NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SPACE SHUTTLE MISSION STS-76

PRESS KIT
MARCH 1996

THIRD SPACE SHUTTLE-MIR DOCKING MISSION

STS-76 INSIGNIA

STS076-S-001 -- The STS-76 insignia depicts the space shuttle Atlantis and Russia's Mir Space Station as the space ships prepare for a rendezvous and docking. The "Spirit of 76," an era of new beginnings, is represented by the space shuttle rising through the circle of 13 stars in the Betsy Ross flag. STS-76 begins a new period of international cooperation in space exploration with the first Shuttle transport of a United States astronaut, Shannon W. Lucid, to the Mir Space Station for extended joint space research. Frontiers for future exploration are represented by stars and the planets. The three gold trails and the ring of stars in the union form the astronaut insignia. Two suited extravehicular activity (EVA) crew members in the outer ring represent the first EVA during Shuttle-Mir docked operations. The EVA objectives are to install science experiments on the Mir exterior and to develop procedures for future EVAs on the International Space Station. The surnames of the crew members encircle the patch: Kevin P. Chilton, mission commander; Richard A. Searfoss, pilot; Ronald M. Sega, Michael R. (Rich) Clifford, Linda M. Godwin and Lucid, all mission specialists. This insignia was designed by Brandon Clifford, age 12, and the crewmembers of STS76.

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.

PHOTO CREDIT: NASA or National Aeronautics and Space Administration.

NEWS MEDIA CONTACTS

For Information on the Space Shuttle

Ed Campion NASA Headquarters Washington, DC	Policy/Management	202/358-1778
Rob Navias Johnson Space Center Houston, TX	Mission Operations Astronauts	713/483-5111
Bruce Buckingham Kennedy Space Center, FL	Launch Processing KSC Landing Information	407/867-2468
June Malone Marshall Space Flight Center Huntsville, AL	External Tank Shuttle Propulsion	205/544-0034
Cam Martin Dryden Flight Research Center Edwards, CA	DFRC Landing Information	805/258-3448

For Information on STS-76 Experiments & Activities

Mike Braukus NASA Headquarters Washington, DC	Mir Science	202/358-1979
Debbie Rahn Headquarters Washington, DC	International Cooperation	202/358-1639
Ray Castillo NASA Headquarters Washington, DC	MEEP	202/358-4555
Beth Schmid NASA Headquarters Washington, DC	KidSat/SAREX	202/358-1760
Tammy Jones Goddard Space Flight Center, Greenbelt, MD	TRIS	301/286-5566

CONTENTS

GENERAL BACKGROUND

General News Release	5
Media Services Information	7
Quick Look	8
Shuttle Abort Modes'	9
Mission Summary Timeline	10
Orbital Events Summary	11
Payload and Vehicle Weights	12
Crew Responsibilities	13
STS-76 PAYLOADS & ACTIVITIES	
DTOs/DSOs	14
MIR Rendezvous/Docking	15
EVA	16
Mir Science	18
Cargo Bay Experiments	
SPACEHAB Module	19
MEEP	22
KidSat	23
SAREX	24
TRIS	26
CREW BIOGRAPHIES	
STS-76 Crewmembers	27
Mir-21 Crewmembers	29

RELEASE: 96-46

CONTINUATION OF U.S./RUSSIA SPACE COOPERATION HIGHLIGHTS THIRD SHUTTLE MISSION OF 1996

The first spacewalk by U.S. astronauts while the shuttle is attached to the Russian Space Station Mir and the first American woman to serve as a Mir station researcher will highlight NASA's third shuttle mission of 1996.

The flight, designated mission STS-76, is the third of nine planned Space Shuttle-Mir link ups between 1995 and 1998, including rendezvous, docking and crew transfers, which will pave the way toward assembly of the International Space Station beginning in November 1997.

The STS-76 crew is commanded by Kevin P. Chilton, making his third Shuttle flight. The pilot for the mission, Richard A. Searfoss, is making his second flight. There are four mission specialists assigned to the flight. Ronald M. Sega, serving as the Payload Commander and Mission Specialist-1 is making his second flight. Mission Specialist-2 is Richard Clifford who is making his third flight. Linda Godwin, serving as Mission Specialist-3, is also making her third flight. Mission Specialist-4, Shannon Lucid, is flying in space for the fifth time. Lucid will remain aboard the Mir station after Atlantis undocks, becoming the first American woman to serve as a Mir crew member. She will remain aboard the orbiting station until Atlantis again docks to Mir in early August.

Launch of Atlantis is currently targeted for no earlier than March 21, 1996 at approximately 3:35 a.m. EST from Kennedy Space Center's Launch Complex 39-B. The actual launch time may vary a few minutes based on calculations of the Mir's precise location in space at the time of launch, due to Shuttle rendezvous phasing requirements. The available launch period or "window" to launch Atlantis, is approximately 6-10 minutes each day.

The STS-76 mission is scheduled to last approximately 9 days, 4 hours, 29 minutes. Docking with Mir is set for the third day of the mission. An on time launch and nominal mission duration would result in a landing on March 30 at 8:04 a.m. EST.

STS-76 rendezvous and docking activities with the Mir actually begin with the precisely timed launch of Atlantis, setting it on a course to meet the orbiting station. Over the next two days, periodic firings of Atlantis' small thruster engines will gradually bring the Shuttle closer to Mir. Docking with the Mir station is planned to take place 43 hours into the flight.

On the sixth day of the mission, Godwin and Clifford are scheduled to perform a six-hour spacewalk while Atlantis is docked to the Mir. They will attach four experiments individually onto handrails located on the Mir Docking Modules. The experiments, collectively referred to as the Mir Environmental Effects Payload (MEEP), are designed to help characterize the space environment at a 51.6 degree inclination, the same inclination at which the International Space Station will be built. The MEEP experiments will be retrieved during a spacewalk 18 months later. Godwin and Clifford also will work with common U.S./Russian EVA hardware such as safety tethers and foot restraints and will retrieve a video camera mounted on Mir. Their EVA also represents one in a series aimed at testing equipment and procedures which may be implemented during assembly and maintenance of the International Space Station.

During the five days of docked operations, many of the planned joint activities will center around the middeck and SPACEHAB module. Equipment being flown in the module includes items to be used during the EVA, supplies for the Russians such as food, water, batteries, navigation equipment, clothing and U.S. supplies to support Dr. Lucid's stay aboard Mir. The SPACEHAB module also will contain an ESA-sponsored science experiment called Biorack, which is a variety of experiments that addresses investigations in both life and microgravity sciences.

