NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SPACE SHUTTLE MISSION STS-45

PRESS KIT
MARCH 1992

ATLAS-1 MISSION

STS-45 INSIGNIA

STS045-S-001 -- *Designed by the crewmembers, the STS-45 insignia depicts the space shuttle launching from the Kennedy Space Center into a high inclination orbit. From this vantage point, the Atmospheric Laboratory for Applications and Science (ATLAS) payload can view the Earth, the sun, and their dynamic interactions against the background of space. Earth is prominently displayed and is the focus of the mission's space plasma physics and Earth sciences observations. The colors of the setting sun, measured by sensitive instruments, provide detailed information about ozone, carbon dioxide, and other gases which determined Earth's climate and environment. Encircling the scene are the names of the flight crew members. The additional star in the ring is to recognize Charles R. Chappell and Michael Lampton, alternate payload specialists, and the entire ATLAS-1 team for its dedication and support of this "Mission to Planet Earth."*

The NASA insignia design for space shuttle flights is reserved for use by the astronauts and for other official use as the NASA Administrator may authorize. Public availability has been approved only in the form of illustrations by the various news media. When and if there is any change in this policy, which we do not anticipate, it will be publicly announced.

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PUBLIC AFFAIRS CONTACTS

Mark Hess/Jim Cast/Ed Campion
Office of Space Flight
NASA Headquarters, Washington, DC
(Phone: 202/453-8536)

Brian Dunbar/Paula Cleggett-Haleim/Mike Braukus
Office of Space Science and Applications
NASA Headquarters, Washington, DC
(Phone: 202/453-1547)

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

Barbara Selby
Office of Commercial Programs
NASA Headquarters, Washington, DC
(Phone: 703/557-5609)

Mike Simmons
Marshall Space Flight Center, Huntsville, AL
(Phone: 205/544-6537)

James Hartsfield
Johnson Space Center, Houston, TX
(Phone: 713/483-5111)

Jane Hutchison
Ames Research Center, Moffett Field, CA
(Phone: 415/604-9000)

Dolores Beasley/Susie Marucci
Goddard Space Flight Center, Greenbelt, MD
(Phone: 301/286-8102)

Myron Webb
Stennis Space Center, MS
(Phone: 601/688-3341)

Nancy Lovato
Ames-Dryden Flight Research Facility, Edwards, CA
(Phone: 805/258-3448)

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INTERNATIONAL STUDIES OF ATMOSPHERE, SUN HIGHLIGHT STS-45

Studies of the sun, the upper reaches of Earth's atmosphere and astronomical objects using an international array of instruments in Atlantis' cargo bay will highlight Shuttle Mission STS-45.

The 46th Shuttle flight and Atlantis' 11th, STS-45 is planned to be launched at 8:01 a.m. EST March 23. With an on-time launch, landing will be at 6:08 a.m. EST March 31 at the Kennedy Space Center, FL.

Atlantis will carry the Atmospheric Laboratory for Applications and Science-1 (ATLAS-1), 12 instruments from the United States, France, Germany, Belgium, Switzerland, the Netherlands and Japan, that will conduct 13 experiments to study the chemistry of the atmosphere, solar radiation, space plasma physics and ultraviolet astronomy. ATLAS-1 is planned to be the first of several ATLAS flights designed to cover an entire 11-year solar cycle, the regular period of energetic activity by the sun. Co- manifested with ATLAS-1 is the Shuttle Solar Backscatter Ultraviolet Instrument (SSBUV), which provides highly calibrated measurements of ozone to fine-tune measurements made by other NASA and NOAA satellites.

Commanding Atlantis will be Charles Bolden, making his third space flight. Brian Duffy will serve as pilot, making his first shuttle flight. Mission Specialists include Kathy Sullivan, making her third flight; Dave Leestma, making his third space flight; and Mike Foale, making his first space flight. Payload specialists will be Byron Lichtenberg, making his second flight, and Dirk Frimout, Belgian Scientist, making his first flight.

ATLAS operations will continue 24 hours a day, with the crew split into two teams each on a 12-hour shift. The Red Team will consist of Leestma, Foale and Lichtenberg. The Blue Team will be Duffy, Sullivan and Frimout. Bolden, as Commander, will set his own hours.

Secondary experiments aboard Atlantis will include Space Tissue Loss, a study of the effects of weightlessness on body tissues; the Visual Function Tester, a study of the effects of weightlessness on human vision; the Radiation Monitoring Equipment, an often-flown device that measures radiation aboard the Shuttle; Investigations into Polymer Membrane Processing, a study of developing polymer membranes used as filters in many industries and in space and the Cloud Logic to Optimize Use of Defense Systems, an investigation to quantify the variation in apparent cloud cover as a function of the angle at which clouds of various types are viewed.

Also flying on STS-45 will be NASA's Get Away Special payload, a program which provides individuals and organizations the opportunity to send scientific research and development experiments on board a Space Shuttle.

In addition, the Shuttle Amateur Radio Experiment will provide amateur radio operators worldwide, plus students at several selected schools, the opportunity to converse with crew members aboard Atlantis.

(END OF GENERAL RELEASE; BACKGROUND INFORMATION FOLLOWS.)

MEDIA SERVICES

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 transmissions 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, FL; Marshall Space Flight Center, Huntsville, AL; Johnson Space Center; and NASA Headquarters, Washington, D.C. The television schedule will be updated 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 television schedule may be obtained by dialing 202/755-1788. This service is updated daily at noon ET.

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

A mission press briefing schedule will be issued prior to launch. During the mission, change-of-shift briefings by the off-going flight director will occur at least once per day. The updated NASA Select television schedule will indicate when mission briefings are planned to occur.

