TIROS SPACE INFORMATION

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Editor: Jos Heyman FBIS

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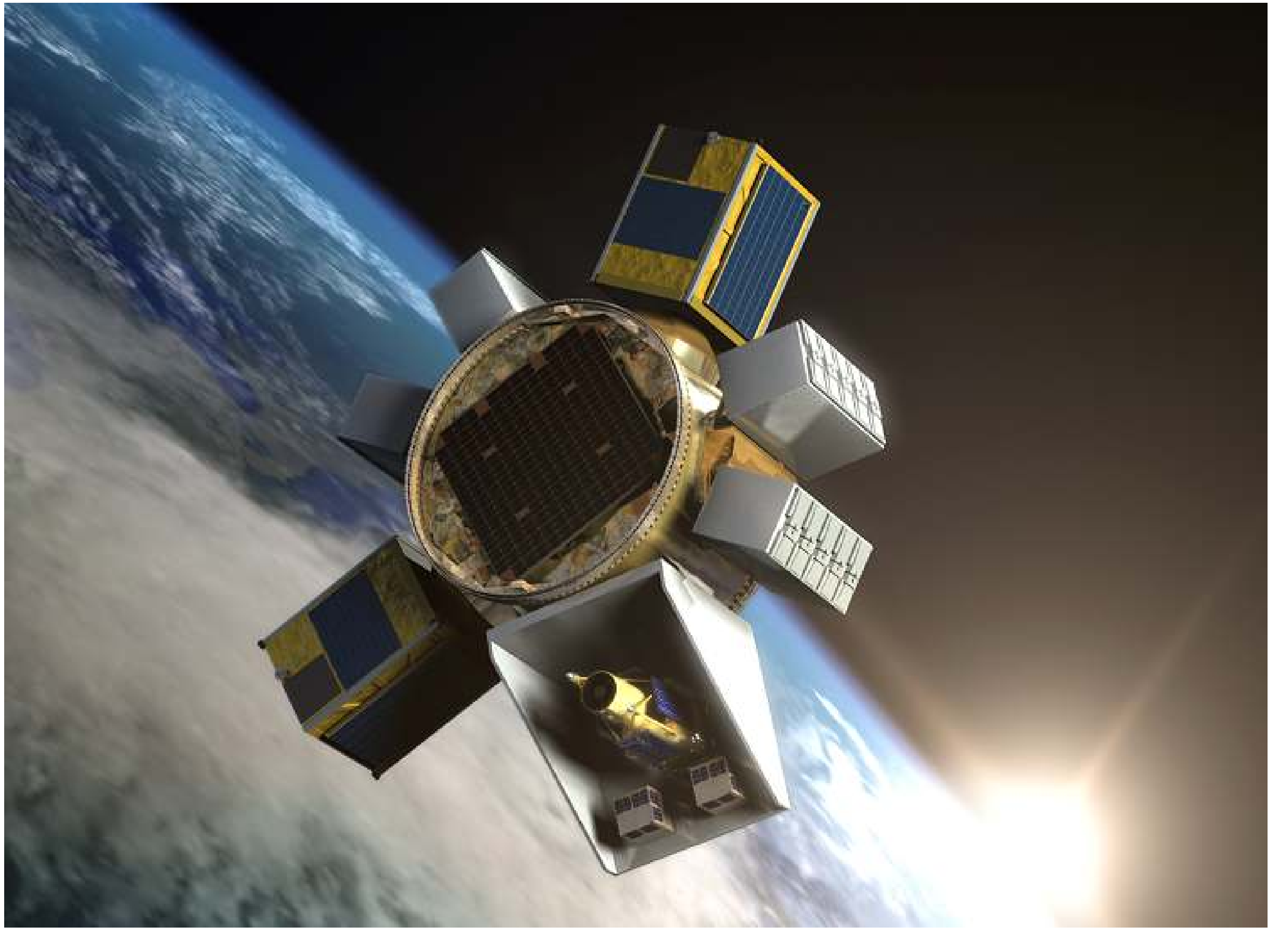

Sherpa

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The *Tiros Space Information (TSI) - News Bulletin* is published to promote the scientific exploration and commercial application of space through the dissemination of current news and historical facts.
In doing so, Tiros Space Information continues the traditions of the Western Australian Branch of the Astronautical Society of Australia (1973-1975) and the Astronautical Society of Western Australia (ASWA) (1975-2006).
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Calling card...