Two payloads will provide students the opportunity to participate with the mission. A new payload known as KidSat will make its first flight and will provide students in grades K-12 access to real-time images of the Earth from their own observing instruments in space. The Shuttle Amateur Radio Experiment (SAREX), which has flown on several flights, allows students to talk with STS-76 crewmembers via ham radio. During the communication sessions, students can talk to the crew about mission activities and learn about how individuals live and work in space.

The STS-76 mission will be the 16th flight of Atlantis and the 76th for the Space Shuttle system.

(END OF GENERAL RELEASE; BACKGROUND INFORMATION FOLLOWS.)

MEDIA SERVICES INFORMATION

NASA Television Transmission

NASA television is available through the Spacenet-2 satellite system. Spacenet-2 is located on Transponder 5, at 69 degrees West longitude, frequency 3880.0 MHz, audio 6.8 MHz.

The schedule for television transmissions from the Orbiter and for mission briefings will be available during the mission at Kennedy Space Center, FL; Marshall Space Flight Center, Huntsville, AL; Dryden Flight Research Center, Edwards, CA; Johnson Space Center, Houston, TX; and NASA Headquarters, Washington, DC. The television schedule will be updated to reflect changes dictated by mission operations.

Television schedules also may be obtained by calling COMSTOR at 713/483-5817. COMSTOR is a computer data base service requiring the use of a telephone modem. A voice update of the television schedule is provided daily at noon Eastern time.

Status Reports

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

Briefings

A mission press briefing schedule will be issued prior to launch. During the mission, status briefings by a flight director or mission operations representative and when appropriate, representatives from the payload team, will occur at least once each day. The updated NASA television schedule will indicate when mission briefings are planned.

Internet Information

The NASA Headquarters Public Affairs Internet Home Page provides access to the STS-76 mission press kit and status reports. The address for the Headquarters Public Affairs Home Page is:

http://www.nasa.gov/hqpao/hqpao_home.html

Informational materials, such as status reports and TV schedules, also are available from an anonymous FTP (File Transfer Protocol) server at **ftp.hq.nasa.gov/pub/pao**. Users should log on with the user name "anonymous" (no quotes), then enter their E-mail address as the password. Within the /pub/pao directory there will be a "readme.txt" file explaining the directory structure.

Pre-launch status reports from KSC are found under **ftp.hq.nasa.gov/pub/pao/statrpt/ksc**, and mission status reports can be found under **ftp.hq.nasa.gov/pub/pao/statrpt/jsc**. Daily TV schedules can be found under **ftp.hq.nasa.gov/pub/pao/statrpt/jsc/tvsked**.

Access by CompuServe

Users with CompuServe accounts can access NASA press releases by typing "GO NASA" (no quotes) and making a selection from the categories offered.

STS-76- QUICK LOOK

Launch Date/Site:	March 21, 1996/KSC Pad 39-B
Launch Time:	3:35 AM EST
Launch Window:	Between 6-10 minutes
Orbiter:	Atlantis (OV-105), 16th flight
Orbit Altitude/Inclination:	160 nautical miles, 213 n.m. for docking/51.6 degrees
Mission Duration:	9 days, 4 hours, 29 minutes
Landing Date:	March 30, 1996
Landing Time:	8:04 AM EST
Primary Landing Site:	Kennedy Space Center, FL
Abort Landing Sites:	Return to Launch Site - KSC Transoceanic Abort Sites Zaragoza, Spain Moron, Spain Ben Guerir, Morocco Moron, Spain Ben Guerir, Morocco Abort-Once Around - KSC
Crew:	Kevin Chilton, Commander (CDR) Rick Searfoss, Pilot (PLT) Ron Sega, Payload Cmdr., Mission Specialist 1 (MS 1) Rich Clifford, Mission Specialist 2 (MS 2) Linda Godwin, Mission Specialist 3 (MS 3) Shannon Lucid, Mission Specialist 4 (MS 4, Ascent-Docking)
Mir 21 Crew:	Yuri Onufrienko, Commander Yuri Usachev, Flight Engineer (Lucid joins the Mir 21 crew after docking for approximately 142 days)
EVA Crew :	Linda Godwin (EV1), Rich Clifford (EV2)
Cargo Bay Payloads:	SPACEHAB-Single Module Orbiter Docking System MEEP
In-Cabin Payloads:	KidSat SAREX

SHUTTLE ABORT MODES

Space Shuttle launch abort philosophy aims toward safe and intact recovery of the flight crew, Orbiter and its payload. Abort modes for STS-76 include:

- Abort-To-Orbit (ATO) -- Partial loss of main engine thrust late enough to permit reaching a minimal 105-nautical mile orbit with the orbital maneuvering system engines.
- Abort-Once-Around (AOA) -- Earlier main engine shutdown with the capability to allow one orbit of the Earth before landing at the Kennedy Space Center, FL.
- Transoceanic Abort Landing (TAL) -- Loss of one or more main engines midway through powered flight would force a landing at either Ben Guerir, Morocco; or Moron, Spain.
- Return-To-Launch-Site (RTLS) -- Early shutdown of one or more engines, and without enough energy to reach a TAL site, would result in a pitch around and thrust back toward Kennedy until within gliding distance of the Shuttle Landing Facility.

MISSION SUMMARY TIMELINE

Flight Day 1
Launch/Ascent
OMS-2 Burn
SPACEHAB Activation
Mir Rendezvous Burns

Flight Day 2
SPACEHAB Operations and Biorack
Rendezvous Tool Checkout
EVA Tool Transfer
KidSat Setup
EMU Checkout
SAFER Checkout
Rendezvous Burns

Flight Day 3
Rendezvous
Docking
Hatch Opening/Welcoming Ceremony/Gift Exchange
Crew Transfer
Logistics Transfers

Flight Day 4
SPACEHAB Operations and Biorack
Mir Photography Experiments
Logistics and Water Transfers

Flight Day 5
SPACEHAB Operations and Biorack
Logistics Transfers
Joint Crew News Conference
EVA Middeck Preparations
Hatch Closure
Cabin Depress

Flight Day 6
EVA Preparations
EVA (6 hours)
Cabin Repress
Wireless Network Experiment
Hatch Opening

Flight Day 7
Logistics Transfers
SPACEHAB Operations and Biorack
Farewell Ceremony
Final Hatch Closure

Flight Day 8
Undocking and Mir Flyaround
Separation Maneuver
KidSat Setup
Transfer Item Stowage
EVA Tool Stowage

Flight Day 9
Cabin Stowage
Flight Control System Checkout
Reaction Control System Hot-Fire
SPACEHAB Operations and Partial Deactivation

Flight Day 10
Final SPACEHAB Deactivation
Entry Review
Deorbit Prep
Deorbit Burn
Entry
KSC Landing

STS-76 ORBITAL EVENTS SUMMARY

(Based on a Mar. 21, 1996 Launch)

Event	MET	Time of Day (EST)
Launch	0/00:00	3:35 AM, Mar. 21
OMS-2	0/00:43	4:18 AM, Mar. 21

Exact times for major events on STS-76 and other Phase 1 Shuttle-Mir docking missions will not be determined until after launch because of the rendezvous requirements needed for Atlantis to reach the Mir space station. Docking with the Mir is predicted to occur about 43 hours after launch. The spacewalk outside Mir is scheduled to begin at an approximate Mission Elapsed Time of 4/22:35. Undocking is predicted to occur at an approximate Mission Elapsed Time of 6/17:34.

