2001 001A (26664)
Name: Shenzhou-2
Country: China
Launch date: 9 January 2001
Re-entry: 16 January 2001
Launch site: Jiuquan
Launch vehicle: CZ 2F
Orbit: 330 x 346 km, inclination: 42.6°

Crewed spacecraft as described for 1999 061A but flown in an automated mode. The flight provided a complete shakedown of all the spacecraft systems and included in orbit maneuvering when on 10 January 2001 it was raised to an orbit of 329 x 334 km from its original orbit of 197 x 335 km. This was followed by further orbital maneuvers on 12 January 2001 and 15 January 2001.
The flight carried 64 scientific experiments. 15 of these experiments were inside the Descent Module, 12 were inside the Orbital Module and 37 on an external exposure facility that may have simulated a docking facility. The experiments included microgravity experiments, life sciences experiments using 19 species of animals and plants, cosmic ray and particle detectors.
Communications satellite built by Alcatel using the Spacebus 3000 platform. The 1577 kg satellite carried 32 transponders in the Ku band. Turksat-2A was also known as Eurasiasat-1. Eurasiasat was a joint venture with Alcatel, based in Monaco.
<table>
<thead>
<tr>
<th><strong>2001 003A (26688)</strong></th>
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<tbody>
<tr>
<td><strong>Name:</strong></td>
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<td><strong>Country:</strong></td>
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<tr>
<td><strong>Launch date:</strong></td>
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<td><strong>Re-entry:</strong></td>
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<td><strong>Launch site:</strong></td>
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<tr>
<td><strong>Launch vehicle:</strong></td>
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<tr>
<td><strong>Orbit:</strong></td>
</tr>
</tbody>
</table>

Cargo transfer spacecraft as described for 2000 005A.
Progress M1-5 docked with the rear port of Mir/Kvant-1 (1986 017A) on 27 January 2001. The spacecraft carried 2677 kg fuel to be used in the de-orbit maneuvers of the space station. At re-entry the spacecraft was still attached to the Mir space station.
<table>
<thead>
<tr>
<th><strong>2001 004A (26690)</strong></th>
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<tbody>
<tr>
<td><strong>Name:</strong> Navstar 2R-7</td>
<td></td>
</tr>
<tr>
<td><strong>Country:</strong> USA</td>
<td></td>
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<tr>
<td><strong>Launch date:</strong> 30 January 2001</td>
<td></td>
</tr>
<tr>
<td><strong>Re-entry:</strong> in orbit</td>
<td></td>
</tr>
<tr>
<td><strong>Launch site:</strong> Cape Canaveral</td>
<td></td>
</tr>
<tr>
<td><strong>Launch vehicle:</strong> Delta 7925</td>
<td></td>
</tr>
<tr>
<td><strong>Orbit:</strong> 20106 x 20264 km, inclination: 54.9°</td>
<td></td>
</tr>
</tbody>
</table>

Navigational satellite as described for 1997 035A. Also known as USA-156, Navstar-50, Navstar-54 and SVN-54.
The Sistema Italiana de Communicazione Reservante Allarmi (Sicral) satellite provided secure communications facilities for the military. The 2596 kg satellite, built by Alenia Spazio, carried nine transponders in the EHF, UHF and SHF bands. In August 2013 it was moved to 37.1°E and later to 22°W. In late 2014 it was moved to 23.5°E in support of a Luxembourg reservation of this location that was due to expire on 18 December 2014 and was eventually filled by Astra-2G (2014 09A) after its launch on 27 December 2014. In March 2016 it was moved back to 16°E.
2001 005B (26695)
Name: Skynet-4F
Country: United Kingdom
Launch date: 7 February 2001
Re-entry: in orbit
Launch site: Kourou
Launch vehicle: Ariane 44L
Orbit: geostationary at 1°W

Military communications satellite as described for 1998 002A. In addition the satellite carried an experimental sensor to measure ambient nuclear radiation.
Crewed spaceflight with astronauts K. Cockrell (Cmdr.), M. Polanski (Pilot), R. Curbeam, T. Jones and M. Ivins (all Mission Specialists), using the orbiter Atlantis as described for 1981 034A. The objective was to undertake the International Space Station (ISS)-5A mission. The payload included the US Laboratory Module, also known as Destiny (2001 006B).

The orbiter docked with the PMA-3 docking port of the International Space Station (1998 067A) on 9 February 2001, following which three EVAs took place.

On 10 February 2001 the PMA-2 docking port was unberthed from the Unity module and was berthed on the Z1 truss. This was followed by the docking of the Destiny module to the Unity module. The docking was assisted by Jones and Curbeam during the first EVA, on 10 February 2001, which lasted 7 hours, 34 minutes. They connected electrical, computer and cooling lines between the module and station.

The second EVA took place on 12 February 2001 and was again undertaken by Jones and Curbeam. During the 6 hours, 50 minutes, they relocated the PMA-2 shuttle docking port from the temporary position on the Z1 truss, where it was placed during the first spacewalk, to a permanent location at the forward end of the Destiny lab. They also attached various equipment and fixtures to the exterior of the new module.

The final EVA, on 14 February 2001, was used to attach a spare S band communications antenna and equipment, called the S Band Antenna Support Assembly (SASA), to the station; install an exterior shutter on the Destiny lab window; and connect electrical and data lines between the PMA-2 shuttle docking port and Destiny. At the end of the 5 hours, 25 minutes space walk, Jones and Curbeam conducted a test of the ability of the Simplified Aid for Extravehicular Activity Rescue (SAFER) jet backpack.

Other experiments undertaken by the crew included:

1. the Biological Protein Crystal Growth – Enhanced Gaseous Nitrogen Dewar (ENG), a low cost protein crystal growth experiment;
2. various photographic observations of terrestrial features:
   - Coastal changes in the Yellow River delta between 1898 and 2000;
   - Coral reefs, to obtain basic data on global coral reefs;
• El Nino, southern oscillations;
• The lower Nile river in Egypt;
3. the Shuttle Ionospheric Modification with Pulsed Local Exhaust (SIMPLEX)-8 experiment as described for STS-84 (1997 023A);
4. Developmental Test Objective (DTO) experiments as described for STS-1 (1981 034A):
   • DTO-263: Shuttle Automatic Reboost Tuning;
   • DTO-675: Incapacitated EVA Crewmember Translation;
   • DTO-700-14: Single String Global Positioning System;
   • DTO-805: Crosswind Landing Performance;
5. Detailed Supplementary Objective (DSO) experiments as described for STS-1 (1981 034A):
   • DSO-496: Individual Susceptibility to Post Space Flight Orthostatic Intolerance;
   • DSO-498: Space Flight and Immune Function; and
   • DSO-802: Educational activities.
Atlantis undocked from the station on 16 February 2001 and landed at Edwards AFB after a flight of 12 days, 21 hours, 17 minutes.
Destiny was an International Space Station (1998 067A) module facility for scientific research which had a length of 7.70 m and a diameter of 4.30 m. It was the first of six planned research modules of the station, and also served as the command and control center for the entire complex. At launch, Destiny was partially outfitted with five systems racks containing equipment to provide electrical power and cooling for future racks, and computers for control of the entire ISS. Destiny was delivered to the space station by STS-98 (2001 006A) and was attached to the Unity module on 10 February 2001.

The 14150 kg space laboratory eventually housed an additional 18 racks for crew support and scientific research that could be removed and replaced periodically as experiment operations warrant. This versatility allowed researchers from around the world to conduct experiments in the unique microgravity environment of space.
2001 007A (26702)
Name: Odin-1
Country: Sweden
Launch date: 20 February 2001
Re-entry: in orbit
Launch site: Svobodny
Launch vehicle: Start 1
Orbit: 622 x 622 km, inclination: 97.6°

The 250 kg satellite carried instruments for the conduct of radio astronomy and aeronomy. The instruments consisted of an optical spectrometer operating on four wavelengths and a radiometer package operating in the five millimeter wavelength. Designed for an operating period of two years the satellite continued to function and during 2007/2008 the measurements were used study clouds and aerosols which may have a cooling effect on the planet.
<table>
<thead>
<tr>
<th>Name:</th>
<th>Progress M-44</th>
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<tbody>
<tr>
<td>Country:</td>
<td>Russia</td>
</tr>
<tr>
<td>Launch date:</td>
<td>26 February 2001</td>
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<tr>
<td>Re-entry:</td>
<td>16 April 2001</td>
</tr>
<tr>
<td>Launch site:</td>
<td>Baikonour</td>
</tr>
<tr>
<td>Launch vehicle:</td>
<td>Soyuz U</td>
</tr>
<tr>
<td>Orbit:</td>
<td>193 x 243 km, inclination: 51.6°</td>
</tr>
</tbody>
</table>

Cargo transfer spacecraft as described for 1989 066A. Progress M-44 docked at the rear Zvezda port of ISS (1998 067A) on 28 February 2001. The flight was also known as ISS-3P. It undocked on 16 April 2001.
2001 009A (26715)
Name: Milstar 2-2
Country: USA
Launch date: 27 February 2001
Re-entry: in orbit
Launch site: Cape Canaveral
Launch vehicle: Titan 401B
Orbit: geostationary at app. 90°W

Military communications satellite as described for 1994 009A but with an increased capacity of 32 transponders in the 44 GHz band as well as the Medium Data Rate payload. Also known as USA-157.
Crewed spaceflight with astronauts/cosmonauts J. Weatherbee (Cmdr.), J. Kelly (Pilot), Y. Usachov (Russia, ISS Cmdr.), J. S. Voss, S. Helms, A. Thomas and P. Richard (all Mission Specialist) using the orbiter Discovery as described for 1981 034A.