When I started preparing the article on the cancelled Constellation programme featured in this News Bulletin as well as last month's issue, I pulled the text from an old file I had in my database. There is, of course, nothing unusual about this because, as an editor one must rely on information gathered over a long period and stored somewhere.
It was, however, halfway through the article, that I began to suspect that some parts of my data were probably direct copies from the original source – a source that I did not record, which is most likely an indication that it was a copyright-free source.
But, with the passing of the years it is sheer impossible to trace the original source, especially if it was one of these sources, like NASA, that does not keep too much historical data on-line.

Anyway, here I had the dilemma – I could not quote the original source (except for one) but felt uncomfortable claiming full authorship. The solution to this dilemma was, however, easy. As the original source was written in the 'present and future tense', I had to convert that to 'past tense', so that, with the changes that had to be made to reflect the 'past tense' as well as the bits and pieces clearly written by myself, I can safely claim' editorship' to the article. But if you recognise some part of the article as something you have authorship of, let me know and I will happily acknowledge this in a forthcoming issue of the News Bulletin.

Having said all that, all that remains for me to do (apart from apologizing for exposing you to the above dilemma) is to say:

Merry Christmas and a Happy New Year

Jos Heyman

BlueSat

Further to our report in the February 2011 issue of the News Bulletin, it can now be reported that the Basic Low-Earth-orbit University of NSW Experimental Satellite (BLUESat) satellite was completed in July 2013. Although the design is based on the cubesat, its size, being 26 x 26 x 26 cm, is different from other cubesats that usually measure 10 x 10 x10 cm. The larger size gives the satellite a mass of 14 kg.
The satellite carries a flight computer, radio transmitters and receivers, a power-control system, battery packs for when its orbit places it in the Earth's shadow, magnets to passively stabilise the satellite and align it with the Earth's magnetic field. It also carries an experimental GPS Namuru V3.2, developed by the UNSW School of Surveying as the payload.
It is hoped to place the satellite in a 750 km polar orbit. No launch vehicle has been selected as yet.

MetOp 2nd Gen

Airbus has received a contract to construct six MetOp 2nd Generation meteorological satellites for Eumetsat. The work will be shared equally between France and Germany, with 27% each, with the balance of the work being done by Britain, Italy, Spain and Sweden. The fact that the contract was for two different payloads, with sounding and imaging instruments, allows the German and French teams to build three satellites each.
The first launch is expected in 2020 and the satellites will replace the current network. They will be placed in polar orbit with an altitude of about 830 km.
Each satellite will carry more than 600 kg of fuel of which 400 kg will be reserved for de-orbit the spacecraft after it use of ended after about 7.5 years.
The first two MetOp 1st Gen satellites were launched on 19 October 2006 and 17 September 2012 with a third scheduled for 2017.

GovSat

The Luxembourg government and Luxembourg based communications satellite operator SES have entered into a joint venture for a military communications satellite. Luxembourg, having an army of less than 1000 and no air force (although it provides a home for NATO aircraft), will offer the services of the satellite to NATO countries.
The satellite, to be named GovSat, would be fitted with X band and Ka band transponders.

MATS

The Swedish government will fund the Mesospheric Airglow/Aerosol Tomography and Spectroscopy (MATS) as the next Swedish scientific satellite. To be launched in 2017, the 50 kg satellite will conduct optical studies of mesospheric gases over a period of two years from an orbit of about 600 km.

