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National Aeronautics and
Space Administration

FM

Space Shuttle Mission 41-G

Press Kit

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CHALLENGER'S SIXTH FLIGHT HIGHLIGHTS EARTH SCIENCE

Space Shuttle Challenger will return to space for the sixth time on the 41-G mission with a record-setting seven crew members and a full slate of scientific instruments and payloads. Launch is set for no earlier than Oct. 5, 1984, during a two-hour launch window that opens at 7:03 a.m. EDT, with landing at the Kennedy Space Center approximately 12:25 p.m. EDT on Oct. 13.

The 41-G mission is the first space mission to include seven crew members, the first flight of a Canadian payload specialist, the first to include two women, the first spacewalk by an American woman, first crewman to fly a fourth Shuttle mission, first demonstration of a satellite refueling technique in space, and the first flight with a reentry profile crossing the eastern United States.

The major payloads being flown on this mission include: NASA's Earth Radiation Budget Satellite (ERBS); NASA's Office of Space and Terrestrial Applications (OSTA-3) payload; Orbital Refueling System (ORS) experiment; and the Canadian National Research Council's scientific experiment packages known as CANEX.

Flying again in the crew cabin will be the large film format IMAX motion picture camera and a handheld device called Radiation Monitoring Equipment. The Aurora Photography Experiment and several battery powered devices to measure gamma radiation will be flying in the crew cabin for the first time.

There will be eight Getaway Special canisters mounted in the cargo bay and the canisters will be activated by crew members at various times during the mission.

Leading the record-sized crew is veteran astronaut Robert L. Crippen, on his fourth Space Shuttle mission. Crippen was pilot of STS-1 and commander of STS-7 and 41-C. The pilot is Jon A. McBride. Mission specialists are STS-7 veteran Sally K. Ride and Kathryn D. Sullivan and David Leestma. The two payload specialists are Canadian Marc Garneau and oceanographer Paul D. Scully-Power.

Challenger will be launched from Kennedy Space Center's complex 39A into a circular 218 statute mile orbit with an inclination to the equator of 57 degrees.

Activities during the crew's first day in space, in addition to the normal systems tasks, will include activating the OSTA-3 and ORS payloads, checkout of the Canadian developed Remote Manipulator System (RMS), unpacking and preparing the IMAX camera, and starting checkout operations for deployment of ERBS.

The ERBS spacecraft will be activated and given a systems checkout before being grappled by the RMS and lifted clear of the cargo bay. Suspended at the end of the arm, more checkouts will be performed and the solar cell panels, antennas and other appendages will be extended and locked. Once the appendages are extended and locked, the spacecraft can no longer be returned to the cargo bay. Approximately nine hours after liftoff, ERBS will be released. The orbiter will separate from the satellite and the ERBS will be free to maneuver to its operational altitude of 329 statute miles.

Flight day two activities will include the start of the Canadian experiments, visual performance tests for crew members, a change in orbital altitude and the first of four crew commanded transfers of fuel in the ORS.

ORS is attached to the same support structure that holds the Large Format Camera and is designed to develop and demonstrate the equipment and techniques for refueling existing satellites on orbit.

Four fuel transfers, controlled by the crew from within the crew cabin, will be performed during the mission in addition to a spacewalk designed to connect a servicing tool to valves which simulate existing satellites not originally designed for on-orbit refueling.

On flight day three, the crew will again change orbital altitudes, this time maneuvering to the optimum altitude for SIR-B radar observations. From this point on, ground controllers will command the SIR-B and Large Format Camera activities from payload operations centers. The flight crew meanwhile will also perform a second ORS fuel transfer by remote control, conduct additional visual performance tests and conduct miscellaneous experiments and tests. On the next day, more IMAX footage will be taken, the CANEX series will continue, and mission specialists Leestma and Sullivan will perform extensive checkouts of the Extravehicular Mobility Units or spacesuits and will also configure the cabin for the spacewalk scheduled for flight day five.

The fifth flight day will see the first spacewalk by an American woman, a three-hour spacewalk in which mission specialists Leestma and Sullivan will install a valve assembly into simulated satellite propulsion plumbing. The simulated plumbing duplicates that of existing Landsat spacecraft, a prime contender for orbital refueling and refurbishment.

Landsat and other existing satellites were not designed to be refueled and the installation of access valves is a prerequisite if such operations are to be undertaken.

During the spacewalk, Leestma will be the lead installer, with Sullivan assisting.

Flight day six and seven will feature tests of the valve system installed during the spacewalk with hydrazine being transferred through the valve section. More IMAX footage will be taken and visual performance tests and dosimeter readings will also be performed on these days.

Flight day eight will include checkout of the Shuttle's flight control system, stowage of the SIR-B antenna and cabin gear and preparations for deorbit.

On the final day, the crew will deactivate all payload systems, close the cargo bay doors and deorbit. The deorbit burn will take place over Australia during the final portion of orbit 132. The reentry track will pass across the United States along a path roughly from northwest Minnesota to southeast Georgia and on to a touchdown at Kennedy Space Center at about 12:25 p.m. EDT, on Oct. 13.

(END OF GENERAL RELEASE: BACKGROUND INFORMATION FOLLOWS.)

41-G BRIEFING SCHEDULE

Time	Briefing	Origin
T-1 Day		
9:00 a.m. EDT	ERBE	KSC
9:10 a.m. EDT	ERBS	KSC
9:45 a.m. EDT	OSTA-3	KSC
10:00 a.m. EDT	SIR-B	KSC
10:20 a.m. EDT	FILE	KSC
10:40 a.m. EDT	MAPS	KSC
11:00 a.m. EDT	LFC	KSC
11:20 a.m. EDT	ORS	KSC
11:40 a.m. EDT	CANEX	KSC
12:00 p.m. EDT	GAS Experiments	KSC
1:30 p.m. EDT	Prelaunch Briefing	KSC
T-Day		
8:00 a.m. EDT (approximately)	Post Launch Press Conference	KSC (local only)
Launch Through End-of-Mission		
Times announced on NASA Select	Flight Director Change of Shift Briefings	JSC
Landing Day		
1:30 pm. EDT (approximately)	Post Landing Briefing	KSC
Landing+1 Day		
1:00 p.m. EDT	Orbiter Status	KSC

GENERAL INFORMATION

NASA Select Television Transmission

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

Status Reports

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

Briefings

Flight control personnel will be on eight-hour shifts. Change-of-shift briefings by the off-going flight director will occur at approximately eight-hour intervals.

