may be much better than current fighter aircraft.

In a joint program with the U.S. Air Force, the Ames-Dryden facility successfully demonstrated a self-repairing flight control system concept using NASA's F-15 Highly Integrated Digital Electronic Control aircraft. The system concept included real-time reconfiguration of flight control surfaces, fault detection and isolation, positive pilot alert and maintenance diagnostics to facilitate repairs.

If fully developed, the system could greatly increase the ability of aircraft to survive battle damage and enhance safety during training missions.

X-30 National Aero-Space Plane

The X-30 National Aero-Space Plane (NASP) program, a joint NASA/Department of Defense effort, reached a milestone in May when the five primary NASP contractors formally merged into a single national contractor team. Combining the technical expertise and top ideas of the contractors -- Rockwell International, McDonnell Douglas, General Dynamics, Pratt & Whitney and Rocketdyne -- has produced a strong team that now uses all the best ideas from industry.

The NASP program took another "giant leap" at the end of October when a new configuration for the X-30 NASP flight research vehicle was unveiled. The latest concept, a twin-tailed lifting-body shape, is a blend of design concepts from the contractor team. In addition, the technical progress of the program continued with major advances in scramjet engine testing and large-scale structural components.

Space Technology

After nearly 6 years in Earth orbit, the Long Duration Exposure Facility (LDEF) was brought home by the crew of STS-32 in January. LDEF's 57 science and technology experiments are providing a bonanza of information about the effects of long-term exposure to the harsh environment of space -- knowledge that will be invaluable to the design of tomorrow's space vehicles.

Two prototype planetary robots made their debut during the year. "Ambler" is a six-legged, 12-foot-tall testbed developed for NASA by Carnegie Mellon University, Pittsburgh. It will test technology for robots that may literally walk through rough terrain on the Moon and Mars. "Robby," a more conventional six-wheeled articulated vehicle, was designed by NASA's Jet Propulsion Laboratory, Pasadena, Calif. Both robots are equipped with experimental computerized navigation systems that let them travel autonomously according to preprogrammed general instructions.

In April, NASA dedicated the Human Performance Research Laboratory (HPRL) at Ames Research Center, Mountain View, Calif. HPRL is the nation's first facility dedicated to studying the role of people in advanced aviation situations and long-duration space travel. The lab also will research the relationships between humans and computers in its Automation Sciences Research Facility, now under construction.

NASA announced in November that it has joined the Concurrent Supercomputing Consortium, a newly-formed group of research organizations that will tackle some of today's most demanding computational challenges. As a benefit of the agency's membership, NASA researchers will have access to the world's fastest supercomputer, the Touchstone DELTA system, when it becomes operational at the California Institute of Technology, Pasadena, Calif., next spring.

Langley Research Center and Honeywell's Space Systems Group, Clearwater, Fla., conducted joint flight tests of an automated landing system in October and November. NASA's Boeing 737 research aircraft made 36 landings using a Honeywell integrated differential navigation system linked to the Global Positioning System constellation of Earth-orbiting satellites. The test data will be useful in designing auto-landing equipment for future spacecraft and will help researchers assess how to reduce risk in automated touchdowns.

INTERNATIONAL RELATIONS

Highlights of NASA's international cooperative activities in 1990 included the launch of three international missions:

o In October 1990, the European Space Agency's Ulysses spacecraft was successfully launched from the Space Shuttle.

Ulysses is a joint NASA/ESA program to study the poles of the Sun and interplanetary space above and below the poles. ESA developed the spacecraft, its ground control computer system and a number of the scientific instruments. NASA provided the upper stages, radioisotopic thermoelectric generator, a part of the science instrument payload, Space Shuttle launch and tracking and data acquisition.

o NASA's Hubble Space Telescope, also a cooperative program, was successfully launched from the Space Shuttle in April 1990. ESA provided the Faint Object Camera and the Solar Arrays. In return for their contributions, ESA will receive 15 percent of the HST's viewing time.

o In June, Roentgen Satellite, a German X-ray spacecraft, was successfully launched aboard a McDonnell Douglas Delta II expendable launch vehicle from Cape Canaveral Air Force Station,

Fla. The spacecraft is a NASA/German Space Agency cooperative program which will provide a detailed survey of the X-ray sources across the sky, followed by studies of some 1,000 of the anticipated 50,000 to 100,000 sources that will be detected.