Satellite Update

Launches in October 2014

Int.Des.	Name	Launch date	Launch vehicle	Country	Notes
2014 060A	Himawari-8	7-Oct-2014	H 2A-202	Japan	Meteorological
2014 061A	IRNSS-1C	16-Oct-2014	PSLV XL	India	Navigational
2014 062A	Intelsat-30	16-Oct-2014	Ariane 5ECA	Intelsat	Communications
2014 062B	Arsat-1	16-Oct-2014	Ariane 5ECA	Argent.	Communications
2014 063A	YW-22	20-Oct-2014	CZ 4C	China	Earth observation
2014 064A	Ekspress AM-6	21-Oct-2014	Proton M/Briz M	Russia	Communications
2014 065A	Chang'e-5-T1	23-Oct-2014	CZ 3C/G2	China	Circumlunar
2014 065B	4M	23-Oct-2014	CZ 3C/G2	Luxemb.	Circumlunar
2014 066A	SJ-11-8	27-Oct-2014	CZ 2C	China	Scientific
failed	Cygnus Orb-3	28-Oct-2014	Antares 130	USA	Failed
failed	Arkyd 3	28-Oct-2014	Antares 130	USA	Failed
failed	Flock 1d-1/26	28-Oct-2014	Antares 130	USA	Failed
failed	RACE	28-Oct-2014	Antares 130	USA	Failed
failed	GOMX-2	28-Oct-2014	Antares 130	Denm.	Failed
2014 067A	Progress M-25M	29-Oct-2014	Soyuz 2.1a	Russia	Docked with ISS on 20 Oct 2014
2014 068A	Navstar 2F-8	29-Oct-2014	Atlas V-401	USA	Navigational
2014 069A	Meridian-7	30-Oct-2014	Soyuz 2-1a/Fregat	Russia	Communications

Other updates

Int. Des.	Name	Notes
1988 032A	Kosmos-1939	Re-entered on 29 October 2014
1998 067DT	Flock 1-16	Re-entered on 26 October 2013
1998 067DZ	Flock 1-18	Re-entered on 29 October 2014
1998 067ED	Flock 1-20	Re-entered on 9 October 2014
2011 062C	Chibis M	Re-entered on 15 October 2014
2012 006G	PW Sat	Re-entered on 28 October 2014
2012 071A	OTV-3	Landed at Vandenberg on 17 October 2014
2013 064C	Cape-2	Re-entered 23 October 2014
2014 009E	Teikyosat-3	Re-entered 25 October 2014
2014 056A	Dragon CRS-4	Undocked and re-entered on 25 October 2014
2014 065A	Chang'e-5-T1	Landing capsule recovered on 31 October 2014

Weather Satellite Follow-on

The US Air Force's next generation meteorological satellite is expected to be launched in 2021 or 2022. Identified so far as the Weather Satellite Follow-on, it would replace the Defense Meteorological Satellite Program.
The system will consist of a single satellite with three instruments to collect data on the ocean-surface wind speed and direction, tropical cyclone intensity, and charged particles in low Earth orbit with the potential to affect satellites.

Virgin Galactic's SpaceShipTwo

On 31 October 2014 the Virgin Galactic's SpaceShip2 crashed during a powered test flight over the Mojave desert. After having been released from the WhiteKnight Two mothership, The crash if probably the result of a pilot error.
This was the 55th flight and the 35th free flight. It was also the fourth time the engines were fired in flight.

SpaceShipTwo is capable of carrying 8 passengers to an altitude of 110 km and achieve a speed of 4000 km/h. It is powered by a single hybrid rocket motor. The inside cabin measures 3.66 m long. Virgin Galactic planned to have another four of these vehicles.
The SpaceShip2 is carried to an altitude of 15.2 km by the White Knight Two aircraft that consist of two separate hulls. One hull is an exact replica of that of SpaceShipTwo and will be used for tourist training. The other hull will carry cut-rate day-trippers into the stratosphere. The vehicle will be powered by four Pratt & Whitney PW308A engines. White Knight Two also is the world largest all carbon composite aircraft and has a unique high altitude lift capacity.
Both vehicle have been designed and built by Scaled Composites.
SpaceShipTwo made its first free flight on 10 August 2010 and its first rocket powered flight on 29 April 2013.
The second SpaceShipTwo is 65% complete and could resume test flights once completed.

Interplanetary cubesats?

There is an increasing interest in using cubesats as secondary payloads on missions to other celestial bodies where they will be deployed to perform scientific observations. Deployment could be as individual satellites or as constellations. Furthermore, because the cubesats are relatively inexpensive, it is possible to take greater exploration risks than would be possible for an expensive integrated spacecraft.

TESS

NASA has announced it will proceed with the Transiting Exoplanet Survey Satellite (TESS), allowing it to go to the development phase.
TESS will observe the brightness of about 500,000 stars during its two year mission and will look, in particular, for variations in the brightness caused by planets that pass in front of a star. The spacecraft will be built by Orbital Sciences and will be launched into a high Earth orbit in 2017.