Science briefings will be scheduled following the morning flight director change-of-shift briefing.

Transcripts

Only transcripts of the change-of-shift briefings will be available at the Shuttle news centers. Transcripts of air-to-ground transmissions have been discontinued.

SHUTTLE MISSION 41-G -- QUICK LOOK FACTS

Crew:	Robert L. Crippen, Commander Jon A. McBride, Pilot Kathryn D. Sullivan, Mission Specialist 1 Sally K. Ride, Mission Specialist 2 David C. Leestma, Mission Specialist 3 Paul D. Scully-Power, Payload Specialist Marc Garneau, Canadian Payload Specialist
Orbiter:	Challenger (OV-099)
Launch Site:	Pad 39A, Kennedy Space Center, Fla.
Launch Date/Time:	Oct. 5; 7:03 a.m. EDT
Window:	2 hours -- to 9:03 a.m. EDT
Orbital Inclination:	57 degrees
Orbital Altitude:	218 statute miles circular
Mission Duration:	8 days, 5 hours, 20 minutes, 12 seconds MET; 132 full orbits; land on 133
Landing Date/Time:	Oct. 13, 12:25 p.m. EDT
Primary Landing Site:	Kennedy Space Center, Fla., Runway 33; Weather Alternate, Edwards Air Force Base, Calif., Runway 17
Cargo and Payloads:	Earth Radiation Budget Satellite (ERBS) Office of Space and Terrestrial Applications (OSTA-3) -- SIR-B, FILE, MAPS, LFC Canadian Experiment (CANEX) Orbital Refueling System (ORS) Get Away Specials (GAS) IMAX (Cabin Camera) Thermoluminescent Dosimeter (TLD) Radiation Monitoring Equipment (RME) Auroral Photography Experiment (APE)
Mission Firsts:	First Shuttle flight with a 7-person crew First entry profile crossing Eastern United States First American woman to perform an EVA First flight to include two women First Canadian Payload Specialist to fly

SUMMARY OF MAJOR ACTIVITIES

FLIGHT DAY 1

Orbit Insertion at 218.7 statute miles,
57 degree inclination
Open Payload Bay Doors
Activate OSTA-3
Power Up ORS
Activation, Checkout and Deploy ERBS
SIR-B Antenna Deploy

FLIGHT DAY 2

ERBS Backup Deploy
CANEX OGLOW (Canadian Orbiter Glow Photography)
Orbit Adjust Burn (170.3 s. mi., circular)
ORS Activity:
Transfer 1 and Checkout
OSTA-3 Data Takes
LFC Stellar Calibration

FLIGHT DAY 3

Orbit Adjust Burn (140.4 s. mi., circular)
ORS Activities:
Transfer 2A
Transfer 2B
OSTA-3 Data Takes

FLIGHT DAY 4

EVA Preparation
10.2 psi Cabin Depressurization
Canadian SPEAM (Sun Photometer Earth Atmosphere
Measurement) experiments
OSTA-3 Data Takes

FLIGHT DAY 5

EVA -- ORS Mod Kit Installation
14.7 psi Cabin Repressurization
OSTA-3 Data Takes

FLIGHT DAY 6

ORS Activities:
  Transfer 3A
  Transfer 3B
OSTA-3 Data Takes

FLIGHT DAY 7

ORS Activities:
  Transfer 4A
  Transfer 4B and Vent
Canadian Activities:
  SPEAM
  OGLOW
OSTA-3 Data Takes

FLIGHT DAY 8

RCS Hot Fire Test
FCS Checkout
OSTA-3 Data Takes
SIR-B Antenna Stow

FLIGHT DAY 9

ORS, OSTA-3 Deactivation
Close Payload Bay Doors
Deorbit on Rev. 132
Land at KSC 12:25 p.m. EDT

