WORLD SPACECRAFT DIGEST by Jos Heyman
2006
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2006 001A (28928)

Name:	New Horizons
Country:	USA
Launch date:	19 January 2006
Re-entry:	in orbit
Launch site:	Cape Canaveral
Launch vehicle:	Atlas 5-551
Orbit:	interplanetary

The 478 kg New Horizons spacecraft will explore Pluto, its moon Charon and several Kuiper Belt objects. It carries seven instruments which have been selected to meet the basic objectives of the mission to find out what the atmosphere is made of and how it behaves, what the surface of Pluto looks like and how the solar wind interacts with Pluto's atmosphere.

The instruments are:

1. Ralph, a camera system comprising the Multispectral Visible Imaging Camera (MVIC) and the Linear Etalon Imaging Spectral Array (LEISA) to obtain high resolution color maps and surface composition maps of the surfaces of Pluto and Charon. The MVIC operates at visible wavelengths whilst the LEISA operates at infrared wavelengths;
2. Alice, an ultraviolet imaging spectrometer to probe the atmospheric composition of Pluto;
3. the Radio Experiment (REX) to facilitate all radio communications with the spacecraft but also to investigate the atmosphere by occultation observations whilst passing behind Pluto, by measuring bending of radio waves by the atmosphere from which the average molecular weight of the gas in the atmosphere and the atmospheric temperature can be determined. In addition REX is to measure the weak radio emission from Pluto whilst transmitted data can be used to derive a very accurate value for Pluto's nightside temperature;
4. the Long Range Reconnaissance Imager (LORRI), a 20.8 cm aperture telescope linked to a charge coupled device (CCD) to take images of Pluto's surface with a resolution of about 100 x 100 m;
5. the Solar Wind Analyzer around Pluto (SWAP) instrument to measure charged particles from the solar wind near Pluto to determine whether Pluto has a magnetosphere and how fast its atmosphere is escaping;
6. the Pluto Energetic Particle Spectrometer Investigation (PEPSSI) is a plasma sensing instrument that is to search for neutral atoms that escape Pluto's atmosphere and subsequently become charged by their interaction with the solar wind; and

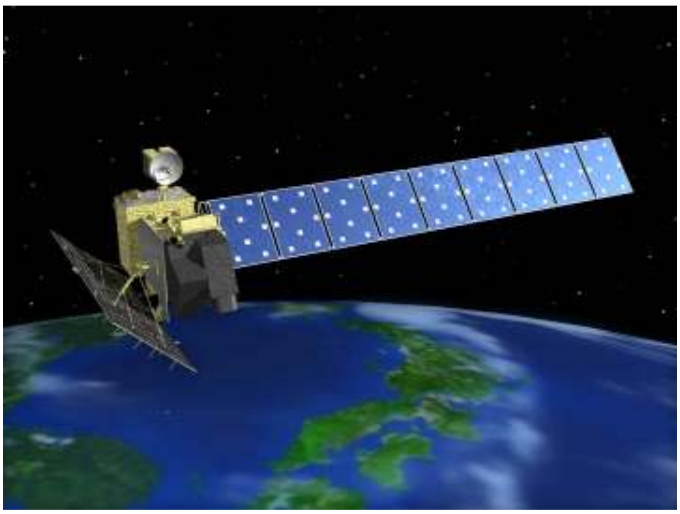
7. the Student Dust Counter (SDC), an experiment to count and measure the sizes of dust particles along New Horizons' entire trajectory. These dust particles are believed to have been created by comets shedding material and Kuiper Belt Objects colliding with one another. SDC is managed and was built primarily by students at the University of Colorado in Boulder.

The payload also includes the ashes of Clyde Tombaugh, who discovered Pluto in 1930.
The spacecraft is powered by a radioisotope thermoelectric generator (RTG) which contains ceramic pellets of plutonium dioxide to be naturally decayed, while the heat produced from the radioactivity will be converted to energy.
The flight trajectory used a Jupiter gravity assist which occurred on 1 March 2007. A fly-by of Uranus took place on 18 March 2011 but no pictures were made as the instruments on board of New Horizons were in an electronic sleep mode. The next planetary encounter was with Neptune on 25 August 2014.
In December 2014 contact was established with the spacecraft to prepare it for its encounter with Pluto on 14 July 2015, at a distance of about 12,500 km and during the first months of 2015 it took photos of Pluto to ensure that it is on track for this fly-by.
The closest approach took place on 14 July 2015 at 11.50 UTC at a distance of 12,500 km and a speed of 13.79 km/sec.
The best photographic image so far, by LORRI, was taken on 13 July and showed the entire sunlit disk of Pluto with a resolution of 3.8 km.
The observation programme continued until 15 July 2015 and included the moons Charon, at a range of 28,585 km, as well as the smaller moons Nix, Hydra, Kerberos and Styx.
As Nix and Hydra were discovered in 2005 whilst the other satellites were discovered until 2011 and 2012, their observation was limited as these had required changes to the observation sequence that had been planned for years in advance. This observation sequence, consisting of over 380 separate observations by all the instruments, required New Horizons to be in constant motion, swinging the spacecraft from target to target, alternating between observations of Pluto and Charon as well as the other moons.
At the point of the closest encounter there was a communications delay of 4 hours and 25 minutes (one-way). The real-time data relay was limited not only by the constant movement of the spacecraft to execute the observation sequence, but also the restricted data download speed of 1,900 bit/s. The large volume of data collected by New Horizons was downloaded until late 2016.

Following the encounter with Pluto, the mission was extended for an encounter with 2014 MU69, a 45 km object in the Kuiper Belt, circling the Sun at a distance of 6.6 billion km. Following a series of rocket burns in October and November 2015, the spacecraft was in the right trajectory for a fly-by on 1 January 2019.

2006 002A (28931)

Name:	Daichi
Country:	Japan
Launch date:	23 January 2006
Re-entry:	in orbit
Launch site:	Tanegashima
Launch vehicle:	H 2A-2022
Orbit:	698 x 700 km, inclination: 98.2°



Daichi or the Advanced Land Observing Satellite (ALOS) was a remote sensing satellite with a mass of 3850 kg.
The instruments on board of the satellite were:

1. the PRISM high-resolution(monochrome) imager to collect elevation data;
2. the AVNIR-2 multi-band(color) imager; and
3. the PALSAR cloud-free, day-and-night radar sensor.

The data collected by these instruments was used to create global topographical maps with a 1/25,000 scale. In addition the spacecraft was used for disaster monitoring, in particular earthquakes, resource surveying. The satellite lost power on 22 April 2011.

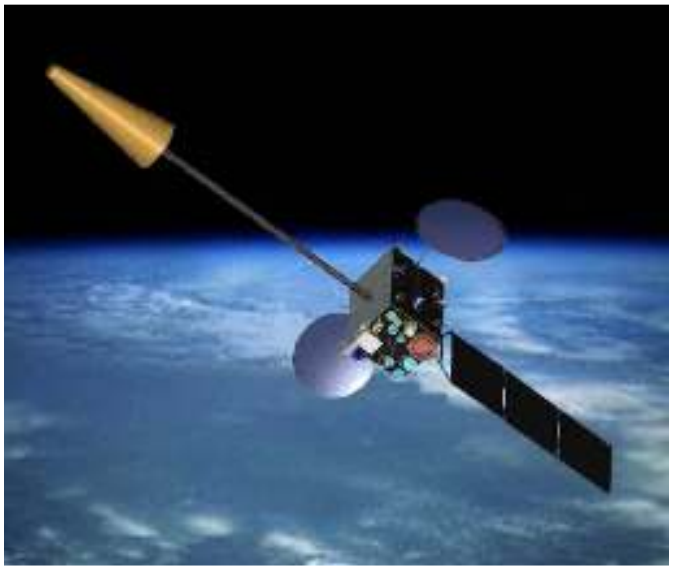
2006 003A (28935)

Name:	Echosat-10
Country:	USA
Launch date:	15 February 2006
Re-entry:	in orbit
Launch site:	Odyssey
Launch vehicle:	Zenit 3SL
Orbit:	geostationary at 110°W

Communications satellite owned by EchoStar communications. Built by Lockheed Martin using the A2100AX platform, the 4333 kg satellite carried 32 Ku band transponders.
The Odyssey platform was located at the equator on 154°W longitude.

2006 004A (28937)

Name:	MTSat-2
Country:	Japan
Launch date:	18 February 2006
Re-entry:	in orbit
Launch site:	Tanegashima
Launch vehicle:	H 2A-2024
Orbit:	geostationary at 145°E



Meteorological and air traffic control satellite as described for 2005 006A but using a Mitsubishi DS-200 platform with a mass of 1700 kg. Also known as Himawari-7.

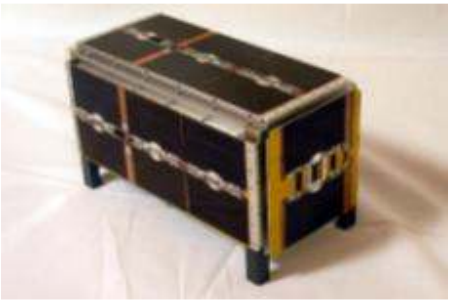
2006 005A (28939)
Name: Astro-F
Country: Japan
Launch date: 22 February 2006
Re-entry: in orbit
Launch site: Kagoshima
Launch vehicle: Mu 5
Orbit: 471 x 717 km, inclination: 96.6°

Previously know as Infrared Imaging Surveyor (IRIS) and also known as Akari, Astro-F was a 952 kg astronomical satellite to undertake an all-sky survey in the infrared with a particular emphasis on protogalaxies, the origin and evolution of galaxies, the life cycle of stars, the search for brown dwarfs, extra solar planetary systems and new comets.
The instrumentation consisted of a 70 cm Ritchey-Chretien telescope which was linked to the Far Infrared Surveyor (FIS) and the Infrared Camera (IRC).
The primary observation programme lasted until August 2007 when the liquid helium used to chill the sensitive far-infrared instrument ran out. Akari continued to make near-infrared camera observation using mechanical coolers on board of the spacecraft until 24 May 2011 when problems with the electrical systems occurred. The satellite was finally switched off on 24 November 2011.

2006 005B (28940)
Name: SSP-1
Country: Japan
Launch date: 22 February 2006
Re-entry: in orbit
Launch site: Kagoshima
Launch vehicle: Mu 5
Orbit: 300 x 707 km, inclination: 94.7°

Shortly after launch a 15 m diameter solar sail was deployed from the third stage of the launch vehicle although Japanese sources indicate that it was only deployed partially.
Also known as Soraseiru Sabupeiro-do (solar sail sub payload or SSP), the experiment was a follow-up to a sub-orbital test conducted on 9 August 2004, when an S-310-34 sounding rocket launched from Kagoshima, tested two methods of deploying solar sails. A clover type deployment took place at 122 km altitude whilst a fan type deployment was conducted at 169 km altitude.

2006 005C (28941)
Name: CUTE-1.7
Country: Japan
Launch date: 22 February 2006
Re-entry: 25 November 2009
Launch site: Kagoshima
Launch vehicle: Mu 5
Orbit: 300 x 712 km, inclination: 94.7°



The CUbical Titech Engineering satellite (CUTE)-1.7 was built at the Tokyo Kogyo Daigaku (Tokyo Institute of Technology) Laboratory for Space Systems (LSS).
The objective of the 30 cm x 10 cm x 10 cm satellite with a mass of 3 kg, was the demonstration of new technologies and gain experience in building satellites. Its payload included a transponder for radio amateur use, an attitude control experiment, a radiation protection system and an advanced photodiode to observe low energy charged particle distributions. In addition the spacecraft was to test the use of a tether to de-orbit the satellite, by deploying the lower panel of the satellite on a 100 m tether.
As there was already a CUTE-1 (2003 031E) satellite, and there was a CUTE-2 programme going, the students selected a number in between. 1.7 was chosen as '7' is considered a lucky number.
The satellite was also known as Oscar-56 or CO-56.

2006 006A (28943)

Name:	Arabsat-4A
Int. Agency:	Arabsat
Launch date:	28 February 2006
Re-entry:	24 March 2006
Launch site:	Baikonour
Launch vehicle:	Proton M/Briz M
Orbit:	505 x 14695 km, inclination: 51.5°

Also known as Badr-One, Arabsat 4-A was a communications satellite owned by the Arab Satellite Communications Organization and built by EADS/Astrium using the Eurostar 2000+ platform. The 3360 kg satellite carried 24 C band transponders and 20 Ku band transponders.
A propulsion failure of the Briz M stage prevented the spacecraft from separating and reaching the intended geostationary orbit at 26°E.
The re-entry was ‘forced’ by the use of the apogee motor.
Just before the launch the satellite had been renamed as Badr-1.

2006 007A (28945)
Name: Hot Bird-7A
Int. Agency: Eutelsat
Launch date: 11 March 2006
Re-entry: in orbit
Launch site: Kourou
Launch vehicle: Ariane 5 ECA
Orbit: geostationary at 13°E

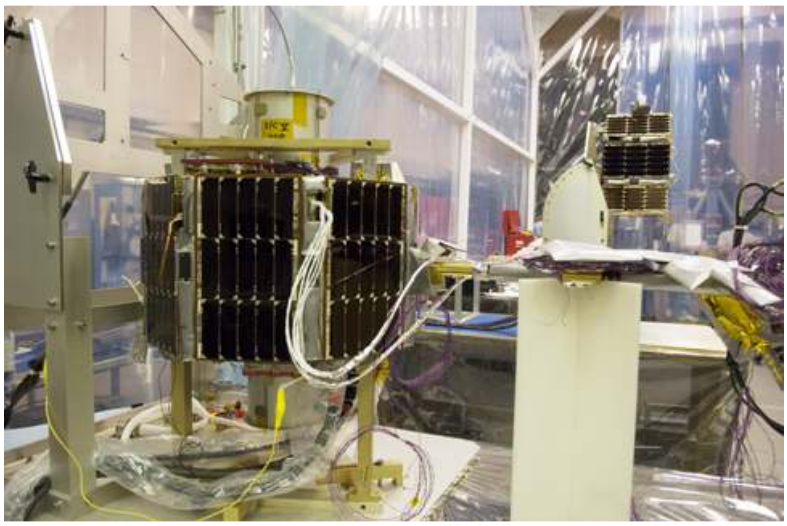
Communications satellite owned by Eutelsat. The 4100 kg was built by Alcatel Alenia using the Spacebus 3000B3 platform. It was fitted with 38 Ku band transponders. It was later renamed as Eurobird-9A and moved to 9ºE. In March 2012 it was renamed as Eutelsat 9-A. In March 2016 it was relocated to 13ºE and renamed Eutelsat Hot Bird 13-E.

2006 007B (28946)

Name:	Spainsat
Country:	Spain
Launch date:	11 March 2006
Re-entry:	in orbit
Launch site:	Kourou
Launch vehicle:	Ariane 5 ECA
Orbit:	geostationary at 30°W

Owned by Hisdesat, a company owned by Hispasat, INSA, EADS CASA Espacio and INDRA y SENER, the satellite provided secure communications for the Spanish government. Some of the transponders were leased to XTAR as XTAR-LANT.
The 3680 kg satellite was built by Space Systems/Loral using a LS-1300 platform that carried thirteen specially configured high-power transponders, twelve at X band and one at Ka band of which five could be leased out to other military customers.