Event	MET	Time of Day (EST)
Deorbit Burn	9/03:29	7:04 AM, Mar. 30
KSC Landing	9/04:29	8:04 AM, Mar. 30

PAYLOAD AND VEHICLE WEIGHTS

	Pounds
Orbiter (Atlantis) empty and 3 SSMEs	152,246
Orbiter Docking System	4,016
SPACEHAB Module and Tunnel Adapter	10,387
Risk Mitigation Experiments (RMEs)	709
KidSat	4
SAREX	28
Shuttle System at SRB Ignition	4,509,746
Orbiter Weight at Landing	246,335

CREW RESPONSIBILITIES

Payloads	Prime	Backup
SPACEHAB	Sega	Godwin
Biorack	Sega	Godwin
Rendezvous	Chilton, Searfoss	Clifford
Orbiter Docking System	Clifford	Godwin
KidSat	Godwin	Searfoss
Russian Language	Sega	----
EVA	Godwin (EV 1)	Clifford (EV 2)
Intravehicular Crewmember	Sega	----
Space Vision System	Clifford	Searfoss
Dewar Transfer	Clifford	Searfoss
Battery Transfer	Clifford	Searfoss
Gyrodyne Transfer	Clifford	Searfoss
Water Transfer	Searfoss	Clifford
Frozen Sample Transfer	Sega	Godwin
SAREX	Godwin	Searfoss

DEVELOPMENTAL TEST OBJECTIVES/DETAILED SUPPLEMENTARY OBJECTIVES/RISK MITIGATION EXPERIMENTS

DTO 301D:	Ascent Structural Capability Evaluation
DTO 307D:	Entry Structural Capability
DTO 312:	ET TPS Performance
DTO 648:	Electronic Still Photography Test
DTO 671:	EVA Hardware for Future Scheduled EVA Missions
DTO 700-5:	Trajectory Control Sensor
DTO 700-10:	Orbiter Space Vision System Video Taping
DTO 700-13:	Signal Attenuation Effects of ET During Ascent
DTO 805:	Crosswind Landing Performance
DTO 1118:	Photographic and Video Survey of Mir Space Station
DTO 1210:	EVA Operations Procedures

DSO 331:	LES and Sustained Weightlessness on Egress Locomotion
DSO 483:	Back Pain Pattern in Microgravity
DSO 487:	Immunological Assessment of Crewmembers
DSO 489:	EVA Dosimetry Evaluation
DSO 901:	Documentary Television
DSO 902:	Documentary Motion Picture Photography
DSO 903:	Documentary Still Photography

RME 1301:	Mated Shuttle and Mir Structural Dynamics Test
RME 1302:	Mir Electric Fields Characterization
RME 1304:	Mir/Environmental Effects Payload
RME 1306:	Mir Wireless Network
RME 1310:	Shuttle/Mir Alignment Stability Experiment
RME 1315:	Trapped Ions in Space Experiment

MIR RENDEZVOUS AND DOCKING

STS-76's rendezvous and docking with the Russian Space Station Mir begins with the precisely timed launch of Atlantis on a course for the station. Over the next two flight days, periodic small engine firings will gradually bring Atlantis to a point eight nautical miles behind Mir on docking day, the starting point for a final approach to the station.

Mir Rendezvous -- Flight Day 3

About two hours before the scheduled docking time on Flight Day Three of the mission, Atlantis will reach a point about eight nautical miles behind the Mir space station and fire a Terminal Phase Initiation (TI) burn, beginning the final phase of the rendezvous. Atlantis will close the final eight nautical miles to Mir during the next orbit. As Atlantis closes in, the Shuttle's rendezvous radar system will begin tracking Mir and providing range and closing rate information to Atlantis. Atlantis' crew also will begin air- to-air communications with the Mir crew.

As Atlantis closes in on the Mir, the Shuttle will have the opportunity for four small successive engine firings to fine-tune its approach using its onboard navigation information. Identical to the two prior Mir dockings, Atlantis will aim for a point directly below Mir, along the Earth radius vector (R-Bar), an imaginary line drawn between Mir's center of gravity and the center of Earth. Approaching along the R-Bar, from directly underneath the Mir, allows natural forces to brake Atlantis' approach more so than would occur along a standard Shuttle approach from directly in front of Mir. During this approach, the crew will also use a handheld laser ranging device to supplement distance and closing rate measurements made by Shuttle navigational equipment.

The manual phase of the rendezvous will begin just as Atlantis reaches a point about a half-mile below Mir. Commander Kevin Chilton will fly the Shuttle using the aft flight deck controls as Atlantis begins moving up toward Mir. During the approach up the R-Bar, Chilton will perform a 180 degree yaw rotation to align the Shuttle with the Mir station. Because of the approach along the R-Bar, from underneath Mir, Chilton will have to perform very few braking firings. However, if such firings are required, the Shuttle's jets will be used in a mode called "Low-Z", a technique that uses slightly offset jets on Atlantis' nose and tail to slow the spacecraft rather than firing jets pointed directly at Mir. This technique avoids contamination of the space station and its solar arrays by exhaust from the Shuttle steering jets.

Using the centerline camera fixed in the center of the Atlantis' docking mechanism, Chilton will center Atlantis' mechanism with the docking module mechanism on Mir, continually refining this alignment as he approaches within 300 feet of the station.

At a distance of about 30 feet from docking, Chilton will stationkeep momentarily to adjust the docking mechanism alignment, if necessary. The crew will use ship-to-ship communications with Mir to inform the two cosmonauts of the shuttle's status and to keep them informed of major events, including confirmation of contact, capture and the conclusion of damping. Damping, the halt of any relative motion between the two spacecraft after docking, is performed by shock absorber-type springs within the docking device.

Once Atlantis is ready to undock from Mir, the initial separation will be performed by springs that will gently push the shuttle away from the docking module. Both the Mir and Atlantis will be in a mode called "free drift" during the undocking, a mode that has the steering jets of each spacecraft shut off to avoid any inadvertent firings.