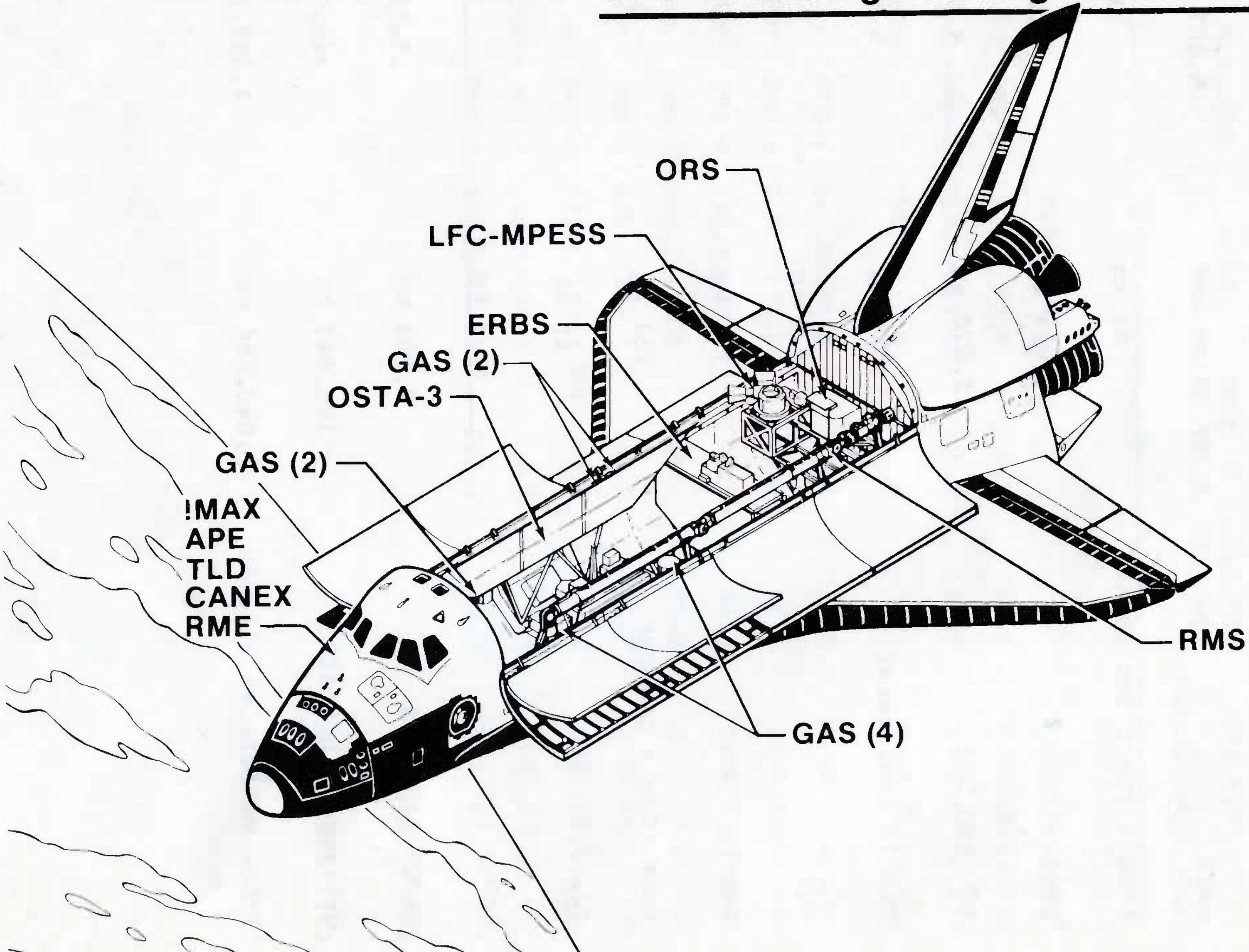
41-G TRAJECTORY SEQUENCE OF EVENTS

NOMINAL FLIGHT EVENT	MANUEVER ID	HA/HP	DELTA V (S. Mi.)	DURATION (Ft/Sec)	TIG TIME (MET) (Sec) (DD:HH:MM:SS.SSS)
LIFTOFF					0:00:00:00.000
MECO		113.8/19.4			0:00:08:18.240
OMS-1	OMS-1	220.1/62.5	232.7	143.8	0:00:10:13.840
OMS-2	OMS-2	219.3/217 8	243.0	151.5	0:00:45:52.840
ERBS DEPLOYMENT (ORBIT 6)		218.6/218.6			0:08:30:00.000
SEP MANEUVER	RCS-1	219.8/219.8	0.5	2.0	0:08:32:00.000
ALTITUDE ADJUST	OMS-3	219.2/170.3	74.9	42.4	1:05:30:00.000
CIRCULARIZATION	OMS-4	170.4/170.4	74.4	41.8	1:06:15:23.645
ALTITUDE ADJUST	OMS-5	170.5/139.5	48.4	27.0	2:00:30:00.000
CIRCULARIZATION	OMS-6	139.2/139.1	47.9	26.7	2:01:14:44.230
TRIM BURN	RCS-2	139.1/137.4	3.8	14.4	5:00:15:00.000
CIRCULARIZATION	RCS-3	138.6/138.5	2.0	7.7	5:00:59:28.137
DEORBIT BURN (ORBIT 132)	OMS-7	133.3/ 15.9	240.2	131.7	8:04:27:54.783
ENTRY INTERFACE (LAT/LONG = 47.4/174.6)					8:04:50:12.384
KSC LANDING (ORBIT 133/D)					8:05:20:12.384

WEIGHTS

ERBS	2,307 kilograms	5,087 pounds
ERBS Support Equipment	63 kg	140 lb.
OSTA-3	1,929 kg	4,254 lb.
LFC and ORS	2,078 kg	4,583 lb.
GAS (8 Canisters)	1,619 kg	3,570 lb.
TLD	9.5 kg	21 lb.
RME	1.8 kg	4 lb.
IMAX (Cabin Camera)	154 kg	340 lb.
APE	15 kg	33 lb.
CANEX	26.7 kg	59 lb.
MAJOR PAYLOADS	8,203 kg	18,091 lb.
Orbiter at Liftoff	109,647 kg	241,780 lb.
Total Vehicle at Liftoff	2,040,296 kg	4,499,000 lb.

National STS Program
STS 41-G Cargo Configuration



OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS (OSTA-3)

OSTA-3 will carry a modified version of the Shuttle Imaging Radar (SIR-B) and three other flight-proven instruments; the Large Format Camera (LFC), Measurement of Air Pollution from Satellites (MAPS) and Feature Identification and Location Experiment (FILE).

During OSTA-3 operations the orbiter's open cargo bay will face the Earth and the nose will point along the direction of flight. Visible data will be recorded on film and/or tape for targets on the Earth's surface directly below the orbiter. The radar antenna will be unfolded in orbit and used at various viewing angles.

The objectives for OSTA-3 are to record photographic and radar images of the Earth's surface, to measure the global distribution of tropospheric carbon monoxide, and to attempt autonomous classification of scenes. The images will be used for making maps interpreting geological features and resource studies.

SHUTTLE IMAGING RADAR-B (SIR-B)

The Shuttle Imaging Radar-B (SIR-B) experiment encompasses 44 different investigations in a wide range of disciplines, including archeology, geology, cartography, oceanography and vegetation studies.

The imaging radar first flew as SIR-A on STS-2 in November 1981. SIR-B is an advanced version of the same radar system. The experiment was developed for the Office of Space Science and Applications by Dr. Charles Elachi and his team at NASA's Jet Propulsion Laboratory, Pasadena, Calif. He also serves as the SIR-B principal investigator, in charge of a science team of 44 participants from 13 countries.