2006 008A (28980)
Name: ST 5-A
Country: USA
Launch date: 22 March 2006
Re-entry: in orbit
Launch site: Vandenberg
Launch vehicle: Pegasus XL
Orbit: 298 x 4554 km, inclination: 105.6°



The objective of the Space Technology (ST) 5 series satellites was to test the concepts for building and operating miniaturized microsats as a precursor to a large constellation of such satellites observing solar activities.
Part of NASA's New Millennium Program, each of the three satellites carried its own guidance, navigation and control, attitude control, propulsion, high bandwidth and complex communication functions but the multiple units of these small satellites reduced the risk of an entire mission failing by the breakdown of a single system on a single satellite.
The satellites had a mass of 21.5 kg. In orbit they were placed in a line with a separation of 40 to 140 km between them.
The instruments on each satellite were:

1. a highly sensitive magnetometer to undertake coordinated multi-point measurements of the Earth's magnetic field;
2. a Cold Gas Micro-Thruster (CGMT) to provide propulsion for orbit maintenance;
3. the X band Transponder Communication System to facilitate two-way communications between the ST-5 micro-satellites and the ground stations;
4. the Variable Emittance Coatings for Thermal Control, to test the ability to configure the thermal characteristics of a radiator surface on the micro sat; and
5. the Complementary Metal Oxide Semiconductor (CMOS) Ultra-Low Power Radiation Tolerant (CULPRiT) Logic, to provide a low-power digital-logic test circuit that reduces power requirements for future satellites.

The launch vehicle was released from the L-1011 carrier aircraft.
ST 5-A was also known as Nanosat Constellation Trailblazer (NCT)-1.

2006 008B (28981)

Name:	ST 5-B
Country:	USA
Launch date:	22 March 2006
Re-entry:	in orbit
Launch site:	Vandenberg
Launch vehicle:	Pegasus XL
Orbit:	303 x 4548 km, inclination: 105.6°

Technology satellite as described for 2006 008A. Also known as NCT-2.

2006 008C(28982

Name:	ST 5-C
Country:	USA
Launch date:	22 March 2006
Re-entry:	in orbit
Launch site:	Vandenberg
Launch vehicle:	Pegasus XL
Orbit:	304 x 4551 km, inclination: 105.6°

Technology satellite as described for 2006 008A. Also known as NCT-3.

Name:	FalconSat-2
Country:	USA
Launch date:	24 March 2006
Re-entry:	n.a.
Launch site:	Omelek Island
Launch vehicle:	Falcon 1
Orbit:	failed to orbit

Originally to be flown on a STS mission, the FalconSat-2 was a 19.5 kg satellite built at the USAF Academy. It carried instrumentation to investigate space plasma as well as a GPS instrument. A fuel leak in the Falcon 1 launch vehicle caused it to explode after 41 seconds, preventing the satellite to be placed in a 400 x 500 km orbit with an inclination of 39°.

2006 009A (28996)
Name: Soyuz TMA-8
Country: Russia
Launch date: 30 March 2006
Re-entry: 29 September 2006
Launch site: Baikonour
Launch vehicle: Soyuz FG
Orbit: 244 x 291 km, inclination: 51.6°

J. Williams

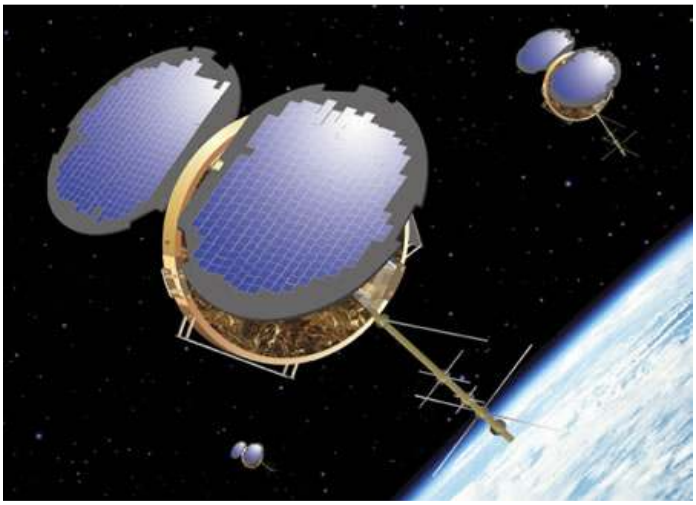
Crewed spaceflight with cosmonauts P. Vinogradov (Cmdr), J. Williams (Fl. Eng.) (USA) and M. Pontes (Brazil) using a Soyuz TMA spacecraft as described for 2002 050A. The mission was also known as ISS-12S and the call sign was Karat. Vinogradov and Williams were the thirteenth permanent crew (EX-13) for ISS. The spacecraft docked with the Zarya nadir docking port of ISS (1998 067A) on 1 April 2006.
Pontes returned to Earth on Soyuz TMA-7 (2005 039A) on 8 April 2006. He had been in space for 9 days, 21 hours, 18 minutes.
Vinogrado and Williams left the space station on 28 September 2006. Their mission had lasted 182 days, 22 hours, 44 minutes.

2006 010A (29045)

Name:	JC Sat-9
Country:	Japan
Launch date:	12 April 2006
Re-entry:	in orbit
Launch site:	Odessey
Launch vehicle:	Zenit 3SL
Orbit:	geostationary at 132°E

Communications satellite owned by JSAT Corporation of Japan and built by Lockheed Martin using an A2100AX platform. The 4425 kg satellite was fitted with 20 Ku band transponders, 20 C band transponders and a single S band transponder. It was later renamed as JC Sat-5A whilst a number of C band transponder were leased to Nippon Telegraph & Telephone as N star-d.
The Odyssey platform was located at the equator on 154°W longitude.

2006 011A (29047)
Name: Formosat-3/F6
Country: Taiwan
Launch date: 15 April 2006
Re-entry: in orbit
Launch site: Vandenberg
Launch vehicle: Minotaur 1
Orbit: 763 x 839 km, inclination: 72.0°



The Formosat-3 or Constellation Observing System for Meteorology, Ionosphere and Climate (COSMIC) series of satellites, also known as Rocsat-3, were a joint programme of the US National Science Foundation and Taiwan to provide atmospheric data in real time over thousands of points on Earth by the bending of radio waves from Global Positioning System satellites as their signals pass through Earth's atmosphere. The satellites converted these measurements into a precise worldwide set of weather, climate, and space weather data.
Each 62 kg satellites carried four global positioning system (GPS) antennas, a Tiny Ionospheric Photometer (TIP) to scan total electric density of a satellite's Earth view and a Tri-Band Beacon to beam down radio signals at three different frequencies. The US participation in the six satellites has also been identified as S00-8.

2006 011B (29048)

Name:	Formosat-3/F1
Country:	Taiwan
Launch date:	15 April 2006
Re-entry:	in orbit
Launch site:	Vandenberg
Launch vehicle:	Minotaur 1
Orbit:	769 x 833 km, inclination: 72.0°

Meteorological satellite as described for 2006 011A.

2006 011C (29049)

Name:	Formosat-3/F5
Country:	Taiwan
Launch date:	15 April 2006
Re-entry:	in orbit
Launch site:	Vandenberg
Launch vehicle:	Minotaur 1
Orbit:	774 x 828 km, inclination: 72.0°

Meteorological satellite as described for 2006 011A.

Name:	Formosat-3/F3
Country:	Taiwan
Launch date:	15 April 2006
Re-entry:	in orbit
Launch site:	Vandenberg
Launch vehicle:	Minotaur 1
Orbit:	675 x 750 km, inclination: 72.0°

Meteorological satellite as described for 2006 011A.

2006 011E (29051)

Name:	Formosat-3/F4
Country:	Taiwan
Launch date:	15 April 2006
Re-entry:	in orbit
Launch site:	Vandenberg
Launch vehicle:	Minotaur 1
Orbit:	752 x 850 km, inclination: 72.0°

Meteorological satellite as described for 2006 011A.

2006 011F (29052)

Name:	Formosat-3/F2
Country:	Taiwan
Launch date:	15 April 2006
Re-entry:	in orbit
Launch site:	Vandenberg
Launch vehicle:	Minotaur 1
Orbit:	771 x 831 km, inclination: 72.0°

Meteorological satellite as described for 2006 011A.

2006 012A (29055)

Name:	Astra-1KR
Country:	Luxembourg
Launch date:	20 April 2006
Re-entry:	in orbit
Launch site:	Cape Canaveral
Launch vehicle:	Atlas 5
Orbit:	geostationary at 19.2°E

Communications satellite owned by SES. The 4332 kg satellite used the Lockheed Martin A2100 platform and was fitted with 32 Ku band transponders.
A replacement for Astra-1K (2002 053A), which failed to achieve correct orbit after its launch on 25 November 2002, the satellite was originally known as Astra-1L and was to be launched by a Proton launch vehicle.

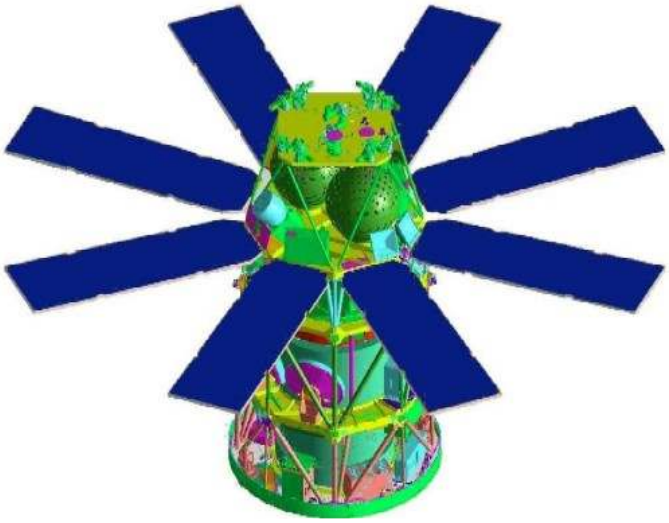
2006 013A (29057)

Name:	Progress M-56
Country:	Russia
Launch date:	24 April 2006
Re-entry:	19 September 2006
Launch site:	Baikonour
Launch vehicle:	Soyuz U
Orbit:	337 x 348 km, inclination: 51.6°

Cargo transfer spacecraft as described for 1989 066A.
Progress M-56 docked at the Zvezda rear port of ISS (1998 067A) on 26 April 2006. The flight was also known as ISS-21P.
The spacecraft undocked on 19 September 2006.

2006 014A (29079)

Name:	Eros B-1
Country:	Israel
Launch date:	25 April 2006
Re-entry:	in orbit
Launch site:	Svobodny
Launch vehicle:	Start 1
Orbit:	503 x 513 km, inclination: 97.3°



Civilian Earth observation satellite owned by Imagesat and built by Israel Aircraft Industries. The 280 kg satellite carried a Charge Coupled Device/Time Delay Integration camera with a resolution of up to 70 cm.

2006 015A (29092)
Name: YW-1
Country: China
Launch date: 26 April 2006
Re-entry: in orbit
Launch site: Taiyuan
Launch vehicle: CZ 4C
Orbit: 624 x 626 km, inclination: 97.8°

Yaogan Weixing (YW) Earth observation satellite which was developed by the Shanghai Academy of Spaceflight Technology. Satellites in this series were fitted with a variety of equipment. The official objectives included land and agricultural surveys, disaster monitoring as well as associated scientific experiments but it is believed there was also a military application. The 2700 kg YW-1 satellite which was also known as Jian Bing 5-1, was fitted with SAR radar imaging equipment.
Other sub-series were identified as Jian Bing 6, Jian Bing 7, Jian Bing 8, Jian Bing 9, Jian Bing 10, Jian Bing 11 ans Jian Bing 12. All appear to have optical observation systems except for Jian Bing 7, which is believed to have been fitted with radar, and Jian Bing 8, which is believed to have been for ocean surveillance and was accompanied by two sub-satellites..
On 4 February 2010 the satellite suffered an explosion and broke up into seven major pieces.

2006 016A (29107)
Name: CALIPSO
Country: France
Launch date: 28 April 2006
Re-entry: in orbit
Launch site: Vandenberg
Launch vehicle: Delta 7420
Orbit: 687 x 689 km, inclination: 98.2°

The Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) was a collaborative effort of NASA and CNES to provide three dimensional radar images which gave a new perspective of how clouds and aerosols form and how they affect the weather.
Previously known as PICASSO-CENA/Earth System Science Pathfinder (ESSP)-3, the science payload of consisted of three co-aligned nadir viewing instruments:

1. a polarization-sensitive lidar that provides high resolution vertical profiles of aerosols and clouds in two wavelengths;
2. an imaging infrared radiometer (IIR) that provides calibrated infrared radiances in three wavelengths that are optimized for combined IIR/lidar retrievals of cirrus particle size; and
3. a high-resolution wide field camera (WFC) that acquires high spatial resolution imagery for meteorological context.

The 587 kg satellite flew in formation with Cloudsat (2006 016B), Aqua (2002 022A), Aura (2004 026A) and PARASOL (2004 049G) with a mean separation between the satellites is approximately 460 km which corresponds to approximately 60 seconds delay between lidar and radar measurements, allowing the radar footprint will overlap the lidar footprint creating coordinated and essentially simultaneous measurements. This formation flight was sometimes refered to as the A Train.

2006 016B (29108)
Name: CloudSat
Country: USA
Launch date: 28 April 2006
Re-entry: in orbit
Launch site: Vandenberg
Launch vehicle: Delta 7420
Orbit: 689 x 690 km, inclination: 98.2°

CloudSat was the NASA contribution to a collaborative effort of NASA and CNES to provide three dimensional radar images on cloud and aerosols formation as part of NASA's Earth System Science Pathfinder(EESP) programme as EESP-4. It was also known as P00-4.
The payload of the 848 kg satellite consisted of:

1. the Cloud Profiling Radar (CPR) which will provide calibrated radar reflectivity as a function of distance of the spacecraft;
2. a polarization-sensitive lidar similar to that carried on CALIPSO, that provides high resolution vertical profiles of aerosols and clouds in two wavelengths;
3. three instruments which were also carried on the Aqua (2002 022A);
   - the Atmospheric Infrared Sounder (AIRS) an infrared spectrometer to determine temperature and humidity vertical profiles;
   - the Advanced Microwave Scanning Radiometer – EOS (AMSR/E) to determine rainfall rates and measure sea surface winds and temperatures;
   - the Clouds and the Earth's Radiant Energy System (CERES), a two band visible to far infrared radiometer to measure the energy balance of the atmosphere; and
   - the Moderate Resolution Imaging Spectro-radiometer (MODIS).

The satellite was also part of the "A Train" formation as described for 2006 016A.

2006 017A (29111)

Name:	Kosmos-2420
Country:	Russia
Launch date:	3 May 2006
Re-entry:	19 July 2006
Launch site:	Plesetsk
Launch vehicle:	Soyuz U
Orbit:	189 x 337 km, inclination: 67.2°

Yantar 4KS2 military reconnaissance satellite as described for 2004 038A.

Name: SPHERES
Country: USA
Launch date: 18 May 2006
Re-entry: n.a.
Launch site: n.a.
Launch vehicle: n.a.
Orbit: n.a

The Synchronized Position Hold Engage Re-orient Experimental Satellites (SPHERES) was a 3.2 kg satellite designed to float weightless in space while maintaining a precise position with a battery powered carbon-dioxide propulsion system that maneuvers the unit. A cluster of such free floating small satellites could serve as parts of a massive telescope looking for planets near other stars.
The three SPHERES satellites were delivered to the space station on Progress M-56 (2006 013A) (red one), STS-121 (2006 028A) (blue one) and STS-116 (2006 055A) (yellow one).
Initially the programme called for a minimum of 16 test sessions each taking about 3.5 hours and consisting of three sessions with one satellite, seven sessions with two satellites and six sessions with three satellites.
On 18 May 2006 the first critical test took place inside the International Space Station (1998 067A) using one satellite (red one). The test, which was conducted by Jeff Williams, was repeated on 20 May 2006. It appears a third test was not conducted.
On 12 August 2006 a further test was performed by Jeff Williams and which was repeated on 19 August 2006 and 11 November 2006. Four further tests were cancelled.