STS-45 QUICK LOOK

Launch Date:	March 23, 1992
Launch Site:	Kennedy Space Center, FL, Pad 39A
Launch Window:	8:01 a.m. - 10:31 a.m. EST
Orbiter:	Atlantis (OV-104)
Orbit:	160 x 160 nautical miles, 57 degrees inclination
Landing Date/Time:	6:08 a.m. EST, March 31, 1992
Primary Landing Site:	Kennedy Space Center, FL
Abort Landing Sites:	Return to Launch Site - Kennedy Space Center, FL Transoceanic Abort Landing - Zaragoza, Spain Alternates - Moron, Spain; Ben Guerir, Morocco Abort Once Around - White Sands, NM
Crew:	Charles Bolden, Commander Brian Duffy, Pilot Kathy Sullivan, Mission Specialist 1 David Leestma, Mission Specialist 2 Mike Foale, Mission Specialist 3 Dirk Frimout, Payload Specialist 1 Byron Lichtenberg, Payload Specialist 2
Cargo Bay Payloads:	ATLAS-1 (Atmospheric Laboratory for Applications and Science-1) SSBUV-4 (Shuttle Solar Backscatter Ultraviolet Instrument) GAS Canisters (Get-Away Specials)
Middeck Payloads:	RME-III (Radiation Monitoring Experiment-III) STL (Space Tissue Loss) VFT-II (Visual Function Tester-II) CLOUDS-1A (Cloud Logic to Optimize Use of Defense Systems) SAREX (Shuttle Amateur Radio Experiment) IPMP (Investigations into Polymer Membrane Processing)

STS-45 LAUNCH WINDOW

Launch Date	Launch Window Opens			Launch Window Closes			Duration
	GMT	EST	CST	GMT	EST	CST	
3/23/92	13:01	8:01	7:01	15:31	10:31	9:31	2:30
3/24/92	13:00	8:01	7:01	15:30	10:30	9:30	2:30
3/25/92	13:00	8:00	7:00	15:30	10:30	9:30	2:30
3/26/92	13:00	8:00	7:00	15:30	10:30	9:30	2:30
3/27/92	12:59	7:59	6:59	15:29	10:29	9:29	2:30
3/28/92	12:59	7:59	6:59	15:29	10:29	9:29	2:30
3/29/92	12:59	7:59	6:59	15:29	10:29	9:29	2:30

Note: Mission Duration is 07/22:07

VEHICLE AND PAYLOAD WEIGHTS

	Pounds
Orbiter (Atlantis) empty and 3 SSMEs	172,293
Atmospheric Lab for Applications and Science-1	15,100
Get-Away Specials/Support Equipment	522
Shuttle Solar Backscatter Ultraviolet Instrument	720
Investigations of Polymer Membrane Processing	17
Radiation Monitoring Experiment-3	23
Space Shuttle Amateur Radio Experiment	30
Visual Function Tester-2	10
Space Tissue Loss	68
DSOs/DTOs	250
CLOUDS	5
Total Vehicle at SRB Ignition	4,495,910
Orbiter Landing Weight	205,046

STS-45 TRAJECTORY SEQUENCE OF EVENTS

Event	**MET (d/h:m:s)**	**Relative Velocity (fps)**	**Mach**	**Altitude (ft)**
Launch	00/00:00:00			
Begin Roll Maneuver	00/00:00:10	183	0.16	776
End Roll Maneuver	00/00:00:19	418	0.37	3,555
SSME Throttle Down to 89%	00/00:00:22	499	0.44	4,791
SSME Throttle Up to 67%	00/00:00:31	718	0.64	9,603
Max. Dyn. Pressure (Max Q)	00/00:00:56	1,244	1.20	30,580
SSME Throttle Up to 104%	00/00:01:06	1,538	1.55	42,347
SRB Separation	00/00:02:05	4,1,41	3.79	155,086
Main Engine Cutoff (MECO)	00/00:08:35	25,001	21.62	376,676
Zero Thrust	00/00:08:41	24,999	N/A	376,909
ET Separation	00/00:08:53			
OMS-2 Burn	00/00:37:08			
Landing	07/22:07:00			

Apogee, Perigee at MECO: 157 x 19 nautical miles
Apogee, Perigee post-OMS 2: 161 x 160 nautical miles

SPACE SHUTTLE ABORT MODES

Space Shuttle launch abort philosophy aims toward 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 either White Sands Space Harbor, NM, or the Shuttle Landing Facility (SLF) at Kennedy Space Center, FL.

- Transatlantic Abort Landing (TAL) -- Loss of one or more main engines midway through powered flight would force a landing at either Zaragoza, Spain; Moron, Spain; or Ben Guerir, Morocco.

- Return-To-Launch-Site (RTLS) -- Early shutdown of one or more engines, and without enough energy to reach Zaragoza, would result in a pitch around and thrust back toward KSC until within gliding distance of the SLF.

STS-45 contingency landing sites are Kennedy Space Center, White Sands, Zaragoza, Moron and Ben Guerir.

STS-45 PRE-LAUNCH PROCESSING

Flight preparations on Atlantis for the STS-45 mission began Dec. 9, 1991 following its last mission, STS-44, which ended with a landing at Edwards Air Force Base, CA.

Atlantis was processed in 55 days, the best ever since mission STS-43, the previous record breaker with a 60-day Orbiter Processing Facility (OPF) flow. Processing took place in OPF bay 2 to prepare Atlantis for its 11th flight, including the installation of the ATLAS-1 payload which is the primary payload for mission STS-45.

Atlantis' systems were fully tested while in the OPF, including the orbital maneuvering system and the forward reaction control system.

Space Shuttle main engine locations for this flight are as follows: engine 2024 in the No. 1 position, engine 2012 in the No. 2 position and engine 2028 in the No. 3 position. These engines were installed on Jan. 10-11.

Work began in January 1990 at KSC to assemble the ATLAS payload components. Over the last 2 years, payload technicians joined the two ATLAS pallets, integrated the experiments and completed required tests. Technicians installed the ATLAS payload into Atlantis' payload bay on Jan. 25, 1992, while the Shuttle was in the OPF. The Shuttle Solar Backscatter Ultraviolet experiment was installed in the payload bay on Jan. 28. A 43- hour test, verifying connections between the orbiter and payload, was performed Jan. 29-31. The payload was closed out for flight in the OPF on Feb. 9.

The Crew Equipment Interface Test, with the STS-45 flight crew, was conducted in the OPF on Feb. 1. The crew became familiar with the configuration of the orbiter, the ATLAS payload and unique equipment for mission STS-45.

Booster stacking operations on mobile launcher platform 1 began Dec. 10 and were completed by Jan. 15. The external tank was mated to the boosters on Jan. 22 and the orbiter Atlantis was transferred to the Vehicle Assembly Building on Feb. 13, where it was mated to the external tank and solid rocket boosters.

The STS-45 vehicle was rolled out to Launch Pad 39-A on Feb. 19. A dress rehearsal launch countdown with the flight crew members was held Feb. 26-27 at KSC.

A standard 43-hour launch countdown is scheduled to begin 3 days prior to launch. During the countdown, the orbiter's onboard fuel and oxidizer storage tanks will be loaded and all orbiter systems will be prepared for flight.

About 9 hours before launch, the external tank will be filled with its flight load of a half a million gallons of liquid oxygen and liquid hydrogen propellants. About 2 and one-half hours before liftoff, the flight crew will begin taking their assigned seats in the crew cabin.

