

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SPACE SHUTTLE MISSION STS-41B

PRESS KIT
FEBRUARY 1984



UNTETHERED EVA; SHUTTLE PALLET SATELLITE (SPAS-01A);
PALAPA-B2 AND WESETAR VI DEPLOYMENT

STS-41B INSIGNIA

S83-45520 -- The orbiter is flanked in the oval by an illustration of a PAM-D assisted satellite deployment; and an astronaut making the first non-tethered extravehicular activity; and eleven stars. The crew member at right is equipped with the manned maneuvering unit, a debuting backpack/motor apparatus allowing for much greater freedom of movement than that experienced by any previous space travelers performing EVA. The artist was Robert McCall.

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ASTRONAUTS TO PRACTICE FOR SATELLITE RESCUE

NASA astronauts will perform the first untethered space walks on the tenth mission of the Space Shuttle (41-B) scheduled for launch Feb. 3 from Kennedy Space Center, Fla. Gas-powered backpacks will be used to demonstrate spacewalk techniques important for the successful retrieval and repair of the disabled Solar Maximum spacecraft.

The primary goal on the eight day mission will be to deploy into orbit two commercial communications satellites -- Western Union's Westar VI and the Indonesian Palapa-B2.

The remainder of the flight will be devoted to a series of rendezvous maneuvers using an inflatable balloon as the target, test flights of two Manned Maneuvering Units (MMU), and checkout of equipment and procedures in preparation for Challenger's next flight (41-C) in April, the Solar Maximum Repair Mission.

The five-man crew for this mission is led by Commander Vance Brand, who also commanded the first operational flight of the Shuttle, STS-5. He is joined by pilot Robert "Hoot" Gibson and three mission specialists -- Bruce McCandless, Ronald McNair and Robert Stewart -- none of whom have flown in space before.

Challenger, making its fourth trip into space, is scheduled to be launched from Kennedy Space Center on Feb. 3 at 8 a.m. EST, into a circular 189.7 statute mile orbit with an inclination to the equator of 28.45 degrees.

The first Shuttle landing at Kennedy is set for Feb. 11 at 7:19 a.m. A Kennedy landing on an earlier Shuttle flight was diverted to Edwards Air Force Base, Calif., because of unsatisfactory weather conditions.

Astronauts McCandless and Stewart are scheduled to perform two five-hour extravehicular activities (EVA), or "space walks," on the fifth and seventh days of the flight. The objectives of these space walks are to check out the critical equipment required for the Solar Maximum rescue mission; obtain engineering data on the performance of the Manned Maneuvering Units; and evaluate a special hydrazine transfer tool proposed for later satellite servicing missions.

This will mark the first flight of the Manned Maneuvering Unit -- a space-age propulsive backpack that, when donned by an astronaut, provides the capability to reach areas outside the orbiter's cargo bay. Two of the units will be carried on this mission.

Several pieces of specialized equipment will be tested during the EVAs. The Manipulator Foot Restraint (MFR), a portable work station, will be attached to the end of and maneuvered by the Remote Manipulator System arm. Attached to the foot restraint, an astronaut can use the robot arm as a space-age "cherry picker" to reach and work on various areas of a satellite.

The 50-foot-long Remote Manipulator System, built for the Shuttle by the National Research Council of Canada, will be used to deploy the Shuttle Pallet Satellite -- SPAS -- as a target for MMU-equipped astronauts to perform docking maneuvers.

SPAS will be used as a simulated Solar Maximum satellite. Astronauts will replace electrical connectors attached to the SPAS during one of the space walks to verify procedures that astronauts will perform on the actual repair mission.

The MMU-equipped astronauts will also attempt to dock with the pallet satellite, thereby simulating maneuvers needed to rendezvous, dock and stabilize the Solar Maximum satellite.

Two days of rendezvous activities using a target balloon will be conducted to evaluate the navigational ability of the Challenger's onboard systems, as well as the interaction between the spacecraft, flight crew and ground control.

The activities are designed to obtain data from Challenger's various sensors (the rendezvous radar, star tracker and crew optical alignment sight) required for rendezvous and to exercise the navigation and maneuvering capabilities of the onboard software.

Rendezvous is planned by maneuvering the orbiter to within 800 feet of a target from a starting distance of approximately 120 miles. In the process, additional sensor performance data will be gathered.

A variety of other payloads will be carried aboard Challenger on flight 41-B. Two Cinema 360 cameras, one in the crew module and one in the payload bay, will provide a test for 35 mm motion picture photography in a unique format designed especially for planetarium viewing.

Making its fifth flight into space, the Monodisperse Latex Reactor (MLR) is designed to manufacture tiny identical-sized latex beads which may have major medical and industrial research applications.

The Acoustic Containerless Experiment System (ACES) is a materials processing furnace experiment located in the orbiter's middeck. The IsoElectric Focusing Experiment (IEF) will evaluate the effect of electro-osmosis on an array of eight columns of electrolyte as DC power is applied and pH levels between anodes and cathodes increase.

A Shuttle Student Involvement Project experiment will test the effects of weightlessness on the development of arthritis using rats as the test subjects. The experiment was proposed by Dan Weber, now a student at Cornell University. Six rats will be carried into space aboard Challenger in an Animal Enclosure Module.

Six Getaway Special canisters will fly in Challenger's cargo bay -- five will carry experiments and the sixth will carry the Cinema 360 camera experiment.

Challenger is scheduled to make the first Shuttle landing on the 15,000-foot-long runway at Kennedy Space Center. Commander Brand will fire Challenger's twin, 6,000-pound-thrust orbital maneuvering engines on orbit 127 as the spacecraft passes off the northwest corner of Australia to slow the vehicle so that the earth's gravity begins to pull it down.

Landfall over Florida will occur over the peninsula's west coast as the orbiter crosses the state on an almost due east ground track. Two distinct sonic booms will be audible the entire width of the central part of the state until the velocity of the spacecraft falls below the speed of sound. A sweeping right-hand turn over the Atlantic ocean will put Challenger onto its final approach for a southeast-to-northwest landing on the prime runway, Runway 33. Nominal landing will occur at Kennedy just minutes after sunrise at approximately 7 days, 23 hours and 19 minutes Mission Elapsed Time.