The objective was to undertake the International Space Station (ISS)-5A.1 mission. The payload included the Italian built Leonardo Multipurpose Logistics Module (MPLM). The MPML was a cargo module that could be lifted out of the cargo bay and be attached to a docking port for unloading and reloading. Afterwards it would be returned to the orbiter’s payload bay again for the return flight to Earth. Three MPMLs were built, the Leonardo, the Rafaeilo and the Donatello. As these were not free-flying satellites, they did not receive an International designation. The Donatello never flew in space and was used for spares.

On this flight the Leonardo module brought six systems racks to the space station including two robotic workstation racks, two DC-to-DC converter units, a US Lab Avionics rack and a Crew Health Care System. In addition there was the Human Research Facility #1 rack, also referred to as External Storage Platform (ESP)-1, that was installed in the US Destiny Laboratory Module. The ESP was an unpressurized external storage pallet with eight attachment sites capable of holding up to seven ISS spare parts and assemblies.

The pallet also had handrails and attachment points for tethers and foot restraints that astronauts can use during EVAs.

Additional experiments carried by the orbiter were:
1. the Passive Dosimeter System (PDS) to monitor radiation exposure in space;
2. G783, a Getaway special as described for STS-3 (1982 022A) containing the Aria-2 educational project comprising 124 passive science experiments;
3. the Space Experiment Module (SEM)-9 as described for STS-80 (1996 065A) which on this flight facilitated the Microgravity Rainbow experiment, the Ponds experiment, the Sunflower Seeds in Space experiment, Operation Cheese Mold, the Effect of Cosmic Radiation on Lichens, the Coco for Coconauts experiment, the Seed for a Larger Service experiment, the Ultra Fluffy Outcome
experiment, the Materials In Space Experiments as well as SSM, a study of the effects of the space environment on a variety on commonly used materials;

4. the Wide-band Shuttle Vibration Force Measurement (WSVFM) experiment to obtain measurements of the vibration forces acting between a payload and its mounting structure;

5. Developmental Test Objective (DTO) experiments as described for STS-1 (1981 034A):
   - DTO-257: Structural Dynamics Model Validation;
   - DTO-261: International Space Station On-orbit Loads Validation;
   - DTO-263: Shuttle Automatic Reboost Tuning;
   - DTO-700-14: Single String Global Positioning System;
   - DTO-805: Crosswind Landing Performance;

6. Detailed Supplementary Objective (DSO) experiments as described for STS-1 (1981 034A):
   - DSO-493: Monitoring Latent Virus Reactivation and Shedding in Astronauts;
   - DSO-496: Individual Susceptibility to Post Space Flight Orthostatic Intolerance; and

The first EVA, on 11 March 2001 by Voss and Helms, lasted 8 hours, 56 minutes, during which the PMA-3 module was moved and relocated to an adjacent port on Unity’s left side. On 12 March 2001 the Leonardo module was attached to Node 1, using the RMS system of the orbiter, following which it was unloaded and eventually filled with unneeded equipment, dirty laundry etc. Following that the module was transferred back into the payload bay on 19 March 2001.
The second EVA took place on 13 March 2001 and was made by Thomas and Richard. During the 6 hours, 21 minutes EVA they installed equipment for Unity module as well as a platform that will eventually hold the Canadian robotic arm.

Usachov, Voss and Helms remained on board of the space station as the next permanent crew, whilst Shepherd, Krikalyov and Gidzenko, who had arrived on Soyuz TM-31 (2000 070A), were carried back to Earth. Their mission duration had been 140 days, 23 hours, 41 minutes.

Usachov, Voss and Helms left on STS-105 (2001 035A).
Discovery undocked from the station on 19 March 2001 and landed at the Kennedy Space Centre after a flight of 12 days, 19 hours and 52 minutes.
2001 011A (26719)
Name: Eurobird-1
Int. Agency: Eutelsat
Launch date: 8 March 2001
Re-entry: in orbit
Launch site: Kourou
Launch vehicle: Ariane 5G
Orbit: geostationary at 28.5°E

Communications satellite owned by Eutelsat. Built by Alcatel and based on the Spacebus 3000B3, the 3050 kg satellite carried 24 transponders in the Ku band. In March 2012 it was renamed as Eutelsat 28-A whilst it was moved to 33°E on 10 July 2015 and renamed Eutelsat 33-C.
2001 011B (26720)
Name: B Sat-2A
Country: Japan
Launch date: 8 March 2001
Re-entry: in orbit
Launch site: Kourou
Launch vehicle: Ariane 5G
Orbit: geostationary at 110.0°E

Direct-to-home digital television broadcasting satellite owned by B Sat Corporation and built by Orbital Sciences using the Star Bus platform. The 1317 kg satellite carried 4 transponders in the Ku band.
XM-2 Rock was a digital direct broadcasting satellite owned by XM Satellite Radio. The 4459 kg satellite was based on the Boeing BSS-702 platform and carried 16 transponders operating in the 2.3/7 GHz band. The launch took place at 154°W, 0°, south of Hawaii.
<table>
<thead>
<tr>
<th><strong>Name:</strong></th>
<th>Ekran M-4</th>
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<tr>
<td><strong>Country:</strong></td>
<td>Russia</td>
</tr>
<tr>
<td><strong>Launch date:</strong></td>
<td>7 April 2001</td>
</tr>
<tr>
<td><strong>Re-entry:</strong></td>
<td>in orbit</td>
</tr>
<tr>
<td><strong>Launch site:</strong></td>
<td>Baikonour</td>
</tr>
<tr>
<td><strong>Launch vehicle:</strong></td>
<td>Proton M/Briz M</td>
</tr>
<tr>
<td><strong>Orbit:</strong></td>
<td>geostationary at 99°E</td>
</tr>
</tbody>
</table>

Communications satellite as described for 1987 109A.
<table>
<thead>
<tr>
<th>2001 014A (26734)</th>
<th>2001 Mars Odyssey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>USA</td>
</tr>
<tr>
<td>Country</td>
<td>Launch date: 7 April 2001</td>
</tr>
<tr>
<td>Launch site</td>
<td>Cape Canaveral</td>
</tr>
<tr>
<td>Launch vehicle</td>
<td>Delta 7925</td>
</tr>
<tr>
<td>Orbit</td>
<td>trans-martian</td>
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</table>

Originally referred to as Mars Surveyor 2001 Orbiter, the 2001 Mars Odyssey was placed in an orbit around Mars on 23 October 2001. Using aerobraking, the 379 kg spacecraft then maneuvered into a Martian orbit of 419 x 450 km with an inclination of 93.1°, which was reached on 17 January 2002. The Orbiter carried three experiments:

1. the Thermal Emission Imaging System (Themis), a high resolution camera and a thermal infrared imaging spectrometer to map mineralogy and morphology of the Martian surface;
2. the Gamma Ray Spectrometer (GRS) to undertake global mapping of the elemental composition of the surface and to determine the abundance of hydrogen in the shallow subsurface; and
3. the Mars Radiation Environment Experiment (MARIE), to investigate the near-space radiation environment in relation to the radiation risk to human explorers.

During its primary mission, which lasted a full Mars year (23 months), it provided scientists with the most detailed complete global maps of Mars to date, with daytime and nighttime infrared images at a resolution of 100 meters revealing details of frozen water deposits and surface textures and minerals. It also provided a communications relay for the Spirit and Opportunity Mars rovers which had been delivered to Mars by the Mars Explorer Rover-A (2003 027A) and Mars Explorer Rover-B (2003 032A).