The end of mission landing is planned at the KSC Shuttle Landing Facility. KSC's landing convoy teams will be on station to prepare the vehicle for towing to the OPF. Atlantis' next flight will be mission STS-46 with the U.S./Italian Tethered Satellite System and the European Space Agency EURECA payload scheduled for launch this summer.

ATLAS-1

ATLAS-1 is the first of up to 10 ATLAS missions to be undertaken throughout one solar cycle, which lasts 11 years. During that period, a cycle of solar flares, sunspots and other magnetic activity moves from intense activity to relative calm.

ATLAS missions are part of Phase I of NASA's Mission to Planet Earth, a large-scale, unified study of planet Earth as a single, dynamic system. Throughout the ATLAS series, scientists will gather new information to gain a better understanding of how the atmosphere reacts to natural and human- induced atmospheric changes. That knowledge will help identify measures that will keep the planet suitable for life for future generations.

ATLAS-1 will perform 14 experiments using 12 instruments to investigate the interactions of the Earth's atmosphere and the sun. The experiments will study the chemistry, physics and movement of the middle and upper atmosphere by measuring the sun's energy and the distribution of trace chemicals in the atmosphere.

By studying these factors throughout a solar cycle, scientists will form a more detailed picture of Earth's atmosphere and its response to changes in the sun. The ATLAS-1 instruments also will observe the links between magnetic fields and electrified gases, called plasma, that lie between the sun and Earth. Also, an astronomical telescope will examine sources of ultraviolet radiation in the Milky Way and other galaxies to learn more about the stages in the life of a star.

The Space Shuttle Atlantis will carry the ATLAS-1 Spacelab on an 8-day flight, during which its crew will gather information to be used by scientists on the ground. The European Space Agency provided the reusable Spacelab platform in 1981 as its contribution to the Space Shuttle program. The versatile Spacelab facility is comprised of pressurized modules that provide laboratory work space and open U-shaped platforms, called pallets, that hold instruments requiring direct exposure to space, such as telescopes. On missions such as ATLAS, which use open pallets alone, the instruments' power supply, command and data-handling system and the temperature control system are housed in a pressurized container called an igloo.

Spacelab elements are arranged in the Space Shuttle cargo bay to meet the unique needs of each flight. For the ATLAS-1 mission, the scientific instruments will be mounted on two Spacelab pallets in the Shuttle cargo bay. All of the instruments flew on earlier Spacelab missions and others will fly on future ATLAS missions, reducing the cost of this space-based research. Reuse of these facilities also will allow scientists to expand their base of knowledge to provide a more accurate, long-term picture of planet Earth and its environment. From Atlantis' 160-nautical-mile orbit, these instruments will be exposed directly to space when the Shuttle bay doors are open. During the mission, the orbiter's position will be changed frequently to point the scientific instruments toward their targets -- the sun, the Earth and space.

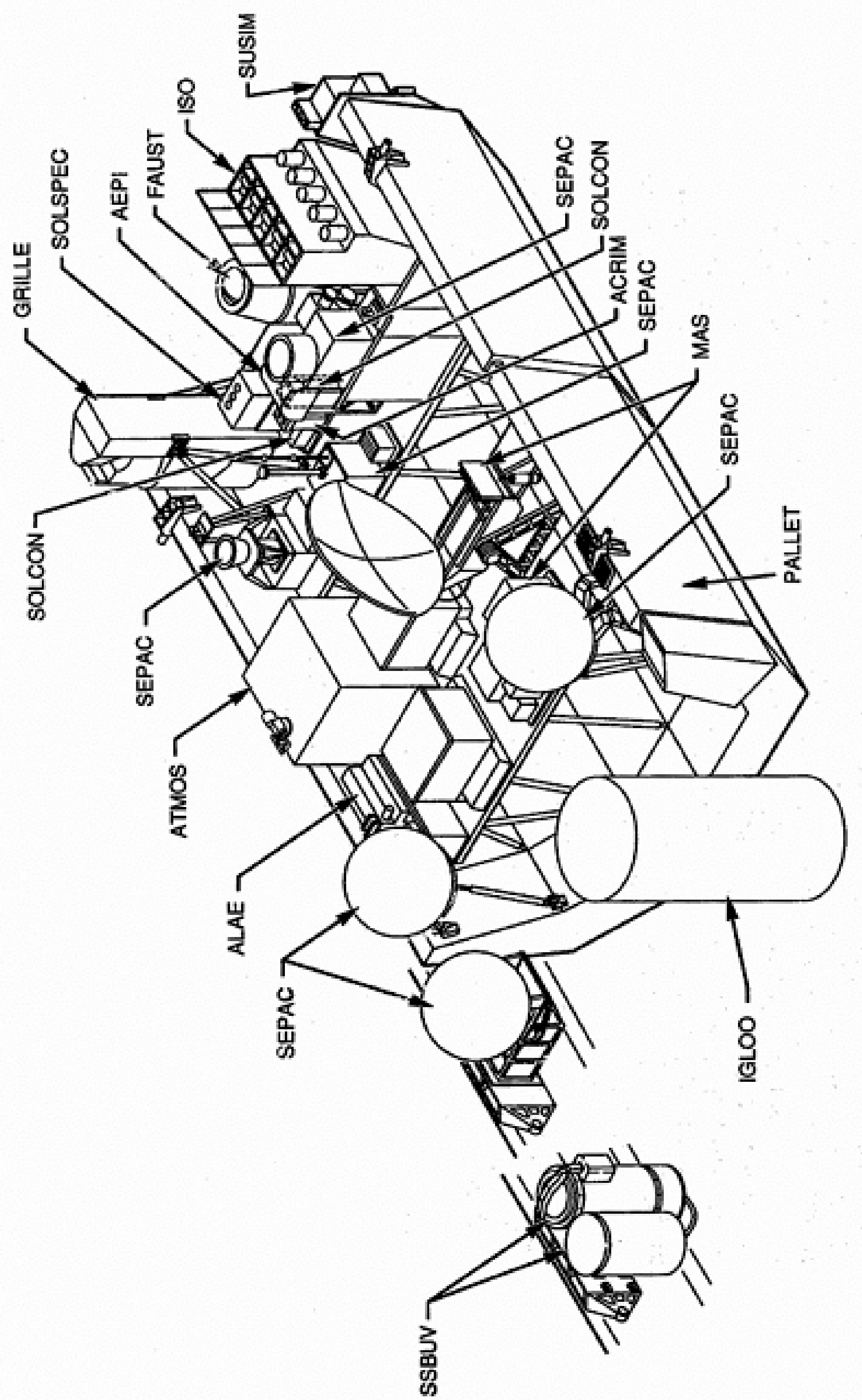
NASA's Office of Space Science and Applications, Washington, DC sponsors the ATLAS-1 mission. Marshall Space Flight Center, Huntsville, AL, is responsible for training the science crew and the ground-based science team. During the flight, NASA's Spacelab Mission Operations Control facility at Marshall will control science activities.