Additional international cooperative activities during the year included initiatives in a number of areas of civil space:

o NASA has invited Japan, Canada and Europe to provide two mission specialist astronaut candidates to join the July 1992 astronaut training class. It is NASA's intention to offer Space Shuttle flight assignments to one or both of each countries' mission specialist candidates in the years following the successful completion of the training program.

o The Italian Tethered Satellite arrived at the Kennedy Space Center, Fla., in November, for final testing and preparation for launch on STS-46 in early 1992, accompanied by an Italian payload specialist. Two Italian candidates are in training.

o Cooperation with the Soviet Union continued to progress under the U.S./USSR joint working groups (JWG) on space biology and medicine; solar system exploration; space astronomy and astrophysics; solar-terrestrial physics and Earth sciences.

Key activities included:

o NASA and its Soviet counterpart signed an agreement on July 25, 1990, to fly NASA's Total Ozone Mapping Spectrometer on a Soviet Meteor-3 spacecraft in 1991. The objective of this project is to continue the availability of global ozone data to assess important environmental phenomena such as the Antarctic ozone hole.

o In March, NASA agreed to participate in the Soviet Academy of Sciences' radio telescope project, RADIOASTRON, a 3-4 year

mission set for launch in the mid-1990s. The RADIOASTRON mission will explore fundamental astrophysical phenomena, including active galaxies and quasars, neutron stars and black holes. NASA will provide precision tracking and the loan of data recorders to support the large Soviet orbiting radio telescope.

o U.S./USSR officials continued discussions on flying the U.S. X-ray All Sky Monitor and an X-Ray Polarimeter on the Soviet Spectrum-X-Gamma high energy astrophysics mission in 1993/1994. Planning also continued on NASA flying a Soviet gamma-ray burst instrument, Konus, on the U.S. spacecraft, scheduled for launch in 1992.

o In November, NASA participated with ESA, the Institute of Space and Astronautical Science of Japan and the Intercomsmos Council of the Soviet Academy of Sciences in meetings of the Inter-Agency Consultative Group for Space Science. The group coordinates more than a dozen space missions in the field of space physics planned by these agencies.

o In July, NASA hosted an International Spacecraft Rendezvous and Docking Conference at the Johnson Space Center. The conference included participation by representatives from the U.S. (NASA), Japan (NASDA), Canada (CSA), and Europe (ESA). The purpose of the conference was to identify standards for design and/or operational practices necessary to accommodate or enable cooperative and/or joint operations in space.

o During the summer of 1990, NASA and Environment Canada together with members of the Canadian Institute for Research in Atmospheric Chemistry, conducted a major joint NASA/Canada atmospheric mission. This project, entitled Atmospheric Boundary Layer Experiment-3, was a part of NASA's Global Tropospheric Experiment, a major scientific initiative established to study the underlying science of man's impact on the chemistry and dynamics of the global troposphere.

OFFICE OF SPACE OPERATIONS

The Office of Space Operations (OSO) provided tracking, communications and data acquisition for three major science missions: the Magellan on its mission to map the surface of Venus; Ulysses, a mission to the sun and the Hubble Space Telescope. OSO also provided coverage for six Space Shuttle flights; the Galileo spacecraft's Earth flyby on its journey to Jupiter and Titan; the Voyagers and Pioneers spacecraft as they leave the solar sytem; atmospheric research activities; and Earth-orbiting spacecraft monitoring weather and other environmental phenomenon.

The fifth Tracking and Data Relay Satellite has essentially been completed and will be ready for launch on a Space Shuttle flight in 1991.

The Advanced Tracking and Data Relay Satellite System (ATDRSS) Phase B study contracts were awarded. Participating companies are to demonstrate their ability and capacity to design, manage, integrate and test large, modern communications spacecraft and associated ground facility modifications. The ATDRSS will ensure the essential continuation of the space network through the year 2012.

Officials of the Goddard Space Flight Center, Greenbelt, Md., and Contel Federal Systems, Chantilly, Va., signed an agreement transferring the title of the TDRSS to NASA effective July 1, 1990. Under the agreement, Contel transferred ownership of the space communication system 42 months earlier than called for under the original 1976 contract.

OFFICE OF SAFETY AND MISSION QUALITY

The Government Accounting Office reviewed the Office of Safety and Mission Quality (SMQ) and concluded that the office is working well in providing independent oversight, review, assessment and policy development . One specific recommendation addressed in the report was to modify the processes and procedures for formulating the SMQ budget to ensure that SMQ activities are funded independently of the programs and activities they are responsible for overseeing. The Associate Administrator for SMQ is evaluating the recommendation.