(END OF GENERAL RELEASE; BACKGROUND INFORMATION FOLLOWS.)

41-B PRESS BRIEFING SCHEDULE

Time	Briefing	Origin
T-2 Days		
9:00 a.m. EST	Countdown Status	KSC
9:30 a.m. EST	Mission Summary/EVA and MMU TDRS/STDN operations	KSC KSC
10:30 a.m. EST	Westar VI	KSC
11:00 a.m. EST	Palapa-B2	KSC
11:30 a.m. EST	SPAS-01A	KSC
1:00 p.m. EST	Getaway Specials	KSC
2:30 p.m. EST	Cinema 360	KSC
3:00 p.m. EST	Shuttle Student Involvement Project	KSC
T-1 Day		
9:00 a.m. EST	Countdown Status	KSC
10:30 a.m. EST	Prelaunch Press Conference	KSC
T-Day		
9:00 a.m. EST (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
T+8 Days	Inflight Press Conference	JSC
Landing Day		
8:30 a.m. EST (approximately)	Post Landing Press Conference	KSC
Landing +1 Day		
11:00 a.m. EST	Orbiter Status	KSC

GENERAL INFORMATION

NASA Select Television Transmission

The schedule for television transmissions from the Challenger 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 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 preparations will be produced by the appropriate NASA news center (Kennedy for launch and landing; Johnson for mission and postlanding).

Briefings

Flight control personnel will be on eight-hour shifts. Change-of-shift briefings by the MOCR Flight Director will occur at approximately eight-hour intervals, if required.

Miscellaneous

Information about pre-launch countdown activities, tracking and data information, Huntsville operations and other activities related to the mission will be made available to the media at news centers in separate publications.

MISSION FACTS

Crew: Vance D. Brand, Commander
Robert L. Gibson, Pilot
Bruce McCandless, II, Mission Specialist
Robert L. Stewart, Mission Specialist
Ronald E. McNair, Mission Specialist

Orbiter: Challenger (OV-099)

Launch Site: Kennedy Space Center, Fla., Pad 39A

Launch Date/Time: Feb. 3, 1984, 8:00 a.m. EST*

Altitude: 165 nautical miles

Orbital Inclination: 28.5 degrees

Mission Duration: 7 days, 23 hours, 19 minutes*

Landing Date/Time: Feb. 11, 1984, 7:19 a.m. EST*

Landing Site:
(weather alternate) Kennedy Space Center, Fla.
Edwards Air Force Base, Calif.

Mission Firsts: First flight Manned Maneuvering Unit
First Extravehicular Activity with no extended prebreathe
First orbiter rendezvous using onboard navigation and sensors
First use of Manipulator Foot Restraint

Principal Cargo: Palapa-B2 (Indonesian Satellite)
Westar VI (Western Union Satellite)
SPAS-01A (Shuttle Pallet Satellite)
IRT (Integrated Rendezvous Target)

Experiments: Shuttle Student Involvement Project Experiment
IsoElectric Focusing Experiment
Monodisperse Latex Reactor
Acoustic Containerless Experiment System
Five Getaway Special Containers
Cinema 360

* Subject to change

SUMMARY OF MAJOR ACTIVITIES

Flight Day 1

Cinema 360 heater activation
Monodisperse Latex Reactor
Westar VI deployment

Flight Day 2

Acoustic Containerless Experiment
IsoElectric Focusing Experiment
Handheld Radiation Monitor/Pocket
Radiation Meter
Cinema 360
Palapa-B2 deployment
Monodisperse Latex Reactor activities
SPAS-01A activities
Animal Enclosure Module

Flight Day 3

Integrated Rendezvous Target operations
Getaway Special activities

Flight Day 4

Handheld Radiation Monitor
Rendezvous/proximity operations
Integration Rendezvous Target separation
SPAS-01A operations
Getaway Special activities

Flight Day 5

Remote Manipulator System powerup
Extravehicular activity
SPAS-01A operations

Flight Day 6

Animal Enclosure Module
SPAS-01A operations
Cinema 360
Getaway Special activities

Flight Day 7

Getaway Special activity
SPAS-01A operations
Cinema 360
Extravehicular activity
Animal Enclosure Module

Flight Day 8

On-orbit press conference
Getaway Special activity

Flight Day 9

Landing

CONFIGURATION

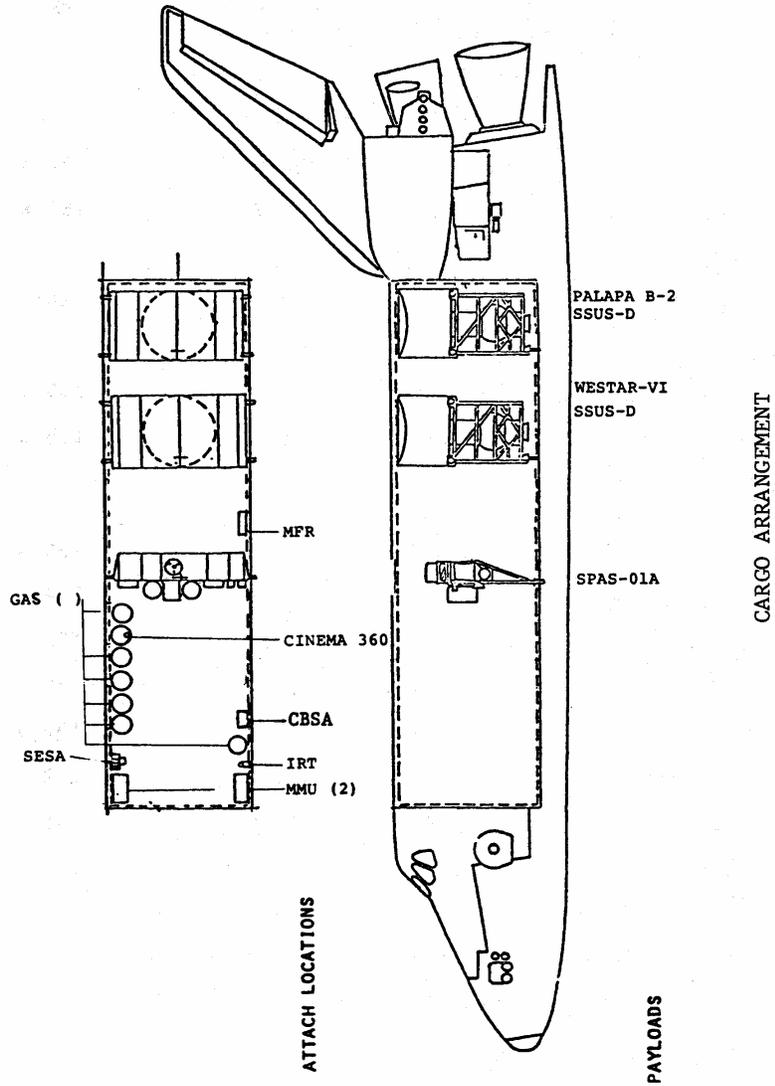
Challenger has the 15.2 m (50 ft.) Canadian-built manipulator arm which will be used for extending the SPAS out and above the payload bay.