Kennedy Space Center in Florida will prepare the Spacelab and will launch it aboard Atlantis. Johnson Space Center in Houston will train the flight crew and provide Shuttle orbiter flight control.

Other countries participating in experiments on the ATLAS-1 payload are Belgium, France, Germany, Japan, the Netherlands, Switzerland and the United Kingdom. The European Space Agency will provide operational support for the European investigations.

Scientists will spend years poring over the data collected during the ATLAS-1 mission. This information will be organized at a special data- processing facility at NASA's Goddard Space Flight Center, Greenbelt, MD, where the data will be made available to other researchers studying global change and form the foundation for the remaining missions in the 11-year ATLAS series.

Atlas-1 Pallet



ATLAS SCIENTIFIC INVESTIGATIONS

Without the atmosphere, life as humans know it could not survive. Proper atmospheric pressure, temperature and oxygen levels are critical to maintaining life. Energy is absorbed and cycled when radiation from the sun interacts with atmospheric chemicals Q mainly nitrogen and oxygen, with traces of carbon dioxide, water vapor and other gases. Additionally, energy is absorbed and cycled when charged particles (ions and electrons) interact with the magnetic field generated by the Earth's core.

Human activities, including agriculture and industry, affect these complex processes. For example, the chlorofluorocarbons (CFCs) used in air conditioning and other industries rise to the stratosphere, where they are reduced to reactive chlorine that depletes the ozone layer which protects the Earth's surface from harmful solar radiation. Halons, which contain bromine and are commonly used as fire inhibitors, behave similarly. Naturally occurring chemicals such as methane and nitrous oxide can lead to ozone depletion or inhibit chlorine-induced ozone depletion. Atmospheric concentrations of all these gases are increasing, as is the concentration of carbon dioxide, which is produced by fossil fuel combustion. These changes are likely to result in increased stratospheric ozone depletion and changes in atmospheric temperatures. The ATLAS mission will help scientists validate and refine their models of the effects of chemical change in the stratosphere.

Earth's atmosphere comprises five layers: troposphere, stratosphere, mesosphere, thermosphere and exosphere. These are classified by temperature, pressure and chemical composition.

Imbedded in the mesosphere and thermosphere is an electrically charged area called the ionosphere. Beyond the ionosphere is the magnetosphere, which separates Earth's magnetic field from interplanetary space. The solar wind Q a high-speed stream of charged particles from the sun Q gives the magnetosphere a comet-like shape with a tail extending for vast distances from the planets night side.

The boundaries of these layers are not exact. They interact and form a chain from Earth's surface to interplanetary space. Since they are interconnected, what happens at levels above the clouds affects us on the ground below.

The instruments aboard ATLAS-1 will collect information about the composition of Earth's atmosphere, investigate how Earth's electric and magnetic fields and atmosphere influence one another, examine sources of ultraviolet light in the universe and measure the energy contained in sunlight and how that energy varies during the mission. The ATLAS-1 investigations are divided into four broad areas -- atmospheric science, solar science, space plasma physics and astronomy.

A master timeline schedule is programmed into a computer aboard the Spacelab to orchestrate mission experiment sequences automatically. Although this timeline may be revised if necessary, computer coordination contributes to the smooth operation of complex instruments and tasks.

Most of the atmospheric and solar instruments and the astronomical telescope will be computer operated. The instrument data will be sent directly to scientists at the Spacelab Mission Operations Control facility on the ground. The crew will run the space plasma physics instruments manually. For example, the crew will report to their counterparts on the ground on visual effects observed from the firing of a beam of charged particles (electrons) into the surrounding plasma.

ATLAS-1 instrument controls are located in the aft flight deck of the Shuttle orbiter. The crew will ensure that automatically controlled instruments function properly and enter observational sequences for manually controlled equipment. They also will fine-tune and align video cameras and television monitors and select camera filters, among other tasks.

ATLAS-1 INVESTIGATIONS

Investigation	Spectral Range	Selected Objectives	Principal Investigator
Atmospheric Science			
ALAE	Far Ultraviolet	Ratio of atmospheric hydrogen to deuterium	J. L. Bertraux, Service d'Aeronomie du CNRS, France
ATMOS	Infrared	Water vapor, ozone, methane, nitrogen compounds	M. Gunson, Jet Propulsion Laboratory, United States
GRILLE	Infrared	Water vapor, ozone, methane, nitrogen compounds	M. Ackerman, Institut d'Aeronomie Spatiale de Belgique, Belgium
ISO	Visible/ Ultraviolet	Atmospheric temperature, nitrogen, oxygen, ions	D. G. Torr, U. Alabama-Huntsville, United States
MAS	Microwave	Temperature, pressure, ozone, chlorine monoxide	G. Hartmann, Max-Planck-Institute for Aeronomy, Germany
SSBUV	Near Ultraviolet	Ozone	E. Hilsenrath, Goddard Space Flight Center, United States
Solar Science			
ACRIM	Total Energy	Solar constant	R. Wilson, JPL, United States
SOLCON	Total Energy	Solar constant	D. Crommelynck, Institut Royal Meteorologique de Belgique, Belgium
SOLSPEC	Infrared to Ultraviolet	Solar spectrum	G. Thuillier, Service d'Aeronomy du CNRS, France
SUSIM	Ultraviolet	Solar spectrum	G. Brueckner, Naval Research Laboratory, United States
Plasma Physics			
AEPI	Visible	Natural aurora and airglow	S. Mende, Lockheed Palo Alto Research Laboratory, United States
SEPAC		Response of plasmas to known disturbances	J. Burch, Southwest Research Institute, United States
ENAP	Visible/ Ultraviolet	Use ISO data to study emissions from energetic atoms	B. Tinsley, U. Texas at Dallas, United States
Astrophysics			
FAUST	Far Ultraviolet	Large-scale astrophysical objects	S. Bowyer, U. California-Berkeley, United States

Atmospheric Science

Six atmospheric science investigations on ATLAS-1 will study the middle and upper atmosphere with a variety of instruments that will help correlate atmospheric composition, temperature and pressure with altitude, latitude, longitude and changes in solar radiation. The types of environmental phenomena to be examined include global distribution of atmospheric components and temperatures, as well as atmospheric reaction to external influences such as solar input and geomagnetic storms.