In August 2004 NASA approved an extension of the mission until September 2006 to provide an additional Mars year of information. In addition the spacecraft assisted in March 2006 the Mars Reconnaissance Orbiter (2005 029A) mission by monitoring atmospheric conditions at the arrival of that spacecraft. Odyssey also analysed potential landing sites for the Phoenix (2007 034A) mission.
2001 015A (26745)
Name:  Gsat-1
Country:  India
Launch date:  18 April 2001
Re-entry:  in orbit
Launch site:  Sriharikota
Launch vehicle:  GSLV Mk.I
Orbit:  33806 x 35665 km, inclination: 1°

Experimental communications satellite based on the Insat-2 platform. The 1540 kg satellite was fitted with a transponder in the S band, two transponders in the C band, a heat-pipe radiator experiment, a fibreoptics gyro experiment, a fast recovery star sensor as well as experimental ion thrusters.

The intended geostationary orbit was not attained as the third stage of the launch vehicle ran out of fuel.

The launch was also intended as the first developmental test flight of the GSLV to validate the vehicle design and its performance parameters as well as the associated ground infrastructure.
2001 016A (26747)
Name: STS-100
Country: USA
Launch date: 19 April 2001
Re-entry: 1 May 2001
Launch site: Cape Canaveral
Launch vehicle: STS
Orbit: 377 x 394 km, inclination: 51.6°

Crewed spaceflight with astronauts K. Rominger (Cmdr.), J. Ashby (Pilot), S. Parazynski, J. Phillips, C. Hadfield (Canada), U. Guidoni (ESA) and Y. Lonchakov (Russia) (all Mission Specialists), using the orbiter Endeavour as described for 1981 034A. The objective was to undertake the International Space Station (ISS)-6A mission. The payload included the Rafaello Multi-Purpose Logistics Module (MPLM) as described for 2001 010A, carrying nine scientific investigations to the space station.

In addition the orbiter carried:
1. the Space Station Remote Manipulating System (SSRMS), fitted on a Spacelab pallet (F004) as described for 1983 116A and consisting of:
   - the Canadarm2, which had a length of 17.59 m and was able to move a mass of 100 tons. It also had the capability to move end-over-end about the station's exterior, in inchworm fashion, using either end to manipulate cargo. It provided electrical power and computer connections with the objects it moved;
   - the Special Purpose Dexteroous Manipulator (SPDM), a smaller, highly advanced detachable two-armed robot that placed on the end of the space arm to perform sophisticated operations including installing and removing small payloads, such as batteries, power supplies and computers. It also handled tools, such as specialized wrenches and socket extensions, for delicate maintenance and servicing tasks, provide power and data connectivity to payloads, as well as manipulate, remove and inspect scientific payloads. The SPDM was also equipped with lights, video, equipment, a tool platform and four tool holders;
   - the Mobile Remote Servicer Base System (MBS), a movable platform for Canadarm2 and the SPDM that slid along rails on the Space Station's main truss structure to transport Canadarm2 to various points on the Station. It was equipped with four Power Data Grapple Fixtures and a Latching End Effector to hold payloads (or alternatively, the SPDM);
2. The Ultra High Frequency (UHF) antenna which was attached to the Destiny module;
3. Developmental Test Objective (DTO) experiments as described for STS-1 (1981 034A):
   - DTO-261: International Space Station On-orbit Loads Validation;
   - DTO-262: On-Orbit Bicycle Ergometer Loads Measurement;
• DTO-263: Shuttle Automatic Reboost Tuning;
• DTO-264: International Space Station On-Orbit Loads Validation;
• DTO-257: Structural Dynamics Model Validation;
• DTO-700-14: Single String Global Positioning System;
• DTO-700-22: Crew Return Vehicle (CRV) Space Integrated Global Positioning System/Inertial Navigation System (SIGI);
• DTO-805: Crosswind Landing Performance;
• DTO-HTD-1403: Micro-Wireless Instrumentation System (Micro-WIS);

4. Detailed Supplementary Objective (DSO) experiments as described for STS-1 (1981 034A):
   • DSO-493: Monitoring Latent Virus Reactivation and Shedding in Astronauts;
   • DSO-496: Individual Susceptibility to Post Space Flight Orthostatic Intolerance;
   • DSO-498: Space Flight and Immune Function; and
   • DSO-499: Eye Movements and Motion Perception Induced by Off-Vertical-Axis Rotation (OVAR) at Small Angles of Tilt After Spaceflight.

The first EVA, on 22 April 2001, by Hadfield and Parazynski, lasted 7 hours, 10 minutes, during which the UHF antenna was installed on the Destiny module and the Canadarm2 was prepared for deployment. Parazynski and Hadfield made a second EVA of 7 hours, 40 minutes on 24 April 2001 during which they completed the attachment of the Canadarm2. In addition the crew unloaded the Rafaello module, including transfer of the two experiment racks, called Expedite the Processing of Experiments to Space Station (EXPRESS) racks which were installed in the station's Destiny module.
Later on 24 April 2001, the hatches between the orbiter and the space station were opened and the Canadarm2 was deployed and attached onto a fixture on the space station. After that the Rafaello module was attached to the docking port on the Unity module.
The Rafaello module was undocked again on 27 April 2001 and returned into the payload bay.
The orbiter undocked on 29 April 2001 and landed at Edwards AFB after a flight of 11 days, 21 hours, 30 minutes.
Crewed spaceflight with cosmonauts T. Musabayev (Cmdr.), Y. Baturin (Fl. Eng.) and D. Tito (Passenger) (USA) using a Soyuz TM spacecraft as described for 1986 035A. The mission was also known as ISS-2S. Their call sign was Kristall.

The spacecraft docked with the Zarya nadir port of ISS (1998 067A) on 30 April 2001.

The crew returned to Earth on 6 May 2001 with Soyuz TM-31 (2000 070A). Their flight duration had been 5 days, 22 hours, 4 minutes.

On 19 October 2001 Soyuz TM-32 was moved from the Zarya nadir port to the Pirs nadir port in a flight that took 16 minutes.

On 31 October 2001 the spacecraft undocked and carried the Soyuz TM-33 (2001 048A) crew consisting of V. Afanasyev, K. Kozeyev and C. Haignere, back to Earth. The spacecraft landed 177 km south east of Dzhezkazgan.
2001 018A (26761)
Name: XM-1 Roll
Country: USA
Launch date: 8 May 2001
Re-entry: in orbit
Launch site: Odyssey
Launch vehicle: Zenit 3SL
Orbit: geostationary at 85°W

Communications satellite as described for XM-2 (2001 012A). The launch took place at 154°W, 0°, south of Hawaii. In December 2015 it was relocated to 39°W.
Communications satellite owned by Pan American Satellite and based on the Boeing BSS-601HP platform. The satellite, which had a mass of 3772 kg, carried 24 transponders in the C band and 24 transponders in the Ku band.

On 1 February 2007 the satellite was renamed as Intelsat-10 and in December 2012 it was moved to 47.5°E.
The Geosynchronous Lightweight Technology Experiment (GeoLite) satellite was a technology satellite for the National Reconnaissance Office (NRO) also known as NROL-17 and USA-158. Built by TRW using the T-310 platform, the 635 kg satellite tested the feasibility of laser communications technology between an orbiting satellite and an Earth ground station. The satellite is believed to have been located over the Indian Ocean.
Name: Progress M1-6  
Country: Russia  
Launch date: 20 May 2001  
Re-entry: 22 August 2001  
Launch site: Baikonour  
Launch vehicle: Soyuz FG  
Orbit: 270 x 316 km, inclination: 51.6°

Cargo transfer spacecraft as described for 2000 005A. Progress M1-6 docked with the rear Zvezda docking port of ISS (1998 067A) on 23 May 2001. The flight was also known as ISS-4P. It undocked on 22 August 2001.
2001 022A (26775)
Name: Kosmos-2377
Country: Russia
Launch date: 29 May 2001
Re-entry: 10 October 2001
Launch site: Plesetsk
Launch vehicle: Soyuz U
Orbit: 176 x 382 km, inclination: 67.1°

Yantar 4K2 military reconnaissance satellite as described for 1981 080A.
2001 023A (26818)
Name: Kosmos-2378
Country: Russia
Launch date: 8 June 2001
Re-entry: in orbit
Launch site: Plesetsk
Launch vehicle: Kosmos 3M
Orbit: 964 x 1010 km, inclination: 82.9°

Parus military navigational satellite as described for 1974 105A.
2001 024A (26824)
Name: Intelsat-901
Int. Agency: Intelsat
Launch date: 9 June 2001
Re-entry: in orbit
Launch site: Kourou
Launch vehicle: Ariane 44L
Orbit: geostationary at 18°W

Communications satellite built by Space Systems/Loral using the LS-1300 platform. The 4723 kg satellite carried 44 transponders in the C band and 12 transponders in the Ku band.
2001 025A (26853)
Name: Astra-2C
Country: Luxembourg
Launch date: 16 June 2001
Re-entry: in orbit
Launch site: Baikonour
Launch vehicle: Proton K/DM-3
Orbit: geostationary at 28.4°E

Communications satellite for Societe Europeenne des Satellites. The 3728 kg satellite was based on a Boeing BSS-601HP platform and was fitted with 32 transponders in the Ku band. It was moved to 60°E in August 2015.
Communications satellite owned by ICO Global Communications, initially a subsidiary of Inmarsat and later renamed New ICO, using a Boeing BSS-601M platform for mobile communications. The satellite was the first of a planned constellation of 10 satellites in a medium Earth orbit. The satellite had a mass of 2750 kg and carried equipment to provide 163 spot beams in the 2 Ghz band.