The Aerospace Safety Advisory Panel presented its annual report to the NASA Administrator. The report covered February 1989 through January 1990, providing findings, recommendations and supporting material regarding the Shuttle, Space Station Freedom, aeronautics and other NASA activities. Overall the report concluded that NASA's management organization is reasonably well defined, communications effective and launch procedures controlled and disciplined.

SMQ made a significant contribution to the successful launch of the Ulysses spacecraft and contingency planning of the Galileo spacecraft flyby. In addition to overall safety planning, the office was responsible for conducting independent reviews and evaluations of risks posed by the use of onboard nuclear power systems. Other activities included developing and coordinating radiological dispersion models, coordinating SMQ approval of contingency plans and safety procedures for all agencies and individuals involved and coordinating and conducting emergency simulations to ensure readiness in the event of a radiological accident.

Over 700 government, academic and contractor personnel, representing over 300 organizations, attended the Seventh Annual NASA/Contractors Conference held in Grenelefe, Fla. The conference provided a forum for senior NASA and aerospace management to exchange information and experiences on Total Quality Management and the continuous improvement process.

NASA Administrator Richard H. Truly announced at the Seventh Annual NASA/Contractors Conference that the NASA Excellence Award would be renamed the George M. Low Trophy: NASA's Quality and Excellence Award. Truly said that "George Low represented quality and excellence like few others and was involved in every success the American space program had". Low was manager of the Apollo spacecraft program and later was Deputy Administrator of NASA from 1969 to 1976.

Rockwell International, Space Systems Division, Downey Calif., and Marotta Scientific Controls, Inc., Montville, N.J., two of nine finalists selected in May, were named recipients of the 1990 George M. Low Trophy. Marotta was the first recipient of the award in the newly established small business category.

The award recognizes NASA prime contractors, subcontractors and suppliers for outstanding achievement in quality and productivity improvement and Total Quality Management.

The Johnson Space Center was chosen as one of three Quality Improvement Prototypes, a distinction that will make it a model for quality improvement efforts at other NASA centers and an example to all federal agencies.

The NASA Trend Analysis Working Group held a special session for various government and industry representatives explaining the NASA trend analysis program. Created in response to recommendations of the Rogers Commission Report, the group ensures that all significant problems and trends that either affect flight hardware and/or systems are quickly identified and communicated to the proper level.

EDUCATIONAL AFFAIRS

NASA adopted the National Education Goals set by the President and the Governors as fundamental guidelines for developing and conducting education programs. As a result, a complementary 10-year plan is being developed.

In May, NASA and DOE announced a memorandum of understanding to collaborate on education programs to help improve the nation's science, engineering and math programs.

Astronauts presented the first live lesson from space on Dec. 7 during the STS-35, Astro-1 mission. "Space Classroom, Assignment: The Stars," focused on the electromagnetic spectrum and its relationship to the high-energy astronomy mission. The 30-minute science lesson was conducted by orbiting Payload Specialist Sam Durrance and Mission Specialist Jeff Hoffman.

Following the crew presentation, Karen Weidenhofer, a teacher, conducted a 1-hour follow-up lecture. The lesson concluded with orbiting Mission Specialist Bob Parker and Payload Specialist Ron Parise answering questions from 12 students in a

classroom at Marshall Space Flight Center and 28 students in a control room at Goddard Space Flight Center. An edited version of the lesson and accompanying teachers guide will be distributed nationally.

Over 4 million budding student scientists planted gardens during the spring semester to experiment with tomato seeds flown in space. Students grew and monitored space-exposed seeds and Earth-based seeds, searching for differences caused by long-term effects of exposure to radiation. The Space Exposed Experiment Developed for Students (SEEDS), was one of 57 experiments housed on the LDEF satellite. NASA distributed over 132,000 kits to approximately 64,000 teachers. Results will be compiled, analyzed and published during the Spring 1991.

Last year 21 Designated Space Grant Colleges/Consortia were selected initiating NASA's National Space Grant College and Fellowship Program. In an effort to expand the program, Phase II was announced in May 1990 offering institutions in the remaining 29 states and the District of Columbia an opportunity to compete for Program Grants or Capability Enhancement Grants. Grantees will be announced in early 1991.

In a new education initiative, the Teacher Training Pre-Service Program, research grants were awarded to two universities to develop teacher training courses that will enable teachers to incorporate aerospace topics and concepts into their classrooms and to create new and imaginative practices in learning.

In March, NASA debuted the first of what it hopes will become a small fleet of tractor-trailer mounted mobile teacher resource centers that will travel the nation providing lesson materials to teachers who could not otherwise travel to a NASA field center. The mobile center is part of a larger education initiative, project LASER (Learning About Science, Engineering and Research).