The high-altitude effects of terrestrial environmental episodes Q volcanic eruptions, forest fires, massive oil fires in Kuwait Q also may be examined. Data collection will help scientists monitor short- and long-term changes, the goal of the series of ATLAS flights.

Gases in the upper atmosphere and ionosphere undergo constant changes triggered by variations in ultraviolet sunlight, by reactions between layers and by air motions. Many of the photochemical reactions Q the effect of light or other radiant energy in producing chemical action Q cause atoms and molecules to emit light of very specific wavelengths. These light signatures are called spectral features.

The Imaging Spectrometric Observatory (ISO) will measure spectral features to determine the composition of the atmosphere, down to trace amounts of chemicals measured in parts-per-trillion. This investigation, which previously flew on Spacelab 1, will add to data about the varied reactions and energy transfer processes that occur in Earth's environment.

The Atmospheric Trace Molecule Spectroscopy (ATMOS) and the Grille Spectrometer (Grille) experiments will map trace molecules, including carbon dioxide and ozone, in the middle atmosphere. This mapping will be accomplished at orbital sunrise and sunset by measuring the infrared radiation that these molecules absorb. An orbital "day" consists of a sunrise and sunset occurring approximately every 90 minutes during flight. These data will be compared with information gathered during other missions to note worldwide, seasonal and long-term atmospheric changes. Both instruments have flown previously, ATMOS on Spacelab 3 in 1985 and Grille on Spacelab 1 in 1983.

The Atmospheric Lyman-Alpha Emissions (ALAE) experiment will measure the abundance of two forms of hydrogen -- common hydrogen and deuterium or heavy hydrogen. ALAE will observe ultraviolet light, called Lyman-Alpha, which hydrogen and deuterium radiate at slightly different wavelengths. Deuterium's relative abundance compared to hydrogen at the altitude's ALAE will study is an indication of atmospheric turbulence in the lower thermosphere. After determining the hydrogen/deuterium ratio, scientists can better study the rate of water evolution in Earth's atmosphere. ALAE flew on Spacelab 1.

The Millimeter-Wave Atmospheric Sounder (MAS) measures the strength of millimeter-waves radiating at the specific frequencies of water vapor, chlorine monoxide and ozone. Observations of these gases will enable scientists to better understand their distribution through the upper atmosphere. MAS data will be particularly valuable because they should be unaffected by the presence of aerosols, the concentrations of which have increased by the eruption of Mount Pinatubo in June 1991. An earlier version of MAS flew on Spacelab 1.

Shuttle Solar Backscatter Ultraviolet

The Shuttle Solar Backscatter Ultraviolet (SSBUV), which measures atmospheric ozone levels, is a calibrating experiment co-manifested with ATLAS-1. Its measurements are compared to those from ozone-observing instruments aboard the National Oceanic and Atmospheric Administrations NOAA-9 and NOAA-11 satellites and NASA's NIMBUS-7 satellite to ensure the most accurate readings possible of atmospheric ozone trends. The SSBUV assesses instrument performance by directly comparing data from identical instruments aboard the NOAA spacecraft and NIMBUS-7 as the Shuttle and satellite pass over the same Earth location. SSBUV data also can be compared to data obtained by the Upper Atmosphere Research

Satellite launched in September 1991 to study the processes that lead to ozone depletion. The solar data taken by SSBUV also will be compared with data from the four solar instruments.

SSBUV is physically separate from the ATLAS-1 payload, housed in two Get Away Special canisters mounted in the Shuttle's payload bay. The instrument canister holds the SSBUV, its aspect sensors and in-flight calibration system. The support canister contains the avionics, including power, data and command systems. SSBUV commands will be sent from a Payload Operations Control Center (POCC) at the Johnson Space Center. SSBUV data will be received at Johnson and the Marshall Space Flight Center.

SSBUV is co-manifested with future ATLAS flights. The ATLAS-1 mission will be the fourth flight of SSBUV, which previously flew in October 1989, October 1990 and August 1991. SSBUV is managed by the Goddard Space Flight Center, Greenbelt, MD.

Solar Science

Four solar science investigations will measure the sun's energy output to determine its variations and spectrum. Such information is important for understanding the effect of solar radiation on the composition of the Earth's atmosphere and ionosphere. Scientists studying Earth's climate and the physical processes of the sun also use the information

Because the sun is Earth's major source of heat, it drives atmospheric circulation and affects the weather. A change of only a few degrees in the temperature of Earth's atmosphere might cause dramatic changes in the ocean levels, ice caps and climate. There is evidence that the solar constant, the amount of heat normally received at the outer layer of Earth's atmosphere, fluctuates. Therefore, it is important to determine its range and variability.

The Active Cavity Radiometer (ACR) and the Measurement of Solar Constant (SOLCON) experiments will measure the total amount of light and energy emitted by the sun, which is especially important in climate studies.

The Solar Spectrum Measurement (SOLSPEC), the Solar Ultraviolet Spectral Irradiance Monitor (SUSIM) and SSBUV investigations will add to scientists' understanding of how variations in the sun's energy output affect the chemistry of the atmosphere. Spectral information is needed to study atmospheric reactions because different atmospheric components at different altitudes absorb different wavelength ranges. These four instruments have flown on previous Space Shuttle missions.

Plasma Physics

Two space plasma physics instruments, the Atmospheric Emissions Photometric Imaging (AEPI) and Space Experiments with Particle Accelerators (SEPAC), will study the charged particle and plasma environment. A third investigation, Energetic Neutral Atom Precipitation (ENAP), will be conducted using data from the ISO instrument. Active and passive probing techniques will investigate key cause-and-effect relationships that link the Earth's magnetosphere, ionosphere and upper atmosphere. Electron and plasma beams will be injected into the surrounding space plasma to study phenomena such as aurora Q visible signatures of magnetic storms that can disrupt telecommunications, power transmissions and spacecraft electronics Q and spacecraft glow.

Spacecraft glow is a recently discovered phenomenon. On Shuttle missions, surfaces facing into the direction of travel were covered with a faintly glowing, thin orange layer. Understanding spacecraft glow is very important because of its impact on experiments in the cargo bay and on other satellites. This emission of light could interfere with sensitive data- collecting instruments.

The space plasma investigations also will help us understand the effects of solar energy on our weather, communications and spacecraft technologies. AEPI and SEPAC flew on Spacelab 1.