Imaging radar produces photograph-like black-and-white images from data collected by transmitting millions of microwave radar pulses sequentially along a broad swath. Characteristics of the terrain alter the signals in different ways -- dry sand reflects a signal differently than a rocky surface. The signal returns to the radar, and the unique signature of each reflected pulse is recorded. These millions of radar snapshots are then reconstructed by computers to produce detailed imagery.

One of the unique features of imaging radar sensors is their ability to acquire data over virtually any region at any time, regardless of weather or sunlight conditions.

The SIR-B antenna consists of a 35-by-7-foot array of eight panels (SIR-A had seven panels).

During launch and landing, the antenna will be folded in three pieces and stowed in the payload bay. On orbit, with the payload bay doors open, the SIR-B antenna will be deployed. It will remain deployed except during Shuttle maneuvers that require large altitude changes. SIR-B will collect 50 hours of data covering 18 million square miles of the Earth's surface. Radar operations and observations will be controlled by the SIR-B team from the payload operations control center at Johnson Space Center.

The most significant new feature of the SIR subsystem is the antenna array tilt mechanism, which allows the antenna to be tilted to angles between 15 to 60 degrees. This will allow target areas to be viewed from several angles during successive orbital passes. In addition, the antenna can be specially tilted to image ground, water or vegetation surfaces that show greater detail when viewed from a steeper or shallower angle. At a command from the ground, the antenna will move from one orientation to another at the rate of about one degree per second.

Analysis of SIR-A data collected over the eastern Sahara Desert revealed that the radar signals penetrated deposits of dry, windblown sand and were reflected by underlying geologic formations. The images revealed evidence of ancient river channels in Egypt and Sudan that are believed to be 5 to 40 million years old.

Several experiments in desert regions were prompted by the SIR-A results in the Sahara. SIR-B will cover much of the deserts of Egypt and Sudan in search of other geologic formations and evidence of previous human habitation. Other desert areas to be studied by SIR-B include regions in southwest Africa, India, the western coast of Peru, China, central Australia, Saudi Arabia and the Mojave in California. In addition, SIR-B data gathered in Saudi Arabia will be used for groundwater prospecting.

The Swedish Island of Oland in the Baltic Sea, a major population center in the Middle Ages, will be viewed by SIR-B in an attempt to find ancient Nordic ruins. The island is extremely dry in summer months, and investigators hope the radar will pass through the thin layer of Earth covering the limestone plateau to reveal any ancient structures or roads.

Other SIR-B investigations include: studies of tectonic features (East Africa, Canada, midwestern United States and Turkey); coastal landforms (The Netherlands); meteor impact craters (Canada); vegetation identification (North and South America, New Zealand, Australia and Europe); tropical deforestation (Brazil); damage to forests by acid rain (Germany); and crop monitoring (Japan, midwestern and western United States and Australia).

Oceanographic studies will address: the propagation of extreme waves (Agulhas Current, southern Atlantic); internal waves (western and eastern Atlantic); sea ice (South Polar Ocean); icebergs (Labrador coast); and oil spills (Pacific Ocean and North Sea).

Data may be collected in one of three modes. Raw digital data produced at a rate of 46 megabits per second will be transmitted to a ground station at White Sands, N. M., via the 50 megabit-per-second data relay channel of the Tracking and Data Relay Satellite (TDRS). When the orbiter's Ku-band antenna is out of view of the TDRS, SIR-B data will be recorded on a digital tape recorder in the aft flight deck of the Challenger. Recorded data will be transmitted to the ground via TDRS later in the mission. SIR-B also carries an optical film recorder that can be used to record raw data in analog form.

LARGE FORMAT CAMERA

The Large Format Camera (LFC) - first of its kind to orbit Earth - makes its debut this mission from a special support structure aboard Challenger. The camera is bigger, more stable, more precise and more technologically advanced in optics and electronics than its airborne predecessors.

The 900-lb. space eye can produce 2,400 negatives from 70 pounds of film, including two types each of black and white and color.

A unique lens combines the high resolution and wide field of view for precise stereo photography. Other camera elements are derived from instruments built for Apollo, Skylab and the Viking Mars landers.

From 185 statute miles up, the camera's lens can capture scenes down to about 70 ft., the length of a single-family house, compared with 270 ft. taken by Landsat satellites, the main source of data for Earth resources. A single LFC frame can photograph an area larger than the state of Massachusetts.

During the 41-G mission, the LFC will be calibrated with views of stars and the moon. It will carry out oblique photography and horizon scans, followed by two 2 1/2-hour hot and cold "soaks."

Once calibrated the LFC will assist in worldwide exploration for oil and mineral resources, mapping and monitoring Earth's environment.

The LFC will be monitored by the orbiter's general purpose computer, with data sent to the Mission Operations Control Center at Johnson Space Center. The crew also can access the information and operate the camera.

Principal investigator is Bernard H. Mollberg at the Johnson Space Center. The camera was produced for NASA by the Itek Optical Systems Division of Litton Industries, Boston, Mass.

Large Format Camera Specifics

Film Format	9 x 18 in. (23 x 46 cm)
Lens Focal Length	12 inches (30.5 cm)
Lens Aperture	F/6.0
Film Capacity (thin-base)	1,219 m (4,000 ft.)
Photo Frames	Approx. 2,400
Exposure Range	1/250 sec to 1/31.25 sec (4 to 32 miliseconds)
Exposure Interval Range	7.5 sec minimum
Ground Resolved Distance (low contrast)	20 m (65 ft.) from 184 s. mi.
Ground Coverage (typical)	138 x 276 s. mi. at 184 s. mi. altitude (222 x 444 km at 296 km altitude)

MEASUREMENT OF AIR POLLUTION FROM SATELLITES (MAPS)

The 41-G mission will carry an experiment called Measurement of Air Pollution from Satellites (MAPS). Having flown previously on the Space Shuttle in November of 1981, the MAPS experiment will provide information as to what happens to industrial wastes after they enter the atmosphere, by measuring the distribution of carbon monoxide in the troposphere on a global scale. Subsequent flights of the MAPS experiment will be made to help determine the seasonal variation in this distribution.