A new series of tests was started on 17 March 2007 which was repeated on 24 March 2007, 27 April 2007, 16 November 2007, 12 December 2007 and 29 December 2007.
Further flights were conducted on 27 January 2008, 30 August 2008, 27 September 2008, 26 October 2008, 27 October 2008, 1 November 2008, 8 November 2008, 9 November 2008, 14 November 2008, 26 June 2009, 11 July 2009, 15 August 2009, 27 August 2009, 9 December 2009, 15 December 2009, 11 June 2010, 19 July 2010, 19 August 2010, 30 September 2010 (?), 9 November 2010, 16 December 2010, 16 August 2011, 28 September 2011, 1 November 2011, 23 January 2012, 2 July 2012, 11 July 2012, 21 July 2012 (?), 28 November 2012, 12 December 2012, 7 January 2013, 11 January 2013, 13 March 2013, 16 April 2013, 23 May 2013, 13 August 2013 and 18 October 2013 (?). By early 2014 77 tests had been conducted.
From 2009 some experiments were conducted as part of the annual Zero Robotics game competition in which high school student groups took part to solve, for instance, the problem of assembling a large solar power station in Earth orbit in three phases. This involved searching for a (virtual) solar panel that was lost in the test, flying to the panel and docking to it by aligning its Velcro face in a specific orientation, and returning with

the panel to a (virtual) station and docking. The first competition was executed on 9 December 2009 and the programme will continue until March 2014.
On 2 July 2012 a 10 minutes communications test with a Smartphone was conducted to evaluate the possibility for Smartphones to control the SPHERES satellites from the ground. This was followed by sessions on 11 July 2012 and later.
By connecting a smartphone, the SPHERES became Smart SPHERES and became more intelligent because they had now built-in cameras to take pictures and video, sensors to help conduct inspections, powerful computing units to make calculations and Wi-Fi connections to transfer data in real time to the computers aboard the space station and at mission control.
On 16 April 2013 the first test in the SPHERES-VERTIGO programme was conducted. As part of the Visual Estimation and Relative Tracking for Inspection of Generic Objects (VERTIGO) study, one of the SPHERES was fitted with a pair of 1.6 kg goggles that included computer based intelligence hardware, to explore the use of this technology to analyze and capture data from specified objects, producing a 3-D model of those objects.

SPHERES-Rings

Commencing in November 2013, the SPHERES were used for the SPHERES-Rings tests to demonstrate new techniques micro-electromagnetic formation flight and wireless-inductive power transfer. The hardware for this included two RINGS Assemblies each consisting of resonant coils, coil housing with fans, power electronics/batteries and RINGS/SPHERES support structure hardware. Each RINGS Assembly has a diameter of 77 cm with a height of 13.5 cm and weighs 8.9 kg.

The SPHERES tests were initially conducted on Destiny and were not permitted in a Russian segment due to infrared interference. Later experiments were also conducted in the Kibo module of ISS.

2006 018A (29155)

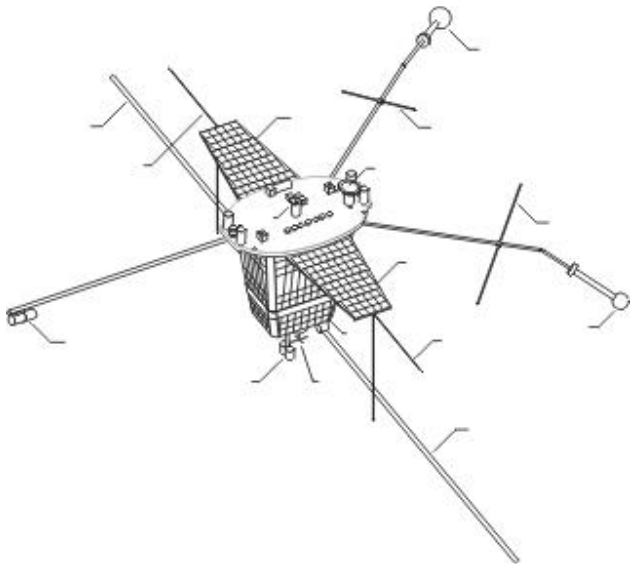
Name:	GOES-13
Country:	USA
Launch date:	24 May 2005
Re-entry:	in orbit
Launch site:	Cape Canaveral
Launch vehicle:	Delta 4M+(4,2)
Orbit:	geostationary at 89.4°W

Meteorological satellite owned by NOAA and built by Boeing using the BSS-601 platform.
The instrumentation of the 3133 kg satellite consisted of:

1. a multispectral five-channel instrument that produces visible and infrared images of Earth's surface, oceans, cloud cover and severe storm developments;
2. a multispectral sounder to provide vertical temperature and moisture profiles of the atmosphere;
3. a solar X-ray imager to monitor the sun's X-rays for the early detection of solar flares;
4. space environment monitoring instruments which monitor X-rays, extreme ultraviolet and particle emissions including solar protons, alpha particles, and electrons;
5. a magnetometer to sample the Earth's magnetosphere;
6. a data collection system to receive and relay environmental data sensed by widely dispersed surface platforms such as river and rain gauges, seismometers, tide gauges, buoys, ships, and automatic weather stations.

Before the launch the satellite was referred to as GOES-N.

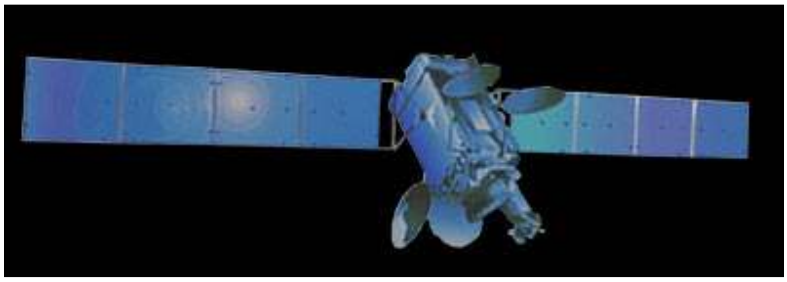
2006 019A (29157)
Name: Kompas-2
Country: Russia
Launch date: 26 May 2006
Re-entry: 28 December 2011
Launch site: Barents Sea
Launch vehicle: Shtil
Orbit: 402 x 525 km, inclination: 78.9º



Scientific satellite as described for 2001 056B. Developed by Makeev KB for the Izmiran geophysics institute, the 80 kg satellite carried detectors for electrons, UHF/VHF waves, UV emission and radiation, a radio frequency analyser for electric field waves as well as a Mayak ionospheric beacon. The satellite has also been referred to as COMPASS, meaning Complex Orbital Magneto-Plasma Autonomous Small Satellite.
The launch vehicle was launched from the submerged submarine Yekaterinburg. Once in orbit the satellite failed due to power problems.

2006 020A (29162)

Name:	Satmex-6
Country:	Mexico
Launch date:	27 May 2006
Re-entry:	in orbit
Launch site:	Kourou
Launch vehicle:	Ariane 5ECA
Orbit:	geostationary at 109.2°W



Communications satellite owned by Satellites Mexicanas and built by Space Systems/Loral using the LS-1300 platform. The 5500 kg satellite was fitted with 36 C band transponders and 24 Ku band transponders. The satellite was later moved to 113oW and was renamed as Eutelsat 113 West-A in May 2014.

2006 020B (29163)

Name:	Thaicom-5
Country:	Thailand
Launch date:	27 May 2006
Re-entry:	in orbit
Launch site:	Kourou
Launch vehicle:	Ariane 5ECA
Orbit:	geostationary at 78.5°E

Communications satellite owned by Shin Satellite of Thailand and built by Alcatel Alenia. The 2760 kg satellite was based on the Spacebus 3000A and carried 25 C band transponders and 14 Ku band transponders.
The satellite was originally built in 1997 as Thaicom-4 but was not completed at that time. It was then to be purchased by Afro Asian Satellite Communications as Agrani-2 and to be launched in 2002 to 120ºE but in 2004 the purchase was cancelled for the reason of being too expensive.

2006 021A (29228)

Name:	Resurs DK-1
Country:	Russia
Launch date:	15 June 2006
Re-entry:	in orbit
Launch site:	Baikonour
Launch vehicle:	Soyuz U
Orbit:	356 x 585 km, inclination: 69.9°

Earth resources satellite developed by the Progress design bureau and based on the basic Resurs F satellite as described for 1979 080A.
The 7000 kg satellite was fitted with improved imaging equipment with a 1 m resolution in black-and-white and a resolution of up to 2 m in color. Instead of film return capsules, the Resurs DK incorporated an advanced communications system to transmit images to ground station.
In addition the satellite carried:

1. the Italian Payload for Antimatter-Matter Exploration and Light-nuclei Astrophysics (PAMELA), to investigate cosmic rays in Earth orbit in order to learn more about dark matter and the relationship between matter and antimatter;
2. a Russian particle detector to identify earthquake precursors in the Earth's magnetic field.

The letters DK stand for Dmitry Kozlov, the designer.

2006 022A (29230)

Name:	Kazsat
Country:	Kazakhstan
Launch date:	17 June 2006
Re-entry:	in orbit
Launch site:	Baikonour
Launch vehicle:	Proton K/DM-3
Orbit:	geostationary at 102°E

Communications satellite owned by Kazakhstan. Assembled by Khrunichev using the Yaktha platform, the satellite, fitted with 12 Ku band transponders, provided television services in Central Asia as well as data on mineral resources and natural anomalies. The satellite had a mass of 1380 kg.

2006 023A (29236)

Name:	Galaxy-16
Country:	USA
Launch date:	18 June 2006
Re-entry:	in orbit
Launch site:	Odyssey
Launch vehicle:	Zenit 3SL
Orbit:	geostationary at 99°W

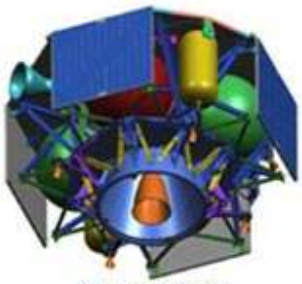
Owned by PanAmSat, Galaxy-16 was a Space Systems/Loral LS-1300 satellite which was fitted with 24 C band and 24 Ku band transponders. It had a mass of 4640 kg.
The Odyssey platform was located at the equator on 154°W longitude.

2006 024A (29240)

Name:	MiTEx-A
Country:	USA
Launch date:	21 June 2006
Re-entry:	in orbit
Launch site:	Cape Canaveral
Launch vehicle:	Delta 7925
Orbit:	geostationary at 65°E

OSC Small Sat

LMC Small Sat



NRL Upper Stage

The two Micro-Satellite Technology Experiment (MiTEx) satellites demonstrated and investigated advanced space technologies such as lightweight power and propulsion systems, avionics and spacecraft structures, affordable and responsive fabrication/build-to-launch techniques, commercial-off-the-shelf processors, as well as single-string components.
One spacecraft was built by Orbital Sciences whilst the other was built by Lockheed Martin.
MiTEx-A, the Orbital Sciences spacecraft, was also known as USA-187 and had a mass of 250 kg.
In 2009 the two satellites were allegedly used in a satellite inspection experiment involving IMEWS-23 (2007 054A).

2006 024B (29241)

Name:	MiTEx-B
Country:	USA
Launch date:	21 June 2006
Re-entry:	in orbit
Launch site:	Cape Canaveral
Launch vehicle:	Delta 7925
Orbit:	geostationary at ? °

The second MiTEx satellite, as described for 2006 024A. Built by Lockheed Martin, it was also known as USA-188 and had a mass of 250 kg.

2006 024C (29242)

Name:	MiTEx-US
Country:	USA
Launch date:	21 June 2006
Re-entry:	in orbit
Launch site:	Cape Canaveral
Launch vehicle:	Delta 7925
Orbit:	geostationary at ? °

MiTEx-Upper Stage (US) was an experimental upper stage developed by the US Naval Research Laboratory. It took the two MiTEx satellites (2006 024A and 2006 024B) from the elliptical transfer orbit into the intended geostationary orbit.
The upper stage was fuelled by monomethylhydrazine and nitrogen tetroxide and was equipped with a 400 N engine as well as a half-dozen 22 N engines.
In addition the stage tested a number of technologies, including:

1. platinum/rhodium bi-propellant attitude control thrusters;
2. high-performance coated columbium delta-V thruster;
3. commercial off-the-shelf manual valve tested to aerospace standards;
4. light-weight Inconel-718 composite overwrap pressure vessels;
5. lightweight titanium propellant tanks with internal propellant management devices;
6. triple junction solar cells;
7. lithium-ion batteries; and
8. a low-cost/high-performance star tracker.

Also known as USA-189, the mass of MiTEx-US was classified.

2006 025A (29245)

Name:	Progress M-57
Country:	Russia
Launch date:	24 June 2006
Re-entry:	17 January 2007
Launch site:	Baikonour
Launch vehicle:	Soyuz U
Orbit:	193 x 245 km, inclination: 51.6°

Cargo transfer spacecraft as described for 1989 066A.
Progress M-57 docked at the Pirs nadir port of ISS (1998 067A) on 26 June 2006. The flight was also known as ISS-22P. The spacecraft undocked on 16 January 2007

2006 026A (29247)

Name:	Kosmos-2421
Country:	Russia
Launch date:	25 June 2006
Re-entry:	19 August 2010
Launch site:	Baikonour
Launch vehicle:	Tsyklon 2
Orbit:	404 x 418 km, inclination: 65.1°

US-PU military ocean surveillance satellite fitted with electronic equipment as described for 1974 103A and 1993 029A. One of the solar panels failed to deploy, leaving the satellite inoperable. It disintegrated on 14 March 2008. The main part re-entered on 18 August 2010.

2006 027A (29249)

Name:	Prowler-1
Country:	USA
Launch date:	28 June 2006
Re-entry:	in orbit
Launch site:	Vandenberg
Launch vehicle:	Delta 4M+(4,2)
Orbit:	1118 x 37643 km, inclination: 62.4°

Probably a military electronic intelligence gathering satellite as described for 1997 068A although it is likely that the satellite incorporated the latest technology, probably including the TWINS-A magnetospheric research and SBIRS HEO-1 infrared missile warning payloads, the latter as described for 2011 019A..
This was the first launch of such a satellite from Vandenberg, previous launches being from Cape Canaveral, as well as the first launch by a Delta type launch vehicle.
Also known as USA-184 and NROL-22.
The satellite may later have been used in the Raven programme as described for 1994 026A.