Once the docking mechanism's springs have pushed Atlantis away to a distance of about two feet from Mir, Chilton will turn Atlantis' steering jets back on when the docking devices will be clear of one another and fire the shuttle's jets in the Low-Z mode to begin very slowly moving away from Mir.

Atlantis will continue away from Mir to a distance of about 600 feet, where Searfoss will begin a flyaround of the station. At that distance, Atlantis will circle Mir twice before firing its jets again to depart the vicinity of the station.

STS-76 Extravehicular Activity

STS-76 crew members Dr. Linda Godwin (EV1) and Rich Clifford (EV2) will perform an approximately six-hour spacewalk on flight day six of the mission to install the Mir Environmental Effects Payload (MEEP) on the exterior of the Mir's docking module and to evaluate new spacewalking equipment. The spacewalk will be the first ever performed from the docked Space Shuttle and Mir complex.

The Simplified Aid For EVA Rescue (SAFER), first test- flown on shuttle mission STS-64 in September 1994, will be worn by Godwin and Clifford and will be used only for a contingency. Spacewalking equipment to be evaluated consists of several new tether designs with hooks that can be attached to both space shuttle handrails and to Mir space station handrails. Normal space shuttle tether hooks are not large enough to be connected to the Mir handrails. A U.S. camera mounted on the exterior of the Mir docking module, used during STS-74 to align the module as it was permanently docked to the Mir, also will be removed by the spacewalkers and returned to Earth for reuse.

While Godwin and Clifford are performing the work in the cargo bay and on the Mir docking module, Mission Specialist Ron Sega will serve as the Intravehicular (IV) crewmember, coordinating the tasks from inside Atlantis' crew cabin. Prior to beginning the spacewalk, the hatches of both Atlantis and the Mir will be closed at the docking mechanism. A hatch at the end of the shuttle tunnel adapter also will be closed, allowing only the airlock and tunnel to be depressurized.

All of the shuttle crew members will be in Atlantis' crew cabin for the duration of the spacewalk, and all Mir crew members, including Mir-21 crewmember astronaut Shannon Lucid, will be aboard the Mir.

Mir Environmental Experiment Payload

Godwin and Clifford will remove the four MEEP experiment containers from their stowed positions along the right and left sides of Atlantis' cargo bay. Each experiment container will be attached to handrails on the exterior of the docking module using special clamps installed by Godwin and Clifford. After each experiment package is clamped to the appropriate module handrails, the spacewalkers will unfold the packages to expose the experiment panels.

Common US/Russian EVA Tools

The tools to be evaluated are called Common US/Russian EVA tools and include safety tethers with larger hooks to allow attachment to the Mir's exterior handrails and a new foot restraint also designed to allow attachment to the Mir fixtures.

Docking Module Television Camera Removal

To remove the Docking Module television camera, the spacewalkers will use cable cutters to sever the cable connecting the camera and then turn a knob that releases the camera's mounting. The camera will be tethered and taken aboard Atlantis.

Simplified Aid For EVA Rescue

The Simplified Aid for EVA Rescue (SAFER) is a small, self- contained, propulsive backpack device that can provide free- flying mobility for a spacewalker in an emergency. It is designed for self-rescue by a spacewalker in the event the shuttle is docked to the Mir and thus unable to retrieve a detached, drifting astronaut.

SAFER is attached to the spacesuit's Portable Life Support System backpack, and is, in essence, a scaled-down, miniature version of the Manned Maneuvering Unit backpack flown aboard shuttle missions in 1984. It is designed for emergency use only, however, without backup systems built in. SAFER's propulsion is provided by 24 fixed-position thrusters that expel nitrogen gas and have a thrust of .8 lbs. each. Stowed in the crew cabin for launch and landing, SAFER's nitrogen supply can be recharged in orbit from the shuttle's nitrogen system. SAFER's three-pound supply of nitrogen can provide only a total 10-foot-per-second change in velocity for the operator before it is exhausted. Its attitude control system includes an automatic attitude hold and six degrees of freedom. A 28-volt battery pack for SAFER can be replaced in orbit.

MIR SCIENCE

Earth orbit places humans in a most unusual environment with reduced gravitational forces, a near-absolute vacuum, a broad spectrum of radiation, and wide temperature extremes. Scientific research has always been one of the most important objectives for both the American and Russian space programs and the long-term research platform supplied by the Mir complex allows extensive studies in fundamental physics, chemistry, human and plant biology, and technology, as well as investigations directed toward understanding processes used on Earth. A carefully planned program of studies designed to use the capabilities of Mir during the next few years will be an integral part of the evolutionary process into understanding the effects of long-duration microgravity on biological and physical processes. Scientists have the opportunity to better understand the space environment, study and learn to cope with the effects that it has on humans, and increase their scientific knowledge and technological developments for implementation on the International Space Station and here on Earth.

The commercial and technology development program will evaluate advanced technologies and manufacturing techniques. Space environmental effects on physical dynamics will also be studied. The Mir station will be used as a test bed to study several major technology disciplines: structures, materials, biotechnology, and physical processes.

Earth sciences research will be performed in ocean biochemistry, land surface hydrology, meteorology, and atmospheric physics and chemistry. Observation and documentation of transient natural and human-made phenomena will be accomplished with the use of passive microwave radiometers, a visible region spectrometer to study the ocean, and a side-looking radar.

Life sciences and fundamental biology applications include investigations that evaluate new technologies for life support systems which enhance the capabilities for on- orbit environmental monitoring. These include characterizing the biological and chemical aspects of the research environment of Mir, and expanding the knowledge of space human factors and extravehicular activity.

International Space Station Risk Mitigation consists of several technology demonstrations associated with human factors and maintenance of crew health and safety aboard the space station. By fully evaluating the Mir interior and exterior environments, such as audible noise levels, radio frequency interference, crew-induced forces to structures, particle impacts on the station, and docking configuration stability, information can be gathered for the improved design of the International Space Station.

Microgravity research has the general goal of advancing scientific understanding and providing value on Earth through research in biotechnology, fluid physics, combustion, and materials science. The ambient acceleration and vibration environment of Mir will be characterized for benefit to both research and engineering programs.

Space science research will collect interstellar and interplanetary particles in space to further our understanding of the origin and evolution of planetary systems and life on Earth.

Most of the Mir 21/NASA 2 research will be conducted on the Mir. Some of the shuttle missions will carry SpaceHab and provide shuttle-based facilities and Middeck lockers for short duration experiments.

SPACEHAB MODULE

STS-76 will begin a series of Shuttle-Mir missions that will carry a SPACEHAB module onboard. Over the course of these missions, SPACEHAB modules will carry a mix of supplies and scientific equipment to and from Mir.