The equipment for MAPS consists of an electro-optical sensor and electronic module, a digital tape recorder, and an aerial camera. This equipment is coupled to a cold plate and mounted on the pallet shelf.

Upon reaching Earth-viewing position, pallet power will be supplied and the MAPS instrument turned on. After a 30-minute warmup, the instrument is balanced and its gain is checked before it begins to acquire data.

The instrument will continue to operate throughout the Earth-observation period, with balance and gain checks recurring every 12 hours upon commands sent from the principal investigator's team.

The principal investigator for MAPS is Dr. Henry G. Reichle, Jr. of NASA's Langley Research Center, Hampton, Va.

FEATURE IDENTIFICATION AND LOCATION EXPERIMENT (FILE)

The Feature Identification and Location Experiment (FILE) is designed to help develop equipment which will make remote sensing instruments more efficient. Based on a simple classification algorithm, this is the first step toward the technology needed to select data at the sensing stage, thus reducing the data load and speeding data dissemination for Earth-observing missions.

The FILE system consists of two charged-coupled detector (CCD) television cameras (one camera equipped with an optical filter for visual read, the other with near infrared), a logic unit, a buffer memory, two Lockheed Mark V tape recorders and two Hasselblad 70mm cameras. Having flown previously on the OAST-1 payload (STS-2) the FILE instrument will be the same except for the absence of the sun sensor. This was done to add greater flexibility to the OSTA-3 version for ground commands and alternative operation by the crew.

The FILE instrument will be operated during sunlit intervals of the Earth-observing period by either ground command or crew activation. Principal investigator is W. Eugene Sivertson with co-investigator R. G. Wilson both from NASA's Langley Research Center, Hampton, Va.

EARTH RADIATION BUDGET EXPERIMENT (ERBE)

The Earth Radiation Budget Experiment (ERBE) is a three-satellite project that will accurately measure the amount of solar energy absorbed in different regions of Earth and the amount of thermal energy emitted back to space.

Earth absorbs more energy in the tropics than it emits, and receives no solar radiation in the winter polar regions, though it continues to emit radiation. The difference in temperature causes the atmosphere and oceans to circulate and transfer energy, creating Earth's weather and climate.

Earth's radiation budget and climate are changed by several processes: variations in the sun's output of radiation, veiling of Earth by volcanic dust, increases in atmospheric carbon dioxide from fossil fuel burning and other processes not yet fully understood.

Investigators at NASA's Langley Research Center, working with other NASA centers, government agencies, universities and private industry, developed the Earth Radiation Budget Experiment to provide new information on radiation exchanges.

The experiment consists of three sets of satellite-mounted instruments. One set is on the Earth Radiation Budget Satellite (ERBS), managed by NASA's Goddard Space Flight Center, that will be deployed during the 41-G mission. A second set will be on a National Oceanic and Atmospheric Administration (NOAA) satellite, NOAA-F, scheduled for launch into near-polar orbit in late 1984. The third set will be aboard NOAA-G, scheduled for launch in late 1985 or early 1986.

The three-satellite ERBE system will measure thermal and solar radiation of the entire Earth at some time during each day, and most of the Earth at all times of day during every month.

Each ERBE package consists of two instruments -- a Scanner and a Non-Scanner -- that use seven radiometer sensors to measure various intensities of radiant energy in the atmosphere and one sensor to measure solar intensity.

ERBE's primary goals are to determine, for at least one year: Earth's average monthly regional, zonal and global radiation budget; seasonal movement of energy from the tropics to the poles; and average daily variation in radiation on a 621-mile regional scale for each month.

Secondary ERBE goals are to insure the accuracy and efficiency of the ERBE instruments and develop analysis techniques for a highly reliable, economical and long-term monitoring system, needed to supply information for climate monitoring and mathematical modeling of climate patterns.

Earth's radiation budget has been studied for several years with instruments on sounding rockets, balloons and satellites, but the studies provided limited measurements, incomplete coverage and sporadic observations.

NASA, the National Academy of Sciences and the National Science Foundation have developed a long-range climate research program to increase understanding of climate processes and determine climate predictability. NASA's program is managed by the Office of Space Science and Applications, NASA Headquarters, Washington, D.C.

EARTH RADIATION BUDGET SATELLITE (ERBS)

The Earth Radiation Budget Satellite (ERBS) is one of three satellites in a program known as the Earth Radiation Budget Experiment Research Program.

The 5,087-lb. spacecraft was built by Ball Aerospace Systems Division Boulder, Colo., which in collaboration with its subcontractor, Bendix Field Engineering Corp., Columbia, Md., also will conduct on-orbit operations under contract to NASA.

The spacecraft has three instruments -- the Earth Radiation Budget Experiment Scanner (ERBE-S); the Earth Radiation Budget Experiment Non-Scanner (ERBE-NS), both of which were built by TRW in Redondo Beach, Calif.; and the Stratospheric Aerosol and Gas Experiment II (SAGE II), built by Ball Aerospace.

The spacecraft will be lifted out of the orbiter's payload bay by the Canadian-built Remote Manipulator System (RMS), a 50-ft. long mechanical arm.

After separation from the RMS, the spacecraft's Orbit Adjust Propulsion System (OAPS) will be fired in a programmed sequence to raise the orbital altitude to 379 statute miles. Orbital inclination will be 57 degrees.

ERBS is 15 ft. wide, 12.5 ft. high and 5.2 ft. long.

The NASA Office of Space Science and Applications oversees the ERBE program; the Goddard Space Flight Center, Greenbelt, Md., is responsible for the overall project management. Langley has responsibility for the three instruments and science data reduction. Program manager is Dick Diller of NASA Headquarters. Project manager is Carl L. Wagner, Jr. of Goddard. The instruments manager is Charles V. Woerner of Langley.

Instrumentation

The ERBE instruments set will provide the measurements required to determine the Earth radiation budget on several spatial and temporal scales. The instrument measurements of the reflected shortwave and emitted longwave radiation from the Earth will be used to derive the solar-absorbed radiation and emitted thermal radiation monthly on regional, zonal and global scales. Data also will be analyzed for equator to pole energy transfer gradient, average diurnal variations, monthly and regionally and the total solar energy output. Furthermore, the data will be analyzed to ascertain instrument engineering integrity, calibration procedure effectiveness and the efficiency of sampling and analysis to determine changes in the radiation budget at the top of the atmosphere.