Astrophysics

Much remains to be learned about the stages and the rate of star formation in other galaxies. Young stars reach very high temperatures and emit intense ultraviolet radiation, which cannot be detected by ground-based astronomers. However, this radiation can be detected by an ultraviolet sensor, such as the Far Ultraviolet Space Telescope (FAUST), placed outside Earth's atmosphere. FAUST, which flew on Spacelab 1, will study astronomical radiation sources at ultraviolet wavelengths inaccessible to observers on Earth. Better knowledge of ultraviolet emission sources will lead to improved understanding of the life cycle of stars and galaxies throughout the universe. FAUST has flown on Spacelab 1.

THE ATLAS PROGRAM

ATLAS-1 is an important part of the long-term, coordinated research that makes up NASA's Mission to Planet Earth. The ATLAS-1 solar science instruments and several of the atmospheric science instruments (MAS, ATMOS, SSBUV) will fly on future ATLAS missions. Beyond its own science mission, a key goal of the ATLAS series is to provide calibration for NASA's Upper Atmosphere Research Satellite (UARS). Two ATLAS-1 instruments, ACR and SUSIM, have direct counterparts aboard UARS, while other instruments aboard each mission are closely related. Repeated flights of the ATLAS instruments, which can be carefully calibrated before and after each flight, will provide long-term calibration data sets for comparison with data from many satellite instruments and for long-term trend studies.

The next ATLAS flight, ATLAS-2, is scheduled for launch in spring 1993. Immediately after ATLAS-1 lands, the science teams for instruments flying on ATLAS-2 will begin recalibrating and preparing their instruments for reflight, while analyzing and interpreting their ATLAS-1 data.

INVESTIGATIONS INTO POLYMER MEMBRANE PROCESSING

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

The objective of the IPMP is to investigate the physical and chemical processes that occur during the formation of polymer membranes in microgravity such that the improved knowledge base can be applied to commercial membrane processing techniques. Supporting the overall program objective, the STS-45 mission will provide additional data on the polymer precipitation process.

Polymer membranes have been used by industry in separations processes for many years. Typical applications include enriching the oxygen content of air, desalination of water and kidney dialysis.

Polymer membranes frequently are made using a two-step process. A sample mixture of polymer and solvents is applied to a casting surface. The first step involves the evaporation of solvents from the mixture. In the second step, a non-solvent (typically water) is introduced and the desired membrane is precipitated, completing the process. Previous flights of IPMP have involved the complete process (STS-41, -43, -48 and -42) and the evaporation step alone (STS-31). On the STS-45 mission, only the precipitation step will be performed.

On this mission, the process is initiated by STS-45 crewmembers. They will begin by accessing the two IPMP units in the stowage location in a middeck locker. By turning the valve on each unit, water vapor is infused into the sample container, initiating the process. Previous work indicates that the entire process should be complete after approximately 10 minutes, and the resulting membrane will not be influenced by gravitational accelerations at that time. The stowage tray containing the two units is then restowed for the duration of the flight. Following the flight, the samples will be retrieved and returned to Battelle for testing. Portions of the samples will be sent to the CCDS's industry partners for quantitative evaluation consisting of comparisons of the membranes' permeability and selectivity characteristics with those of laboratory-produced membranes. Lisa A. McCauley, Associate Director of the Battelle CCDS, is program manager for IPMP. Dr. Vince McGinness of Battelle is principal investigator.

GET AWAY SPECIAL EXPERIMENT

NASA's Get Away Special (GAS) program's goal is to provide access to space to everyone by offering individuals and organizations of all countries the opportunity to send scientific research and development experiments on board the Space Shuttle on a space-available basis.

Ten GAS experiments most recently flew on STS-42 in January 1992. To date, 77 GAS cans have flown on 17 missions. The GAS program began in 1982 and is managed by Goddard Space Flight Center. Clarke Prouty is GAS Mission Manager and Larry Thomas is Technical Liaison Officer.

(G-229) Experiment in Crystal Growth
NASA Technical Manager: Dave Peters

This experiment was designed to grow crystals of gallium arsenide (GaAs). GaAs is a versatile electronic material used in high-speed electronics and optoelectronics. The crystal grown on this mission will be 1 inch in diameter by 3.5 inches long and will be grown using a gradient freeze growth technique.

The payload is entirely self-sufficient and includes its own power system, growth system and control and data acquisition systems. The crystal growth will last nearly 11 hours and will be initiated by an astronaut closing a switch. This is the only human interaction necessary with this payload.

This experiment is a reflight of a successful GAS experiment conducted on STS-40 in June 1991, but with additional features included to enhance the ability to analyze convection effects on crystal growth in microgravity.

The payload was designed and constructed at GTE Laboratories in Waltham, ME, and is jointly sponsored by GTE, the U.S. Air Force Wright Research and Development Center Materials Laboratory, Dayton, Ohio, and the Microgravity Science and Applications Division of the NASA Office of Space Science and Applications. The Space Experiment Division of NASA's Lewis Research Center, Cleveland, manages the project. Project manager is Dr. Richard W. Lauver.

This experiment is part of a comprehensive program that involves a comparative study of crystal growth under a variety of terrestrial conditions in addition to crystal growth in microgravity aboard the Space Shuttle. Scientists from each research institution will contribute to characterization of the space-grown crystals.

SHUTTLE AMATEUR RADIO EXPERIMENT (SAREX)

The Shuttle Amateur Radio Experiment is designed to demonstrate the feasibility of amateur short-wave radio contacts between the Space Shuttle and ground amateur radio operators, often called ham radio operators. SAREX also serves as an educational opportunity for schools around the world to learn about space first hand by speaking directly to astronauts aboard the Shuttle via ham radio. Contacts with certain schools are included in planning the mission.

In addition, if the Russian Mir Space Station becomes visible to the STS-45 crew during the mission, SAREX may be used to attempt a conversation with the Mir cosmonauts, who also have a ham radio aboard.

Four of the STS-45 crew members are licensed amateur radio operators: Mission Specialists Dave Leestma, call sign N5WQC; Kathy Sullivan, call sign N5YVV; Pilot Brian Duffy, call sign N5WQW; and Payload Specialist Dirk Frimout, call sign ON1AFD. Frimout and Sullivan are fluent in several European languages and hope to make contacts in that part of the world. However, STS-45's 57-degree inclination will place the spacecraft in an orbit that will allow worldwide contact possibilities, including high latitude areas not normally on the Shuttle's groundtrack.

Ham operators may communicate with the Shuttle using VHF FM voice transmissions, a mode that makes contact widely available without the purchase of more expensive equipment. The primary frequencies to be used during STS-45 are 145.55 MHz for transmissions from the spacecraft to the ground and 144.95 MHz for transmissions from the ground to the spacecraft.