The company failed in August 2009 but the satellite was kept operational, albeit without usage, until March 2012, when it was decided to abandon the satellite.

In 2013 Sirion, an Australian company, purchased capacity on the satellite.
NASA's Microwave Anisotropy Probe (MAP) executed a number of lunar fly-bys the spacecraft to achieve an orbit at the L2 Libration point, 1.5 million km from Earth. From this location it observed the dark extragalactic sky with differential microwave radiometers using two 1.5-meter reflectors working at 22 to 90 GHz. It also measured fluctuations in the cosmic 3°K microwave background down to 35 micro°K on scales of down to 0.2°K. The spacecraft had a dry mass of 768 kg. It was also known as Midex-2 and Explorer-80.
Crewed spaceflight with astronauts S. Lindsey (Cmdr.), C. Hobaugh (Pilot), J. Kavandi, M. Gernhardt, J. Reilly (all Mission Specialists), using the orbiter Atlantis as described for 1981 034A. The objective was to undertake the International Space Station (ISS)-7A mission. The payload included the Joint Airlock and High Pressure Gas Assembly. The Joint Airlock, a 6.14m long and 4.00m diameter unit was built by Boeing and provided an EVA capability from the space station for both US and Russian EVA suits. It was carried on two Spacelab pallets as described for 1983 116A. In orbit it was renamed Quest. The High Pressure Gas Assembly augmented the Service Module’s gas re-supply systems.

This mission completed Phase 2 of the ISS programme.

The payload also included:

1. Developmental Test Objective (DTO) experiments as described for STS-1 (1981 034A):
   - DTO-261: International Space Station On-orbit Loads Validation;
   - DTO-262: On-Orbit Bicycle Ergometer Loads Measurement;
   - DTO-264: International Space Station On-Orbit Loads Validation;
   - DTO-692: International Space Station Waste Collector Subsystem Refurbishment;
   - DTO-700-14: Single String Global Positioning System;
   - DTO-805: Crosswind Landing Performance;
   - DTO-HTD-1403: Micro-Wireless Instrumentation System (Micro-WIS);

2. Detailed Supplementary Objective (DSO) experiments as described for STS-1 (1981 034A):
   - DSO-493: Monitoring Latent Virus Reactivation and Shedding in Astronauts;
   - DSO-496: Individual Susceptibility to Post Space Flight Orthostatic Intolerance;
   - DSO-498: Space Flight and Immune Function;
   - DSO-634: Sleep-Wake Actigraphy and Light Exposure During Spaceflight; and
• DSO-635: Spatial Reorientation Following Spaceflight.
On 15 July 2001 astronauts Gernhardt and Reilly made a spacewalk of 5 hours, 59 minutes during which they
removed thermal covers from Quest and added handrails to it and to the O₂/N₂ tanks stored on the Spacelab pallets. The Station’s Canadarm 2 moved Quest from the payload bay and attached it to the Unity module.
The astronauts made a second spacewalk on 18 July 2001 during which they installed the various tanks to
the Quest module. That spacewalk lasted 6 hours, 29 minutes. This was finally followed by the first EVA through the Quest module, when Gernhardt and Reilly made a 4 hours, 2 minutes spacewalk to install some more equipment and undertake some other activities.
The orbiter undocked on 22 July 2001. It landed at the Kennedy Space Centre after a flight of 12 days, 18
hours, 35 minutes.
The Advanced Relay and Technology Mission satellite (Artemis) demonstrated new communications techniques and services. The payload consisted of the Opale optical terminal of the Satellite In Orbit Laser experiment (Silex) laser beam optical communications experiment to provide high rate data links between low-Earth orbiting satellites within a framework of future data relay satellites, a S band high performance multiple access instrument to prepare for an operational data relay system and a L band mobile payload to demonstrate satellite communication for European land vehicles.

In addition it carried a navigation payload which was part of the European Geostationary Navigation Overlay Service (EGNOS) programme. EGNOS was an augmentation system designed to provide greater accuracy for users of space based navigational systems such as GPS and GLONASS. The EGNOS system consisted of the space segment, ground segment and user segment. The two other satellites used for the EGNOS system were Inmarsat 3-1 (1996 020A) and Inmarsat 3-2 (1996 053A).

The 3100 kg Artemis satellite also demonstrated an electrical ion engine for station keeping. Due to a launcher malfunction the satellite was initially in an orbit of 590 x 17487 km, with an inclination of 2.94°. Using on-board propellant it was eventually placed in a 31,000 km circular orbit with an inclination of 0.85° following which ion propulsion slowly increased the orbit to a geostationary orbit which was reached in January 2003.

With the completion of the scientific programme, the satellite was sold to Avanti in October 2013.
2001 029B (26864)
Name: B Sat-2B
Country: Japan
Launch date: 12 July 2001
Re-entry: 28 January 2014
Launch site: Kourou
Launch vehicle: Ariane 5G
Orbit: 591 x 17470 km, inclination: 2.9°

Communications satellite as described for 2001 011B. Propulsion problems with the launch vehicles final stage the satellite ended up in an orbit lower than intended for the transfer into a geostationary orbit at 110°E.
<table>
<thead>
<tr>
<th>Name</th>
<th>Cosmos 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country</td>
<td>USA</td>
</tr>
<tr>
<td>Launch date</td>
<td>20 July 2001</td>
</tr>
<tr>
<td>Re-entry</td>
<td>n.a.</td>
</tr>
<tr>
<td>Launch site</td>
<td>Barents Sea</td>
</tr>
<tr>
<td>Launch vehicle</td>
<td>Volna</td>
</tr>
<tr>
<td>Orbit</td>
<td>failed</td>
</tr>
</tbody>
</table>

Launched from the submerged submarine Borisoglebsk, the Volna launch vehicle was to deploy an inflatable frame work with a pair of fan-like solar sails. The mission, which was undertaken for the Planetary Society of the USA, was a failure as the payload separated too early from the third stage. The flight was intended to be sub-orbital.
2001 030A (26867)
Name: Molniya 3-51
Country: Russia
Launch date: 20 July 2001
Re-entry: in orbit
Launch site: Plesetsk
Launch vehicle: Molniya M
Orbit: 255 x 40811 km, inclination: 62.7°

Communications satellite as described for 1974 092A. Also referred to as Molniya 3-K.
2001 031A (26872)
Name: GOES-12
Country: USA
Launch date: 23 July 2001
Re-entry: in orbit
Launch site: Cape Canaveral
Launch vehicle: Atlas IIA
Orbit: geostationary at 90°W

Meteorological satellite as described for 1994 022A. The satellite also carried a Solar Soft X-ray imager.
Name: Koronas F  
Country: Russia  
Launch date: 31 July 2001  
Re-entry: 6 December 2005  
Launch site: Plesetsk  
Launch vehicle: Tsyklon 3  
Orbit: 499 x 540 km, inclination: 82.5°

Also known as AUOS-SM-KF, Koronas F (the ‘F’ designated FIAN, the Lebedev Institution) studied the solar physics. It was fitted with instruments observing solar radiation in a spectrum ranging from radiowaves to gamma rays. Built by NPO Yuzhnoye, the satellite had a mass of 2260 kg and used the Automatic Universal Orbital Station (AUOS)-SM satellite bus as described for 1994 014A.