ERBE NON-SCANNER (ERBE-NS)

The ERBE-NS has five sensors with cavity radiometer detectors. Four of the sensors are primarily nadir-pointed Earth-viewing sensors, with a fifth sensor used for solar viewing. Of the four nadir-pointed sensors, two view the entire Earth's disc from limb to limb. They are designated wide-field-of-view sensors.

The other two nadir-pointed sensors are designated medium-field-of-view. One of each pair of nadir-viewing channels measures the total radiation of the Earth, and the other measures the shortwave radiation.

ERBE SCANNER (ERBE-S)

The ERBE-S has three sensors with radiometric thermistor bolometers (devices for measuring minute amounts of radiant energy). One is for shortwave measurements, one for longwave measurements, and the third for total radiation measurements. The sensors are located within a continuously moving scanhead assembly which is oriented to perform cross-track scanning with a rapid retrace. A two-point inflight calibration is provided for each sensor. For one point, each detector views space during each scan for zero radiance. The second point is obtained periodically when the sun is in position for viewing or by inflight calibration.

The ERBE-S measures 15.9 by 13.9 by 24.8 in. and weighs 70.8 lb.

The ERBE-NS and the ERBE-S also will be launched aboard NOAA-F (1984) and NOAA-G (1985) as part of the ERBE Research Program.

STRATOSPHERIC AEROSOL AND GAS EXPERIMENT (SAGE II)

The Stratospheric Aerosol and Gas Experiment (SAGE II) instrument will monitor the vertical global distribution of aerosols and gases in the stratosphere by measuring the attenuation (reduction in intensity) of the sun's energy through Earth's atmosphere. The experiment was developed at NASA's Langley Research Center.

The scientific objectives of the mission are to: (1) globally map vertical profiles of stratospheric aerosols, ozone, water vapor and nitrogen dioxide with one-kilometer vertical resolution from 80 degrees south to 80 degrees north latitude; (2) determine seasonal variations in the aerosols and gases to define a baseline for investigating natural and human effects on changes in climate and environmental quality; and (3) identify sources and sinks of the aerosols and gases and observe natural transient phenomena such as volcanic eruptions, tropical upwellings and dust storms.

SAGE-II is 15.2 in. in diameter by 28.3 in. in length and weighs 65 lb.

SAGE II will view about 15 sunrises and 15 sunsets each 24 hours, collecting solar attenuation profiles that will be mathematically reduced to atmospheric constituent concentration profiles. Each event occurs at a different latitude and longitude, and global coverage is repeated every three to four weeks.

SAGE II data will be stored aboard the ERBS satellite and transmitted to a ground station each day. Instrument radiance data and spacecraft orbital parameters, synchronized to a common time base, will be provided to the SAGE II science team at the Langley Research Center for reduction and analysis.

ERBS PAYLOAD OPERATIONS CONTROL CENTER (POCC)

The Payload Operations Control Center (POCC) is the controlling facility for all spacecraft mission operations. The POCC contains all the processing resources, switching, control consoles and testing facilities to operate the mission assigned. All spacecraft operations will be conducted by Bendix Field Engineering Corp. personnel at the Goddard Space Flight Center, under the direction of Ball Aerospace Systems Division.

ORBITAL REFUELING SYSTEM (ORS)

The Orbital Refueling System experiment is a demonstration of Shuttle-human-tended capabilities to refuel already orbiting satellites once their self-contained thruster systems have depleted fuel reserves. This demonstration is a precursor to actual Shuttle refueling missions for satellites.

The ORS has been designed to deliver about 550 lb. of fuel to a retrieved satellite. The system, developed by the Engineering Directorate at Johnson Space Center, will be tested on 41-G in various stages leading to a full hydrazine transfer between two different tanks on the ORS support structure.

For the final fuel transfer stage, mission specialists David Leetsma and Kathryn Sullivan will don their spacesuits and proceed to the aft end of the payload bay where the ORS equipment is mounted on an MPESS (Mission Peculiar Experiment Support Structure) along with the Large Format Camera. There the crewmembers will open the tool kit and remove the hydrazine servicing tool -- which will already be hooked up to the fuel supply tank. The crewmemebers will connect it to the ground fill panel of a simulated satellite panel, thus completing the fuel supply link. After pressure checking the hookup, the crewmembers will return to the cabin.

The actual transfer of the hydrazine, which is a very toxic and corrosive material, will be controlled from the aft flight deck experiment control panels. The ORS is equipped with sensors which provide pressure and temperature values and switch and valve positions.

CANADIAN EXPERIMENTS (CANEX)

Marc Garneau, the Canadian payload specialist, will conduct 10 experiments for the National Research Council (NRC) of Canada. They fall into three categories: space technology, space science and life sciences.

NRC Space Vision System

The National Research Council Space Vision System is a state-of-the-art development in robotic technology being designed to work with the Space Shuttle and Canadarm, the remote manipulator system that Canada contributed to the United States Space Shuttle program. The same technology also has many potential applications in the industrial community.

The system is being designed to give more precise guidance information to make it easier for astronauts to approach, capture and then berth large satellites or to assemble other structures in space under the dramatically changing lighting conditions which can occur rapidly in space.

During their tests, Marc Garneau will assist in the operation of the orbiter's closed-circuit television cameras and make video recordings of stationary and moving test targets under a range of lighting conditions and distances.

The purpose of the tests is to aid development of the NRC Space Vision System to be used in space for rendezvous, inspection and assembly tasks and to be flown in orbit for the first time in 1986.

Advanced Composite Materials Exposure

Spacecraft structures and mechanisms have begun to make use of strong, lightweight composite materials of graphite fiber and epoxy compounds. There is some evidence that these materials deteriorate in the space environment through exposure to atomic oxygen at high velocities (eight kilometers a second).