SAREX has flown previously on Shuttle missions STS-9, STS-51F, STS-35 and STS-37. The equipment aboard Atlantis for STS-45 will include a low-power, hand-held FM transceiver, spare batteries, a headset, an antenna designed to fit in the Shuttle's window, an interface module and an equipment cabinet.

SAREX is a joint effort of NASA, the American Radio Relay League (ARRL), the Amateur Radio Satellite Corp. and the Johnson Space Center Amateur Radio Club. Information about orbital elements, contact times, frequencies and crew operating times will be available from these groups during the mission and from amateur radio clubs at other NASA centers.

Ham operators from the JSC club will be operating on HF frequencies and the AARL (W1AW) will include SAREX information in its regular HF voice and teletype bulletins. The Goddard Space Flight Center Amateur Radio Club will operate 24 hours a day during the mission, providing information on SAREX and retransmitting live Shuttle air-to-ground communications.

STS-45 SAREX Operating Frequencies

Location	Shuttle Transmission	Shuttle Reception
U.S., Africa,	145.55 MHz	144.95 MHz
South America and Asia	145.55	144.97
	145.55	144.91
Europe	145.55	144.95
	145.55	144.75
	145.55	144.70

Goddard Amateur Radio Club Operations (SAREX information and Shuttle audio broadcasts)

3.860 MHz	7.185 MHz	14.295 MHz	21.395 MHz	28.395 MHz

SAREX information also may be obtained from the Johnson Space Center computer bulletin board (JSC BBS), 8 N 1 1200 baud, at 713/483-2500 and then type 62511.

RADIATION MONITORING EQUIPMENT-III (RME)

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, done every 2 days. RME-III will be activated by the crew as soon as possible after reaching orbit and operated throughout the mission. A crew member will enter the correct mission elapsed time upon activation. RME-III is sponsored by the Department of Defense in cooperation with NASA.

VISUAL FUNCTION TESTER-II (VFT-II)

The objective of the Visual Function Tester-II experiment is to measure changes in a number of vision parameters in the vision of subjects exposed to microgravity. VFT-II consists of a hand-held battery-powered testing device which incorporates a binocular eyepiece and uses controlled illumination to present a variety of visual targets for subject testing. The device measures changes in the contrast ratio threshold in the vision of subjects exposed to prolonged microgravity. Test results are read on a display and recorded on data sheets. VFT-II has flown previously on Shuttle missions STS-27, STS-28 and STS-36.

On STS-45, the payload specialists will be the primary subjects for VFT-II and will perform testing at 2 weeks and 1 week prior to the flight. In flight, they will be tested each day. Post-flight, they will be tested 2 days after landing and 1 week after landing. VFT-II is sponsored by the Air Force Space Systems Division, Los Angeles.

CLOUDS-1A

The overall objective of the CLOUDS-1A program is to quantify the variation in apparent cloud cover as a function of the angle at which clouds of various types are viewed and to develop meteorological observation models for various cloud formations.

The CLOUDS-1A experiment is stowed in a middeck locker and consists of a Nikon F3/T camera assembly and film. On-orbit, a crew member will take a series of high resolution photographs of individual cloud scenes, preferably severe weather and high "wispy" cirrus clouds, over a wide range of viewing angles.

SPACE TISSUE LOSS (STL)

Space Tissue Loss is a life sciences experiment that studies cell growth during spaceflight. The hardware developed for this experiment allows drugs to be added and the response tested at any preprogrammed time during the mission. The objective of the experiment is to study the response of muscle, bone and endothelial cells by evaluating various parameters including shape, cytoskeleton, membrane integrity and metabolism, activity of enzymes that inactivate proteins and the effects or change of response to various drugs on these parameters.

The payload consists of a large tray assembly which can be refurbished and replaced. The tray fits inside a standard middeck locker. All fluids and cells within the tray have three levels of containment to assure that nothing escapes from the package into the middeck. The self-contained computer system is preprogrammed for medium and gas delivery to the cells, environmental monitoring of temperature and other important parameters, timed collection of medium and/or cells and cell fixation.

STS-45 CREWMEMBERS

STS045-S-002 **--** *Official portrait of the STS-45 Atlantis, Orbiter Vehicle (OV) 104, crewmembers selected for the Atmospheric Laboratory for Applications and Science 1 (ATLAS-1) mission. Wearing launch and entry suits (LESs), holding launch and entry helmets (LEHs), and seated in front are mission commander Charles F. Bolden (right) and pilot Brian Duffy (left). Standing behind them, also in LESs, are (left to right) payload specialist Byron K. Lichtenberg, mission specialists C. Michael Foale and David C. Leestma, and payload commander (PLC) Kathryn D. Sullivan, and payload specialist Dirk D. Frimout of Belgium. The backdrop is the Earth limb at sunset and was added using a double exposure technique by NASA JSC contract photographer Mark Sowa.*

PHOTO CREDIT: NASA or National Aeronautics and Space Administration.

BIOGRAPHICAL DATA

CHARLES F. BOLDEN Jr., 45, Col., USMC, will serve as Commander. Selected as an astronaut in 1980, Bolden was born in Columbia, SC, and will be making his third space flight.

Bolden graduated from C.A. Johnson High School in Columbia in 1964; received a bachelor of science in electrical science from the Naval Academy in 1968; and received a master of science in systems management from the University of Southern California in 1978.

Bolden was designated a naval aviator in 1970 and flew more than 100 sorties in Vietnam in the A-6A Intruder. In 1979, he graduated from the Naval Test Pilot School. He later served as a test pilot for the A-6E, EA-6B and A-7C/E aircraft until his selection by NASA.

His first space flight was as pilot of STS-61C in January 1986. He next served as pilot for STS-31 in April 1990. Bolden has logged more than 267 hours in space.

BRIAN DUFFY, 38, Lt. Col., USAF, will serve as Pilot. Selected as an astronaut in 1985, Duffy was born in Boston, MA, and will be making his first space flight.

Duffy graduated from Rockland High School, Rockland, Ma., in 1971; received a bachelor of science in mathematics from the Air Force Academy in 1975; and received a master of science in systems management from the University of Southern California in 1981.

Duffy completed pilot training in 1976 and flew the F-15 out of Langley Air Force Base, Hampton, VA, until 1979. He graduated from the Air Force Test Pilot School in 1982 and served as Director of F-15 flight tests at Eglin Air Force Base, FL, until his selection by NASA.

At NASA, Duffy has participated in Shuttle software development, served as Technical Assistant to the Director of Flight Crew Operations and worked as CAPCOM or spacecraft communicator for several Shuttle missions in Mission Control.

