Appendix

Comparative Chronology of U. S. and Russian Human Space Missions from November 1994 through August 1996

This list of Russian and U.S. human missions is provided for quick reference. It also includes flights of the Russian Progress-M cargo vehicles which, although they did not actually transport humans, ferried supplies for humans on Mir missions. Launch to landing dates are shown at left; mission descriptions are on the right. Dates of dockings and other notable milestones within a mission are included in the description column. Russian missions are indicated by bold dates and names, U. S. missions by underlining, and joint Russian-U.S. missions by italics.

Date	Mission
October 3, 1994-March 22, 1996	**Mir Principle Expedition 17.** Crew: Commander Alexandr Viktorenko, Flight Engineer Yelena Kondakova, and cosmonaut Valeri Polyakov, who set a new record for human space flight duration with his 438-day stay. Mir 17 hosted Euromir 94, first ESA mission aboard Mir. Space Shuttle Atlantis rendezvoused with Mir on its STS-63 mission.
November 3-14, 1994	STS-66. Crew: Commander Donald R. McMonagle, Pilot Curtis L. Brown, Jr., Payload Commander Ellen Ochoa, Mission Specialists Scott E. Parazynski, Joseph R. Tanner, Jean-Francois Clervoy (ESA astronaut). Part of NASA's Mission to Planet Earth, the flight had an international crew and experiments provided by several nations. The Atmospheric Laboratory for Applications and Sciences-03 (ATLAS-03), the primary payload, was flown to study the energy of the sun and how it affects the Earth's climate and environment.
November 11, 1994-February 16, 1995	**Progress M-25** docked with Mir on November 13 with crew supplies and repair parts.
February 3-10, 1995	*STS-63*. U.S. Space Shuttle Orbiter Discovery rendezvoused with Mir from February 6 through 8. Crew members were Commander James D. Wetherbee, Pilots Eileen M. Collins and Michael Foale, Mission Specialists Janice E. Voss and Bernard A. Harris, Jr., and Russian cosmonaut Vladimir G. Titov. Primary objectives were to verify flight techniques and interfaces between communications and navigation equipment, and to study Shuttle Orbiter/Mir proximity operations in preparation for the STS-71 docking mission. An EVA during which two astronauts manipulated the Spartan-204 free-flying retrievable platform provided experience with manipulating large objects in space.

February 15-March 15, 1995	**Progress-M 26**, with a cargo that included equipment for experiments on the Mir 18 mission, docked with Mir on February 17.
March 2-18, 1995	STS-67. Endeavor set a Space Shuttle Orbiter record of 16 days, 15 hours in space. The primary payload was Astro-2, a suite of three instruments flown on Spacelab for astronomical observations in the ultraviolet spectrum. Crew: Commander Stephen S. Oswald, Pilot William G. Gregory, Payload Commander Tamara E. Jernigan (3) , Mission Specialists John M. Grunsfeld and Wendy B. Lawrence, Payload Specialists Ronald A. Parise and Sammuel Durrance.
March 14-July 7, 1995	*Mir Principle Expedition 18*. Crew: Commander Vladimir Dezhurov, flight engineer Gennadiy Strekalov, Cosmonaut-Researcher Norman Thagard (U.S. astronaut). Joint U.S.-Russian medical research and weightlessness effects investigations were conducted and the station was reconfigured for the arrivals of the Spektr science module and the Space Shuttle Atlantis. Notable "firsts" were the addition of the first new module (Spektr) since Kristall arrived in 1990, the first American (Thagard) to be part of a Mir crew, and the first docking of a U.S. spacecraft (Atlantis on STS-71) with the Mir complex. The crew returned to Earth on Atlantis.
March 14-September 11, 1995	*Soyuz-TM 21*, carrying the Mir 18 crew, docked with Mir on March 16. Because Atlantis took that crew home and brought up the next crew on STS-71, Soyuz-TM 21 did not return to Earth until the end of the 19th Principle Expedition. From March 14-18, the thirteen space travelers aboard Mir (crews 17 and 18) and Endeavor set a record for number of humans in orbit at one time.
March 22, 1995	**Soyuz-TM 20**, which had been launched October 3, 1994, to deliver the Principle Expedition 17 crew to Mir, returned that crew to Earth. Physician Valeri Polyakov, who went up on January 8, 1994 with the Mir 15 crew, had attained a record 438 days in space.
April 9-May 23, 1995	**Progress-M 27** docked at Mir with supplies on April 11.
May 20, 1995	**Spektr**, launched by a Proton-K rocket on May 20, docked with Mir's -X port on June 1 and was relocated to the -Y port on June 2. Spektr was the first new module to be added to Mir since 1990, bringing the total to five permanent habitable modules.