2006 028A (29251)
Name: STS-121
Country: USA
Launch date: 4 July 2006
Re-entry: 17 July 2006
Launch site: Cape Canaveral
Launch vehicle: STS
Orbit: 332 x 351 km, inclination: 51.6°

Crewed spaceflight with astronauts S. Lindsey (Cmdr.), M. Kelly (Pilot), P. Sellers, M. Fossum, L. Nowak, S. Wilson and T.Reiter (ESA) (all Mission Specialists), using the orbiter Discovery as described for 1981 034A. The objective was to undertake the International Space Station (ISS)-Utilization Logistics Flight (ULF)-1.1 mission.
Other objectives included the further development of inspection of the orbiter and repair of thermal systems. The payload included the Leonardo Multipurpose Logistics Module (MPML) as described for 2001 010A, that carried experiments and supplies for the space station including the Oxygen Generation System (OGS), the Minus Eighty Laboratory Freezer for ISS (MELFI), the European Modular Cultivation System (EMCS) and the Percutaneous Electrical Muscle Stimulator (PEMS).
Also carried in the payload bay was the Integrated Cargo Carrier (ICC) as described for 2000 027A, on which an External Active Thermal Control System (EATCS) and Trailing Umbilical System Reel Assembly (TUS-RA) were mounted.
The final item in the payload bay was the Lightweight Multipurpose Experiment Support Structure Carrier (LMC) on which several items necessary for the spacewalks was mounted.
Other experiments conducted on this flight were:

1. Developmental Test Objective (DTO) experiments as described for STS-1 (1981 034A):
   - DTO-702: MADS PCMU to SSR telemetry;
   - DTO-805: Crosswind Landing Performance;
   - DTO-848: Orbiter Thermal Protection System (TPS) repair techniques;
   - DTO-849: OBSS SRMS Loads Characterization with EVA Crew Members;
   - DTO-850: Water Spray Boiler Cooling with Water/PGME Antifreeze;
   - DTO-851: EVA Infrared Camera;
   - DTO-852: SMS On-orbit Loads, Heavy Payloads;
2. Detailed Supplementary Objective (DSO) experiments as described for STS-1 (1981 034A):
   - DSO-490B: Bioavailability and Performance Effects of Promethazine during Spaceflight;
   - DSO-493: Monitoring Latent Virus Reactivation and Shedding in Astronauts;
   - DSO-498: Space Flight and Immune Function;

- DSO-499: Eye Movements and Motion Perception Induced by Off-Vertical-Axis;
- DSO-500: Spaceflight Induced Reactivation of Latent Epstein-barr Virus;
- DSO-634: Sleep-Wake Actigraphy and Light Exposure During Spaceflight;
- DSO-635: Spatial Reorientation Following Spaceflight;
- DSO-637: Chromosomal Aberrations in Blood Lymphocytes of Astronauts;

3. Station Development Test Objective (SDTO) experiments which tested space station systems or hardware or proposed improvements:
   - SDTO-12004-4: Shuttle Booster Fan Bypass;
   - SDTO-13005-U: ISS Structural Life Validation and Extension.
4. several Short-duration Research and Station Experiments;
   - Maui Analysis of Upper Atmospheric Injections (MAUI), to observe exhaust plumes of the Space Shuttle; and
   - Ram Burn Observations (RAMBO), as described for STS-111 (2002 028A).

The orbiter docked with the PMA-2 docking port docking port of the International Space Station (1998 067A) on 6 July 2006.

The Leonardo module was moved from the Shuttle's payload bay with the Shuttle's robotic arm and attached to the Unity module on 7 July 2006.

Three spacewalks were undertaken by Sellers and Fossum using the Quest airlock. On the first EVA, on 8 July 2006, they tested the Robotic Arm Boom extension and also performed some maintenance on the Mobile Transporter. This EVA lasted 7 hours, 31 minutes.

On the second EVA of 6 hours, 47 minutes, on 10 July 2006, they installed the thermal control systems of the pump module and replaced the nadir trailing umbilical system of the Mobile Transporter. The final EVA, on 11 July 2006, was devoted to testing techniques for in-orbit thermal system repairs to the orbiter. It lasted 7 hours, 11 minutes.

The Leonardo module was returned to the orbiter's payload bay on 14 July 2006 and the orbiter undocked on 15 July 2006. T. Reiter remained on board of the International Space Station as a member of the EX-13 crew. Eventually he became a member of the EX-14 crew until his return to Earth on STS-116 (2006 055A) in December 2006.

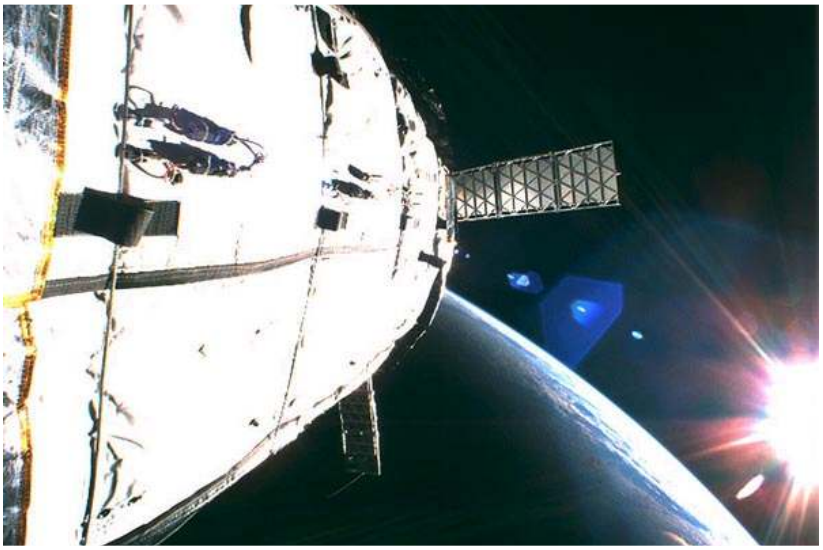
STS-121 landed at the Kennedy Space Centre on 17 July 2006. The mission had lasted 12 days, 18 hours, 37 minutes.

Name:	Insat 4-C
Country:	India
Launch date:	10 July 2006
Re-entry:	n.a.
Launch site:	Sriharikota
Launch vehicle:	GSLV Mk.I (2)
Orbit:	failed to orbit

The Insat 4-C satellite was built by the Indian Space Research Organization. It had a mass of 2168 kg and carried 12 Ku band transponders.
Failure of the launch vehicle after 30 seconds prevented the satellite from reaching the intended 74ºE geostationary orbit.

2006 029A (29252)

Name:	Genesis-1
Country:	USA
Launch date:	12 July 2006
Re-entry:	in orbit
Launch site:	Yasniy
Launch vehicle:	Dnepr
Orbit:	556 x 561 km, inclination: 64.5°



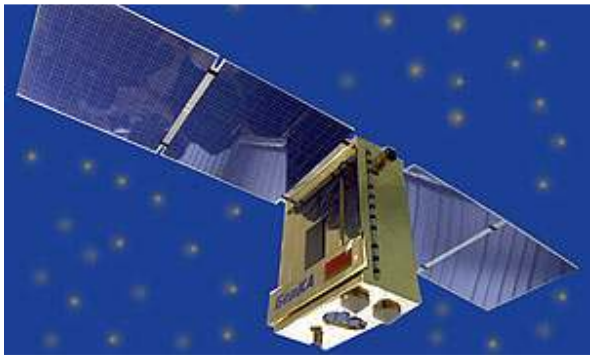
Genesis-1 was a 1/3 test version of the Nautilus commercial inflatable Earth-orbit space module developed by Bigelow Aerospace. After launch it inflated to a 1.9 x 3.8 m structure. Genesis-1 has a mass of 1400 kg and carried live insect colonies and equipment to keep the temperature inside the spacecraft at 28°C. Also on board was NASA's GeneBox, a small payload that carried sensors and optical systems to detect proteins and specific genetic activity. It was released inside the Genesis-1 spacecraft where it was allowed to float freely. The spacecraft was constructed from several layers of vectran, a material twice as strong as kevlar. Also, flexible walls should be able to sustain micrometeorite impacts better than rigid walls.

2006 030A (29260)

Name:	Kosmos-2422
Country:	Russia
Launch date:	21 July 2006
Re-entry:	in orbit
Launch site:	Plesetsk
Launch vehicle:	Molniya M
Orbit:	534 x 39134 km, inclination: 62.8°

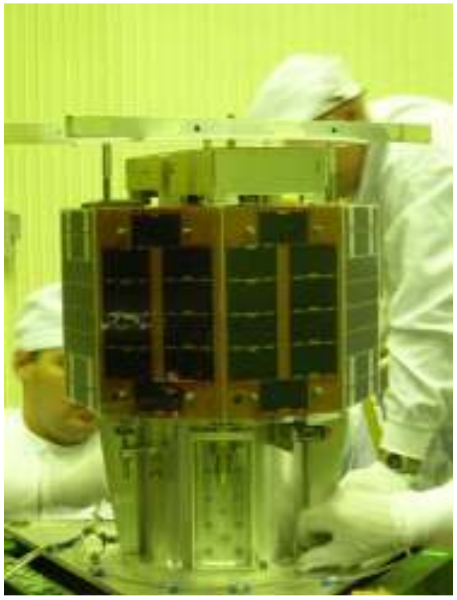
Oko military early warning satellite as described for 1972 072A.

Name:	BelKA-1
Country:	Belarus
Launch date:	26 July 2006
Re-entry:	n.a.
Launch site:	Baikonour
Launch vehicle:	Dnepr 1
Orbit:	failed to orbit



The Belaruski Kasmicni Aparat (BelKA)-1 was an Earth observation satellite with a mass of 750 kg which was to undertake imaging of the Earth's surface in visible and near infrared regions with a high spatial resolution of 2.5 m fin panchromatic and 10 m in multispectral. The spacecraft used a Viktoriya universal space bus.
The satellite failed to orbit as the first stage of the launch vehicle shut down prematurely after 89 seconds.

Name:	Unisat-4
Country:	Italy
Launch date:	26 July 2006
Re-entry:	n.a.
Launch site:	Baikonour
Launch vehicle:	Dnepr 1
Orbit:	failed to orbit



The 12 kg Unisat-4 was a technology satellite developed by the Universita di Roma. It carried cameras, a GPS experiment and an aerodynamic re-entry device experiment.
The satellite failed to orbit as the first stage of the launch vehicle shut down prematurely after 89 seconds.

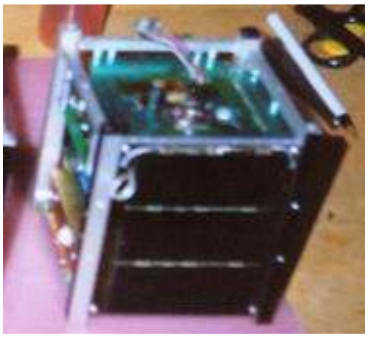
Name:	Baumanets
Country:	Russia
Launch date:	26 July 2006
Re-entry:	n.a.
Launch site:	Baikonour
Launch vehicle:	Dnepr 1
Orbit:	failed to orbit

Baumanets was a 92 kg remote sensing satellite developed by Russia's Bauman Moscow State Technical University. It carried an Earth imaging instrument and an amateur radio transponder.
The satellite failed to orbit as the first stage of the launch vehicle shut down prematurely after 89 seconds.

Name:	PICPOT
Country:	Italy
Launch date:	26 July 2006
Re-entry:	n.a.
Launch site:	Baikonour
Launch vehicle:	Dnepr 1
Orbit:	failed to orbit

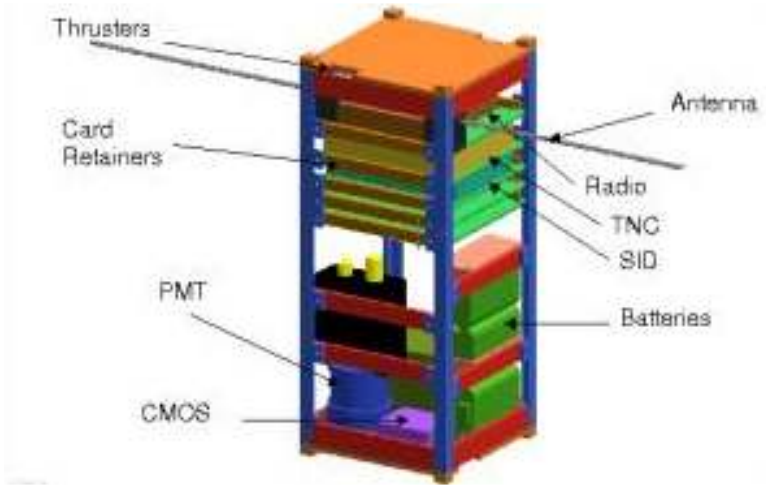
The Piccolo Cubo del Politecnico di Torino (PICPOT) was a small 2 kg cube satellite built by the Politecnico di Torino. It carried three colour cameras for Earth imaging as well as a radio amateur transponder.
The satellite failed to orbit as the first stage of the launch vehicle shut down prematurely after 89 seconds.

Name:	SACRED
Country:	USA
Launch date:	26 July 2006
Re-entry:	n.a.
Launch site:	Baikonour
Launch vehicle:	Dnepr 1
Orbit:	failed to orbit



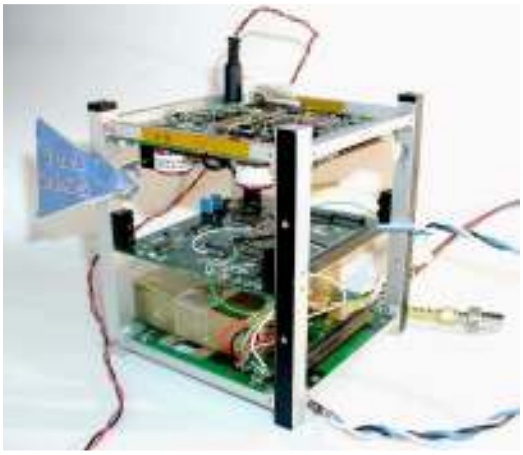
Sacred was a cooperative effort between The University of Arizona Tucson, Montpelier University and Alcatel Space Systems of France. The instruments on board of the satellite was to measure the total amount of high-energy radiation over a two-year span and to test four commercial integrated circuit components for their radiation hardness, functionality and annealing properties. It had a mass of 1 kg.
The satellite, which was to be deployed from the Poly-Picosatellite Orbital Deployer (P-POD)-A picosatellite deployer that was carried on the launch vehicle, failed to orbit as the first stage of the launch vehicle shut down prematurely after 89 seconds.
The P-POD was developed by the Stanford University and California Polytechnic Institute and held three single cubesats stacked on top on each other.

Name:	ION
Country:	USA
Launch date:	26 July 2006
Re-entry:	n.a.
Launch site:	Baikonour
Launch vehicle:	Dnepr 1
Orbit:	failed to orbit



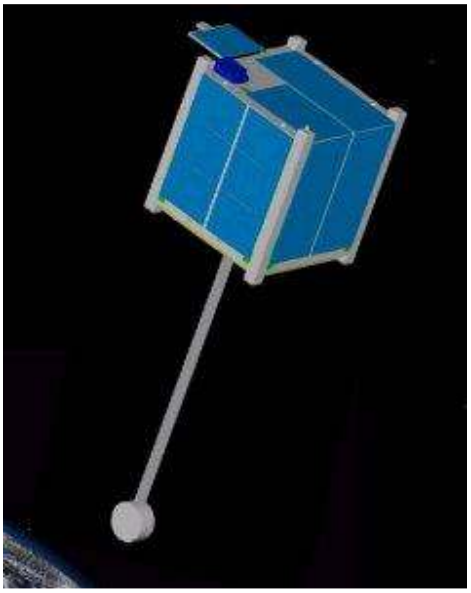
The Illinois Observing Nanosatellite (ION) comprised a dual cubesat, ie it had a mass of 2 kg. It was a scientific satellite developed by the University of Illinois. It carried a CMOS camera to view the airglow layer of the atmosphere and also was to test a vacuum arc thruster system.
The satellite, which was to be deployed from the P-POD-A picosatellite deployer that was carried on the launch vehicle, failed to orbit as the first stage of the launch vehicle shut down prematurely after 89 seconds.