The LASER van is outfitted with six work stations each equipped with a computer providing acess to "NASA Spacelink," and electronic information system with a broad range of information and educational materials and a videotape recorder and monitoring system for copying NASA educational videotapes. Teachers also can photocopy and duplicate lesson plans, activities and slides.

A student experiment, selected under the Space Shuttle Student Involvement Program, flew aboard the Space Shuttle Discovery in April 1990. On STS-31, student investigator Greg Peterson, Brigham City, Utah, flew an experiment designed to study the effects of weightlessness on electrical arcs.

In its 10th year, the Space Science Student Involvement Program selected eight national winners in the Space Station category. Top honors, plus a $2,500 scholarship, went to Catherine Cusimano, Landsdale, Pa., and to Jihyun Oh, Lenexa,

Kan. Also honored were national winners in the Space Station, Student Newpaper advertisement, Newspaper Feature and Moon Base competitions.

The Aerospace Education Services Project continues to be one of NASA's most popular education programs. During 1990, over 1.3 million students and 20,500 teachers were reached through school visits, classroom lectures and teacher workshops.

During the summer, educators spent 2 weeks at one of NASA's nine field centers learning the latest in aerospace science and working with educational specialists to fit materials into a classroom curriculum. There were 115 elementary school teachers participating in NASA's Educational Workshop for Elementary School Teachers and 100 teachers participating in NASA's Educational Workshops for High School Math and Science Teachers.

Over 120,000 educators in the 50 states and parts of Canada tuned in for NASA's satellite video conferences for educators. NASA projects covered in the live, interactive program this year included the Mission to Planet Earth program, Astro-1 mission, SEEDS and Robotics in Space.

Over $10 million was awarded to 523 students at approximately 150 universities for advanced study in engineering and space, physical, life and environmental sciences under NASA's Graduate Student Researcher's Program, including the Under-represented Minority Focus component.

Continuing its efforts to encourage the next generation of scientists and engineers, NASA selected 37 graduate students at U.S. universities to take part in the new Global Change Fellowship Program. Students will conduct research in atmospheric physics and chemistry, biogeochemistry, ecosystems, hydrology and oceanography, receiving $22,000 beginning in the 1990-91 academic year.

FY 1991 NASA APPROPRIATIONS

The VA-HUD-Independent Agencies Appropriations Bill for Fiscal Year 1991 was signed Nov. 5. NASA's funding was set at $13,868.3 billion, a 13 percent increase over 1990, but $1.257 billion less than the President's request of $15,125.2 billion.

NASA's request was designed to fund a start-up of the Space Exploration Initiative, begin hardware development of Space Station Freedom, continue research and development on projects such as the Earth Observing System and the National Aerospace Plane while proceeding with on-going and planned space science missions and Shuttle operations.

As Congress considered NASA's budget request, several issues emerged which had an impact on the final outcome. Most important of these were the Administration/Congressional Budget Summit

negotiations aimed at cutting the federal budget deficit. At the same time, oversight committees in both the House and Senate were questioning NASA's management of large-scale projects in hearings on problems such as the Hubble Space Telescope's spherical aberration, the Shuttle hydrogen leaks and maintenance requirements for the Freedon Sspace Station.

On Oct. 16, House-Senate appropriation conferees reached an agreement which included $1.9 billion for SSF, $551 million less than requested, and deleted funding for SEI. Additionally, NASA was directed to submit plans for a redesigned space station and advised to expect growth of no more than 10 per cent over the next 5 years. The bill was passed by the Senate on Oct. 25 and by the House the following day.

- end -

NASA news releases and other NASA information are available electronically on CompuServe and GEnie, the General Electric Network for Information Exchange. For information on CompuServe, call 1-800-848-8199 and ask for representative 176. For information on GEnie, call 1-800-638-9636.

NASA News

National Aeronautics and
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For Release

Jeff Vincent
Headquarters, Washington, D.C.

(Phone: 202/453-8369)

December 17, 1990

2 P.M. EST

RELEASE: 90-161

NASA LEADERSHIP MEETS WITH TASK FORCE

NASA Administrator Richard H. Truly and his senior managers from across the agency met Sat., Dec. 15, with Chairman Norman R. Augustine and a majority of the other members of the Advisory Committee on the Future of the U.S. Space Program. The advisory committee issues its full report this week.