The instruments on board the spacecraft were:

1. the DIFOS instrument to monitor fluctuations in light intensity in six optical bands (350, 500, 650, 850, 1,100, and 1,500 nm) to obtain a spectrum of normal mode seismic oscillations in the Sun;
2. the SORS instrument which monitored solar radio bursts of II, III, and IV types, in the range 0.1-30 MHz;
3. the ZENIT instrument, a coronograph to monitor the corona out to six solar radii in the 750-850 nm band, at a resolution of 1 arc-min;
4. the SUFR instrument, a UV radiometer operating in the 0.1-130 nm band to capture the full disk emission from the Sun, in the dynamic range 0.1-30 erg/sq-cm/sec;
5. the VUSS instrument which monitored the intensity of full-disk, 121.6 nm Lyman-Alpha line in a band of 5 nm width, with a dynamic range of 0.1-30 erg/sq-cm/sec;
6. the DIAGENESS instrument to scan the Sun's active regions and flares at five arc-sec resolution in the bands at a temporal resolution of 0.1-10 seconds. It monitored the full disk X-ray emissions in the bands 2-8 keV, and 10-160 keV at a temporal resolution of about one second;
7. the RESIK instrument, a bent crystal X-ray spectrometer to monitor the a range of bands;
8. the IRIS experiment, monitoring hard X-ray flares in the 2.0-200 keV energy range at temporal resolution of 0.01-2.5 seconds, with a sensitivity of 10 nanoergs/sq-cm/sec;
9. the HELIKON instrument which captured high energy X-rays and gamma rays in the range 10 keV-8 MeV with two detectors, one pointing to the Sun and the other in the anti-solar direction;
10. the SKL instrument consisting of three components: SONG to measure solar gamma rays, neutrons and electrons, MKL to capture protons and electrons, and SKI-3 is to ascertain the chemical composition in ions;
11. the RES-K instrument, an X-ray spectroheliograph to provide high-resolution images of the solar disk;
12. the RPS instrument, an X-ray spectrometer covering the 3-30 keV band in steps of 1.5 keV; and
13. the SPR-N instrument, an X-ray polarimeter to measure nonthermal/synchrotron emissions in solar flares at a sensitivity of one microerg/sq-cm/sec.
2001 033A (26880)
Name: IMEWS-21
Country: USA
Launch date: 6 August 2001
Re-entry: in orbit
Launch site: Cape Canaveral
Launch vehicle: Titan 402B
Orbit: geostationary at 69.5°E

Military early warning satellite as described for 1989 046A. The satellite was also known as USA-159. It was moved to 131°E in September 2014.
The objective of the Genesis mission, the fifth mission in NASA’s Discovery programme, was to collect particles of the solar wind and bring it back to Earth. The 633 kg spacecraft carried:

1. solar wind collector arrays made of materials such as diamond, gold, silicon and sapphire, designed to entrap the solar wind particles;
2. an ion monitor that recorded the speed, density, temperature and composition of the solar wind;
3. an electron monitor to make similar measures of the electrons in the solar wind; and
4. an ion concentrator which separated oxygen and nitrogen in the solar wind.

On 16 November 2001 the spacecraft arrived at the L1 Libration point where it collected 10 to 20 micrograms, less than a few grains of salt, of the invisible charged particles.

On 1 May 2004 it flew again past Earth at an altitude of 386,000 km, sending it on a trajectory which eventually brought the spacecraft on 8 September 2004 to an altitude of 242 km when the re-entry capsule separated for a mid-air recovery over Utah. The capsule was to be caught with a helicopter but as both the chute and the parafoil failed to deploy, it crashed into the desert. Scientists, however, managed to retrieve sufficient solar wind particles to meet most of the scientific objectives.
The main spacecraft was redirected into a new orbit of 245 x 1350949 km with an inclination of 52°. In 2003 it had been proposed to place the spacecraft into a solar orbit near Earth from which it could undertake solar wind observations as part of a new mission called Exodus. However, the Exodus proposal was not accepted.
Crewed spaceflight with astronauts S. Horowitz (Cmdr.), R. Sturckow (Pilot), D. Barry, P. Forrester (all Mission Specialists), using the orbiter Discovery as described for 1981 034A. Also on board were the next permanent crew for ISS: F. Culbertson, V. Dezhurov (Russia) and M. Tyurin (Russia).

The objective was to undertake the International Space Station (ISS)-7A.1 mission and the orbiter docked with the PMA-2 docking port of the International Space Station (1998 067A) on 12 August 2001.

The payload included the Leonardo Multipurpose Logistics Module (MPML) as described for 2001 010A, which carried a range of experiment racks for installation in the Destiny laboratory as well as a range of other equipment. Leonardo was moved from the Shuttle's payload bay with the Shuttle's robotic arm and attached to the Unity module on 13 August 2001.

The payload also included:

1. the Materials International Space Station Experiments (MISSE)-1 and -2, also known as S00-4, which were installed on the outside of the Quest module to undertake a range of materials and space exposure experiments;

2. Simplesat, which was released on 21 August 2001 as 2001 035B;

3. the Space Experiment Module (SEM)-10 as described for STS-80 (1996 065A) which on this flight facilitated Space Travel's Affect on Roots, Flowers In Space, Food for Earth and Space; Corn-Tomorrow's Food on Earth and in Space and Rusting in Space, Shirt and Shoes Required, Agrilaser, Space Laser Comm 2001, Different Types of Seeds, Stuck On Space, Sci-Five and Imaging Media and Radiation Shielding Experiment;

4. the Alkali Metal Thermal to Electric Converter (AMTEC), a technology experiment to investigate metals and metal alloys for use in high temperature energy conversion devices;

5. two Getaway specials as described for STS-3 (1982 022A):
   - G780: Cell Growth in Microgravity Getaway special, studying the germination of faba beans;
   - G774: Microgravity Smoldering Combustion (MSC) as described for STS-69 (1995 048A);

6. Developmental Test Objective (DTO) experiments as described for STS-1 (1981 034A):
   - DTO-700-14: Single String Global Positioning System;
   - DTO-701: Space Vision Laser Camera;
   - DTO-805: Crosswind Landing Performance;
7. Detailed Supplementary Objective (DSO) experiments as described for STS-1 (1981 034A):
   - DSO-498: Space Flight and Immune Function; and
   - DSO-635: Spatial Reorientation Following Spaceflight.

Simplesat, SEM-10, Getaway special G774, along with Advanced Carrier Equipment (ACE), an avionics system for these experiments, were also collectively referred to as Hitchhiker Experiments Advancing Technology (HEAT).

Barry and Forester made two EVAs on 16 August 2001 (6 hours, 16 minutes) and 18 August 2001 (5 hours, 29 minutes), during which they attached the MISSE as well as other equipment to the space station, including the Early Ammonia Servicer, a tank with additional coolant in case the space station’s cooling system would fail. The EAS was installed on the P6 truss on 16 August 2007. On 19 August 2001 the Leonardo module was returned into the payload bay and the orbiter undocked on 20 August 2001.

On the return to Earth, the orbiter carried the retiring crew of ISS: Y. Usachev, S. Helms and J. Voss who had arrived on STS-102 (2001 010A).

STS-105 landed at the Kennedy Space Centre after a flight of 11 days, 21 hours, 13 minutes. Usachev, Helms and Voss had been in space for 165 days, 4 hours, 10 minutes.
Simplesat was the prototype of a small satellite for educational institutions. With a mass of 52 kg, it was ejected from a Hitchhiker canister on board of STS-105 (2001 035A). It carried a GPS payload as well as a 30 cm telescope attached to a CCD camera system.
2001 036A (26890)
Name: Progress M-45
Country: Russia
Launch date: 21 August 2001
Re-entry: 22 November 2001
Launch site: Baikonour
Launch vehicle: Soyuz U
Orbit: 193 x 245 km, inclination: 51.7°

Cargo transfer spacecraft as described for 1989 066A. Progress M-45 docked at the rear Zvezda port of ISS (1998 067A) on 23 August 2001. The flight was also known as ISS-5P. It undocked on 22 November 2001.
2001 037A (26892)
Name: Kosmos-2379
Country: Russia
Launch date: 24 August 2001
Re-entry: in orbit
Launch site: Baikonour
Launch vehicle: Proton K/DM-2
Orbit: geostationary at 80°E

US-KMO military early warning satellite as described for 1984 031A.
The Laser Retroreflector Experiment (LRE) was used for geodesy experiments. A passive mirror ball with a mass of 87 kg, it was covered with 24 glass sheets and 126 prisms.
<table>
<thead>
<tr>
<th>2001 038B (26899)</th>
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<tbody>
<tr>
<td>Name: VEP-2</td>
</tr>
<tr>
<td>Country: Japan</td>
</tr>
<tr>
<td>Launch date: 29 August 2001</td>
</tr>
<tr>
<td>Re-entry: in orbit</td>
</tr>
<tr>
<td>Launch site: Tanegashima</td>
</tr>
<tr>
<td>Launch vehicle: H 2A-202</td>
</tr>
<tr>
<td>Orbit: 279 x 36212 km, inclination: 28.1°</td>
</tr>
</tbody>
</table>

The Vehicle Evaluation Payload (VEP)-2 carried instrumentation to monitor the performance of the H 2A launch vehicle. It remained attached to the second stage.
Name: Intelsat-902
Int. Agency: Intelsat
Launch date: 30 August 2001
Re-entry: in orbit
Launch site: Kourou
Launch vehicle: Ariane 44L
Orbit: geostationary at 55°E

Communications satellite as described for 2001 024A, but with 72 transponders in the C band and 22 transponders in the Ku band.
NOSS 3-1 was the first of a third generation of military ocean surveillance satellites as described for 1976 038A. Also known Gemini, NROL-13 and USA-160, it had a mass of 4740 kg. The third generation NOSS satellites were accompanied by only one sub-satellite. Observers have suggested that this sub-satellite was 2001 040C although this has been cataloged as USA-160 debris.
Name: Progress M-SO1
Country: Russia
Launch date: 14 September 2001
Re-entry: 27 September 2001
Launch site: Baikonour
Launch vehicle: Soyuz U
Orbit: 388 x 393 km, inclination: 51.6°

Cargo transfer spacecraft based on the Progress M1 spacecraft as described for 1989 066A. The normal cargo and fuel section were replaced by the Stikovochniy Otsek (SO)-1 (Docking Module 1). The flight was also identified as International Space Station (ISS)-4R.