Name:	Rincon-1
Country:	USA
Launch date:	26 July 2006
Re-entry:	n.a.
Launch site:	Baikonour
Launch vehicle:	Dnepr 1
Orbit:	failed to orbit



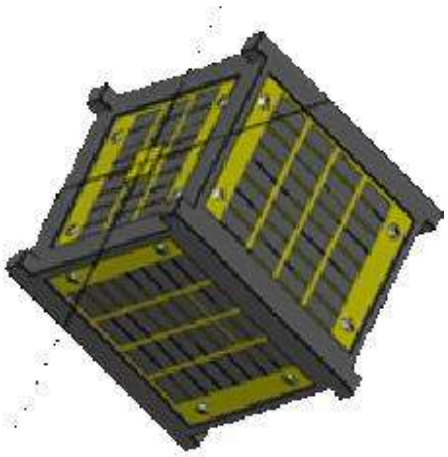
Rincon-1 carried a low-power beacon board developed by the Rincon Research Corporation in association with the University of Arizona Tucson. It had a mass of 1 kg.
The satellite, which was to be deployed from the P-POD-B picosatellite deployer that was carried on the launch vehicle, failed to orbit as the first stage of the launch vehicle shut down prematurely after 89 seconds.

Name:	ICECube-1
Country:	USA
Launch date:	26 July 2006
Re-entry:	n.a.
Launch site:	Baikonour
Launch vehicle:	Dnepr 1
Orbit:	failed to orbit



The Ionospheric sCintilation Experiment Cubesat (ICECube)-1 was developed by Cornell University and was to measure fluctuations in the signals that GPS satellites emit when the signals pass through the ionosphere. It had a mass of 1 kg.
The satellite, which was to be deployed from the P-POD-B picosatellite deployer that was carried on the launch vehicle, failed to orbit as the first stage of the launch vehicle shut down prematurely after 89 seconds.

Name:	KUTESat
Country:	USA
Launch date:	26 July 2006
Re-entry:	n.a.
Launch site:	Baikonour
Launch vehicle:	Dnepr 1
Orbit:	failed to orbit

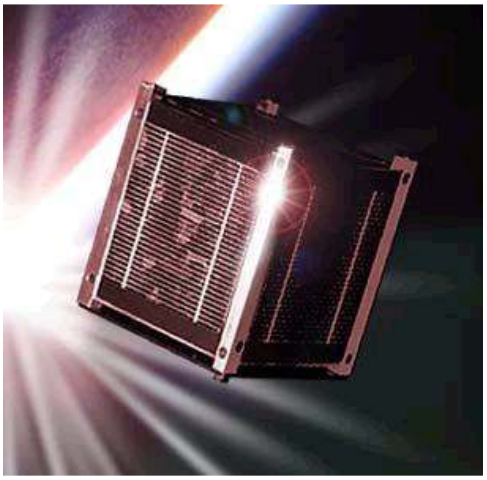


The Kansas Universities' Technology Evaluation Satellite (KUTESat) was a joint venture of several universities in Kansas. The 1 kg satellite was to measure the radiation in orbit and was to take photographs with an onboard camera.
The satellite, which was to be deployed from the P-POD-B picosatellite deployer that was carried on the launch vehicle, failed to orbit as the first stage of the launch vehicle shut down prematurely after 89 seconds.

Name:	SEEDS
Country:	Japan
Launch date:	26 July 2006
Re-entry:	n.a.
Launch site:	Baikonour
Launch vehicle:	Dnepr 1
Orbit:	failed to orbit

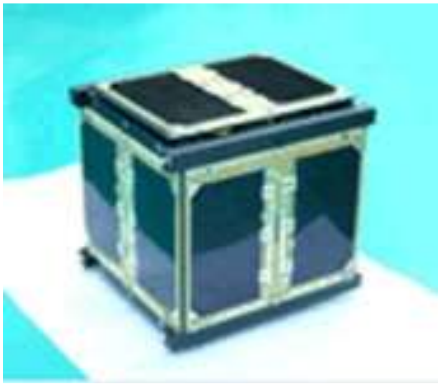
The Space Engineering Educational Satellite (SEEDS) was developed by the Nihon University of Japan and carried a CW transmitter, a FM transmitter, a FM receiver, a monopole deployable antenna and several sensors. It was to operate at 430MHz band, allowing it to communicate with amateur ground stations. It had a mass of 1 kg.
The satellite, which was to be deployed from the P-POD-C picosatellite deployer that was carried on the launch vehicle, failed to orbit as the first stage of the launch vehicle shut down prematurely after 89 seconds.

Name:	Ncube-1
Country:	Norway
Launch date:	26 July 2006
Re-entry:	n.a.
Launch site:	Baikonour
Launch vehicle:	Dnepr 1
Orbit:	failed to orbit



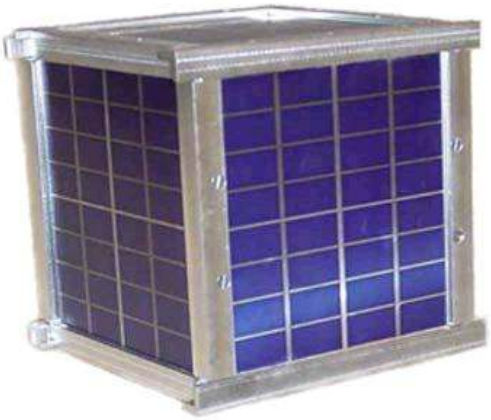
The Norwegian Student Satellite Project Ncube (Ncube-1) provided students of Norwegian educational institutions with experience in the designing, building, testing and operating of a satellite with a mass of 1 kg. The satellite, which was to be deployed from the P-POD-C picosatellite deployer that was carried on the launch vehicle, failed to orbit as the first stage of the launch vehicle shut down prematurely after 89 seconds.

Name:	HAUSAT-1
Country:	Korea
Launch date:	26 July 2006
Re-entry:	n.a.
Launch site:	Baikonour
Launch vehicle:	Dnepr 1
Orbit:	failed to orbit



The Hankuk Aviation University SATellite (HAUSAT)-1 was a student satellite fitted with a GPS receiver to collect satellite positioning data. The 1 kg satellite was also to test a deployment mechanism of solar cell panel and a new sun sensor.
The satellite, which was to be deployed from the P-POD-C picosatellite deployer that was carried on the launch vehicle, failed to orbit as the first stage of the launch vehicle shut down prematurely after 89 seconds.

Name:	MEROPE
Country:	USA
Launch date:	26 July 2006
Re-entry:	n.a.
Launch site:	Baikonour
Launch vehicle:	Dnepr 1
Orbit:	failed to orbit



The Montana EaRth Orbiting Pico-Explorer (MEROPE) was to measure the radiation in the Van Allen belts. The 1 kg satellite was developed by the Montana State University.
The satellite, which was to be deployed from the P-POD-D picosatellite deployer that was carried on the launch vehicle, failed to orbit as the first stage of the launch vehicle shut down prematurely after 89 seconds.

Name:	CalPoly CP-2
Country:	USA
Launch date:	26 July 2006
Re-entry:	n.a.
Launch site:	Baikonour
Launch vehicle:	Dnepr 1
Orbit:	failed to orbit

CalPoly CP-2, was developed by the California Polytechnic Institute and carried a duplex 1200bps digital communications system and data processing and storage equipment. It had a mass of 1 kg.
The satellite, which was to be deployed from the P-POD-D picosatellite deployer that was carried on the launch vehicle, failed to orbit as the first stage of the launch vehicle shut down prematurely after 89 seconds.

Name:	AeroCube-1
Country:	USA
Launch date:	26 July 2006
Re-entry:	n.a.
Launch site:	Baikonour
Launch vehicle:	Dnepr 1
Orbit:	failed to orbit

AeroCube-1 was a 1 kg satellite developed by the Aerospace Corp. Its instruments included an inertial rate measurement unit, a lithium battery power system and a VGA (video graphics array) camera developed by the Harvey Mudd College.
The satellite, which was to be deployed from the P-POD-D picosatellite deployer that was carried on the launch vehicle, failed to orbit as the first stage of the launch vehicle shut down prematurely after 89 seconds.

Name:	CalPoly CP-1
Country:	USA
Launch date:	26 July 2006
Re-entry:	n.a.
Launch site:	Baikonour
Launch vehicle:	Dnepr 1
Orbit:	failed to orbit

CalPoly CP-1 carried a sun sensor developed by Optical Energy Technologies and an experimental magnetorquer developed at the California Polytechnic Institute by undergraduate students. The satellite had a mass of 1 kg and was also known as K7RR-Sat in memory of AMSAT member and CubeSat team mentor Clifford Buttschardt.
The satellite, which was to be deployed from the P-POD-E picosatellite deployer that was carried on the launch vehicle, failed to orbit as the first stage of the launch vehicle shut down prematurely after 89 seconds.

Name:	Voyager
Country:	USA
Launch date:	26 July 2006
Re-entry:	n.a.
Launch site:	Baikonour
Launch vehicle:	Dnepr 1
Orbit:	failed to orbit

Also known as Mea Huaka'i, the Voyager was a 1 kg satellite developed by the University of Hawaii. It carried communications equipment operating at VHF/UHF frequencies as well as test thermal sensors.
The satellite, which was to be deployed from the P-POD-E picosatellite deployer that was carried on the launch vehicle, failed to orbit as the first stage of the launch vehicle shut down prematurely after 89 seconds.

Name:	ICECube-2
Country:	USA
Launch date:	26 July 2006
Re-entry:	n.a.
Launch site:	Baikonour
Launch vehicle:	Dnepr 1
Orbit:	failed to orbit

Scientific satellite as described for ICECube-1, which was also on this launch vehicle.
The satellite, which was to be deployed from the P-POD-E picosatellite deployer that was carried on the launch vehicle, failed to orbit as the first stage of the launch vehicle shut down prematurely after 89 seconds.

2006 031A (29268)

Name:	Arirang-2
Country:	Korea
Launch date:	28 July 2006
Re-entry:	in orbit
Launch site:	Plesetsk
Launch vehicle:	Rockot/Briz KM
Orbit:	656 x 681 km, inclination: 98.1°

Also known as the Korean Multipurpose Satellite (Kompsat)-2, the 804 kg satellite was equipped with a high-resolution multi-spectral camera with a resolution is 1 m and had the capability to reduce its orbit to an altitude of 150 kilometers, increasing its resolution to 25 cm.

2006 032A (29270)

Name:	Hot Bird-8
Int. Agency:	Eutelsat
Launch date:	4 August 2006
Re-entry:	in orbit
Launch site:	Baikonour
Launch vehicle:	Proton M/Briz M
Orbit:	geostationary at 13°E

Communications satellite owned by Eutelsat. The 4875 kg satellite was built by EADS Astrium using a Eurostar E3000 platform. It was fitted with 64 Ku band transponders.
In March 2012 it was renamed as Eutelsat Hot Bird 13-B.

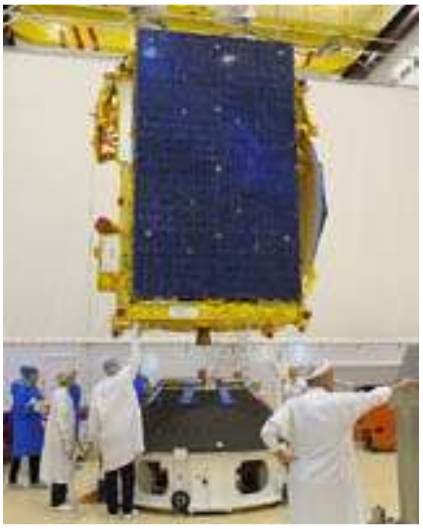
2006 033A (29272)

Name:	JC Sat-10
Country:	Japan
Launch date:	11 August 2006
Re-entry:	in orbit
Launch site:	Kourou
Launch vehicle:	Ariane 5 ECA
Orbit:	geostationary at 128°E

Communications satellite owned by JSAT Corp. and built by Lockheed Martin using an A2100AX platform. The 4048 kg satellite carried 30 Ku band and 12 C band transponders. It was later renamed as JC Sat-3A.

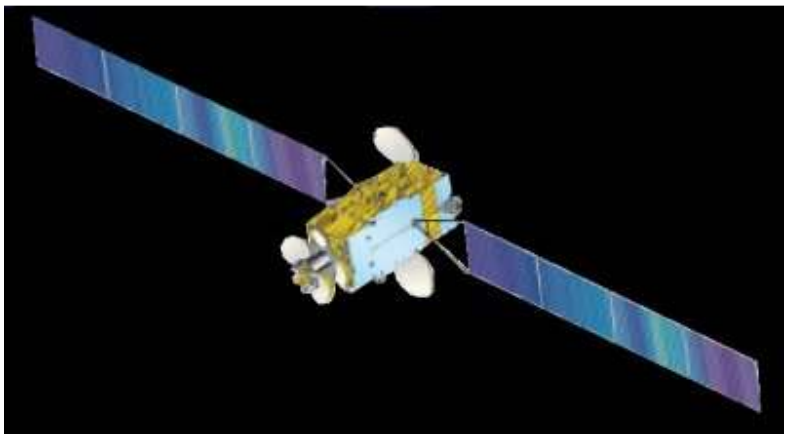
2006 033B (29273)

Name:	Syracuse 3-B
Country:	France
Launch date:	11 August 2006
Re-entry:	in orbit
Launch site:	Kourou
Launch vehicle:	Ariane 5 ECA
Orbit:	geostationary at 5°W



Military communications satellite as described for 2005 041B.

2006 034A (29349)
Name: Mugunghwa-5
Country: Korea
Launch date: 22 August 2006
Re-entry: in orbit
Launch site: Odyssey
Launch vehicle: Zenit 3SL
Orbit: geostationary at 113°E



The 4465 kg Koreasat-5 communications satellite served both the commercial requirements of the KT Corp and the requirements of the Korean military.
Built by Alcatel Space using a Spacebus 4000C1 platform, the satellite was fitted with 8 transponders in the SHF band, 4 transponders in the Ka band and 24 transponders in the Ku band. The satellite was also known as Koreasat-5.
The Odyssey platform was located at the equator on 154°W longitude.

Because of the association of the number '4' with death, there was no Mugunghwa-4 satellite.

2006 035A (29385)

Name:	SJ-8
Country:	China
Launch date:	9 September 2006
Re-entry:	1 November 2006
Launch site:	Jiuquan
Launch vehicle:	CZ 2C
Orbit:	178 x 428 km, inclination: 63.0°

Shi Jian-8 was a recoverable satellite that carried 2000 seeds (215 kg) from different plants to expose them to cosmic radiation and microgravity. The results of these experiments are expected to assist in the development of fruit and vegetables with a high-yield and high-quality. The satellite probably used a FSW 3 platform as described for 2003 051C with a mass of about 3400 kg. The payload was recovered on 24 September 2006.