"The meeting was candid and very constructive," said Truly following the 3-hour, closed-door session in Easton, Md. "We find the committee's report to be extremely supportive of NASA and the civil space program, and we clarified a number of points during our meeting that will help us move forward quickly." The report makes 15 specific recommendations and a number of suggestions for changes in the direction and scope of future U.S. initiatives in space.

Truly also announced he had named Donald R. Puddy, Director of the Flight Crew Operations Directorate at the Johnson Space Center, Houston, to head a small team to assist him in determining how best to implement those recommendations in the report under the purview of NASA.

"Many of the report's recommendations are consistent with initiatives already underway at NASA," Truly said. "Others can be put in place fairly soon, while some, by their very nature, will take longer. Many of the most important recommendations are interrelated and resource-dependent and will depend on the strong support of not only NASA, but also the White House and Congress."

Truly plans a holiday message to all NASA employees at noon (EST) tomorrow on NASA Select television, including a report on the weekend meeting.

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The session with the advisory committee members took place at the end of a 2-day NASA Senior Management Meeting (which had been previously scheduled) comprising the top managers from NASA Headquarters and the Directors and Deputy Directors of all NASA centers. The first day of the meeting was devoted to an in-depth discussion among the agency's leaders. The advisory committee members who joined the meeting the next day included Augustine, Edward C. (Pete) Aldridge, Jr., D. James Baker, Daniel J. Fink, Robert T. Herres, David T. Kearns and Louis J. Lanzerotti.

- end -

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For Release

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NASA ANNOUNCES CREW MEMBERS FOR FUTURE SPACE SHUTTLE FLIGHTS

NASA today announced crew members for future Space Shuttle flights STS-48 Upper Atmosphere Research Satellite (UARS), STS-46 Tethered Satellite Systems, STS-49 Intelsat and STS-50 U.S. Microgravity Laboratory (USML-1).

STS-48 UARS, scheduled for launch Nov. 1991, is a mission to study the Earth's upper atmosphere on a global scale. Nine UARS sensors will provide comprehensive data on energy inputs, winds and chemical composition of the stratosphere. Crew members are:

Commander: John O. Creighton, Capt. USN
Pilot: Kenneth S. Reightler, Jr., Cdr. USN
Mission Specialists: James F. Buchli, Col. USMC
Mark N. Brown, Col. USAF
Charles D. "Sam" Gemar, Maj. USA

Creighton, 47, was born in Orange, Texas, and received his bachelor of science from the U.S. Naval Academy and master of science in administration of science and technology from George Washington University. He was pilot on STS-51G and commander on STS-36.

Reightler, 39, was born at Patuxent River Naval Air Station, Md., and received his bachelor of science in aerospace engineering from the U.S. Naval Academy; master of science in aeronautical engineering from the U.S. Naval Postgraduate School and master of science in systems management from the University of Southern California. He was selected as a pilot astronaut in 1987, and this is his first Shuttle mission.

- more -

Buchli, 45, was born in New Rockford, N.D., and received his bachelor of science in aeronautical engineering from the U.S. Naval Academy and master of science in aeronautical engineering systems from the University of West Florida. He has flown on STS-51C, STS-61A and STS-29.

Brown, 39, was born in Valparaiso, Ind., and received his bachelor of science in aeronautical and astronautical engineering from Purdue University and master of science in astronautical engineering from the U.S. Air Force Institute of Technology. He flew on STS-28.

Gemar, 35, was born in Yankton, S.D., and received his bachelor of science in engineering from the U.S. Military Academy. He flew on STS-38.

STS-46 TS, scheduled for March 1992, is a tethered satellite which will be deployed from the orbiter payload bay on an approximately 12-mile tether where it will collect electrodynamic data in the upper reaches of the Earth's atmosphere. Also, the European Retrievable Carrier (EURECA), a free-flying reusable platform dedicated to material science and life science experiments, will be deployed. Crew members are:

Commander: Loren J. Shriver, Col. USAF
Pilot: James D. Wetherbee, Cdr. USN
Mission Specialists: Andrew M. Allen, Maj. USMC
STS-46 Mission Specialists previously named: Franklin R. Chang-Diaz, Ph.D.; Jeffrey A. Hoffman, Ph.D.; Claude Nicollier, ESA Astronaut
Payload Specialist: A prime and backup payload specialist will be selected from the two announced candidates: Umberto Guidoni, Italy and Franco Malerba, Italy

Shriver, 46, was born in Jefferson, Iowa, and received his bachelor of science in aeronautical engineering from the U.S. Air Force Academy and master of science in astronautical engineering from Purdue University. He was pilot on STS-51C and commander on STS-31.