Flight 41-B payloads, Westar VI and Palapa-B2 are housed in the aft area of the payload bay. There are six Getaway Special canisters located on the forward starboard side, the IRT canister port forward and two MMUs, one on each side, near the forward bulkhead.

The MLR, student experiment and other experiments are located in the forward middeck.

Major 41-B payload component weights are: Palapa-B2/PAM, 3,435 kg (7,574 lb.); PAM cradle, 1,084 kg (2,309 lb.); Westar VI/PAM, 3,325 kg (7,331 lb.); PAM cradle, 1,086 kg (2,394 lb.); SPAS-01A, 1,448 kg (3,192 lb.).

Liftoff weight of the Challenger at SRB ignition will be 2,043,140 kg (4,504,350 lb.).



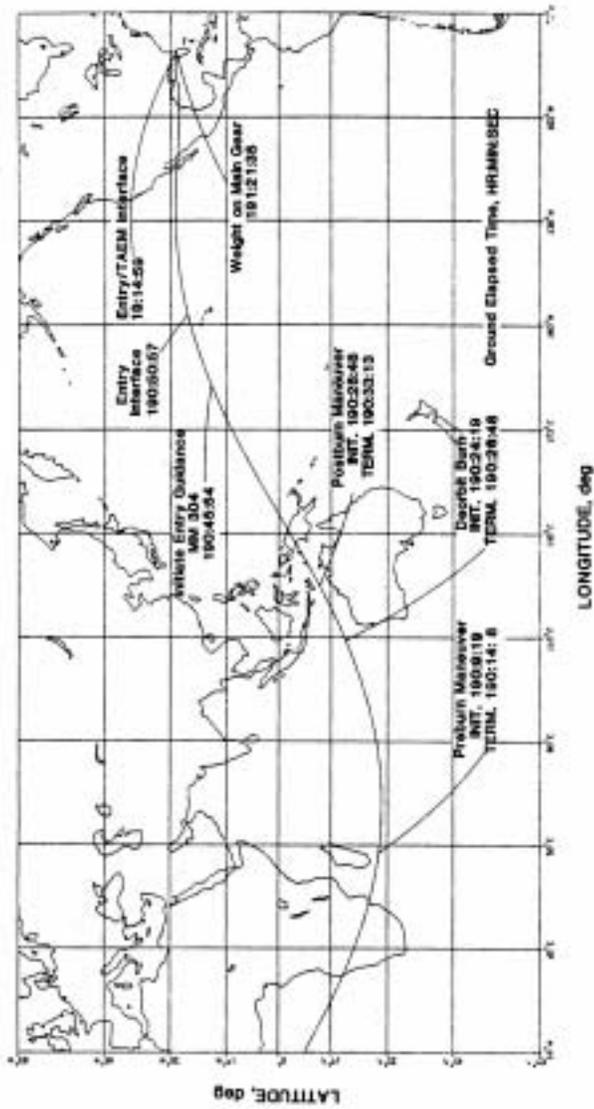
41-B FLIGHT SEQUENCE OF EVENTS

Event	MET (h:m:s)	Delta V (fps)	Hp/Ha (n mi)
Launch	00:00:00		
MECO	00:08:27	3x83	
OMS-1 (2m 39s)	00:10:21	250.9	51x165
OMS-2 (2m 10s)	00:45:04	202.7	165x165
Westar deploy	07:59:23		
OMS sep from Westar	08:14:23	11	165x170
Palapa-B2 deploy	27:37:11		
OMS sep from Palapa	27:52:11	11	165x176
Orbit adjust maneuver	50:36:59	36.6	155x155
Deploy rendezvous Target (IRT)	51:24:21		
Rendezvous separation	51:44:23	0.8	155x156
Rendezvous transfer	52:16:55	2.8	154x156
Rendezvous NCC	53:14:30	7.8	153x155
Rendezvous NC	68:16:28	27.4	138x155
Rendezvous NH	69:01:34	4.2	138x152
Rendezvous NCC-1	70:20:23	0.4	138x152
Rendezvous TI	71:15:52	21.0	149x152
Rendezvous TF	72:36:20	5.6	150x152
Rendezvous separation	74:20:01	4.0	152x152
Deorbit OMS burn	190:22:39	278.4	0x152
Landing at KSC-SLF	191:19:04		