2006 036A (29391)
Name: STS-115
Country: USA
Launch date: 9 September 2006
Re-entry: 21 September 2006
Launch site: Cape Canaveral
Launch vehicle: STS
Orbit: 335 x 350 km, inclination: 51.6°

Crewed spaceflight with astronauts B. Jett (Cmdr.), C. Ferguson (Pilot), J. Tanner, D. Burbank, S. MacLean (Canada) and H. Stefanyshyn-Piper (all Mission Specialists), using the orbiter Atlantis as described for 1981 034A.
Known also as the International Space Station (ISS)-12A mission, the objectives included the delivery and installation of the Integrated Truss Structure Port (ITS P)-3 and -4 which provide additional power arrays, deployment of the Solar Alpha Rotary Joint (SARJ) drive lock assemblies, the delivery and installation of four of four Alpha Joint Interface Structure (AJIS) struts and retrieve the Materials on the International Space Station Experiment (MISSE)-5 payload which had been installed by STS-114 (2005 026A).
The mission also carried:

1. the Effect of Spaceflight on Microbial Gene Expression & Virulence (MICROBE) experiment which was to investigate the effects of space on common microbes;
2. Developmental Test Objective (DTO) experiments as described for STS-1 (1981 034A):
   - DTO-805: Crosswind Landing Performance;
3. Station Development Test Objective (SDTO) experiments as described for STS-121 (2006 028A):
   - SDTO-12004-4: Shuttle Booster Fan Bypass;
   - SDTO-13005-U: ISS Structural Life Validation and Extension;
   - SDTO-15003-U: Microgravity Environment Definition;
4. several Short Duration Bioastronautics Investigations (SDBI) which were a continuation of several Detailed Supplementary Objective (DSO) experiments as described for STS-1 (1981 034A):
   - SDBI-1490B: Bioavailability and Performance Effects of Promethazine (PMZ) During Spaceflight (formerly DSO-490B);
   - SDBI-1493: Monitoring Latent Virus Reactivation and Shedding in Astronauts (formerly DSO-493); and
   - SDBI-1634: Sleep-Wake Actigraphy and Light Exposure during Spaceflight (formerly DSO-634).

The orbiter docked with the PMA-2 docking port of the International Space Station (1998 067A) on 11 September 2006.
Three spacewalks were undertaken using the Quest airlock.

The first EVA on 12 September 2006, was undertaken by Tanner and Piper and involved the connection of the power cables of the P3 and P4 trusses, releasing the Solar Array Blanket Box and Beta Gimbal Assembly Restraints and preparing the Solar Alpha Rotary Joint for operations. This EVA lasted 6 hours, 26 minutes.

The second EVA of 7 hours, 11 minutes, on 13 September 2006, was undertaken by Burbank and MacLean. They completed preparations for the activation of the Solar Alpha Rotary Joint. On 14 September 2006 the 73 m wide solar array was unfolded. The solar arrays provide one quarter of the station's power requirements.

The final EVA, on 15 September 2006, was again undertaken by Tanner and Piper and they completed the installation of the P3 and P4 solar arrays and the Solar Alpha Rotary Joint, retrieved the MISSE-5 experiment as well as some minor activities. This EVA lasted 6 hours, 42 minutes.

STS-115 undocked on 17 September 2006. The landing was delayed by one day when a few small objects were detected flying in close proximity of the orbiter. Whilst these objects were not further identified, and inspection of the orbiter's heat shield with the robotic arm, indicated there was no damage of the heat shield. The orbiter landed at the Kennedy Space Centre on 21 September 2006. The mission had lasted 11 days, 19 hours, 6 minutes.

2006 037A (29393)

Name:	IGS-3A
Country:	Japan
Launch date:	11 September 2006
Re-entry:	in orbit
Launch site:	Tanegashima
Launch vehicle:	H 2A-202
Orbit:	478 x 479 km, inclination: 97.4°

Military reconnaissance satellite as described for 2003 009A. Launched as a replacement for the satellite that failed on 29 November 2003, it is believed IGS-3A was fitted with an optical imager and has also been referred to as Kougaku-2 and Optical-3.

2006 038A (29399)

Name:	Zhongxing-22
Country:	China
Launch date:	12 September 2006
Re-entry:	in orbit
Launch site:	Xichang
Launch vehicle:	CZ 3A
Orbit:	geostationary at 98°E

Military communications satellite as described for 2000 003A. It was also known as FH-3.

2006 039A (29402)

Name:	Kosmos-2423
Country:	Russia
Launch date:	14 September 2006
Re-entry:	23 November 2006
Launch site:	Baikonour
Launch vehicle:	Soyuz U
Orbit:	186 x 272 km, inclination: 64.9°

Don military reconnaissance satellite as described for 1989 056A. The satellite was ‘fragmented’ on 17 November 2006.

2006 040A (29404)

Name:	Soyuz TMA-9
Country:	Russia
Launch date:	18 September 2006
Re-entry:	21 April 2007
Launch site:	Baikonour
Launch vehicle:	Soyuz FG
Orbit:	333 x 350 km, inclination: 51.6°

Crewed spaceflight with cosmonauts M. Tyurin (Cmdr), M. Lopez-Alegria (Fl. Eng) (USA) and A. Ansari (USA) using a Soyuz TMA spacecraft as described for 2002 050A. The mission was also known as ISS-13S and the call sign was Vostok. Tyurin and Lopez-Alegria were the fourteenth permanent crew (EX-14) for ISS. The spacecraft docked with the rear Zvezda docking port of ISS (1998 067A) on 20 September 2006.
Ansari, a US citizen who was born in Iran, had replaced D. Enomoto (Japan) who was dropped from the mission because he failed to meet medical requirements. Ansari returned to Earth on Soyuz TMA-8 (2006 009A) on 29 September 2006. She had been in space for 10 days, 20 hours, 56 minutes.
On 10 October 2006 Tyurin, Lopez-Alegria and Reiter moved the spacecraft from the rear Zvezda docking port to the Zarya nadir docking port. On 29 March 2007 Tyurin, Lopez-Alegria, and S. Williams moved Soyuz TMA-9 again from the Zarya nadir docking port to the Zvezda rear docking port.
On 21 April 2007 the the spacecraft undocked and returned Tyurin and Lopez-Alegria back to Earth along with Simonyi who had arrived on the space station on Soyuz TMA-10 (2007 008A). Tyurin and Lopez-Alegria had been in space for 215 days, 8 hours, 22 minutes.

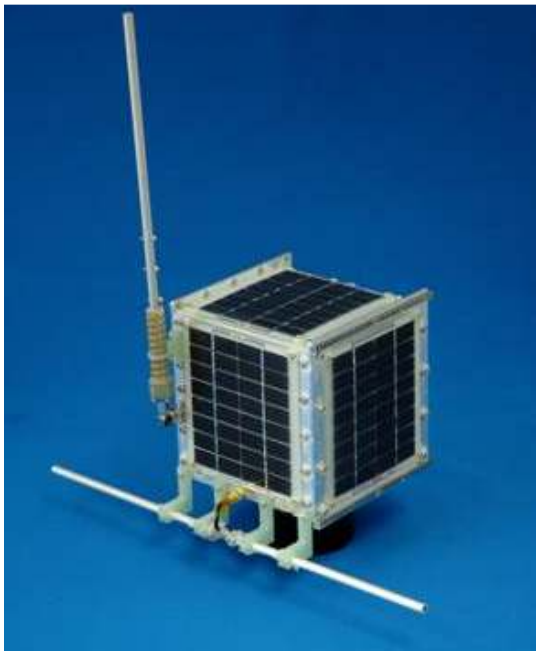
2006 041A (29479)
Name: Hinode
Country: Japan
Launch date: 22 September 2006
Re-entry: in orbit
Launch site: Kagoshima
Launch vehicle: Mu 5
Orbit: 318 x 675 km, inclination: 98.3°

The Hihode spacecraft studied the mechanisms which power the solar atmosphere and look for the causes of violent solar eruptions.
The mission was undertaken in cooperation with the European Space Agency and the payload comprised:

1. the Solar Optical Telescope (SOT) with an aperture of 50 cm;
2. the X-ray Telescope (XRT) which will provide coronal images at different temperatures;
3. the Extreme Ultraviolet Imaging Spectrometer (EIS) to determine velocity fields and other plasma parameters in the corona and transition region.

The 900 kg satellite was also known as Solar-B.

2006 041B (29480)
Name: Hitsat
Country: Japan
Launch date: 22 September 2006
Re-entry: in orbit
Launch site: Kagoshima
Launch vehicle: Mu 5
Orbit: 280 x 668 km, inclination: 98.3°



Radio amateur satellite built by the Hokkaido Institute of Technology. The 2.2 kg satellite was fitted with a transponder operating in the 437 MHz band. The satellite was also known as Camatai and Oscar-59 or HO-59.

2006 041C (29481)

Name:	SSP-2
Country:	Japan
Launch date:	22 September 2006
Re-entry:	in orbit
Launch site:	Kagoshima
Launch vehicle:	Mu 5
Orbit:	281 x 637 km, inclination: 98.3°

Solar sail experiment as described for 2006 005B.

2006 042A (29486)

Name:	Navstar 2R-15
Country:	USA
Launch date:	26 September 2006
Re-entry:	in orbit
Launch site:	Cape Canaveral
Launch vehicle:	Delta 7925-9.5
Orbit:	20020 x 20342 km, inclination: 55.0°

Navigational satellite as described for 2005 038A. Also known as Navstar 2R-M2, USA-190, Navstar-52. Navstar-58 and SVN-52.

2006 043A (29494)

Name:	Direc TV-9S
Country:	USA
Launch date:	13 October 2006
Re-entry:	in orbit
Launch site:	Kourou
Launch vehicle:	Ariane 5 ECA
Orbit:	geostationary at 101°W

Communications satellite owned by Direc TV and built by Space Systems Loral using the LS1300 platform. The 5535 kg satellite carried 52 Ku band transponders and 5 Ka band transponder.

2006 043B (29495)

Name:	Optus D-1
Country:	Australia
Launch date:	13 October 2006
Re-entry:	in orbit
Launch site:	Kourou
Launch vehicle:	Ariane 5 ECA
Orbit:	geostationary at 160°E

Communications satellite owned by Optus and built by Orbital Science's using a Star-2 platform. The 2299 kg satellite carried 24 transponders in the Ku band.

2006 043C (29496)
Name: LDREX-2
Country: Japan
Launch date: 13 October 2006
Re-entry: 30 Septemner 2010
Launch site: Kourou
Launch vehicle: Ariane 5 ECA
Orbit: 264 x 35648 km, inclination: 7.0°

The Large Deployable Reflector Small-sized Partial Model 2 (LDREX-2) tested a 6.5 m diameter deployable antenna system. It had a mass of 221 kg and was successfully deployed shortly after the launch.

2006 044A (29499)
Name: MetOp-1
Int. Agency: Eumetsat
Launch date: 19 October 2006
Re-entry: in orbit
Launch site: Baikonour
Launch vehicle: Soyuz 2-1a/Fregat
Orbit: 819 x 821 km, inclination: 98.7°

MetOp-1 was the first polar orbiting satellite Eumetsat to collect high-resolution data to complement the hemispheric survey of the atmosphere conducted from geostationary orbit by the Meteosat system.
Built by an industrial team led by EADS Astrium, the 4175kg satellite carried 11 instruments:

1. the Advanced Very High Resolution Radiometer (AVHRR/3) for day and night imaging of clouds and the Earth surface;
2. the High resolution Infrared Radiation Sounder (HIRS/4), a 20-channel radiometric sounder measuring radiance in the infrared spectrum which is used to determine ocean surface temperatures, total atmospheric ozone levels, precipitable water, cloud height and coverage and surface radiance;
3. the Advanced Microwave Sounding Unit-A (AMSU-A) to measure scene radiance in the microwave spectrum to calculate the global atmospheric temperature and humidity profiles and to provide precipitation and surface measurements including snow cover, sea ice concentration and soil moisture;
4. the Microwave Humidity Sounder (MHS) to measure the atmospheric humidity and temperature at various altitudes;
5. the Infrared Atmospheric Sounding Interferometer (IASI) spectrometer to provide highly accurate temperature and humidity profile measurements;
6. the Global Ozone Monitoring Experiment (GOME)-2 spectrometer to probe the atmosphere for ozone and trace gas concentrations;
7. the Advanced Scatterometer (ASCAT) to measure wind speed and direction on the ocean surface;
8. the Global Navigation Satellite System Receiver for Atmospheric Sounding (GRAS) to provide atmospheric profiles using the occultation of radio signals from GPS satellites;
9. the Advanced Data Collection System (A-DCS), also known as Argos, to provide worldwide in-situ environmental data collection and Doppler-derived location services;
10. a Search and Rescue package, comprising Search And Rescue Processor (SARP)-3 instrument to receive and process emergency signals from aircraft and ships in distress and determines the name, frequency and time of the signal, and the Search And Rescue Repeater (SARR) instrument

for immediate transmission to Search and Rescue Satellite (SARSAT) distress terminals on the ground; and

11. the Space Environment Monitor (SEM)-2 spectrometer to monitor charged particle flux in space, or so-called 'space weather'.

Name:	Kavoshgar-1
Country:	Iran
Launch date:	22 October 2006 or later
Re-entry:	n.a.
Launch site:	Semnan
Launch vehicle:	M5
Orbit:	sub-orbital to 10 km

Sub-orbital flight to test telemetry. It is believed that the flight failed.
This flight was revealed on 4 February 2008 as having occurred in the Iranian calendar month Aban 1385, which equates to the period 22 October to 20 November 2006.

2006 045A (29503)

Name:	Progress M-58
Country:	Russia
Launch date:	23 October 2006
Re-entry:	27 March 2007
Launch site:	Baikonour
Launch vehicle:	Soyuz U
Orbit:	329 x 346 km, inclination: 51.6°

Cargo transfer spacecraft as described for 1989 066A. Progress M-58 docked at the rear Zvezda docking port of ISS (1998 067A) on 26 October 2006. The flight was also known as ISS-23P. The spacecraft undocked on 27 March 2007.

2006 046A (29505)

Name:	SJ-6C
Country:	China
Launch date:	23 October 2006
Re-entry:	in orbit
Launch site:	Taiyuan
Launch vehicle:	CZ 4B
Orbit:	593 x 600 km, inclination: 97.7°

Shi Jian scientific satellite as described for 2004 035A.

2006 046B (29506)

Name:	SJ-6D
Country:	China
Launch date:	23 October 2006
Re-entry:	in orbit
Launch site:	Taiyuan
Launch vehicle:	CZ 4B
Orbit:	596 x 601 km, inclination: 97.7°

Shi Jian scientific satellite as described for 2004 035A.