June 27-July 7, 1995

STS-71. Atlantis docked with Mir, the first U.S. Space Shuttle Orbiter to do so, and the first U.S. craft to dock with a Russian one since the Apollo-Soyuz mission on July 17, 1975. A new Orbiter Docking System had been installed in the payload bay for the docking with Kristall's APAS system. The U.S. crew members were Commander Robert L. Gibson, Pilot Charles J. Precourt, Mission Specialists Ellen S. Baker, Bonnie J. Dunbar, and Gregory J. Harbaugh. The ascending crew included that of Mir 19 Commander Anatoly Solovyev and Flight Engineer Nikolai Budarin. The descending crew included Mir 18 Commander Vladimir Dezhurov, Flight Engineer Gennadiy Strekalov, and (American) Cosmonaut Researcher Norm Thagard. During the 5-day docking, June 29-July 4, the 10 members of the combined crews set a record for the most humans aboard a single space complex at the same time. This was the 100th Space Shuttle Orbiter flight.

June 27-September 11, 1995

Mir Principle Expedition 19. Commander Anatoly Solovyev and flight engineer Nikolai Budarin were the first Mir crew launched on a Space Shuttle Orbiter. They began their work on Mir in conjunction with a visiting U.S. crew and a departing international crew and ended their stay by welcoming an incoming international crew. Two of their EVAs involved deployment and retrieval of international experiments.

July 13-22, 1995

STS-70. The Discovery astronauts deployed a Tracking and Data Relay Satellite (TDRS-G) completing world-wide coverage for the TDRS ground-to-satellite communications network, which is one of NASA's means of contacting the shuttles. Crew members were Commander Terence T. Henricks, Pilot Kevin R. Kregel, Mission Specialists Nancy Jane Currie, Donald A. Thomas, and Mary Ellen Weber.

July 20-September 4, 1995

Progress-M 28 docked with Mir on July 22 to resupply the station and provide ESA equipment for the Euromir 95 (Mir 20) mission.

September 3, 1995-February 29, 1996

Mir Principle Expedition 20. Soyuz-TM 22 docked with Mir on September 5, carrying the Mir 20/Euromir 95 international crew: Commander Yuriy Gidzenko, Flight Engineer Sergey Avdeyev, and ESA Cosmonaut Researcher/Flight Engineer Thomas Reiter. The crew returned in the same Soyuz-TM, 44 days later than originally scheduled. During the Mir 20 mission, Atlantis docked with the station on STS-74. Euromir 95 included studies of microgravity effects on the human body and materials processing experiments.