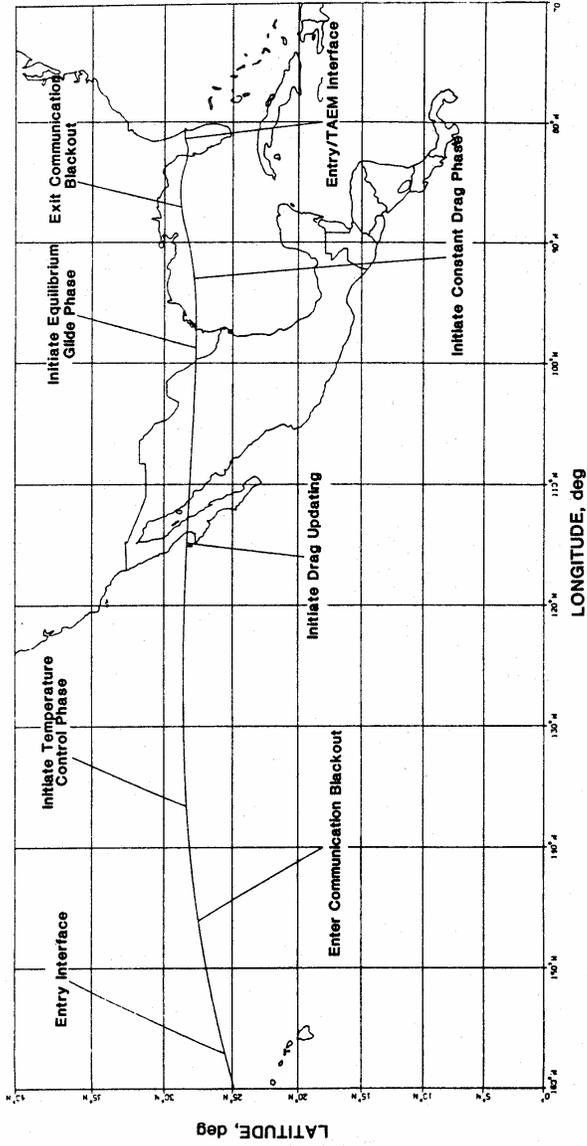
IRT - Integrated Rendezvous Target NH - Normal Height

NC - Normal Corrective TF - Transition Final

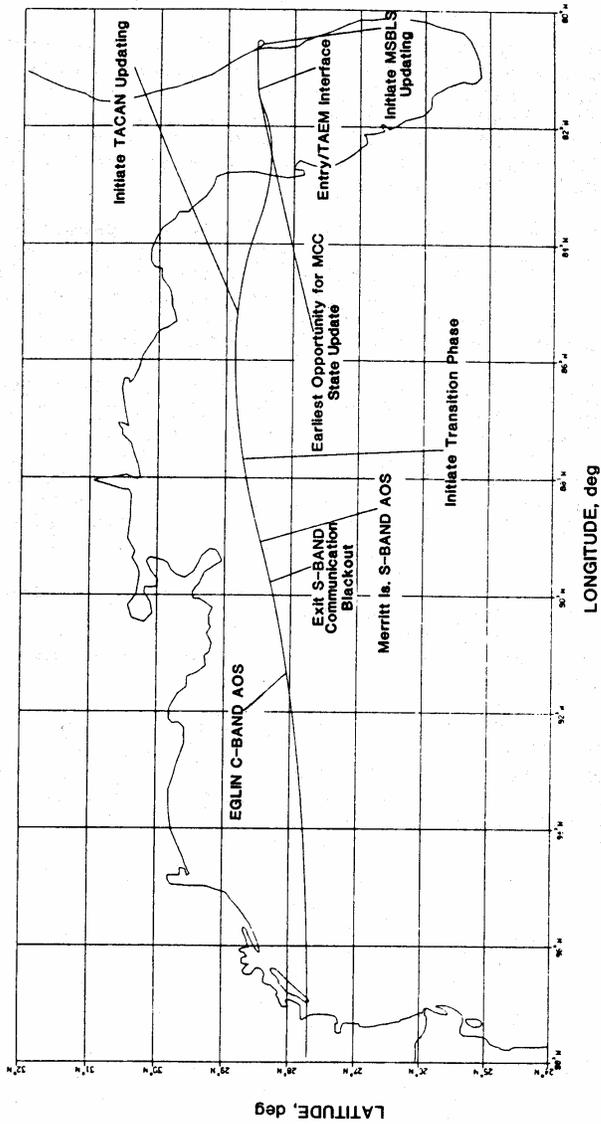
NCC - Normal Corrective Combination TI - Transition Initiation



41-B Descent Groundtrack



41-B Entry Groundtrack



41-B Postblackout Entry Groundtrack

MANNED MANEUVERING UNIT

Resembling its ancestor flown inside the Skylab orbital Workshop in the early 1970s, the Manned Maneuvering Unit (MMU) is a self-contained backpack with nitrogen gas propulsion that will allow orbiter crews to move outside the payload bay to other parts of the orbiter or to other spacecraft. The MMU latches to the spacesuit (Extravehicular Mobility Unit-EMU) backpack and can be donned and doffed by an astronaut unassisted.

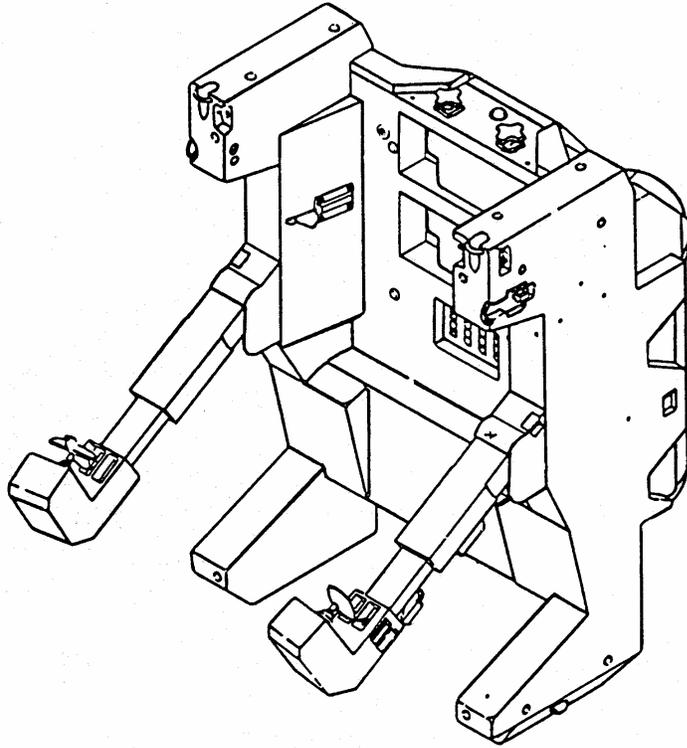
MMU controls follow the layout familiar to spacecraft crews: the left hand controller governs fore-aft, right-left, up-down translations, while the right hand controller handles roll, pitch and yaw motions. The controllers may be used singly or in combination to give a full range of movement within the operating logic of 729 command combinations, including attitude hold.