2006 047A (29510)
Name: STEREO-A
Country: USA
Launch date: 26 October 2006
Re-entry: in orbit
Launch site: Cape Canaveral
Launch vehicle: Delta 7925
Orbit: 0.95 x 0.97 AU, inclination: 0.12°

The two Solar TErrestrial RElations Observatory (STEREO) satellites were nearly identical and provided a three dimensional view of the Sun and the solar wind and explore the origin, evolution and interplanetary consequences of coronal mass ejections by the Sun. The combined mission was also known as Coronal Mass Ejection Warning System (CMEWS) and S00-6.
Over a period of three months the spacecraft flew first to a point just beyond the Moon, where STEREO-B (B meaning 'behind') was placed in a position 'behind' the Earth. The second spacecraft, STEREO-A (with A meaning 'ahead') then maneuvered to a position 'ahead' of Earth. The separation allows the generation of three-dimensional images.
Each of the 620 kg spacecraft will carry two instrument suites as well as two separate instruments:

1. the Sun-Earth Connection Coronal and Heliospheric Investigation (SECHHI) instrument suite consisting of
   - the COR1 Coronagraph which will explore the inner corona in white light;
   - the COR2 Coronagraph which will image the corona with a high resolution;
   - the Extreme Ultraviolet Imager (EUVI) which will observe the photospheric magnetic field, chromosphere, and innermost corona;
   - the Guide Telescope, a fine sun sensor for the EUVI;
   - the Heliospheric Imager (HI) which will obtain direct imaging observations of coronal mass ejections in interplanetary space;
2. the In situ Measurements of PArticles and Coronal mass ejection Transients (IMPACT) instrument suite consisting of
   - the Solar Wind Electron Analyzer (SWEA) to measure the distribution function of the solar wind core and halo electrons with high spectral and angular resolution;
   - the Suprathermal Electron Telescope (STE), an instrument that covers electrons in the energy range ~2-20 keV;
   - a Magnetometer (MAG);

- the Solar Electron Proton Telescope (SEPT), consisting of two dual, double-ended magnet/foil solid state detector particle telescopes;
- the Suprathermal Ion Telescope (SIT), an ion mass spectrometer that measures elemental composition of He-Fe ions;
- the Low Energy Telescope (LET), a special double-fan arrangement of 14 solid state detectors designed to measure protons and helium ions;
- the High Energy Telescope (HET), six solid state detectors in a traditional linear arrangement to measure protons and helium ions;

3. the PLAsma and SupraThermal Ion Composition (PLASTIC) instrument to study coronal-solar wind and solar wind-heliospheric processes;
4. the STEREO/WAVES (S/WAVES) is an interplanetary radio burst tracker that will trace the generation and evolution of traveling radio disturbances from the sun to Earth's orbit.

In September 2009 STEREO-A passed the L4 Lagrangian point and in October 2009 STEREO-B passed the L5 Lagrangian point. During these passes the spacecraft looked for asteroids that may have been trapped at these orbital locations.

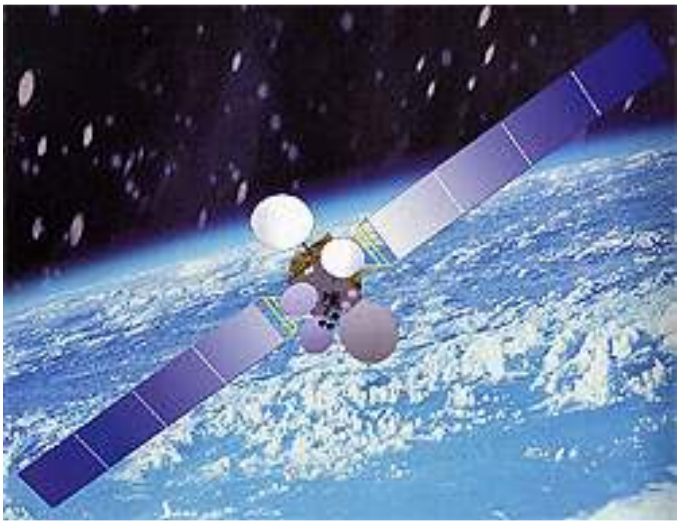
2006 047B (29511)

Name:	STEREO-B
Country:	USA
Launch date:	26 October 2006
Re-entry:	in orbit
Launch site:	Cape Canaveral
Launch vehicle:	Delta 7925
Orbit:	0.99 x 1.09 AU, inclination: 0.03°

Scientific satellite as described for 2006 047A.

2006 048A (29516)

Name:	Xinnuo-2
Country:	China
Launch date:	29 October 2006
Re-entry:	in orbit
Launch site:	Xichang
Launch vehicle:	CZ 3B
Orbit:	geostationary at 110°E



Direct broadcasting satellite owned by Sinosat and built by the Chinese Academy of Space Technology using a DFH-4 platform. It carried 22 Ku band transponders and was also known as Sinosat-2.
As the solar power panels failed to operate, the satellite was abandoned.

2006 049A (29520)

Name:	XM-4 Blues
Country:	USA
Launch date:	30 October 2006
Re-entry:	in orbit
Launch site:	Odessey
Launch vehicle:	Zenit 3SL
Orbit:	geostationary at 115°W

Communications satellite as described for XM-2 (2001 012A) but with slight improvements. The launch took place at 154°W, 0°, south of Hawaii. It had a mass of 5193 kg.

2006 050A (29522)

Name:	DMSP F-17
Country:	USA
Launch date:	4 November 2006
Re-entry:	in orbit
Launch site:	Vandenberg
Launch vehicle:	Delta 4 Medium
Orbit:	842 x 855 km, inclination: 98.8°

Military meteorological satellite as described for 1999 067A. DMSP F-17 was also known as USA-191.
The payload did not include the SSF and SSB/X2 instruments, but included the SSUSI Ultraviolet Spectrographic Imager.

2006 051A (29526)

Name:	Badr-4
Int. Agency:	Arabsat
Launch date:	8 November 2006
Re-entry:	in orbit
Launch site:	Baikonour
Launch vehicle:	Proton M/Briz M
Orbit:	geostationary at 26°E

Communications satellite owned Arabsat and built by EADS Astrium using a Eurostar 2000+ platform. The 3297 kg satellite was fitted with 32 Ku band transponders. The satellite was also known as Arabsat-4B.

Name:	Goddard-1
Country:	USA
Launch date:	13 November 2006
Re-entry:	n.a.
Launch site:	Van Horn
Launch vehicle:	Goddard
Orbit:	suborbital to 0.087 km

Test launch of a sub-scale model of the New Shepard spacecraft developed by Blue Origin. Named Goddard-1 and launched using on-board rocket engines, from a site near Van Horn, Texas on 13 November 2006, it reached an altitude of 87 m. The vehicle was propelled by nine hydrogen peroxide monopropellant rocket engines. It was also known as PM1.

2006 052A (29601)

Name:	Navstar 2R-16
Country:	USA
Launch date:	17 November 2006
Re-entry:	in orbit
Launch site:	Cape Canaveral
Launch vehicle:	Delta 7925
Orbit:	20206 x 20367 km, inclination: 55.1°

Navigational satellite as described for 2005 038A. Also known as Navstar 2R-M3, USA-192, Navstar-58, Navstar-59 and SVN-58.

2006 053A (29640)

Name:	Feng Yun 2-D
Country:	China
Launch date:	8 December 2006
Re-entry:	in orbit
Launch site:	Xichang
Launch vehicle:	CZ 3A
Orbit:	geostationary at 86.5°E

Meteorological satellite as described for 1997 029A. It was moved to 123.5ºE in August 2015.

2006 054A (29643)

Name:	WildBlue-1
Country:	USA
Launch date:	8 December 2006
Re-entry:	in orbit
Launch site:	Kourou
Launch vehicle:	Ariane 5ECA
Orbit:	geostationary at 111°W

Communications satellite owned by WildBlue Communications. The 4735 kg satellite was based on the SpaceSystems/Loral LS-1300 satellite and carried Ka band transponders to generate 41 overlapping spot beams to provide broadband access to homes and business in communities where terrestrial broadband access is either limited or unavailable.
The system was previously referred to as iSky and KaStar.

2006 054B (29644)

Name:	AMC-18
Country:	USA
Launch date:	8 December 2006
Re-entry:	in orbit
Launch site:	Kourou
Launch vehicle:	Ariane 5ECA
Orbit:	geostationary at 105°W

Communications satellite owned by SES Global. The 2080 kg satellite was built by Lockheed Martin using the A2100 platform and carried 24 C band transponders.

2006 055A (29647)
Name: STS-116
Country: USA
Launch date: 10 December 2006
Re-entry: 22 December 2006
Launch site: Cape Canaveral
Launch vehicle: STS
Orbit: 315 x 338 km, inclination: 51.6°

Crewed spaceflight with astronauts M. Polansky (Cmdr.), W. Oefelein (Pilot), R. Curbeam, C. Fuglesang (ESA), J. Higginbotham and N. Patrick (all Mission Specialists) as well as an ISS Expedition crew member, S. Williams, using the orbiter Discovery as described for 1981 034A. The objective was to undertake the International Space Station (ISS)-12A.1 mission. The mission was also know by ESA as Celsius.
The payload included:

1. the Integrated Truss Structure Port (IST P)-5, which was attached to ITS P-3 and P-4;
2. the Integrated Cargo Carrier cargo module which on this flight consisted of an unpressurised flatbed panel carrying, amongst others, the STP-H2 satellite deployment facility;
3. the Spacehab logistics module (FU2) as described for 1993 037A which carried a variety of hardware and experiments for the space station;
4. a Developmental Test Objective (DTO) experiment as described for STS-1 (1981 034A):
   - DTO-805: Crosswind Landing Performance;
5. Station Development Test Objective (SDTO) experiments as described for STS-121 (2006 028A):
   - SDTO-12004-4: Shuttle Booster Fan Bypass;
   - SDTO-13005-U: ISS Structural Life Validation and Extension;
   - SDTO-15003-U: Microgravity Environment Definition;
6. several Short Duration Bioastronautics Investigations (SDBI) as described for STS-115 (2006 036A):
   - SDBI-1493: Monitoring Latent Virus Reactivation and Shedding in Astronauts (formerly DSO-493);
   - SDBI-1503S: Test of Midodrine as a Countermeasure against Postflight Hypertension (formerly DSO-503);
   - SDBI-1634: Sleep-Wake Actigraphy and Light Exposure during Spaceflight (formerly DSO-634);
7. several Short-duration Research and Station Experiments:
   - Maui Analysis of Upper Atmospheric Injections (MAUI) as described for STS-121 (2006 028A);
   - Effect of Space Flight on Microbial Gene Expression and Virulence (Microbe) to investigate the effects of the space flight environment on virulence of three microbial pathogens;
   - Perceptual Motor Deficits in Space (PMDIS) to investigate why astronauts experience difficulties with hand-eye coordination whilst in orbit; and
   - Ram Burn Observations (RAMBO), as described for STS-111 (2002 028A).

The Space Test Program (STP)–H2 deployment facility carried the two Atmospheric Neutral Density Experiment (ANDE) two microsatellites whilst a P-PODS system carried two Microelectromechanical System-Based (MEMS) PICOSAT Inspector (MEPSI), the Radar Fence Transponder (RAFT) and the Military Affilliate Radio System (MARScom) 'cubesats'.
The orbiter docked with the PMA-2 docking port of the International Space Station (1998 067A) on 11 December 2006.

The the first EVA on 12 December 2006 was undertaken by Curbeam and Fuglesang. The EVA lasted 6 hours, 36 minutes and they installed the ITS P5 module.
During the second EVA of 5 hours, 0 minutes, on 15 December 2006, Curbeam and Fuglesang configured the space station power to the permanent architecture. They also relocated two Crew and Equipment Translation Aid (CETA) carts from the starboard site of the station to the port side to make way for the station's Mobile Transporter. In addition they performed two secondary tasks.

The third EVA was on 16 December 2006 and was undertaken by Curbeam and Williams. The 7 hours, 31 minutes spacewalk was further devoted to configure the space stations electrical power system whilst the astronauts also installed three Service Module Debris Panels.
Problems with a solar array that could not be fully retracted lead to a fourth EVA by Curbeam and Fuglesang on 18 December 2006. This EVA lasted 6 hours, 38 minutes, during which the solar array was successfully retracted.

Fourth EVA

The orbiter undocked on 19 December 2006. Sunita Williams remained on board of the ISS to become a member of the EX-14 crew. She returned to Earth on STS-117 (2007 024A). In her place STS-116 took Thomas Reiter, who had arrived on the space station on STS-121 (2006 028A), back to Earth.
On 21 December 2006 the MEPSI-4 (2006 055B), RAFT (2006 055C), MARSCom (2006 055D), ANDE-MMA (2006 055E) and ANDE-FCAL (2006 065J) satellites were released. These satellites were collectgively known as STP-H2.
STS-116 landed at the Kennedy Space Centre on 22 December 2006. The mission had lasted 12 days, 20 hours, 44 minutes. Reiter had been in space for 171 days, 4 hours, 10 minutes.

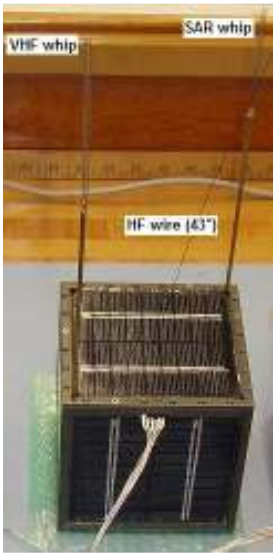
2006 055B (29660)
Name: MEPSI-4
Country: USA
Launch date: 21 December 2006
Re-entry: 8 March 2007
Launch site: Cape Canaveral
Launch vehicle: STS
Orbit: 303 x 320 km, inclination: 51.6°

The two Micro Electro-mechanical System (MEMS) based Picosat Inspector (MEPSI)-4 satellites were connected by a 16 m tether line to demonstrate on-board imaging capability to assess spacecraft damage, monitor launch and deployment sequences as well as augment servicing operations. The tethered satellites had a mass of 3.5 kg and have also been referred to as MEPSI-2A and -2B. The satellites were deployed from a P-PODS system carried by STS-116 (2006 055A).

2006 055C (29661)
Name: RAFT
Country: USA
Launch date: 21 December 2006
Re-entry: in orbit
Launch site: Cape Canaveral
Launch vehicle: STS
Orbit: 310 x 328 km, inclination: 51.6°

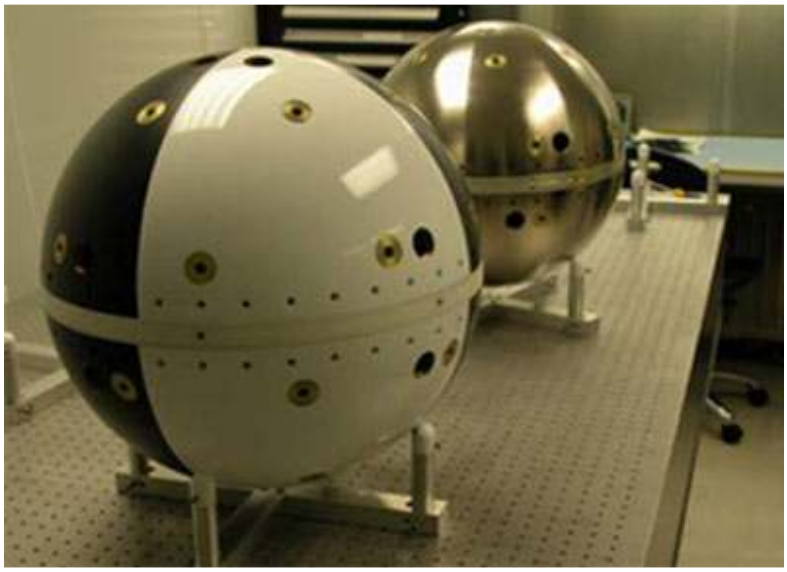
The Radar Fence Transponder (RAFT) was a 3 kg cubesat developed at the US Naval Academy to give students hand-on experience in satellite engineering, design and operations. The satellite carried a number of transponders including one that was used for experiments with Navy Space Surveillance System. The satellite was deployed from a P-PODS system carried by STS-116 (2006 055A).
The satellite was also designated as Oscar-60 or NO-60.

2006 055D (29662)
Name: MARScom
Country: USA
Launch date: 21 December 2006
Re-entry: 6 May 2007
Launch site: Cape Canaveral
Launch vehicle: STS
Orbit: 309 x 328 km, inclination: 51.6°



The Military Affilliate Radio System (MARS)com 'cubesat', also referred to as NMARS, was developed by the US Naval Academy and explored and demonstrated a very low cost communications capability for education and training of both Midshipmen and the large numbers of Navy Marine Corps communications cadre personnel. The transponder operated in the 148 MHz band. The satellite had a mass of 3 kg and was deployed from a P-PODS system carried by STS-116 (2006 055A).