Progress M-SO1 docked with the lower or Earth facing port of the Zvezda module of ISS (1998 067A) on 16 September 2001.

SO-1 was named Pirs. The airlock and docking module featured a large hatch, 1 m in diameter, allowing spacesuited cosmonauts and astronauts to exit and return to the station. The module also had a Soyuz TM/Progress M docking port that allowed an additional Soyuz TM or Progress M1 spacecraft to be docked. These docking ports were different the other ports on, for instance Zarya. Prior to the delivery of Pirs, the rotation of Soyuz TMs and the need to have one Soyuz TM permanently attached to the station, meant that any Progress M that was docked on the only available second docking port, had to be left floating in space for a while, until the Soyuz TM transfer was completed.

On the flight to the space station, Pirs carried cargo, including a second Strela deployable boom and an additional Orlan M spacesuit. The Pirs module was originally developed for the Mir-2 space station in the early nineties. It had a diameter of 2.2 m to fit in the standard payload bay of a Soyuz launcher.

The service module of Progress M-SO1 undocked on 26 September 2001.
---
Name: Orbview-4
Country: USA
Launch date: 21 September 2001
Re-entry: n.a.
Launch site: Vandenberg
Launch vehicle: Taurus 2110
Orbit: failed to orbit

Earth observation satellite as described for 1997 037A. The satellite failed to orbit as the first stage separation did not take place.
The Quick Total Ozone Mapping Spectrometer (QuikTOMS) satellite was to investigate the global ozone levels and determine the ozone depletion in the polar regions. It carried the Total Ozone Mapping Spectrometer (TOMS)-5 which originally was to have been flown on a Russian Meteor 3 satellite. The satellite failed to orbit as the first stage separation did not take place.
The Special Bus Design (SBD) was a 73 kg test of the Orbital Microstar satellite bus. The payload included the two Celestis-5 funeral capsules (Odyssey Flight) as described for 1997 017B. It was not intended to separate SBD from the upper stage of the launch vehicle. The satellite failed to orbit as the first stage separation did not take place.
Atlantic Bird-2 was a communications satellite owned by Eutelsat. Using an Alcatel Spacebus 3000B2 platform it carried 26 transponders operation in the Ku band. The satellite had a mass of 3150 kg. In March 2012 it was renamed as Eutelsat 8 West-A. It was subsequently moved to 12.6°W and renamed as Eutelsat 12 West-B.
Starshine-3 was a 90 kg satellite which was covered with 1500 aluminum mirrors. It was tracked visually by high schools across the USA and other countries. Also known as Oscar-43 and SO-43.
2001 043B (26930)
Name: Picosat
Country: USA
Launch date: 30 September 2001
Re-entry: in orbit
Launch site: Kodiak
Launch vehicle: Athena 1
Orbit: 790 x 798 km, inclination: 67.0°

Also known as STP P97-1, the 68 kg satellite carried the Polymer Battery Experiment (PBEX), the Ionospheric Occultation Experiment (IOX), the Coherent Electromagnetic Radio Tomography (CERT) experiment and the ultra-quiet platform OPPEX to conduct a vibration isolation experiment.
PCSat (for Prototype Communications satellite) was designed and built at the US Naval Academy. The 10 kg satellite carried an amateur radio transponder and was also known as Oscar-44 and NO-44.
Sapphire was a small satellite developed at Stanford University, to space qualify two sets of infrared horizon detectors as well as a digital camera and a voice synthesizer. It was also known as Oscar-45, Satellite Quick Research Testbed (SQUIRT)-1 and NO-45 and had a mass of 16 kg.
2001 044A (26934)
Name: Advanced KH 11-4
Country: USA
Launch date: 5 October 2001
Re-entry: in orbit
Launch site: Vandenberg
Launch vehicle: Titan 404B
Orbit: 150 x 1050 km, inclination: 97.9°

Military reconnaissance satellite as described for 1992 083A. Also known as USA-161 and NROL-14, the orbit was modified at a later date and was 410 x 850 km in September 2002.
2001 045A (26936)
Name: Raduga 1-6
Country: Russia
Launch date: 6 October 2001
Re-entry: in orbit
Launch site: Baikonour
Launch vehicle: Proton K/DM-2
Orbit: geostationary at 85°E

Military communications satellite as described for 1989 048A.
2001 046A (26948)
Name: SDS 2-3
Country: USA
Launch date: 11 October 2001
Re-entry: in orbit
Launch site: Cape Canaveral
Launch vehicle: Atlas IIAS
Orbit: 500 x 39850 km, inclination: 63.4°

Military data relay satellite as described for 1996 038A. It was also known as USA-162, NROL-12 and Aquila. It may have been placed in a geostationary orbit. Based on amateur observations it was moved from 144°W to 141°W in early 2013 and to 127°W I March 2015.
Remote sensing satellite as described for 2000 074A.
Crewed spaceflight with cosmonauts V. Afanasyev (Cmdr.), K. Kozeyev (Fl. Eng.) and C. Haignere (Fl. Eng.) (ESA) using a Soyuz TM spacecraft as described for 1986 035A. The mission was also known as ISS-3S. Their call sign was Derbent although France called the mission Andromede. The experiments included in the Andromede mission were:

1. the Cognitive process for 3-D orientation perception and navigation in weightlessness (COGNI) experiment;
2. AQUARIUS, an investigation into the embryonic development of amphibians in weightlessness;
3. the evaluation of a multi-purpose bag specially designed to assist an astronaut to manipulate objects in a weightless environment (MIRSUPIO);
4. the Granada Crystallisation Facility (GCF);
5. Lightning and Sprites Observations (LSO);
6. IMEDIAS, the observation of environmental phenomena;
7. the PKE-Nefedov extended research programme into the growth of particles under microgravity conditions;
8. the study of particle spectra and their influence on advanced components (SPICA-S); and
9. the study of the evolution of cardiovascular deconditioning phenomena under weightless conditions (CARDIOSCIENCE).

The spacecraft docked with the Zarya nadir port of ISS (1998 067A) on 23 October 2001. The crew returned to Earth on 31 October 2001 with Soyuz TM-32 (2001 017A). Their flight duration had been 9 days, 18 hours, 59 minutes.

On 20 April 2002 Soyuz TM-33 was moved to the Pirs nadir port. On 5 May 2002 the spacecraft undocked and carried Y. Gidzenko, R. Vittori and M. Shuttleworth, who had arrived on Soyuz TM-34 (2002 020A), back to Earth. They landed 25 km south-east of Arkalyk.
The Technology Experiments Satellite (TES) demonstrated critical technologies for use in future missions planned for launch with PSLV. The 1108 kg satellite carried experimental attitude control and reaction control equipment, an improved satellite positioning system and a panchromatic camera for remote sensing.
The Project for On Board Autonomy (PROBA)-1 satellite had a mass of 94 kg. It carried:
1. the Compact High Resolution Imaging Spectrometer (CHRIS) which had a resolution of 25 m;
2. the High Resolution Camera (HRC) which had a resolution of 10m;
3. the Space Radiation Environment Monitor (SREM) which measured electron and proton fluxes as well as the total dose of radiation received;
4. the Miniaturised Radiation Monitor (MRM) to measure radiation; and
5. the Debris in Orbit Evaluator (DEBIE), to measure mass, impact speed and penetration power of dust in the environment around the spacecraft.
The Bispectral Infrared Detector (Bird) satellite tested small satellite technology and also carried an infrared detector for the detection of forest fires and volcanoes. It had a mass of 91 kg.
2001 050A (26970)
Name: Molniya 3-52
Country: Russia
Launch date: 25 October 2001
Re-entry: 6 December 2011
Launch site: Plesetsk
Launch vehicle: Molniya M
Orbit: 646 x 40658 km, inclination: 62.9°

Communications satellite as described for 1974 092A.
<table>
<thead>
<tr>
<th>Name:</th>
<th>Progress M1-7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country:</td>
<td>Russia</td>
</tr>
<tr>
<td>Launch date:</td>
<td>26 November 2001</td>
</tr>
<tr>
<td>Re-entry:</td>
<td>20 March 2002</td>
</tr>
<tr>
<td>Launch site:</td>
<td>Baikonour</td>
</tr>
<tr>
<td>Launch vehicle:</td>
<td>Soyuz FG</td>
</tr>
<tr>
<td>Orbit:</td>
<td>230 x 244 km, inclination: 51.6°</td>
</tr>
</tbody>
</table>

Cargo transfer spacecraft as described for 2000 005A. Progress M1-7 docked with the rear Zvezda docking port of ISS (1998 067A) on 28 November 2001. The flight was also known as ISS-6P. The docking partially failed because of a rubber seal left over from Progress M-45 (2001 036A) that blocked the docking mechanisms. On 3 December 2001 Dezhurov and Tyurin made an EVA of 2 hours, 46 minutes during which they cleared the docking port after which the docking was completed.