On STS-76, the SPACEHAB module will be in a single module configuration, similar to previous SPACEHAB missions. In addition to the Spacelab short tunnel and airlock which have flown on SPACEHAB single module missions before, there will be an extended tunnel beyond the airlock and a 19-inch tunnel extension built by SPACEHAB, Inc. to position the SPACEHAB module in the optimal point in the Shuttle's cargo bay. Because the single module will be positioned further aft than on previous missions, the module will be able to carry up to 4,800 pounds of useable payload up to and back from Mir.

Equipment that will be carried in the SPACEHAB module on STS-76 can be categorized in the following five types:

1. Russian Logistics
2. Extravehicular Activity (EVA) Tools
3. ISS Risk Mitigation Experiments (RME)
4. American Logistics
5. Science and Technology Experiments.

1. Russian Logistics: A double rack will be dedicated to some of the Russian logistics, including the gyrodyne and the individual equipment and seat liner (IESL) kit. The gyrodyne will be transferred by the crew to and from Mir to replace a used gyrodyne. The IESL kit will be transferred by the crew to Mir to be available for use by Mission Specialist Shannon Lucid in case of an emergency return to Earth in a Soyuz capsule. Three Russian storage batteries which were returned to Earth from Mir on STS-71 will be mounted on the aft bulkhead of the SPACEHAB module. During docked operations, the crew will remove the batteries and transfer them to Mir. Numerous Russian logistics items totaling approximately 1,900 lbs. will be carried in the SPACEHAB soft stowage system. Items include food and water containers, clothing and sleeping articles, personal hygiene equipment, a current transformer, and a Mir supplemental kit. These items will be transferred to Mir by the crew.

2. EVA Tools: Several soft bags will be used to carry EVA support equipment. The EVA tools will support Detailed Test Objectives (DTOs) as listed. The equipment will include Waist Tethers (DTO 672), Push Lock Tether Tools (DTO 671, 672) and a 35 mm Camera and Accessories (Tools for 96 Bolts). Other Detailed Science Objectives (DSOs) also will be supported by the EVA equipment, including DSOs 486, 489 and 494.

3: ISS Risk Mitigation Experiments (RME): The Risk Mitigation Experiments hardware will be carried in soft stowage bags and consist of the following items: Mir Electric Field Characterization (MEFC) hardware, and the Mir Environmental Effects Payload (MEEP) attachment brackets.

- The MEFC experiment will collect data on the internal and external radio interference in the 400 MHz to 18 GHz frequency band. The hardware consists of a radio frequency spectrum analyzer and power cable, an orbiter window antenna, and a payload general support computer. The experiment hardware will be removed from the SPACEHAB module. Experiment operations will be performed on the shuttle's flight deck then returned to the module for return to Earth.

- The MEEP experiment is designed to collect samples of orbital and micrometeoroid debris and will be attached to Mir during an EVA by the crew. The MEEP attachment brackets will be clamped to external handrails on Mir and will remain there after their installation during the mission.

4. American Logistics: About 15 full water bags supplied through the shuttle's water system will be transferred to Mir. New film also will be swapped for film already shot aboard Mir, and the docking module light and television camera will be returned to Earth.

5. Science And Technology Experiments:

Biorack: The European Space Agency's Biorack experiment will share a double rack with the Life Sciences Laboratory Equipment Refrigerator/Freezer (LSLE) in the SPACEHAB module. The Biorack is a multi-purpose facility designed to enable biological investigations on plants, tissues, cells, bacteria, and insects during spaceflight. Its main purpose is to investigate the effects of microgravity and cosmic radiation, particularly the effects of high-energy (HZE) particles, on the development of these species. Eleven experiments will be conducted during the mission: three from the U.S., three from France, three from Germany, one from Switzerland and one from the Netherlands. Over 21 hours of crew time will be spent with the Biorack.

The equipment which comprises the Biorack includes incubator units, a glovebox, an experiment power switching unit, an external power data panel, and one soft stowage locker. In addition to the rack-mounted hardware, the Biorack also will use three middeck lockers, each containing a passive thermal conditioning unit (PTCU).

The incubator units provide controlled temperature environments for certain payload element containers during Biorack operations while on orbit. The glovebox is a containment facility to be used for specimen manipulations. The glovebox provides a means to contain accidental spillage of any toxic materials and to prevent contamination of biological samples when the covers of the payload element containers are removed for operations. Payload element containers come in two sizes, one about the size of cigarette packs, and another about the size of one-pint ice cream cartons. The PTCU provides controlled temperature environments for the payload element containers when active temperature conditioning cannot be provided. Biorack will require the partial use of one LSLE freezer to contain payload element samples for on-orbit processing and for descent. The LSLE will be operated in the freezer mode at -22 degrees C on orbit and for the descent.

Biorack will be a combination of nine different payload elements to be performed throughout the mission. High-energy atomic number charged particles (HZE) radiation will be studied to explicitly correlate biological responses with naturally occurring HZE particles. Also, the study of microgravity potential modifications of biological responses to radiation will be analyzed.

Studies also will include the effect of microgravity on bone loss by investigating alterations in select gene expression patterns, the continuing studies of microgravity on gravity sensing, and response in Hematopoietic cells. Studies on PKC, which is an important enzyme in intra-cellular signaling pathways, will be analyzed under microgravity conditions. The signaling pathways appear to be sensitive to gravity in a number of cell types.

The effects of using centrifuges as 1-g references have demonstrated sedimentation and convection may affect cells on a macroscopic scale by the formation of oxygen and nutrient gradients. A Biorack payload element will study this phenomena which implies that a 1-g reference centrifuge may not necessarily be an optimal control for all types of space experiments. An analysis on the effects of the transfer from 1-g to microgravity on the polarity of statocytes and the role of actin filaments on the positioning of treated and untreated roots will be conducted during the mission. Additional plant experiments will study the effects of microgravity on cell wall regeneration, cell division, and growth and differentiation of plants from protoplasts.

A dosimetry experiment will be flown to document the radiation environment inside the Biorack facility and other locations inside the SPACEHAB module and the middeck. The data will provide a radiation baseline for Biorack payload elements and in addition, the payload element will be monitoring the SPACEHAB module along with new orbit inclination and altitude.