Wetherbee, 38, was born in Flushing, N.Y., and received his bachelor of science in aerospace engineering from the University of Notre Dame. He was pilot on STS-32.

Allen, 35, was born in Philadelphia, Pa., and received his bachelor of science in mechanical engineering from Villanova University. He was selected as a pilot astronaut in 1987, and this is his first Shuttle mission.

STS-49 Intelsat, scheduled for launch in May 1992, is a flight on which crew members will attach a new booster and redeploy the Intelsat satellite. Additionally, three spacewalks will be performed in an extensive test of techniques to be employed during assembly of Space Station Freedom. This will be the first flight for the new orbiter Endeavour. Crew members are:

Commander: Daniel C. Brandenstein, Capt. USN
Pilot: Kevin P. Chilton, Maj. USAF
Mission Specialists: Pierre J. Thuot, Cdr. USN; Kathryn C. Thornton, Ph.D.; Richard J. Hieb; Thomas D. Akers, Maj. USAF; Bruce E. Melnick, Cdr. USCG

Brandenstein, 47, was born in Watertown, Wis., and received his bachelor of science in mathematics and physics from the University of Wisconsin at River Falls. He was pilot on STS-8 and commander on STS-51G and STS-32.

Chilton, 36, was born in Los Angeles, Calif., and received his bachelor of science in engineering sciences from the U.S. Air Force Academy and master of science in mechanical engineering from Columbia University. He was selected as a pilot astronaut in 1987, and this is his first Shuttle mission.

Thuot, 35, was born in Groton , Conn., and received his bachelor of science in physics from the U.S. Naval Academy and master of science in systems management from the University of Southern California. He flew on STS-36.

Thornton, 38, was born in Montgomery, Ala., and received her bachelor of science from Auburn University, master of science and doctorate of philosophy in physics from the University of Virginia. She flew on STS-33.

Hieb, 35, was born in Jamestown, N.D., and received his bachelor of arts in mathematics and physics from Northwest Nazarene College and master of science in aerospace engineering from the University of Colorado. He is scheduled to fly on STS-39 in March 1991.

Akers, 39, was born in St. Louis, Mo., and received his bachelor and master of science in applied mathematics from University of Missouri-Rolla. He flew on STS-41.

Melnick, 41, was born in New York, N.Y., and received his bachelor of science in engineering from the U.S. Coast Guard Academy and master of science in aeronautical systems from the University of West Florida. He flew on STS-41.

STS-50 USML-1, scheduled for June 1992, is a complement of microgravity materials processing technology experiments to be flown on the first extended duration orbiter mission aboard Columbia. This mission is planned for a 13-day duration, the longest Shuttle mission to date. Crew members are:

Commander: Richard N. Richards, Capt. USN
Pilot: John H. Casper, Col. USAF
Mission Specialists: Kenneth D. Bowersox, Lt. Cdr. USN
Bonnie J. Dunbar, Ph.D. Payload Commander (previously named)
Carl J. Meade, Lt. Col. USAF
Payload Specialists: Two prime and two backup will be selected from the announced candidates: Lawrence J. DeLucas, Ph.D.; Joseph M. Prahl, Ph.D.; Albert Sacco, Jr., Ph.D.; Eugene H. Trinh, Ph.D.

Richards, 44, was born in Key West, Fla., and received his bachelor of science in chemical engineering from the University of Missouri and master of science in aeronautical systems from the University of West Florida. He was pilot on STS-28 and commander on STS-41.

Casper, 47, was born in Greenville, S.C., and received his bachelor of science in engineering science from the U.S. Air Force Academy and master of science in astronautics from Purdue University. He was a pilot on STS-36.

Bowersox, 34, was born in Portsmouth, Va., and received his bachelor of Science in aerospace engineering from the U.S. Naval Academy and master of science in mechanical engineering from Columbia University. He was selected as a pilot astronaut in 1987, and this is his first Shuttle mission.

Meade, 40, was born at Chanute AFB, Ill., and received his bachelor of science in electrical engineering from the University of Texas where he participated in plasma dynamics research and master of science in electronics engineering from the California Institute of Technology as a Hughes Fellow doing research involving the application of information theory to neurophysiology. He flew on STS-38.

- end -

NASA News

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For Release
December 20, 1990

RELEASE: 90-164

NASA SELECTS PROJECTS FOR COMMERCIAL USE OF REMOTE SENSING

NASA today announced the selection of 12 research projects to develop new private sector applications of space-based and airborne remote sensing technologies.