Thrust impulses are from 24 dry nitrogen gas thrusters each with 7.56 Newtons thrust. Two 25-by-76 centimeter (9.8-by-30 inch) Kevlar filament-wrapped aluminum nitrogen tanks each hold 5.9 kilograms (13 pounds) of nitrogen when fully charged. Two 16.8-volt, 752 watt-hour silver zinc batteries supply MMU electrical power, enough for one six-hour EVA. The nitrogen tanks may be recharged in less than 20 minutes at the payload bay MMU service rack.

The MMU will have a 35 mm still photo camera operated by the astronaut during EVA/MMU operations.

The two MMUs are located in the forward section of the orbiter payload bay.

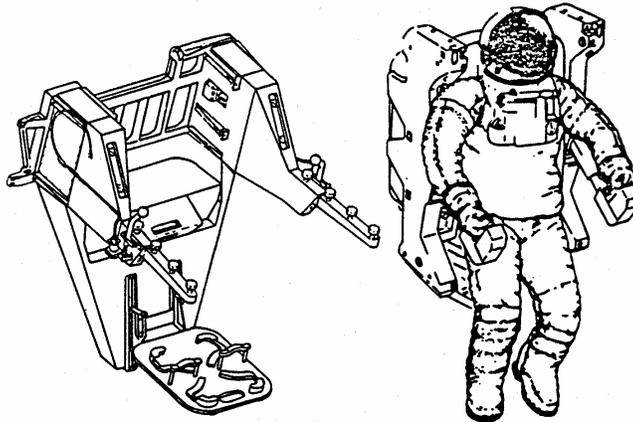
Built by Martin Marietta, Denver, Colo., the MMU is 1.2 m (49.4 in.) high, 81 cm (32.5 in.) wide, and 1.1 m (44.2 in.) deep with control arms extended. The MMU weighs 136 kg (300 lb.) when charged with nitrogen. With a space suited crewman and consumables added, on-orbit mass is about 335 kg (740 lb.).



MANNED MANEUVERING UNIT



Donning configuration



Egress/ingress

MANNED MANEUVERING UNIT/FLIGHT SUPPORT STATION INTERFACE

TWO UNTETHERED "SPACEWALKS" PLANNED

Mission specialists Bruce McCandless and Robert Stewart will conduct the Space Shuttle's second extravehicular activity or spacewalks with two five-hour EVAs on flight days five and seven. The two EVAs will combine engineering checkout of the Manned Maneuvering Unit with a rehearsal of Solar Maximum Mission (SMM) satellite orbital capture and repair planned for the next mission (41-C) in April.

In addition to two MMUs in service racks in the cargo bay, a foot restraint attachment to the Remote Manipulator System (RMS) arm and a prototype hydrazine transfer device will be evaluated in the 10 hours of EVA.

McCandless and Stewart will don their spacesuits (EMUs) and do a shortened pre-breathe prior to moving through the airlock to the payload bay. The pre-breathe time is shortened because of the drop in cabin pressure from 14.7 psi to 10.2 psi. Cabin depressurization begins about nine hours before the first EVA.

Each space suit will carry a small color TV camera attached to the EMU helmet. The hand-sized camera is solid state and housed above the helmet visor. It was developed for NASA by Fairchild Weston Systems Inc., of Syosset, N.Y.

Both McCandless and Stewart will fly untethered from Challenger to distances of about 50 m (150 ft.), then to 100 m (300 ft.) and return. The SPAS-01, rotating slowly at the end of the RMS "hand, n will be a stand-in for the Solar Max as both astronauts will practice MMU approach, capture and stabilization of the SPAS using the MMU's thrusters to stop the pallet's rotation.

During the EVAs, McCandless' call-sign on air-to-ground will be "EV-1" and Stewart's will be "EV-2."

The Manipulator Foot Restraint (MFR) is a work platform that provides restrained access to EVA worksites within reach of the RMS. It can be easily attached to the end of the remote arm. It provides the astronaut positioning and restraint at the worksite location selected by the crew. In addition, it has a tool restraint deck and a safety tether. The restraint can also be adjusted for work activity by the spacesuited astronaut. This will be its first test

The Special Equipment Stowage Assembly (SESA) provides a location for tools, hydrazine test equipment and the Trunnion Pin Attachment Device (TPAD) assembly.

The attachment device assembly will be used by the astronaut, while strapped to the MMU, to dock with and stabilize the Solar Max satellite. It attaches to the MMU arms and actually contains two docking mechanisms, a primary and a secondary TPAD. It also provides an optional capability to attach a Remote Manipulator System grapple fixture to a satellite.

The Shuttle Pallet Satellite (SPAS) is specially equipped with a trunnion pin for attachment device docking exercises and also contains a simulated Solar Max Main Electronics Box (MEB).

Also located in the cargo bay is a contingency EVA tool box called the Cargo Bay Stowage Assembly (CBSA).

During the EVA, Stewart (EV-2) will conduct a demonstration of space refueling. A fueling port mockup of a Landsat 4 satellite has been installed in the orbiter's special tool box. Stewart will attempt to hook up a newly designed hydrazine fueling line attachment.

EVA-1 TIMELINE (Day 5)

Time	EV-1 (McCandless)	EVA-2 (Stewart)
0:00	Egress MMU-1 Prep and checkout	Egress
1:00	Extended movements - 150 to 300 feet	Trunnion Pin Attachment Device (TPAD) Preparations
2:00	Don TPAD/Dock with Special Equipment Storage Assembly	Grapple Manipulator Foot Restraint (MFR)
3:00	Recharge MMU	Ingress Evaluate MFR mechanisms MFR force evaluations MMU-1 Prep Extended movements 150/300 ft.
4:00	Ingress MFR Solar Max Electronics Box task simulation Stow equipment	Don TPAD/Dock with SPAS in Bay
5:00	Ingress	Stow equipment Ingress

EVA-2 TIMELINE (Day 7)

Time	EV-1 (McCandless)	EVA-2 (Stewart)
0:00	Egress MMU-2 Prep and checkout	Egress TPAD Prep
1:00	Don TPAD/Dock with rotating SPAS	
2:00	Recharge MMU-2	Recharge MMU-1 MMU-2 Prep
3:00	MMU-1 Prep MMU Engineering Evaluation	Hydrazine Tool Evaluation
4:00	Stow equipment	Stow equipment
5:00	Ingress	Ingress

SHUTTLE PALLET SATELLITE

The Shuttle Pallet Satellite (SPAS-01A) will fly for the second time in space, but remain in the attached mode during this mission.