Life Sciences Laboratory Equipment Refrigerator/Freezer (LSLE R/F): The LSLE R/F is a vapor compression refrigerator which will be carried in a double rack (with the Biorack) in the SPACEHAB module. The LSLE R/F has flown five times on board the Shuttle. Its internal volume is 2.5 ft 3 in., and can accept a variety of racks, shelves and containers, and maintains internal temperatures ranging from +10 degrees C to -22 degrees C. On STS-76, the LSLE R/F will carry processed samples from the Biorack as well as the Johnson Space Center Frozen Stowage experiment which includes blood, urine and saliva samples from the Mir-21 crew. These samples will be analyzed on Earth for evidence of accelerated renal stone development and protein metabolism in microgravity.

Mir Glovebox Stowage (MGBX): The MGBX will be carried in soft stowage bags to replenish hardware for the MGBX located on Mir. Equipment included in the MGBX includes the Combustion Experiments Parts Box to be used with the candle flames in microgravity experiment and the Forced Flow Flamespread Test, the Passive Accelerometer, the Protein Crystal Growth Experiment, and the Protein Crystal Growth Thermal Enclosure System Ancillary.

Queen's University Experiment in Liquid Diffusion (QUELD). QUELD will be carried in a soft stowage bag and middeck locker.

High Temperature Liquid Phase Sintering (LPS). Developed by the University of Alabama at Huntsville's (UAH) Consortium for Materials Development of Space--one of NASA's 11 Centers for the Commercial Development of Space--the Liquid Phase Sintering (LPS) experiment will be carried to the Mir space station aboard STS-76 and will be returned to U.S. experimenters for analysis following the planned August Shuttle-Mir docking mission of STS-79.

The experiment will use the Optizon furnace aboard Russia's Mir space station. A variety of metals will be bonded together in a series of experiments over a two week period on Mir. Researchers are using a process called Liquid Phase Sintering to create these metal composites. By conducting these technology experiments in space, new insights may be gained concerning industrial needs and operations on Earth.

As one example, Liquid Phase Sintering experiments in microgravity may provide greater understanding on how metals bond. One area which could benefit from improved metal composites is the tool industry.

MIR ENVIRONMENTAL EFFECTS PAYLOAD (MEEP)

MEEP, managed by NASA's Langley Research Center, Hampton, VA, will study the frequency and effects of space debris striking the Mir space station. MEEP will study both human-made and natural space debris, capturing some debris for later study. It will be attached to the Mir shuttle docking module during a spacewalk by mission specialists Linda M. Godwin and Michael (Rich) Clifford.

MEEP also will expose selected and proposed International Space Station materials to the effects of space and orbital debris. Because the International Space Station will be placed in approximately the same Earth orbit as Mir, flying MEEP aboard Mir will give researchers an opportunity to test materials for the International Space Station in a comparable orbital position.

MEEP consists of four separate experiments. The Polished Plate Micrometeoroid and Debris experiment is designed to study how often space debris hit the station, the sizes of these debris, the source of the debris, and the damage the debris would do if it hit the station. The Orbital Debris Collector experiment is designed to capture orbital debris and return them to Earth to determine what the debris are made of and their possible origins.

The Passive Optical Sample Assembly I and II experiments consist of various materials that are intended for use on the International Space Station. These materials include paint samples, glass coatings, multi-layer insulation and a variety of metallic samples.

MEEP will remain attached to Mir until late 1997, when the four experiment containers will be retrieved by another space shuttle crew (STS-86) and returned to Earth for study. The data will be studied to determine what kind of debris hit the space station and how those contaminants can actually collect on some of the different surfaces of a space station, affecting its surfaces and long-term performance.

The four MEEP experiments are contained in four Passive Experiment Carriers (PEC). Each of the four PECs consists of a sidewall carrier for attachment to the payload bay of Atlantis (STS-76), a handrail clamp for attachment to the Mir shuttle docking module, and an experiment container to house the individual experiment.

KIDSAT

KidSat is a three-year pilot project that will fly on the shuttle once a year. This is the project's first flight. KidSat seeks to give middle school students the opportunity to participate in space exploration. KidSat will enable students to configure their own payload of digital video and a camera for flight on the Shuttle, command the camera from their classrooms, and download their images of Earth in near real-time. Images will be used as the basis for a variety of classroom discoveries, including history, geography, geology, physics, oceanography, mathematics and current events, and as a means of exploring their own planet using NASA data.

KidSat will be powered on and tested at three participating schools on flight day two. Images will be posted on the KidSat home page. Interested public school districts, teachers, and students may view the images and information provided by students during the mission via the World Wide Web site:

http://www.jpl.nasa.gov/kidsat/

Participating Schools

For the first flight, three pilot districts were selected on the basis of three criteria: 1) urban schools; 2) proximity to one of the institutional partners; 3) previous involvement with Space Shuttle missions. Each district selected a classroom to initiate the pilot program: Samuel Gompers Secondary School, San Diego, CA (7-8th grade); Washington Accelerated Learning Center, Pasadena, CA (5th grade) Buist Academy, Charleston, SC (5-8th grade).

Institutional Partners

The KidSat concept was inspired by a group of high school students working on a Shuttle mission as part of the Jet Propulsion Laboratory's (JPL) collaboration with The Johns Hopkins University Institute for Academic Advancement of Youth (IAAY). The program was developed by JPL, IAAY and the University of California, San Diego (UCSD). JPL has the lead role in the project management of KidSat, the development of the remote sensing instruments and cameras, and the data system. The UCSD provides the mission operations for this program, and IAAY is leading the curriculum development, teacher training, and evaluation. Significant support from the Johnson Space Center also is a key element of this project, and the first digital still camera is a Kodak DC460C. The project is supported by NASA's Office of Human Resources and Education, Washington, DC, with support from NASA's Office of Mission to Planet Earth, Office of Space Flight, and the Office of Space Science, Washington, DC.

SHUTTLE AMATEUR RADIO EXPERIMENT (SAREX)

U.S. students will have a chance to speak via amateur radio with astronauts aboard STS-76. Ground-based amateur radio operators ("hams") will be able to contact shuttle astronauts through a direct voice ham radio link as time permits.

Shuttle Pilot Richard A. Searfoss (call sign KC5CKM) and mission specialists Linda Godwin (N5RAX), Ron Sega (KC5ETH) and Shannon Lucid (call sign pending) as well as Commander Chilton will talk with students in five U.S. schools using ham radio.

Students in the following schools will have the opportunity to talk directly with orbiting astronauts for approximately 4 to 8 minutes:

- Artesia Public Schools, Artesia, NM
- Troy Middle School, Troy, TX
- S.J. Davis Middle School, San Antonio, TX
- Bethlehem Central Senior High School, Delmar, NY
- University of Colorado, Colorado Springs, CO

The radio contacts are part of the SAREX (Shuttle Amateur Radio EXperiment) project, a joint effort by NASA, the American Radio Relay League (ARRL), and the Radio Amateur Satellite Corporation (AMSAT).