September 7-18, 1995	STS-69. Crew: Commander David M. Walker, Pilot Kenneth D. Cockrell, Payload Commander James S. Voss, Mission Specialists James H. Newman and Michael L. Gernhardt. Two free-flying experiments, the Wake Shield Facility and the Spartan 201 astronomy satellite, were released into orbit and retrieved before mission end.
October 8-December 19, 1995	**Progress-M 29** docked with Mir on October 10. Its cargo included additional equipment for the extended Euromir 95 mission.
October 20-November 5, 1995	STS-73 was the second Microgravity Laboratory flight (USML-2). Other payloads aboard Columbia included the Orbital Acceleration Research Experiment (OARE) and the Midcourse Space Experiments (MSX). Crew: Commander Kenneth D. Bowersox, Pilot Kent Rominger, Payload Commander Kathryn Thornton, Mission Specialists Catherine Coleman and Michael Lopez-Alegria, Payload Specialists Fred Leslie and Albert Sacco.
November 12-20, 1995	*STS-74*. On its second docking with Mir, Atlantis delivered the Russian-built Docking Module, which was installed on Kristall for use in future Shuttle dockings. Two new solar arrays were stowed on the exterior of the Docking Module for deployment later. Crew members were Commander Kenneth D. Cameron, Pilot James D. Halsell, Mission Specialists Jerry L. Ross, William S. McArthur, and Canadian Chris A. Hadfield.
December 18, 1995-February 22, 1996	**Progress-M 30** docked with Mir on December 30.
February 21-September 2, 1996	**Mir Principle Expedition 21. Soyuz-TM 23** docked with Mir on February 23, delivering the two Russian members of the Mir 21 crew, Commander Yuri Onufrienko and Flight Engineer Yuri Usachev. Cosmonaut Researcher Shannon Lucid (U.S. astronaut) joined them on March 22 after Atlantis docked with Mir a third time, during the STS-76 mission. The last permanent module, Priroda, was added to the complex in April.
February 22-March 9, 1996	STS-75. Columbia featured reflight of the Italian Tethered Satellite System (TSS-1R). Although the tether was deployed successfully, it broke as it neared the end of its planned 12.8 mile distance. The international crew included ESA Mission Specialists Maurizio Cheli and Claude Nicollier, and Italian Payload Specialist Umberto Guidoni. U.S. crew members were Commander Andrew M. Allen,

	Pilot Scott J. Horowitz, Payload Commander Franklin R. Chang-Diaz, and Mission Specialist Jeffrey A. Hoffman.
March 22-31, 1996	*STS-76*. In its third U.S. Shuttle docking mission with Mir, Atlantis delivered the third Mir 21 crew member, U.S. astronaut Shannon Lucid. Other STS-76 crew members were Commander Kevin Chilton, Pilot Rick Searfoss, Payload Commander Ron Sega, Mission Specialists Rich Clifford and Linda Godwin. During the March 23-28 docking phase, Godwin and Clifford installed the Mir Environmental Effects Payload (MEEP) on the Docking Module in the first Mir EVA by U.S. astronauts.
April 23, 1996	**Priroda** docked flawlessly with Mir on April 26 despite concern about the battery-powered electrical system. The module, devoted primarily to Earth resources investigations, is the sixth (and last) permanent habitable Mir module.
May 5-Aug. 1 , 1996	**Progress-M 31** docked with Mir on May 7.
May 19-29, 1996	STS-77. Endeavour flew microgravity research experiments aboard the Spacehab module and deployed and retrieved the Spartan-207/IAE (Inflatable Antenna Experiment) satellite. Crew: Commander John H. Casper, Pilot Curtis L. Brown Jr., Mission specialists Daniel W. Bursch, Mario Runco, Jr., Canadian Marc Garneau, and Andrew S. W. Thomas.
June 20-July 7, 1996	STS-78. Endeavour's flight of the Life and Microgravity Spacelab (LMS) mission set a new U.S. Space Shuttle endurance record with its duration of 16 days, 21 hours, 47 minutes. Crew: Commander Terence T. Henricks, Pilot Kevin R. Kregel, Flight Engineer, Susan J. Helms, Mission Specialists Richard M. Linnehan, Charles E. Brady, Jr., Payload Specialists Jean-Jacques Favier (France) and Robert Brent Thirsk (Canada).
July 31, 1996-	**Progress-M 32** docked with Mir August 2. The module was undocked from the -X port under automatic control on August 18 to make room for Soyuz-TM 24. It was placed in a parking orbit until the departure of Soyuz-TM 23, at which time it was redocked at the +X port.
August 17, 1996-	**Soyuz-TM 24** arrived at Mir on August 19 with the Mir 21 crew, Commander Valery Korzun and Flight Engineer Alexander Kaleri, and visiting French cosmonaut-researcher Claudie Andre-Deshays.