On flight day 7, the SPAS-01A will be raised out of the payload bay by the Remote Manipulator System to a position overhead about 1.5 to 3 m (5 to 10 ft.) from the forward payload bay bulkhead. In the attached mode, the SPAS-01A will be rotated at 1 degree per second to duplicate the attitude and dynamics of the Solar Max satellite. EV-1 (McCandless) will fly up to the SPAS-01A from a position near the aft bulkhead of the payload bay. EV-2 (Stewart) will follow in a similar Pattern.

The astronauts will use the trunnion pin attachment device to dock with a trunnion pin located on the center-rear side of the SPAS . Located on the center-top, near the grapple fixture, is the simulated Main Electronics Box (MEB). This is designed to simulate an electronics box on the Solar Max satellite that will require replacement on flight 41-C.

The West German-built platform will carry the same set of experiments that were aboard during STS-7.

The SPAS-01A weighs 1,448 kg (3,192 lb.). It measures 4.8 m (15.7 ft.) across, 3.4 m (11 ft.) high and 1.5 m (4.9 ft.) wide.

A 70 mm Hasselblad still camera, a 16 mm motion picture camera and two color television cameras, built by Fairchild Weston Systems, Inc., of Syosset, N.Y., will be aboard the SPAS-01A.

The SPAS was built by Messerschmitt-Bolkow-Blohm (MBB) GmbH, of Munich, Federal Republic of Germany. The West German Federal Ministry of Research and Technology supported the SPAS project and contributed substantially to the system.

PAYLOADS

Palapa-B2

Palapa-B2, the Indonesian national telecommunications satellite, will be deployed from Challenger on the second day of the mission. The satellite is the second Palapa to be placed into orbit by the orbiter Challenger; the first was during the STS-7 mission.

Palapa-B2 will provide 24 additional transponders to the communications network that provides service to the island nation of Indonesia and also to ASEAN (the Association of Southeast Asia Nations) which includes the Philippines, Thailand, Malaysia, Singapore and Papua, New Guinea.

The spacecraft (with antennas deployed) is 6.8 m (22.4 ft.) high and 2.16 m (7 ft.) in diameter. Liftoff weight (with perigee stage) is 4,366 kg (9,625 lb.). Weight in orbit after reaching geosynchronous orbit is 630 kg (1,400 lb.).

A McDonnell Douglas Payload Assist Module (PAM) will be used to place the satellite into geosynchronous orbit. The PAM deployment includes spinup of the payload to 50 rpm, a spring assisted kick out of the cargo bay and solid rocket motor ignition on the spacecraft at deploy plus 45 minutes.

The Palapa is built by Hughes Communications International, Inc., Los Angeles, Calif.

Westar VI

Westar VI will be third advanced Western Union communications satellite in orbit and the first Westar satellite to be launched from the Space Shuttle. Previous Westars were launched aboard the NASA Delta launch vehicle. The current four-satellite Westar system provides continuous video, facsimile, data and voice communications service throughout the continental United States, Alaska, Hawaii, Puerto Rico and the Virgin Islands.

Westar VI has 24 transponders and six backup transponders. Each transponder is capable of handling 2,400 one-way voice circuits or a color TV transmission. This particular satellite will be committed to business communications.

The satellite was built by Hughes Aircraft Co. of El Segundo, Calif. It is similar in shape and size to the Palapa-B2 satellite.

A McDonnell Douglas Payload Assist Module (PAM) will be used to boost the satellite into its geosynchronous transfer orbit.

REHEARSAL RENDEZVOUS

As a forerunner to the Solar Maximum Repair Mission (41-C), the rendezvous, capture and on-orbit repair of the SMM satellite scheduled for April 1984, this flight will perform a closed-loop rendezvous sequence using a large balloon as a passive target.

The Integrated Rendezvous Target (IRT) is a 2 m (6.4 foot) diameter balloon that will be deployed from a rack bolted to the forward end of the Challenger's longeron on the port side of the payload bay. The target and its canister will be ejected from the Challenger, on flight day 3, in a retrograde direction at 1.5 feet per second. One minute after ejection from the payload bay the canister will split in half and will be inflated automatically with nitrogen to a pressure of .3 psia.

Built of one-mil thick aluminized Mylar, the IRT balloon is flat white in color except for one of the 24 gores painted infrared black. The balloon, inflation equipment and sintered tungsten ballast results in a total weight of 90.7 kg (200 lb.). Following deployment and inflation the IRT will spin at a rate of 3 revolutions per minute.

Challenger will separate from the IRT and initially practice rendezvous maneuvers from 9.2 to 14.8 km (5 to 8 mi.) away from the IRT. The next day, after a sleep period during which the orbiter will have drifted to a distance of approximately 222 km (120 mi.) behind the balloon, new state vectors and two maneuvers will be received from mission control. After executing the maneuvers, the crew will use the Ku-band ranging system and other rendezvous sensors to provide data to the General Purpose Computer's navigation software to update the state vectors. The updated state vectors will be used to compute the maneuvers that will place the orbiter into the proper rendezvous position. The maneuvers are designed to allow the orbiter to catch up to the IRT in two orbits.

SHUTTLE STUDENT INVOLVEMENT PROGRAM

A student experiment carried in Challenger's middeck will test the effects of weightlessness on the development of arthritis. The experiment was one of the first group of 10 high school student proposals chosen in 1981 by NASA as part of the Shuttle Student Involvement Program (SSIP).