In addition to the cargo, the spacecraft carried the Kolibri 2000 microsatellite (2001 051C) which was released after that the spacecraft undocked on 20 March 2002.
Kolibri 2000 was a 21 kg scientific micro satellite to study the sporadic increases of intensity of solar and cosmic radiation affecting the Earth’s radiation belts, as well as study the impact of solar plasma ejected from the surface of the Sun. School students in Russia and Australia participated in the programme. It carried a particle and electromagnetic field analyser and an magnetometer, as well as radio equipment operating in the 145/435 Mhz band. The satellite, which was also known as Radio-21, was released from Progress M1-7 (2001 051A).
2001 052A (26985)
Name: Direc TV-4S
Country: USA
Launch date: 27 November 2001
Re-entry: in orbit
Launch site: Kourou
Launch vehicle: Ariane 44LP
Orbit: geostationary at 101°W

Direct television broadcasting satellite owned by Hughes and based on the Boeing BSS-601HP platform. The satellite, which had a mass of 2100 kg, carried 38 transponders operating in the Ku band.
2001 053A (26987)
Name: Kosmos-2382
Country: Russia
Launch date: 1 December 2001
Re-entry: in orbit
Launch site: Baikonour
Launch vehicle: Proton K/DM-2
Orbit: 19114 x 19144 km, inclination: 64.8°

The Glonass M navigational satellite, was an improved version of the Glonass navigational satellite as described for 1982 100A. Also known as Uragan M, the satellites had an increased lifetime of seven years.
2001 053B (26988)
Name: Kosmos-2381
Country: Russia
Launch date: 1 December 2001
Re-entry: in orbit
Launch site: Baikonour
Launch vehicle: Proton K/DM-2
Orbit: 18690 x 19119 km, inclination: 64.8°

Glonass navigational satellite as described for 1982 100A.
2001 053C (26989)
Name: Kosmos-2380
Country: Russia
Launch date: 1 December 2001
Re-entry: in orbit
Launch site: Baikonour
Launch vehicle: Proton K/DM-2
Orbit: 19113 x 19156 km, inclination: 64.8°

Glonass navigational satellite as described for 1982 100A.
Crewed spaceflight with astronauts D. Gorie (Cmdr.), M. Kelly (Pilot), L. Godwin, D. Tani (Mission Specialists) and ISS EX-4 crew Y. Onufriyenko (Russia, Commander), astronaut C. Walz and D. Bursch (both USA), using the orbiter Endeavour as described for 1981 034A. The objective was the International Space Station (ISS)-Utilization Flight (UF)-1 mission. This mission marked the commencement of the scientific programmes on ISS.

The payload included the Rafaello Multi-Purpose Logistics Module (MPLM) as described for 2001 010A, carrying eight Resupply Stowage Racks and four Resupply Stowage Platforms with equipment and experiments to the space station.

In addition the orbiter carried:

1. the Avian Development Facility, to test an incubator designed for space experiments that use Japanese quail eggs. In this mission it was used to undertake two experiments to study the effect of the lack of gravity on the development of embryos and to study the effect of spaceflight on skeletal development;

2. the Commercial Biomedical Testing Module Experiment, to study osteoporosis using laboratory mice;

3. Starshine-2 (2001 054B), a geodetic satellite which was deployed on 16 December 2001;

4. the Capillary Pumped Loop Experiment (CAPL)-3, a development of the Capillary Pump Loop (CPS) experiment as described for STS-51D (1985 028A);

5. Prototype Synchrotron Radiation Detector (PSRD), to measure cosmic ray background data in support of the development of the Alpha Magnetic Spectrometer, an International Space Station payload;

6. the Collision into Dust Experiment (COLLIDE)-2, a follow on from a similar experiment flown on STS-90 (1998 022A) to conduct low-velocity impact experiments in microgravity;

7. six Getaway special payloads as described for STS-3 (1982 022A):
   - G761: Argentine Experiment Package, seven experiments consisting of the Transport Fluids in Non-Circular Tubing Experiment, the Surface Vibration of Water Drops Experiment, Migration of Drops and Bubble in Microgravity, Exposure of Seeds to Space, Crystal Formation and Growth in a Microgravity Environment, Maximum Accelerations Register and Geophysical Fluids Movement;
- G775: Microgravity Smoldering Combustion (MSC) experiment;
- G221: four experiments by Utah State University studying Nucleic Boiling, Chemical Units Process, Crystal Growth and Microwaved Popcorn and Seeds;
- G730: Weak Convection Influencing Radial Segregation;
- G064: three experiments from Penn State University: the PSU Germinator I, a Magnetometer and an Orbital Debris Experiment;
- G785: a test of a miniature two-stage pulse tube cryocooler;
- a number of student experiments stored in Space Experiment Module canisters SEM-11 as described for STS-80 (1996-065A);
  - Restraint Release Using Melting Wire Experiment (RESUME) an Argentinean experiment testing release mechanisms for fastening deployable systems in spacecraft;
  - Aria-3, a series of 22 experiments focussing on the effect of space on Australian flora and fauna;
  - Effect of Weightlessness on the Development Cycle in Gypsy Moth, a Moroccan experiment;
  - Portugal - Unified Learning through Space & Research (PULS'R), testing the modification of Portuguese and Mediterranean plant seeds;
  - Cristanar, an Argentinean experiment to study microgravity effects on certain crystals;
  - Three-Dimensional Resonance Modes in Microgravity, to study the effect of microgravity on a wax like substance suspended in a sodium silicate solution;
  - Electro-Deposition of CuSO4;
  - SISTEM, to study the effect of the space environment on subsequent generations of seeds flown in space;
  - Artemia Space Launch Experiment, to see how microgravity affects the rate of hatching and development of brine shrimp;
- a number of student experiments stored in Space Experiment Module canisters SEM-12 as described for STS-80 (1996-065A);
  - Space FLZ-ics, an experiment using yeast cells in a closed fermentation chamber;
  - Blast Off, to study the effect of the space environment on selected materials;
  - A study on the Role of Adhesives in Entombed Hybrid Patches;
  - The Effect of the Space Environment on Shape Memory Alloy;
  - Medium Movement, looking at movement of a range of spheres during spaceflight;
  - The Florida-Mars Connection, a plant experiment to see if they can grow in simulated Martian soil;
  - Sprouting Seeds, to investigate the effect of the space environment on seeds;
  - Neurospora Cresse on Bread in Space, to study how the space environment affects organisms harmful to food;
  - Endeavour, a number of smaller seed and bacterial experiments;
  - Space Soy, Generation GappED, to determine how soy will grow after seeds have been exposed to space;
- a number of student experiments stored in Space Experiment Module canisters SEM-15 as described for STS-80 (1996-065A);
  - Invertebrates in Microgravity, using the eggs of Edith’s Checkerspot butterflies;
  - MEDLAB, to study the effects on animal tissue in space;
  - Magnetic Stars, to investigate the reaction of magnets in space;
  - Magnets and the Magnetosphere, to investigate how spaceflight affects magnetic items;
  - Folger McKinsey Space Owls, to study the effect of the space environment on a range of materials;
  - Aria-4, studying the effects of space on 22 biological samples;
  - Soothing, Minty and Fresh on ISS, studying the effect of the space environment on everyday material such as dental gum, cough drops etc.;
  - The Effects of Environmental Conditions on Soil and Water;
  - From Anthracite to Space Flight, to study the effect of spaceflight on a range of anthracite derived products;
  - Countdown to Wildflowers, to study the effect of space on wildflower seeds;
11. Developmental Test Objective (DTO) experiments as described for STS-1 (1981 034A):
   • DTO-262: On-Orbit Bicycle Ergometer Loads Measurement;
   • DTO-700-14: Single String Global Positioning System;
   • DTO-700-22: Crew Return Vehicle (CRV) Space Integrated Global Positioning System/Inertial Navigation System (SIGI);
   • DTO-805: Crosswind Landing Performance;

12. Detailed Supplementary Objective experiments as described for STS-1 (1981 034A):
   • DSO-490: Bioavailability and Performance Effects of Promethazine During Space Flight;
   • DSO-498: Space Flight and Immune Function;
   • DSO-500: Space Flight-Induced Reactivation of Latent Epstein-Barr Virus;
   • DSO-503S: Test of Midodrine as a Countermeasure Against Postflight Orthostatic Hypertension; and
   • DSO-632: Pharmacokinetics and Contributing Physiologic Changes During Spaceflight.