2006 055F (29664)
Name: ANDE-MAA
Country: USA
Launch date: 20 December 2006
Re-entry: in orbit
Launch site: Cape Canaveral
Launch vehicle: STS
Orbit: 311 x 335 km, inclination: 51.6°



MAA in the foreground, FCAL in the background

The two Atmospheric Neutral Density Experiment (ANDE) microsatellites were developed by the Naval Research Laboratory to study the atmosphere of the Earth from low-Earth orbit by monitoring total atmospheric density at a 400 km altitude in an effort to improve methods for the precision orbit determination of space objects and to calibrate the US Navy's space surveillance system.
The instrumented satellite, known as ANDE-Fence Calibration (FCAL) Sphere, carried five instruments:

1. a miniature wind and temperature spectrometer (WATS) to measure atmospheric composition, cross-track winds, and neutral temperature;
2. a Global Positioning Sensor (GPS);
3. a thermal monitoring system (TMS) to monitor the temperature of the satellite;
4. an electrostatic analyzer to monitor plasma density; and
5. a spacecraft charging sensor.

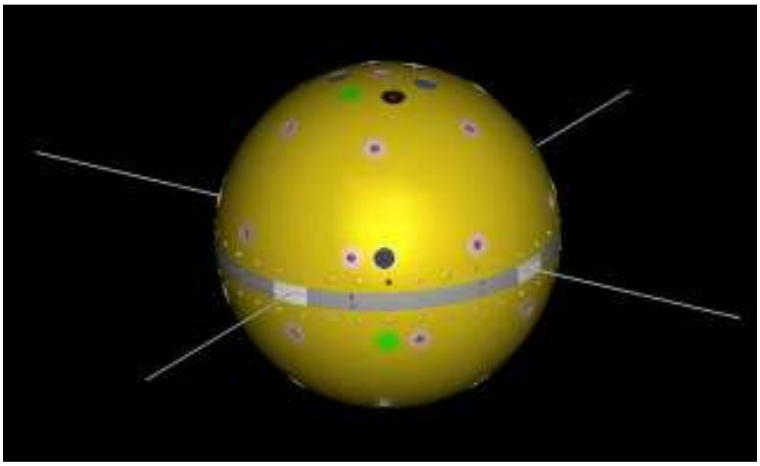
ANDE-FCAL had a mass of 75 kg.
The other satellite, known as ANDE-Mock Ande Active (MAA), was a passive satellite with a mass of 50 kg. It was instrumented with six photovoltaic cells. The satellite was also designated as Oscar-61 or NO-61.

The two microsatellites were to be released by a novel deployment mechanism carried by STS-116 (2006 055A) in the cargo bay as none of the existing deployment systems met the requirements. Named the Canister for All Payload Ejections (CAPE) or Internal Cargo Unit (ICU), the canister, with the two satellites in it, was released as a single unit, following which it split into two units (2006 055E and 2006 055G) and a separate avionics disk (2006 055H), with the satellites to be released from the units – thus ending up with five objects.
Initially one satellite failed to deploy from the canister unit and it was reported that ANDE-MAA satellite was deployed and that ANDE-FCAL (2006 055J) remained inside the canister unit. The subsequent receipt of telemetry information from the ANDE-FCAL led to the conclusion that the satellite had eventually deployed itself from the canister.

The payloads were intended to drift apart with the passive satellite leading the active satellite. Both satellites were to be observed by the US Space Surveillance Network (SSN) and scientists were to determine their position from which they would have computed total density and validate drag coefficient models.

Canister deployment

2006 055J (29667)
Name: ANDE-FCAL
Country: USA
Launch date: 20 December 2006
Re-entry: in orbit
Launch site: Cape Canaveral
Launch vehicle: STS
Orbit: 311 x 335 km, inclination: 51.6°



Scientific satellite as described for ANDE-MAA (2006 055E). The satellite was also designated as Oscar-62 or NO-62.

2006 056A (29648)
Name: Measat-3
Country: Malaysia
Launch date: 12 December 2006
Re-entry: in orbit
Launch site: Baikonour
Launch vehicle: Proton M-Briz M
Orbit: geostationary as 91.5°E

Communications satellite owned by Binariang Satellite Systems of Malaysia. The 3220 kg Boeing BSS-601HP satellite carried 24 C band and 24 Ku band transponders.

2006 057A (29651)

Name:	USA-193
Country:	USA
Launch date:	14 December 2006
Re-entry:	21 February 2008
Launch site:	Vandenberg
Launch vehicle:	Delta 7920-10
Orbit:	352 x 363 km, inclination: 58.5°

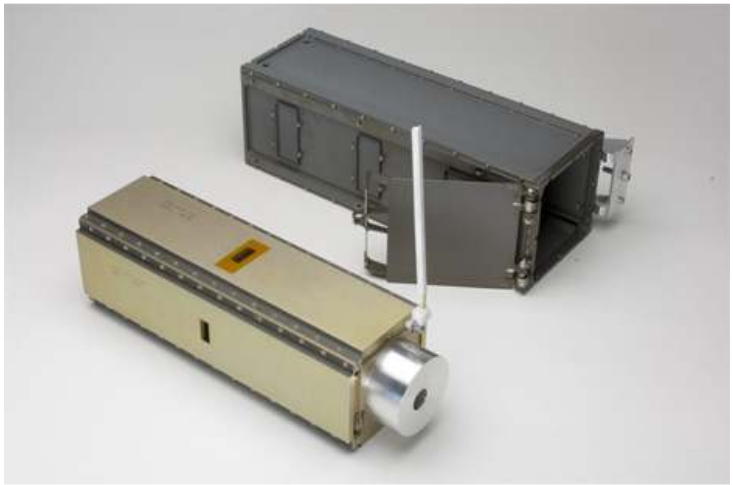
Military reconnaissance satellite also known as NROL-21. The satellite is believed to have been built by Lockheed Martin in the Future Imagery Architecture programme and tested prototype instruments for future spy satellites, possibly including a radar sensor.
The satellite was probably to have been placed into a higher orbit of 20,000 km but it has been suggested it was abandoned due to failure to establish communications with the satellite.
Its orbit was not officially known although, based on visual observations, on 11 February 2008 it had reduced to about 250 km with a daily reduction of 1 km. The daily reduction was to increase as the spacecraft would get lower and it was estimated the spacecraft would decay mid March 2008.
Concern about the 500 kg of hydrazine on board, which was consider to have been frozen solid, led to the decision to destroy the spacecraft with an SM-3 missile fired from the USS Lake Erie on 21 February 2008. The missile was fired from a location in the Pacific Ocean west of Hawaii when USA-193 was in a 242 x 257 km orbit and destroyed the spacecraft, resulting in more than 80 pieces of debris that burned up in the atmosphere over the next few days.

2006 058A (29653)
Name: TacSat-2
Country: USA
Launch date: 16 December 2006
Re-entry: 5 February 2011
Launch site: Wallops Island
Launch vehicle: Minotaur 1
Orbit: 410 x 426 km, inclination: 40.0°

TacSat-2 was a 415 kg technology satellite for the Air Force Research Laboratory. Also known as Joint Warfighting Space Demonstrator (JWS D)-1, the satellite used a platform developed by MSI (MicroSat System's Inc.) and spare parts from TechSat-21, which was cancelled in early 2003.
The experiments were:

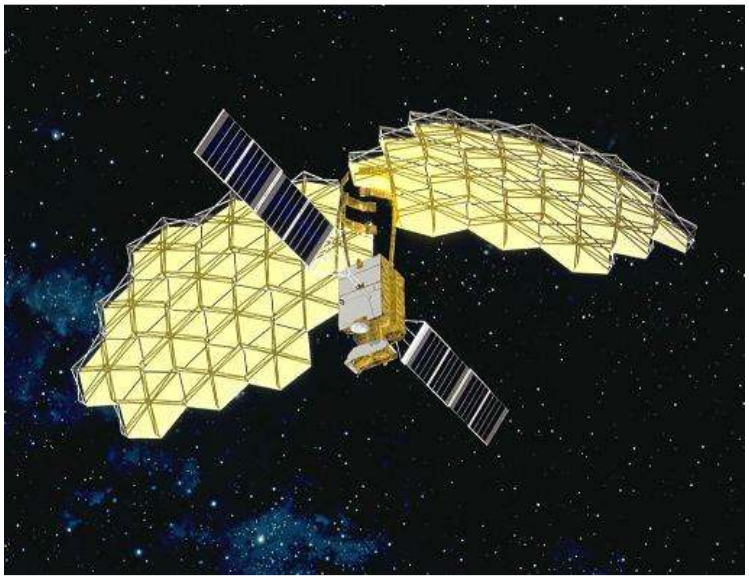
1. the Earth Surface Imager (ESI) to provide 1 m high-resolution imagery;
2. the Target Indicator Experiment (TIE), an instrument to locate targets based on RF signatures and in conjunction with aircraft;
3. the Common Data Link (CDL), an experimental communication system;
4. the Roadrunner On-orbit Processing Experiment (ROPE), an instrument designed to process imagery into standard military imaging formats;
5. the Hall Effect Thruster (HET), a demonstration of an ion engine;
6. the Integrated GPS On-orbit Receiver (IGOR), to conduct ionospheric reflection and transmission experiments and to provide precise navigational data;
7. the Atmospheric Density Specifications (ADS), to characterize the neutral wind of the upper atmosphere;
8. the Absolute Density Mass Spectrometer (ADMS) to gain a better understanding of the dynamic processes that affect the variability of the upper atmosphere;
9. the Miniaturized Vibration Isolation System (MVIS) to demonstrate damping of spacecraft jitter;
10. the Experimental Solar Array (ESA) to demonstrate two different solar cell technologies and two different deployment mechanisms;
11. the Autonomy Experiment (AE) comprising the On-Orbit Checkout Experiment (OOCE) featuring technology for autonomously commissioning the spacecraft during its first day of orbital life as well as the Autonomous Tasking Experiment (ATE) which allows non-expert users in the battlefield to send data requests to the spacecraft; and
12. the Inertial Stellar Compass (ISC), a NASA experiment to determine the spacecraft’s attitude or the direction in which it is pointing.

2006 058B (29654)
Name: Genesat-1
Country: USA
Launch date: 16 December 2006
Re-entry: 4 August 2010
Launch site: Wallops Island
Launch vehicle: Minotaur 1
Orbit: 413 x 420 km, inclination: 40.0°



GeneSat-1 was cubesat which carried bacteria into orbit. The bacteria were contained in a miniature laboratory that included sensors and optical systems to detect proteins and genetic activities, from which researchers hoped to determine the effect of spaceflight on microscopic living things. The satellite consisted of three standard 10 x 10 x 10 cm Cubesats developed by Stanford University giving it a mass of about 3 kg.

2006 059A (29656)
Name: ETS-8
Country: Japan
Launch date: 18 December 2006
Re-entry: in orbit
Launch site: Tanegashima
Launch vehicle: H 2A-204
Orbit: geostationary at 146°E



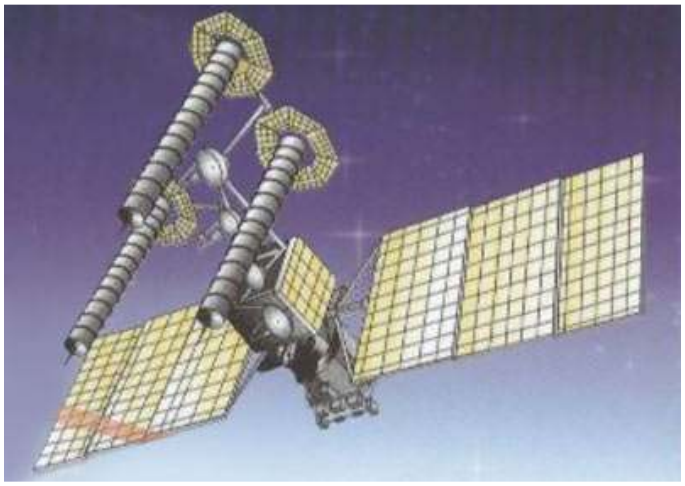
Also known as Kiku-8, the 2800 kg technology satellite demonstrated digital voice broadcasts, e-mail and other communication means, from a geostationary orbit using S band equipment. The satellite was equipped with two Large Deployable Antenna Reflectors measuring 19 x 17 m which enabled direct communications with mobile users.
In addition the satellite was equipped with a high accuracy atomic clock for basic positioning data acquisition.

2006 060A (29658)
Name: SAR Lupe-1
Country: Germany
Launch date: 19 December 2006
Re-entry: in orbit
Launch site: Plesetsk
Launch vehicle: Kosmos 3M
Orbit: 467 x 506 km, inclination: 98.2°

The Synthetic Aperture Radar (SAR) – Lupe was a military reconnaissance satellite system developed by OHB System. Although built for the German Department of Defense, data was also made available to non-military government users. The 770 kg satellite was fitted with a radar reconnaissance system. The fully operational system consists of five satellites.
Lupe is the German word for magnifying glass.

2006 061A (29668)

Name:	Meridian-1
Country:	Russia
Launch date:	24 December 2006
Re-entry:	in orbit
Launch site:	Plesetsk
Launch vehicle:	Soyuz 2.1a/Fregat
Orbit:	979 x 39670 km, inclination: 62.8°



Communications satellite developed by NPO-PM to replace the Molniya series of satellites as well as the military Parus satellites. The estimated mass was app. 2500 kg.

2006 062A (29670)

Name:	Kosmos-2425
Country:	Russia
Launch date:	25 December 2006
Re-entry:	in orbit
Launch site:	Baikonour
Launch vehicle:	Proton K/DM-2
Orbit:	19078 x 19133 km, inclination: 64.8°

Glonass M navigational satellite as described for 2001 053A.

2006 062B (29671)

Name:	Kosmos-2426
Country:	Russia
Launch date:	25 December 2006
Re-entry:	in orbit
Launch site:	Baikonour
Launch vehicle:	Proton K/DM-2
Orbit:	19137 x 19157 km, inclination: 64.8°

Glonass M navigational satellite as described for 2001 053A.

2006 062C (29672)

Name:	Kosmos-2424
Country:	Russia
Launch date:	25 December 2006
Re-entry:	in orbit
Launch site:	Baikonour
Launch vehicle:	Proton K/DM-2
Orbit:	19122 x 19139 km, inclination: 64.8°

Glonass M navigational satellite as described for 2001 053A.

2006 063A (29678)

Name:	Corot
Country:	France
Launch date:	27 December 2006
Re-entry:	in orbit
Launch site:	Baikonour
Launch vehicle:	Soyuz 2.1b/Fregat
Orbit:	872 x 884 km, inclination: 90.0°

The objective of the Convection Rotation and Planetary Transits (COROT) mission was to probe the inner structure of the stars by means of stellar seismology, as well as to detect many extrasolar planets, by observing the periodic micro-eclipses occurring when these bodies transit in front of their parent star.
The 630 kg satellite was fitted with a 27 cm diameter afocal telescope to detect planets as they passed in front of their parent star blocking some of the light. It also carried a 4-CCD widefield camera sensitive to tiny variations of the light intensity from stars.
The initial scientific programme was to last 2.5 years but was extended in 2009 and 2012. But in November 2012,shortly after the last extension, to 2016, the satellite's instruments were damaged by radiation. Following a further series of technological experiments, the satellite was switched off in June 2014.