The amateur radio station at the Goddard Space Flight Center, Greenbelt, MD, (WA3NAN), will operate around the clock during the mission, providing SAREX information, and retransmitting live Shuttle air-to-ground audio. The Goddard amateur radio club's planned HF operating frequencies are:

3.860 MHz	7.185 MHz
14.295	21.395
28.650	

Information about orbital elements, contact times, frequencies and crew operating schedules will be available during the mission. Current Keplerian elements to track the Shuttle and SAREX specific information are available from the following sources:

- NASA Spacelink computer information system

BBS: (205) 895-0028
Internet, Telnet, FTP, Gopher: spacelink.msfc.nasa.gov
WWW: http://spacelink.msfc.nasa.gov

- NASA SAREX WWW Home Page:

http//www.nasa.gov/sarex/sarex_mainpage.html

-- American Radio Relay League
Telephone: (860) 594-0301
BBS: (860) 594-0306
WWW: http://www.arrl.org

- AMSAT

Telephone: Frank Bauer (AMSAT/NASA) (301) 286-8496
WWW: http://www.amsat.org

- NASA Johnson Space Center Amateur Radio Club

BBS: (713) 244-5625

- Goddard Amateur Radio Club

BBS: (301) 286-4137
WWW: http://garc.gsfc.nasa.gov/www/garc-home-page.html

STS-76 SAREX Frequencies

IMPORTANT NOTE: Since the flight is a Shuttle-Mir docking mission, and SAREX and Mir amateur radio stations usually share the same downlink frequency (145.55), the SAREX Working Group has decided to make the following SAREX frequency changes for the STS-76 mission:

Worldwide downlink frequency is 145.84 MHz.

The voice uplink frequencies are: 144.45, 144.47 MHz

Note: Ham operators should not transmit on the Shuttle's downlink frequency. The downlink is your receiving frequency. The uplink is your transmitting frequency. In addition, the astronauts will not favor any one of the above frequencies. Therefore, the ability to talk with an astronaut depends on selecting one of the above frequencies chosen by the astronaut.

TRAPPED IONS IN SPACE (TRIS)

The Naval Research Laboratory's (NRL's) Trapped Ions in Space (TRIS) experiment will fly as a Get Away Special payload on STS-76. TRIS will measure a recently-discovered belt of energetic cosmic ray nuclei trapped in Earth's magnetic field to quantify radiation hazards in space and lead to a better theoretical understanding of how these cosmic ray nuclei have become trapped in the Earth's magnetic field.

So-called "anomalous cosmic rays", which originate in the nearby interstellar medium, form the radiation belt which TRIS will observe. These trapped anomalous cosmic rays, say the researchers, have sufficient energy to pose a potential radiation hazard to some lightly shielded electronic systems planned for the International Space Station and perhaps to astronauts during spacewalks in certain parts of the orbit.

Although the existence of this radiation belt was predicted by scientists in 1977, it was not confirmed until 1991, when an NRL-led team of U.S. and Russian scientists compared satellite data from both countries. Since 1992 trapped anomalous cosmic rays have also been observed by experiments aboard NASA's Solar, Anomalous, and Magnetospheric Particle Experiment (SAMPEX) satellite at an altitude of about 372 miles. At present, however, there is insufficient theoretical understanding of trapped anomalous cosmic rays to extrapolate from the SAMPEX observations down to altitudes of 217-279 miles, where the Russian Space Station Mir is located and where the ISS will operate. Scientists will be able to compare simultaneous observations from TRIS and SAMPEX to bridge this gap.

TRIS, which previously flew on a space shuttle mission in 1984, measures and identifies cosmic ray nuclei using polycarbonate detectors, including some of the same type that are routinely used in the astronauts' dosimeter badges. Ionizing particles produce trails of radiation damage as they pass through these detectors. After return from space, the detectors are chemically etched in the laboratory to reveal the damage trails, which are then measured with high- precision microscopes. The atomic numbers, energies, and arrival directions of the cosmic ray nuclei are determined from these measurements.

TRIS was built by NRL's Space Science Division. The flight is being sponsored by the U.S. Air Force Space Test Program office at the Johnson Space Center.

STS-76 CREWMEMBERS

STS076-S-002 -- These six NASA astronauts will be launched into space aboard the space shuttle Atlantis early next year. Front row, left to right, are astronauts Ronald M. Sega, mssion specialist; Kevin R. Chilton, mission commander; and Richard A. Searfoss, pilot. Back row, left to right, are mission specialists Michael R. (Rich) Clifford, Shannon W. Lucid and Linda M. Godwin. STS-76 begins a new period of international cooperation in space exploration with the first shuttle transport of a United States astronaut (Lucid) to Russia's Mir space station for extended joint space research. Clifford and Godwin, pictured here in training versions of the extravehicular mobility Unit (EMU), are scheduled to perform the first extravehicular activity (EVA) during Mir-Shuttle docked operations.

PHOTO CREDIT: NASA or National Aeronautics and Space Administration.

BIOGRAPHICAL DATA

Note: Complete biographical information on all NASA astronauts is available through the NASA Shuttle Web home page on: **http://shuttle.nasa.gov**.

STS-76 CREW

Kevin Chilton (Col., USAF) was born November 3, 1954 in Los Angeles, CA. He received a bachelor of science degree in engineering science in 1976 from the U.S. Air Force Academy and a master of science degree in mechanical engineering from Columbia University on a Guggenheim Fellowship in 1977. He became an astronaut in 1988 and served as pilot on his first two Shuttle flights, STS-49 in 1992 and STS-59 in 1994.

Richard Searfoss (Lt. Col., USAF) was born on June 5, 1956 in Mount Clemens, MI, but considers Portsmouth, NH, to be his hometown. He received a bachelor of science degree in aeronautical engineering from the USAF Academy in 1978 and a master of science degree in aeronautics from the California Institute of Technology on a National Science Foundation Fellowship in 1979. Searfoss was selected to join the astronaut corps in 1990 and served as pilot on his first Shuttle flight, STS-58 in 1993.

Ronald Sega (Ph.D.) was born December 4, 1952 in Cleveland, OH, but considers Northfield, OH, and Colorado Springs, CO, to be his hometowns. He received a bachelor of science degree in mathematics and physics from the U.S. Air Force Academy in 1974, a master of science degree in physics from Ohio State in 1975 and a doctorate in electrical engineering from the University of Colorado in 1982. Sega became an astronaut in 1991 and served as a mission specialist on his first space flight, STS-60 in 1994.