For this experiment, a number of samples of different materials have been attached to the Remote Manipulator Arm to see what deterioration, if any, occurs during a short-duration flight. The arm will be extended so that the samples face the direction of flight for 36 hours. Analysis will be conducted after the flight when the samples have been returned to Canada.

Measurements Using a Sunphotometer

The Canadian-made Sunphotometer is a hand-held instrument which is pointed at the sun to obtain readings of solar radiation at several wavelengths in the visible and the near-infrared region of the spectrum. This instrument is used by the Canadian Atmospheric Environment Service to measure local atmospheric constituents and to monitor acidic haze.

Atmospheric Emission and Shuttle Glow Measurements

During space flight, some surfaces of the orbiter develop a faintly visible reddish glow which could affect optical instruments of payloads.

The causes and characteristics of the glow are not fully understood; but, under suitable conditions, it may be photographed. This experiment involves the use of very high-resolution optical filters and an image intensifier to obtain photographs which can be analyzed to identify the reactions which produce these emissions.

Space Adaptation Syndrome Experiment Studies

Marc Garneau will conduct a set of experiments to isolate and measure several of the key adaption processes occuring during the first days in space.

The experiments located in the mid-deck will examine vestibulo-ocular reflex, sensory function in limbs, proprioceptive illusions, awareness of external objects, space motion sickness and taste in space.

GETAWAY SPECIAL EXPERIMENTS

Eight small self-contained payloads are scheduled for the 41-G Space Shuttle mission.

G-0007 - Space Processing and Transmitting Computer Voice on Amateur Radio Bands

Sponsored by the Alabama Space and Rocket Center (ASRC) as an educational project, this experiment is also supported by the University of Alabama in Huntsville (UAH) and the Alabama A&M University in Huntsville.

The three student experiments consist of one that will study the solidification of lead-antimony and aluminum-copper alloys in a micro-gravity environment and compare the resulting crystalline structure and alloy strength with those of Earth-based equivalents.

A second experiment will investigate the growth of potassium tetracyanoplatinate hydrate crystals in an aqueous solution by an electrochemical method. The third experiment will study germination of radish seeds in low gravity and will compare their growth characteristics with seeds grown on Earth.

The amateur radio transmission experiment sponsored by the Marshall Amateur Radio Club (MARC) will receive a "turn on" signal from the astronauts' hand-held controller.

A microprocessor will obtain real-time data from all experiments and the data will be transmitted on an amateur radio frequency of 435.033 MHz. The signals can be received by radio "hams" around the world and will subsequently be relayed by radio or by telephone to MARC for detailed analysis during or after flight.

The payload manager is Conrad Dannenberg, Alabama Space and Rocket Center, Huntsville, Ala.

G-0013 - Halogen Lamp Experiment (HALEX)

Special optical radiation type furnaces have been developed for material science research and processing in space. These furnaces rely on halogen lamps as heat sources. The purpose of this experiment is to verify the use of halogen lamps during extended periods of microgravity.

The minimum lamp operation time during the 41-G mission is expected to be more than 60 hours.

The project is funded by the European Space Agency (ESA), and the payload was built, integrated and tested by Kayser-Threde, Munich, Federal Republic of Germany, while the mirror compartment and halogen lamp was supplied by Dornier System.

The payload manager is Gunter Schmitt, Kayser-Threde, Munich, Federal Republic of Germany.

G-0032 - Physics of Solids and Liquids in Zero Gravity

The Asahi National Broadcasting Company, Limited, Tokyo, Japan, with Kazuo Fujimoto as the payload manager, intends to make two kinds of experiments in weightlessness.

One experiment is designed to provide clear-cut answers as to what happens when a metal or plastic (solid) is allowed to collide with a water ball (liquid) in weightlessness. The behavior of the metal or plastic ball and the water ball after collision will be observed on video systems.

The other experiment is designed to produce five kinds of new materials simultaneously in space. The formation of crystals of three metal alloys and two glass composites in five small electrical furnaces in weightlessness will be observed.

G-0038 - Vacuum Deposition - (Art in Space)

Sculptor Joseph McShane of Prescott, Ariz., will become the world's first space artist. Challenger will carry a computerized payload designed by McShane, which will produce the first works of art created in the weightless, vacuum environment of space.

McShane will use vacuum deposition techniques to coat eight glass spheres with gold, platinum and other metals to create lustrous space sculptures.

A ninth sphere will be exposed to outer space via a valve.

The payload manager is sculptor Joseph McShane, Prescott, Ariz.

G-0074 - Zero G Fuel System Test

A McDonnell Douglas Astronautics Company experiment is designed to show how liquid fuel in partially full tanks can be delivered, free of gas bubbles, to engines that control and direct spacecraft in orbit. The experiment will provide data for designing more versatile lower-cost fuel tanks for future spacecraft.

The payload manager is George Orton, McDonnell Douglas Astronautics Co., St. Louis, Mo.

G-0306 - Trapped Ions in Space (TRIS) Experiment

The TRIS experiment is a joint project of the Cosmic Ray Astrophysics Group at the Naval Research Laboratory (NRL), Washington, D.C., and the Sigma Pi Sigma Physics Honor Society at the United States Naval Academy (USNA).

The goal of the experiment is to investigate the unexpectedly large flux of heavy ions (electrically charged ions of oxygen and heavier atomic elements) that was first observed in an experiment onboard Skylab in 1973 and 1974. The experiment will record these particles in a stack of special track detecting plastic sheets.

The payload manager is Dr. James Adams Jr., Naval Research Laboratory, Washington, D.C.

G-0469 - Cosmic Ray Upset Experiment (CRUX III)

CRUX III will be the third in a series of flight experiments on the Space Shuttle to test for cosmic ray upsets of microcircuits.

CRUX III is noteworthy also because it represents a joint, cooperative effort between NASA and the Federal Systems Division of IBM to investigate the Single Event Upsets (SEU) phenomenon.

The payload manager is John W. Adolphsen, Goddard Space Flight Center (GSFC). For IBM, the payload manager is Gino Manzo of IBM/FSD, Manassas, Va.