Dan Weber, now a student at Cornell University designed the arthritis experiment while a student at Hunter College High School in New York. For the past three years, he has been working closely with scientists at Pfizer, Inc., Groton, Conn., at General Dynamics Convair Div., San Diego, Calif., and with NASA advisors

Weber's hypothesis -- that arthritis may be affected by gravity -- grew out of his relationship with his grandfather, who suffers from rheumatoid arthritis. Weber knew that his grandfather's arthritis was relieved by swimming and hydrotherapy -which seemed to work by reducing the inflammation and pressure on the joints. He wondered if weightlessness might not have a similar effect on the disease. Weber had learned that astronauts gained up to an inch in height in space because with no gravity, the spine is not compressed as it is on earth. He wondered if this lack of pressure would relieve some of the symptoms of arthritis.

Six rats will be carried into space this mission in the Animal Enclosure Module (AEM) developed by General Dynamics. The AEM flew with six normal rats on the eighth shuttle mission in August 1983. That hardware test was successfully completed.

For this flight, three rats will be injected with complete Freund's adjuvant, which causes symptoms similar to rheumatoid arthritis in humans. This technique is used by pharmaceutical companies to study arthritis and arthritic medications. The other three rats will be flown as normal controls. Six additional animals will be kept at Kennedy Space Center as further controls for the experiment.

The animals will be measured at Kennedy before the flight for weight, food and water consumption, paw volume and activity levels. A blood sample will be taken immediately after the flight to measure blood chemicals associated with arthritis. These same measurements will be made at Pfizer laboratories where Weber will work with his science advisor to determine the results of the experiment. X-rays will also be taken postflight to determine joint deterioration.

Seven Shuttle Student Involvement Program experiments have flown on Space Shuttle missions prior to this one. The third Shuttle mission carried an SSIP study designed by Todd Nelson, on the effect of weightlessness on insect flight motion with bees, moths and flies.

other SSIP studies have included a crystal growth experiment by Michelle Issel, a test of zero gravity on convection by Scott Thomas and the growth of sponges in weightlessness by Aaron Gillette -- all flown aboard the fifth Space Shuttle mission.

GETAWAY SPECIAL PAYLOADS

There are a total of six Getaway Special (GAS) canisters aboard the Challenger. Five of the canisters will carry Getaway Specials, while the other will carry a camera experiment, which is not cataloged as a "Getaway Special."

Utah State University-University of Aberdeen

GAS-payload G-004 contains experiments designed and developed by students from Utah State University, Logan, and the University of Aberdeen in Scotland.

The payload was purchased by L.R. Megill, a professor at Utah State University, and donated to that institution.

The canister is divided into three segments. Each experiment is allotted a volume approximately 10 cm (4 in.) deep in a hexagon 48 cm (19 in.) between the corners, with a weight limit of approximately 8 kg (17.6 lb.). Each "spacepak" contains a battery power supply and a computer driven controller.

Experiment #1 was built by Taka Kitaura, a Utah State student from Japan. His experiment is designed to study capillary waves in liquids. The waves are driven by surface tension forces which are dominant in a microgravity environment.

Experiment #2, built by USU student Scott Thomas, will study thermocapillarity, or the motion of liquids due to surface tension effects in which a temperature gradient has been established. These forces are dominant in a low gravity environment.

The third "spacepak" contains three experiments developed by students from the University of Aberdeen. The experiments include a dimensional stability experiment, a light scattering experiment and the flight of some spores in space.

AIAA-Utah Section

GAS payload G-008 was purchased by the Utah Section of the American Institute of Aeronautics and Astronautics and donated to Utah State University. Three experiment shelves or "spacepaks", each weighing about 8 kg (17.6 lb.) are aboard the canister, each containing a battery driven computer controller.

Spacepak #1 contains a seed growing experiment conducted by students at Brighton High School, Salt Lake City, in which radish seeds will be sprouted in a zero-g environment. A unique feature of the experiment is that about one-half of the germinated seeds have been flown in an STS-6 experiment by the Geo. W. Park Seed Co., Greenwood, S.C.

The second experiment designed by the University of Utah, will be an attempt to crystallize proteins in a controlled temperature environment under zero-g conditions. The crystallization of proteins is necessary for studies in X-Ray crystallography.

The third unit of the payload is two experiments devised by two Utah State students. The first is a reflight of a soldering experiment flown on the initial Getaway Special G-001. The second is a test of an experimental concept for the creation of a flow system for electrophoresis experiments.

Atomic Oxygen Flux Monitor-GSFC, G-349

The Atomic oxygen Flux Monitor G-349 is designed to measure the flow of atomic oxygen by determining the mass loss of two materials -- carbon and osmium -- known to readily oxidize. The mass loss will indicate the atomic oxygen flux as a function of time which can be correlated to altitude, attitude and direction.

The package is very similar to a GAS payload flown on STS-8. Data from the experiment will provide insights into material behavior and environmental effects at high altitudes.

Co-investigators are Jack Triolo, Roy McIntosh and Ray Kruger of NASA's Goddard Space Flight Center, Greenbelt, Md.

Arc Lamp Research

This experiment, G-0051 will pursue fundamental research on the configuration of an arc lamp in gravity-free surroundings. Arc lamps are normally used for outdoor lighting of football fields and indoor lighting of arenas. Scientists hope the experiment will pave the way for the development of a more energy-efficient commercial lamp.

The experiment is being carried out by GTE Laboratories Inc., Waltham, Mass.

Cosmic Ray Upset Experiment

The Cosmic Ray Upset Experiment, or CRUX, is a repeat flight for Goddard Space Flight Center's G-0347 Getaway Special initially flown on STS-8. The experiment is designed to resolve questions concerning upsets, or changes in the logic state of a memory cell, caused by highly active energetic particles passing through a sensitive volume in the memory cell.

The reflight is sponsored by the U.S. Air Force. The principal investigator is John W. Adolphson of NASA's Goddard Space Flight Center.

CINEMA 360

Two Cinema 360 cameras will be carried aboard the Challenger to provide a test for motion picture photography in a unique format designed especially for planetarium viewing. One camera will be located in the crew cabin area and the other in a GAS canister in the payload bay. The primary objective is to test the equipment and concept. Film footage taken by the two systems will also be of considerable value.