Duffy has logged more than 3,000 flying hours in more than 25 different types of aircraft.

KATHRYN D. SULLIVAN, 40, will serve as Mission Specialist 1. Selected as an astronaut in 1978, Sullivan considers Woodland Hills, CA, her hometown and will be making her third space flight.

Sullivan graduated from Taft High School, Woodland Hills, in 1969; received a bachelor of science in Earth sciences from the University of California at Santa Cruz in 1973; and received a doctorate in geology from Dalhousie University, Halifax, Nova Scotia, in 1978.

Sullivan first flew on STS-41G in October 1984. Her second flight was on STS-31 in April 1990. Sullivan has logged more than 318 hours in space.

BIOGRAPHICAL DATA

DAVID C. LEESTMA, 42, Capt., USN, will serve as Mission Specialist 2. Selected as an astronaut in 1980, Leestma was born in Muskegon, MI, and will be making his third space flight.

Leestma graduated from Tustin High School, Tustin, CA, in 1967; received a bachelor of science in aeronautical engineering from the Naval Academy in 1971; and received a master of science in aeronautical engineering from the Naval Postgraduate School in 1972.

Leestma first flew on STS-41G in October 1984 and on STS-28 in August 1989. Leestma has logged more than 318 hours in space.

MICHAEL FOALE, 35, will serve as Mission Specialist 3. Selected as an astronaut in 1987, Foale considers Cambridge, England, his hometown and will be making his first space flight.

Foale graduated from Kings School, Canterbury, England, in 1975; received a bachelor of arts in physics from the University of Cambridge, Queens' College, in 1978; and received a doctorate in laboratory physics from Queens' College in 1982.

Prior to his selection as an astronaut, Foale worked for NASA as a payloads officer in Mission Control. As an astronaut, his assignments have included work in the Shuttle Avionics Integration Laboratory and on crew rescue and operations planned for Space Station Freedom.

DIRK D. FRIMOUT, 51, will serve as Payload Specialist 1. A European Space Agency staff member, Frimout was born in Poperinge, Belgium, and will be making his first space flight.

Frimout graduated from Atheneum secondary school in Ghent, Belgium; received a bachelor's degree in electrotechnical engineering from the State University of Ghent in 1963; received a doctorate in applied physics from the University of Ghent in 1970; and performed post-doctorate work at the University of Colorado Laboratory of Atmospheric and Space Physics in 1971.

Frimout worked at the Belgian Institute for Space Aeronomy as head of section instrumentation from 1965-1978. From 1978-1984, he served ESA as crew activities coordinator and experiment coordinator for Spacelab 1. From 1984-1989, he worked in the microgravity division of ESTEC and is a senior engineer in the Payload Utilization Department of the Columbus Directorate for ESA.

BYRON K. LICHTENBERG, 44, will serve as Payload Specialist 2. First selected as a payload specialist by NASA in 1978, Lichtenberg was born in Stroudsburg, PA, and will be making his second space flight.

Lichtenberg graduated from Stroudsburg High School in 1965; received a bachelor of science in aerospace engineering from Brown University in 1969; received a master of science in mechanical engineering from the Massachusetts Institute of Technology (MIT) in 1975; and received a doctorate in biomedical engineering from MIT in 1979.

Lichtenberg joined the U.S. Air Force in 1969 and later earned wings as an F-4 fighter pilot, logging more than 2,500 flying hours on 138 combat missions. After discharge from the Air Force, he attended graduate school at MIT. Lichtenberg first flew as a payload specialist on STS-9 Spacelab-1 in November 1983, logging 10 days in space.

STS-45 MISSION MANAGEMENT

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Donald Williams	SSBUV Mission Manager
Clarke Prouty	GAS Mission Manager
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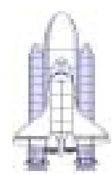
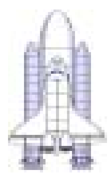
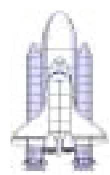
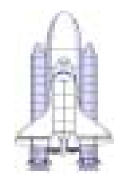
SHUTTLE FLIGHTS AS OF MARCH 1992

45 TOTAL FLIGHTS OF THE SHUTTLE SYSTEM -- 20 SINCE RETURN TO FLIGHT









		STS-42 01/22/92 - 01/30/92	
		STS-48 09/12/91 - 09/18/91	
		STS-39 04/28/91 - 05/06/91	
STS-40 06/05/91 - 06/14/91		STS-41 10/06/90 - 10/10/90	
STS-35 12/02/90 - 12/10/90	STS-51L 01/28/86	STS-31 04/24/90 - 04/29/90	STS-44 11/24/91 - 12/01/91
STS-32 01/09/90 - 01/20/90	STS-61A 10/30/85 - 11/06/85	STS-33 11/22/89 - 11/27/89	STS-43 08/02/91 - 08/11/91
STS-28 08/08/89 - 08/13/89	STS-51F 07/29/85 - 08/06/85	STS-29 03/13/89 - 03/18/89	STS-37 04/05/91 - 04/11/91
STS-61C 01/12/86 - 01/18/86	STS-51B 04/29/85 - 05/06/85	STS-26 09/29/88 - 10/03/88	STS-38 11/15/90 - 11/20/90
STS-9 11/28/83 - 12/08/83	STS-41G 10/05/84 - 10/13/84	STS-51-I 08/27/85 - 09/03/85	STS-36 02/28/90 - 03/04/90
STS-5 11/11/82 - 11/16/82	STS-41C 04/06/84 - 04/13/84	STS-51G 06/17/85 - 06/24/85	STS-34 10/18/89 - 10/23/89
STS-4 06/27/82 - 07/04/82	STS-41B 02/03/84 - 02/11/84	STS-51D 04/12/85 - 04/19/85	STS-30 05/04/89 - 05/08/89
STS-3 03/22/82 - 03/30/82	STS-8 08/30/83 - 09/05/83	STS-51C 01/24/85 - 01/27/85	STS-27 12/02/88 - 12/06/88
STS-2 11/12/81 - 11/14/81	STS-7 06/18/83 - 06/24/83	STS-51A 11/08/84 - 11/16/84	STS-61B 11/26/85 - 12/03/85
STS-1 04/12/81 - 04/14/81	STS-6 04/04/83 - 04/09/83	STS-41D 08/30/84 - 09/05/84	STS-51J 10/03/85 - 10/07/85
OV-102 Columbia (11 flights)	**OV-099 Challenger (10 flights)**	**OV-103 Discovery (14 flights)**	**OV-104 Atlantis (10 flights)**