G-0518 - Physics and Material Processing

The experiments included on this flight from Utah State University are designed to study basic physical processes or, in some cases, their effects on a variety of processes. They include the following:

- o Capillary Waves Under Zero-G - this study will excite waves in a water surface and photograph the results.
- o Solder Flux Separation - this experiment studies the separation of flux and solder in Zero-G.
- o Heat Pipe Experiment - this experiment is a test of a fluid flow system which will later be used in an electrophoresis experiment.
- o Thermocapillary Convection - this experiment studies the flow patterns set up by a temperature difference.

The payload manager is Dr. Rex Megill, Utah State University.

RADIATION MONITORING EQUIPMENT (RME)

Radiation Monitoring Equipment (RME) will be used to actively measure any gamma radiation exposure to the crew in the orbiter cabin. The experiment consists of a handheld radiation monitor (Gamma and Electron Dosimeter) and two pocket REM meters (Neutron and Proton Dosimeter). The two meters are self-contained and each includes a 9-volt alkaline battery. Data will be collected several times throughout the mission, with the meters being operated by the crew.

THERMOLUMINESCENT DOSIMETER (TLD)

The Thermoluminescent Dosimeter (TLD) is a small portable dosimetry system developed by the Central Research Institute for Physics in Budapest, Hungary, and will be carried in a cabin locker. It is beng flown to obtain cosmic radiation doses during space flight for comparison with the presently used dosimetry systems.

IMAX

Located in the mid-deck will be an IMAX motion picture camera, making the third and final scheduled trip into space aboard the Shuttle. Footage from the Shuttle flights will be assembled into a film called "The Dream Is Alive."

The IMAX high-fidelity motion picture system uses a large 70mm film frame which, because of its size, improves picture quality. IMAX films are displayed on a screen that is nine times larger than a conventional screen.

The IMAX camera is part of a joint project among NASA, the National Air and Space Museum, IMAX Systems Corp. of Toronto, Canada, and the Lockheed Corp.

41-G FLIGHT CREW DATA

ROBERT L. CRIPPEN, 47, Captain, USN, is commander of the 41-G mission. A native of Beaumont, Texas, he became a NASA astronaut in 1969.

Crippen was pilot on the first orbital test flight of the Shuttle Columbia in 1981. He commanded STS-7, the seventh Space Shuttle mission last year, and 41-C, his third mission.

Crippen received his commission through the Navy's Aviation Officer Program at Pensacola, Fla., which he entered after graduation from the University of Texas in 1960. From 1962 to 1964, he completed 2 1/2 years of duty as attack pilot aboard the aircraft carrier USS Independence.

JON A. MCBRIDE, 41, Commander, USN, is the pilot for 41-G. He became a NASA astronaut candidate in 1978. McBride was lead chase pilot for the maiden voyage of Columbia.

McBride's naval service began in 1965. He served three years as a fighter pilot and while in Southeast Asia flew 64 combat missions. He was awarded three Air Medals, the Navy Commendation Medal with Combat V, a Navy Unit Commendation, the National Defense Medal and Vietnamese Service Medal.

A native of Charleston, West Virginia, McBride was graduated from the U.S. Naval Postgraduate School in 1971 and did graduate work in human resources management at Pepperdine University, Malibu, Calif.

KATHRYN D. SULLIVAN, 32, Ph.D, is Mission Specialist One on 41-G. She became a NASA astronaut candidate in 1978.

Since joining NASA, Sullivan's research interests have focused on spaceborne remote sensing and planetary geology. She qualified as a systems engineer operator in NASA's WB-57F high-altitude research aircraft in 1978 and participated in several remote sensing projects in Alaska. She is a co-investigator on the Shuttle Imaging Radar-B (SIR-B) experiment.

Sullivan concentrated on academic study and research and as an Earth sciences major at the University of California, Santa Cruz. She spent two years as an exchange student at the University of Bergen, Norway, before receiving a bachelor's degree with honors. She received her Doctorate at Dalhousie University, Halifax, Nova Scotia in 1973.

SALLY K. RIDE, 33, Ph.D, the first American woman in space, is Mission Specialist Two on Space Shuttle flight 41-G. She became an astronaut candidate in 1978.

Born in Los Angeles, Ride was graduated from Stanford University with a BS in physics, BA in english, MS and Doctorate degrees in physics.

Ride was a mission specialist on STS-7 last year.

DAVID C. LEESTMA, 35, Lieutenant Commander, USN, is Mission Specialist Three on Space Shuttle flight 41-G. He became a NASA astronaut candidate in 1980.

Leestma received a BS degree in aeronautical engineering from the U.S. Naval Academy, graduating first in his class, and a MS degree in aeronautical engineering from the U.S. Naval Postgraduate School.

His special honors include the Navy Commendation and Navy Achievement Medals, Meritorious Unit Commendation (VX-4), National Defense Service Medal and the Rear Admiral Thurston James Award.

PAUL D. SCULLY-POWER, 40, is one of two payload specialists assigned to Space Shuttle mission 41-G. He is the recipient of 18 Navy special achievement awards.

Scully-Power is senior scientist and technical specialist at the Naval Underwater Systems Center, New London, Conn. He has spent extensive time at sea, taking part in 24 scientific cruises, 13 for which he was chief scientist.

He attended schools in London and Sydney, Australia, and received a post graduate diploma of education and honors in applied mathematics. He was selected Royal Australian Navy Exchange Scientist to the USN, working at the Naval Underwater Systems Center in New London, and at the office of Naval Research in Washington, D.C.

MARC GARNEAU, 35, Ph.D, is the second payload specialist on Space Shuttle Mission 41-G. He is section head of Communications and Electronic Warfare, Ottawa, responsible for all naval communications and electronic warfare equipment and systems.

Dr. Garneau is a naval commander classified as a combat systems engineer. He was graduated with a BS in physics from the Royal Military College of Kingston and received a doctorate in electrical engineering from the Imperial College of Science and Technology, London, England.

Garneau is one of six original Canadian astronauts selected in 1983 and began astronaut training at NASA early this year.

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