Arriflex 35 mm Type 3 motion picture cameras with an 8 mm/f2.8 "fisheye" lens will be used. The Cinema 360 camera, including an accessory handle and lens guard/support, weighs approximately 9.5 kg (21 lb.). A system power supply weighs an additional 7.7 kg (17 lb.).

Filming inside the orbiter will show activities on the flight deck. The camera system located in the GAS canister in the payload bay will provide film on exterior activities including EVA/ MMU operations, satellite deployment or Remote Manipulator System operations. Lens focus, diaphragm setting and frame speed will be preset, thus requiring no light level readings or exposure calculations by the crew. Each camera system will carry a 122-m (400-ft.) film magazine.

Filming done on this flight and subsequent missions will be used in the production of a motion picture about the Space Shuttle program.

Cinema 360 signed a joint endeavor agreement with NASA in 1983. Under terms of the agreement Cinema 360 would develop the flight hardware and produce the film.

Cinema 360 is a consortium of four planetariums, located in Tucson, Ariz.; Jackson, Miss.; Reno, Nev.; and Chicago. The Gannett Foundation of Rochester, N.Y., has agreed to assume the costs of the film production.

EXPERIMENTS

Monodisperse Latex Reactor

The Monodisperse Latex Reactor (MLR) has been carried on four previous Shuttle flights. The materials processing experiment is designed to develop identical-sized (monodisperse) latex particles. The particles may have major medical and industrial research applications.

The reactor, developed at NASA's Marshall Space Flight Center, Huntsville, Ala., and at Lehigh University, Bethlehem, Pa., is mounted in a locker in the orbiter crew compartment. It consists of four .3-m (1-ft.) high reactors, each containing a chemical latex-forming recipe, housed in a .6-m (2-ft.) high metal cylinder .

Acoustic Containerless Experiment System

The Acoustic Containerless Experiment System (ACES) is a materials processing furnace experiment enclosed in two airtight canisters in the orbiter middeck. Activated at 23 hours mission elapsed time, the ACES will run a preprogrammed sequence of operations and shut itself off after two hours.

IsoElectric Focusing Experiment

The IsoElectric Focusing (IEF) experiment is another self-contained experiment package in the middeck lockers and activated by the crew at the same time the ACES is turned on. IEF evaluates the effect of electro-osmosis on an array of eight columns of electrolyte solutions as DC power is applied and pH levels between anodes and cathodes increase.

STS-41B CREWMEMBERS



S83-40555 -- Seated from left to right are Vance Brand, crew commander, and Robert "Hoot" Gibson, pilot. Both men are wearing shuttle blue flight suits. Standing from left to right are mission specialists Robert Stewart, Ronald McNair and Bruce McCandless. Both Stewart and McCandless are wearing extravehicular mobility units (EMU).

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BIOGRAPHICAL DATA

VANCE D. BRAND, 52, is commander of the 10th flight of the Space Shuttle. Brand, a native of Colorado, was selected as a NASA astronaut in 1966.

Prior to joining NASA, he was a naval aviator in the U.S. Marine Corps and a civilian test pilot. He received two bachelor's degrees from the University of Colorado and a master's degree from the University of California.

Brand's first space mission was as command module pilot on the Apollo Soyuz Test Project (ASTP) mission. Brand logged 217 hours on the unique international mission.

Brand was commander of the STS-5 mission, the first fully operational flight of the Space Shuttle. The flight was launched from the Kennedy Space Center, Fla., on Nov. 11, 1982, and saw the deployment of two communications satellites, later placed into geosynchronous orbit. The 122-hour mission concluded with a landing on a concrete runway at Edwards Air Force Base, Calif.

ROBERT L. GIBSON, 37, is pilot for the 41-B flight. Born in New York, he considers Lakewood, Calif., his hometown. A former Navy fighter pilot, who flew combat missions in Southeast Asia, Gibson was selected as a NASA astronaut in January 1978.

Nicknamed "Hoot" by his friends, Gibson is married to astronaut mission specialist Dr. M. Rhea Seddon.

This is his first space mission.

He received a bachelor's degree from California Polytechnic State University.

ROBERT L. STEWART, 41, is a mission specialist on this flight of the Challenger. It is his first space mission. Born in Washington, D.C., he considers El Lago, Texas, to be his hometown.

Stewart was selected for the NASA astronaut corps in January 1978. He entered the U.S. Army in 1964 and has distinguished himself as a U.S. Army aviator, flying both helicopter and fixed wing aircraft. Stewart has logged approximately 5,200 hours flight time in 38 types of airplanes and helicopters.

He received a bachelor's degree from the University of Southern Mississippi and a master's from the University of Texas.

RONALD E. McNAIR, 33, is a mission specialist on flight 41B. He was born in Lake City, S.C. He graduated from North Carolina A & T University with a degree in physics and earned his doctorate in physics from Massachusetts Institute of Technology, Cambridge, Mass.

McNair has studied extensively in the field of laser physics. He has published numerous papers on lasers and molecular spectroscopy.

McNair was selected as an astronaut candidate in 1978. This will be his first space flight.

BRUCE McCANDLESS II, 46, is a mission specialist on flight 41-B. Born in Boston, Mass., McCandless received his bachelor's degree from the U.S. Naval Academy in 1958 and a master's degree from Stanford University in 1965.

McCandless was a naval aviator and has logged more than 4,000 hours flying time. He was selected for the NASA astronaut program in April 1966. McCandless has been involved in the development of the Manned Maneuvering Unit since the Skylab program in the early 1970s. This is his first space mission.

SHUTTLE FLIGHTS AS OF FEBRUARY 1984

9 TOTAL FLIGHTS OF THE SHUTTLE SYSTEM



STS-9 11/28/83 - 12/08/83	
STS-5 11/11/82 - 11/16/82	
STS-4 06/27/82 - 07/04/82	
STS-3 03/22/82 - 03/30/82	STS-8 08/30/83 - 09/05/83
STS-2 11/12/81 - 11/14/81	STS-7 06/18/83 - 06/24/83
STS-1 04/12/81 - 04/14/81	STS-6 04/04/83 - 04/09/83

**OV-102
Columbia
(6 flights)**

**OV-099
Challenger
(3 flights)**