Funding for the Earth Observations Commercialization Applications Program (EOCAP) projects represents a continuation of a program aimed at increasing broader use of NASA-developed technology for gathering and analyzing valuable information about Earth and ocean resources through remote satellite or aircraft observations.

The program, sponsored by NASA's Office of Commercial Programs (OCP), will fund over $2 million of research annually. Investigator teams are required to provide substantial co-funding of proposed research as a contribution to the project.

Projects funded under the program will identify and research new commercial products and services that might be developed from use of existing technology and explore ways of improving and expanding the uses of remote sensing by commercial ventures.

The first solicitation for EOCAP was issued in late 1987. Of the more that 120 proposals received and evaluated, 20 projects were selected and funded over a 3-year period with $12 million from OCP and the Office of Space Science and Applications.

The second solicitation for proposals was issued in June 1990. A total of 50 proposals were received and reviewed prior to today's selection announcement. Projects will be managed by OCP through the Science and Technology Laboratory at NASA's John C. Stennis Space Center in Mississippi.

- more -

The 12 projects selected for negotiation leading to 1-year funding contracts, with options to extend funding for an additional 2 years, will be procured in two phases expected to begin in March 1991, with the second phase as early as July 1991.

Phase I projects are:

- Hazardous Waste Detection: A Pilot Remote Sensing Assisted Environmental Audit, proposed by investigators affiliated with Earthscan, Inc., Austin, Texas.

- Improved Urban Infrastructure Mapping for Market Forecasting using Remote Sensing and Geographic Information Systems Technology, proposed by investigators affiliated with BellSouth Services, Inc., Birmingham, Ala.; University of South Carolina, Columbia; and NASA John C. Stennis Space Center, Miss.

- Development and Marketing of Land Use and Cover Change Analysis System (LUCAS), proposed by investigators affiliated with Pacific Meridan Resources, Emeryville, Calif.; USDA Forest Service, Portland, Ore.; and Oregon Department of Land Conservation and Development, Salem.

- Integrated Software System for Analyzing Remote Sensed Data, proposed by investigators affiliated with Statistical Sciences, Inc., Seattle; University of Washington, Seattle; and Hewlett-Packard, Denver.

- Application of Remote Sensing Technology for Real Time Disaster Assessment, proposed by investigators affiliated with Terra-Mar Resource Information Services, Mountain View, Calif.; Teale Data Center, Sacramento, Calif.; NASA Ames Research Center, Mountain View, Calif.; Pacific Southwest Forest and Range Experiment Station, Forest Fire Laboratory, Riverside, Calif.; Hewlett Packard Co., Fort Collins, Colo.; Visual Information Technologies, Inc., Plano, Texas; and ESL, Inc., Sunnyvale, Calif.

- Use of Satellite Derived Estimates of Precipitation and Evapotransporation to Enhance Hydrologic Forecasting, proposed by investigators affiliated with The Electric Power Research Institute, Palo Alto, Calif.; C.F. Haines, Hydrologistics, Inc., Northport, Ala.; NASA Stennis Space Center; Department of Commerce, National Oceanic and Atmospheric Administration; National Environmental Satellite, Data, and Information Service, Camp Springs, Md.; and Alabama Power Co., Birmingham.

- Demonstrate and Market Oil Seep Surveys, proposed by investigators affiliated with Earth Satellite Corp., Rockville, Md.; Chevron Overseas Petroleum, Inc., San Ramon, Calif.; Marathon Oil Co., Houston; Arco Oil and Gas Co., Plano, Texas; Geosat Committee, Norman, Okla.; and Central Trading System, West Islip, N.Y.

Phase II Projects are:

- GeoStack Database for Geographic Information Systems, proposed by investigators affiliated with ST Systems Corp., Lanham, Md.; University of Florida, Gainesville; Stennis Space Center, Science and Technology Laboratory; Chevron Overseas Petroleum, Inc., San Ramon, Calif.; and Weyerhaeuser Co., Tacoma, Wash.

- Pipeline Infrastructure Monitoring and Management, proposed by investigators affiliated with James W. Sewall Company, Old Town, Maine; Algonquin Gas Transmission Co., Boston, Mass.; NASA Stennis Space Center, Science and Technology Laboratory; Panhandle Eastern Pipe Line Co. Houston; Texas; Eastern Gas Pipeline Co. and Trunkline Gas Co., Houston.