CAPL-3, Starshine-2, COLLIDE-2, PSRD, SEM-11, SEM-12, SEM-15 and Getaway special G761, were also collectively referred to as Multiple Application Customized Hitchhiker-1 (MACH-1).

The orbiter docked with the PMA-2 docking port of the International Space Station (1998 067A) on 7 December 2001.

On 8 December 2001 the Rafaello module was attached to the docking port on the Unity module. It was undocked again on 14 December 2001 and returned into the payload bay.

On 10 December 2001 Godwin and Tani made an EVA that lasted 4 hours, 11 minutes, during which they installed thermal blankets on solar arrays as well as undertook several other supplementary tasks.

The orbiter undocked on 15 December 2001 and landed at Edwards AFB after a flight of 11 days, 19 hours, 35 minutes. On the return flight the orbiter took F. Culbertson, V. Dezhurov and M. Tyurin, who had arrived on STS-105 (2001 035A) back to Earth. They had been in space for 129 days, 7 hours, 45 minutes.
Starshine-2 was a geodetic satellite covered by 845 mirrors similar to Starshine-1 (1999 030B). It was deployed by STS-108 (2001 054A). The satellite was observed by schools students across the Earth.
2001 055A (26997)
Name: Jason-1
Country: France
Launch date: 7 December 2001
Re-entry: in orbit
Launch site: Cape Canaveral
Launch vehicle: Delta 7920-10C
Orbit: 1328 x 1340 km, inclination: 66.0°

Jason-1 was a joint French/NASA mission as a follow-up for the Topex/Poseidon (1992 052A) satellite mission. The satellite used a French Proteus modular platform and had a mass of 472 kg. It carried the Poseidon 2 dual frequency radio altimeter to measure ocean surface movements and ocean currents. This data provided an understanding of the effect of oceans on long term climatic changes. Also on board were a radiometer, the Doris package, GPS receivers and several laser reflectors, all of which were used to determine the satellite's position with an accuracy of 15 cm. Most of the transmitters ceased to operate in September 2005 and the final one ceased on 21 June 2013, after which the spacecraft was abandoned.
The Thermosphere Ionosphere Mesosphere Energetics and Dynamics (TIMED) satellite studied solar and auroral energy input, atmospheric cooling rates and atmospheric composition, temperature and wind profiles. The programme originally consisted of two satellites which would have concentrated on the region between 60 km and 180 km altitude, a region too high for balloon carried instruments and too low for satellites. The satellites would have used 95° and 49° inclination orbits with a perigee of just 130 km and an apogee of 9000 km to investigate this region. To prevent them from burning up in the atmospheres at the lower altitudes, the vehicles would be aerodynamically shaped and be fitted with a propulsion unit. The programme was later modified to a single satellite. The 587 kg satellite carried:

1. the Global Ultraviolet Imager (GUVI) to measure the composition and temperature profiles of the region;
2. the Solar Extreme Ultraviolet Experiment (SEE) to study the solar X-ray, ultraviolet and far-UV radiation;
3. the Timid Doppler Interferometer (Tidi) to observe winds and temperature profiles; and
4. the Sounding of the Atmosphere using Broadband Emission Radiometry (Saber) experiment to measure atmospheric cooling rates, pressure, temperature and chemical constituents.

The length of the mission was originally for two years but since then the mission has been extended four times. The latest extension, in October 2010 saw the spacecraft collect data through to 2014. TIMED focused this time on a problem that has long puzzled scientists: differentiating between human-induced and naturally occurring changes in this atmospheric region. The extension also allowed TIMED to collect data beyond a full 11-year solar cycle.
2001 056A (27001)
Name:  Meteor 3M-1
Country:  Russia
Launch date:  10 December 2001
Re-entry:  in orbit
Launch site:  Baikonour
Launch vehicle:  Zenit 2
Orbit:  996 x 1016 km, inclination: 99.7°

Meteorological satellite based on the Meteor 3 as described for 1985 100A. The satellite carried the US Stratospheric Aerosol and Gas Experiment (SAGE)-3 instrument. Other instruments included a multispectral scanner, a multispectral imaging system, the Severyanin-M radar system and an atmosphere temperature and humidity sensing module.
Kompas-1 was an 80 kg satellite for the Izmiran geophysics institute that carried a magnetometer and other sensors to attempt the prediction of earthquakes.
<table>
<thead>
<tr>
<th>2001 056C (27003)</th>
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<tr>
<td><strong>Name:</strong> Badr-2</td>
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<td><strong>Country:</strong> Pakistan</td>
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<td><strong>Launch date:</strong> 10 December 2001</td>
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<td><strong>Re-entry:</strong> in orbit</td>
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<td><strong>Launch site:</strong> Baikonour</td>
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<tr>
<td><strong>Launch vehicle:</strong> Zenit 2</td>
</tr>
<tr>
<td><strong>Orbit:</strong> 986 x 1014 km, inclination: 99.7°</td>
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</tbody>
</table>

Badr-2 was built by engineers at Pakistan’s Space and Upper Atmosphere Research Commission (SUPARECO). The 69 kg satellite carried a British built wide angle CCD camera for Earth imaging.
Maroc-Tubsat was a 45 kg satellite built by the Technical University of Berlin for the Centre Royale de Teledetection Spatiale of Morocco. The satellite carried an imager and a store-forwards communications experiment.
Reflektor was a 6 kg Russian satellite for space debris studies as a joint experiment with the USAF’s Air Force Research Laboratory. The satellite had four triangular fins and an array of laser retroreflectors. It also tested the deployment of a large antenna system.
2001 057A (27053)
Name: Kosmos-2383
Country: Russia
Launch date: 21 December 2001
Re-entry: 20 March 2004
Launch site: Baikonour
Launch vehicle: Tsylkon 2
Orbit: 405 x 417 km, inclination: 65.0°

US-PU military ocean surveillance satellite fitted with electronic equipment as described for 1974 103A and 1993 029A. The satellite was fragmented in orbit in February 2004.
2001 058A (27055)
Name: Kosmos-2384
Country: Russia
Launch date: 28 December 2001
Re-entry: in orbit
Launch site: Plesetsk
Launch vehicle: Tsylkon 3
Orbit: 1415 x 1433 km, inclination: 82.6°

Strela 3 military communications satellite as described for 1985 003A.
2001 058B (27056)
Name: Kosmos-2385
Country: Russia
Launch date: 28 December 2001
Re-entry: in orbit
Launch site: Plesetsk
Launch vehicle: Tsyklon 3
Orbit: 1417 x 1426 km, inclination: 82.5°

Strela 3 military communications satellite as described for 1985 003A.
2001 058C (27057)
Name: Kosmos-2386
Country: Russia
Launch date: 28 December 2001
Re-entry: in orbit
Launch site: Plesetsk
Launch vehicle: Tsyklon 3
Orbit: 1415 x 1415 km, inclination: 82.5°

Strela 3 military communications satellite as described for 1985 003A.
Name: Gonets D-10
Country: Russia
Launch date: 28 December 2001
Re-entry: in orbit
Launch site: Plesetsk
Launch vehicle: Tsyklon 3
Orbit: 1412 x 1418 km, inclination: 82.5°

Message relay communications satellite as described for 1996 009A.
2001 058E (27059)  
**Name:** Gonets D-11  
**Country:** Russia  
**Launch date:** 28 December 2001  
**Re-entry:** in orbit  
**Launch site:** Plesetsk  
**Launch vehicle:** Tsyklon 3  
**Orbit:** 1404 x 1418 km, inclination: 82.5°  

Message relay communications satellite as described for 1996 009A.
2001 058F (27060)
Name: Gonets D-12
Country: Russia
Launch date: 28 December 2001
Re-entry: in orbit
Launch site: Plesetsk
Launch vehicle: Tsyklon 3
Orbit: 1404 x 1418 km, inclination: 82.5°

Message relay communications satellite as described for 1996 009A.