M. Richard Clifford (Lt. Col., USA, ret.) was born October 13, 1952 in San Bernardino, CA, but considers Ogden, UT, to be his hometown. He received a bachelor of science degree from the United States Military Academy, West Point, New York, in 1974 and a master of science degree in aerospace engineering from the Georgia Institute of Technology in 1982. Clifford was selected as an astronaut in 1990 and has flown as a mission specialist on two previous Shuttle flights, STS- 53 in November 1992 and STS-59 in April 1994.

Linda Godwin (Ph.D.) was born July 2, 1952 in Cape Girardeau, MO, but considers Jackson, MO, to be her hometown. She received a bachelor of science degree in mathematics and physics from Southeast Missouri State in 1974 and a master of science degree and a doctorate in physics from the University of Missouri in 1976 and 1980. Godwin began working at NASA in 1980 and became an astronaut six years later. She has flown in space twice, on STS-37 in April 1991 and STS-59 in April 1994.

Shannon Lucid (Ph.D.) was born January 14, 1943 in Shanghai, China but considers Bethany, OK, to be her hometown. She received a bachelor of science degree in chemistry from the University of Oklahoma in 1963 and a master of science and doctor of philosophy degrees in biochemistry from the University of Oklahoma in 1970 and 1973, respectively. Lucid was selected as an astronaut in 1978 and has served as a mission specialist on four previous Shuttle flights, STS 51-B in 1985, STS-34 in 1989, STS-43 in 1991 and STS-58 in 1993. At the conclusion of Shuttle-Mir joint-docked operations, Lucid will remain aboard Mir serving as a station researcher. She will return to Earth when Atlantis again docks to Mir during mission STS-79 in August 1996.

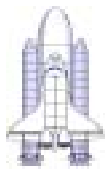
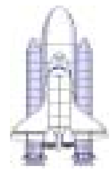
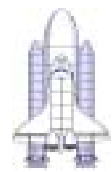
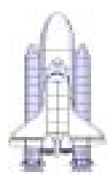
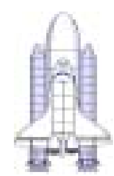
MIR-21 CREW

Yuri Onufrienko (Mir-21 Commander) - was born February 6, 1961 in the village of Ryasnoye, Zolochevsk district, Kharlov region, Russia. He graduated from the V.M. Komarov Eisk Higher Military Aviation School for Pilots in 1982 with a pilot-engineer's diploma. He was assigned to the Gagarin Cosmonaut Training Center in 1989. From September 1989 to January 1991 he attended the general space training course. From April 1991 to February 1994 he trained for space flight as part of the test-cosmonaut group in the Mir orbital station program. From February 1994 to February 1995 he trained for flight as backup crew commander for Mir-18 and Mir-Shuttle programs. From March to June 1995 he trained for flight on the Mir station for Mir-19 and Mir-Shuttle programs as the commander of the backup crew. Since June 1995, he trained for space flight in the Soyuz-TM transport vehicle and Mir station as commander of the main crew for Mir-21. Onufrienko along with Mir-21 Flight Engineer Yuri Usachev were launched aboard a Soyuz-TM transport vehicle on the start of the Mir-21 mission on February 21, 1996. Onufrienko and Usachev docked to the Mir station two days later. The Mir-21 mission is Onufrienko's first space flight mission.

Yuri Usachev (Mir-21 Flight Engineer) - was born October 9, 1957 in the city of Donetsk, Rostov Region, Russia. He graduated from the Moscow Aviation Institute in 1985. Since 1985 he has worked at the RSC Energia. He joined the cosmonauts of RSC Energia in 1989. From September 1989 to January 1991 he attended the general space training course at the Gagarin Cosmonaut Training Center. From April 1991 to August 1992 he trained for space flights as a member of the test-cosmonaut group in the Mir station program. In 1992 and 1993 he trained for flight on the Mir complex in the Mir-13 program as flight engineer of the backup crew. From February to June 1993 he trained for flight on the Mir complex in the programs Mir-14 and Altaire (France) as flight engineer of the backup crew. From August 1993 to January 1994 he trained in the Mir-15 program as flight engineer of the main crew. From January to July 1994 he flew on the Mir complex for 182 days. From April to June 1995 he trained for flight on the Mir station as flight engineer of the backup crew in the Mir- 19 and Mir-Shuttle programs. Since June 1995, he trained for space flight in the Soyuz-TM transport vehicle and Mir station as flight engineer of the main crew for Mir-21. Usachev along with Mir-21 Commander Yuri Onufrienko were launched aboard a Soyuz-TM transport vehicle on the start of the Mir-21 mission on February 21, 1996. They docked to the Mir station two days later. The Mir-21 mission is Usachev's second space flight mission.

SHUTTLE FLIGHTS AS OF MARCH 1996

75 TOTAL FLIGHTS OF THE SHUTTLE SYSTEM -- 50 SINCE RETURN TO FLIGHT

		STS-70 07/13/95 - 07/22/95		
		STS-63 02/03/95 - 02/11/95		
STS-75 02/22/96 - 03/09/96		STS-64 09/09/94 - 09/20/94		
STS-73 10/20/95 - 11/05/95		STS-60 02/03/94 - -2/11/94		
STS-65 07/08/94 0 07/23/94		STS-51 09/12/93 - 09/22/93		
STS-62 03/04/94 - 03/18/94		STS-56 04/08/83 - 04/17/93		
STS-58 10/18/93 - 11/01/93		STS-53 12/02/92 - 12/09/92	STS-74 11/12/95 - 11/20/95	
STS-55 04/26/93 - 05/06/93		STS-42 01/22/92 - 01/30/92	STS-71 06/27/95 - 07/07/95	
STS-52 10/22/92 - 11/01/92		STS-48 09/12/91 - 09/18/91	STS-66 11/03/94 - 11/14/94	
STS-50 06/25/92 - 07/09/92		STS-39 04/28/91 - 05/06/91	STS-46 07/31/92 - 08/08/92	
STS-40 06/05/91 - 06/14/91		STS-41 10/06/90 - 10/10/90	STS-45 03/24/92 - 04/02/92	
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-72 01/11/96 - 11/20/96
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-69 09/07/95 - 09/18/95
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-67 03/02/95 - 03/18/95
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-68 09/30/94 - 10/11/94
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-59 04/09/94 – 04/20/94
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-61 12/02/93 - 12/13/93
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-57 06/21/93 - 07/01/93
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-54 01/13/93 - 01/19/93
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-47 09/12/92 - 09/20/92
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	STS-49 05/07/92 - 05/16/92
OV-102 Columbia (19 flights)	**OV-099 Challenger (10 flights)**	**OV-103 Discovery (21 flights)**	**OV-104 Atlantis (15 flights)**	**OV-105 Endeavour (10 flights)**