- Marketing Remote Sensing Data for North Pacific Fisheries Development and Management, proposed by investigators affiliated with Natural Resources Consultants, Inc., Seattle; Western Resources Analysis, Wenatchee, Wash.; Pacific Remote Sensing Alliance, Bothell, Wash.; NASA Ames Research Center; Department of the Navy, Naval Postgraduate School, Monterey, Calif.; University of Alaska Fairbanks, Fairbanks, Alaska; Alaska Factory Trawler Associations, Seattle; North Pacific Fishing Vessel Owners' Association, Seattle; University of Washington, Seattle; U.S. Department of Commerce, National Oceanic and Atmospheric Administration; Alaska Fisheries Science Center, Law Enforcement Division, Seattle; Washington Sea Grant Program, Seattle; University of New Mexico, Technology Application Center, Albuquerque; and RSMAS/University of Miami, Fla.

- Satellite Remote Sensing for Agricultural Production Management, proposed by investigators affiliated with Cropix, Inc., Hermiston, Ore.; NASA Ames Research Center; Oregon State University, Corvallis; IRZ Consulting, Hermiston, Ore.; Eagle Ranch, Echo, Ore.; L & L Farms, Echo, Ore.

- Wetlands Information Services, proposed by investigators affiliated with Applied Analysis Incorporated, Billerica, Mass.; and Clemson University, Clemson, S.C.

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NASA News

National Aeronautics and
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For Release

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December 26, 1990

RELEASE: 90-165

SPACE STATION INTEGRATED DESIGN REVIEW COMPLETED

The Integrated System Preliminary Design Review (ISPDR) for the Freedom space station, a major milestone leading to the construction, launch and assembly of the station, was completed on schedule this week marking the end of a year-long assessment of Freedom's preliminary design by the NASA centers, their prime contractors and the international partners involved in the space station project.

Over the course of the last 13 months, over 80 separate design reviews were conducted at NASA centers and contractor facilities to ensure Freedom's preliminary design could satisfy requirements for safety, physical and functional compatibility and for its ability to be built, integrated with other hardware, and tested. During this time, every major component, subsystem and system, which together comprise the space station, were examined.

"We did it," said Marc Bensimon, Deputy Manager for Freedom's Program and Operations Office, Reston, Va., who headed the ISPDR effort. "We established the schedule for the PDR last April and we met every milestone as planned."

"This was an outstanding effort," said Robert Moorehead, Deputy Director for Space Station Freedom Program and Operations. "Not only did we accomplish the PDR on schedule, we made the schedule despite having to devote a lot of time and attention to other issues, like weight and power and EVA (extravehicular activity) resources."

Preliminary figures for Freedom's weight as of June 1990 were 143,000 pounds higher than the allocated limit of 512,000 pounds for the total space station, and housekeeping power exceeded the maximum 45 kw available by nearly 15 kw. An intensive summer-long resources scrub reduced weight estimates by 130,000 pounds and reduced the housekeeping power by 13 kw. Users will receive 30 kw of power to conduct their experiments.

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Despite the added rigors of the ISPDR review progress, weight and power levels have remained stable. "What this means is that the design is maturing and converging," said Bensimon. "While a PDR is typically conducted with the hardware only 10 percent designed, I was impressed with the detail of the preliminary design and the knowledge our systems managers displayed with respect to expected performance of their systems."

While hardware was a major focus of the ISPDR, space station managers also reviewed and baselined ground processing procedures, computer software specifications and pre-flight verification plans for Freedom. They also approved design modifications such as those suggested by Dr. William F. Fisher and Charles R. Price, Co-chairman of the External Maintenance Task Team. In the EVA systems area, program managers approved a change that would provide a handle on all external orbital replacement units so that those components could be replaced by robots as well as humans.

Both Moorehead and Bensimon acknowledge the current restructure assessment (begun in November as a result of a 1991 fiscal year budget shortfall of more than $550 million along with a Congressional mandate to significantly reduce out-year spending) will have an impact on the design but are confident that the ISPDR has laid a firm foundation for the restucturing.

"Certainly there will be design changes," said Moorehead, "but I think that from a systems and subsystems standpoint, the ISPDR configuration provides us with an excellent baseline to work from for the restructuring. Afterall, regardless of what Freedom will look like from an overall configuration standpoint, we will still have to have systems like power, thermal control, data management and guidance and control. I anticipate being able to use a significant proportion of those systems in the station that comes out of our restructure assessment."

Bensimon said the next major milestone in the development process will take place next spring. By then, engineers will have completed incorporating the design changes that come out of the restructuring and can begin a series of stage design reviews that carefully examine the configuration at various steps along the assembly sequence. At each stage, engineers must make certain the station can function like an independent spacecraft, with all the necessary backups, to ensure overall mission success.

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