ViaSat-2

ViaSat Inc. has selected a Falcon Heavy as the launch vehicle for its ViaSat-2 communications satellite. To be launched in mid-2016, the Ka-band satellite will provide broadband services to North America.

Antares 130 failure

On 28 October 2014 the first Antares 130 rocket exploded seconds after its launch from Wallops Island.
The Antares 130 differs from earlier version in that it has a Castor 30XL engine for the second stage.

The launch vehicle carried the Cygnus Orb-3 cargo transfer spacecraft that was to dock with the Harmony module of ISS on 3 November 2014 and would remain attached until 3 December 2014.
Also known as SS Deke Slayton, the spacecraft carried 2215 kg of supplies for ISS, including several scientific experiments, crew provisions, spare parts and experimental hardware.
Some of the experiments were:

- Pea Shoot Growth in Space, a student experiment to test the performance of pea shoot growth in space;
- Yankee Clipper, a student experiment that would have investigated a range of topics from a crystal growth study to a study how the investigate how microgravity affects milk spoilage;
- Drain Brain, a human health study to study the blood flow in space as a possible aid in the treatment of headaches and other neurological systems reported by crew members;
- The Meteor Composition Determination, or Meteor, to use high-resolution video and images for the analysis of the atmosphere in order to learn about the physical and chemical properties of meteoroid dust; and
- Reentry Breakup Recorder-W (REBR) to collect and transmit data during the reentry and breakup of the spacecraft on re-entry.

In addition it carried 26 Flock 1d Earth observation satellite along with the Arkyd 3, RACE and GOMX-2 cubesats that were to be ejected with the NanoRack Cubesat deployers located in the airlock of the Kibo module of ISS. Deployment was expected in early 2015.

Arkyd 3 was a 3U cubesat developed by Planetary Resources, a US company, to test subsystems for the planned Arkyd 100 satellite. These sub-systems included avionics, attitude determination and control system (both sensors and actuators), and integrated propulsion system that will enable proximity operations. Also known as A3, the 3 kg satellite was named after a fictional Star Wars probe droid made by Arakyd Industries.
Formerly known as CubeSat Hydrometric Atmospheric Radiometer Mission (CHARM) the Radiometer Atmospheric CubeSat Experiment (RACE) was a 3U CubeSat developed by the University of Texas at Austin as part of NASA’s ELaNa-8 programme.
The satellite was to use a 183 GHz radiometer fitted with an indium phosphide low noise amplifier front-end, to measure water vapor emission from the Earth’s atmosphere.
GOMX-2 was a 2U cubesat to test a de-orbit system designed by Aalborg University in Denmark. It also carried an optical communications experiment from the National University of Singapore and was to test a new highspeed UHF transceiver and SDR receiver by Aalborg University.

The transporter erector launcher and lightning suppression rods at the launch site were damaged and some support buildings in the immediate area suffered broken windows and imploded doors. A sounding rocket launcher adjacent to the pad, and buildings nearest the pad, suffered the most severe damage.

Meanwhile, Orbital has announced that it will accelerate the development of an upgraded version of the Antares which wold have a new first stage engine which has not yet been selected. This new version could fly in 2016. Early investigations of the launch failure seem to point towards the failure of one of the AJ-26 engines, which is a refurbished Russian NK-33. It may be possible that the use of this engine will be discontinued.

Furthermore, Orbital announced that it will select other launch vehicles to meet its contractual Cygnus launches to ISS.

Sherpa

Sherpa is a space tug being developed by Spaceflight Inc. The system allows secondary payloads, such as cubesats, to be accommodated on a range of launch vehicles and, rather than being placed in the same orbit as the primary payload, place these in different orbits.
For this the space tug has five ports and a series of adapters to attach the various payloads with a maximum capacity of 1500 kg. It will also have a propulsive system.

Sherpa will be built in two versions. The first one, Sherpa 400, will accelerate a payload to a 400 m/s change in velocity, whereas the second, and larger version, known as Sherpa 2200, will accelerate to 2,200 m/s. The Sherpa 400 is optimised for low-Earth orbits, whereas the Sherpa 220 will bring small satellites from a low-Earth orbit to a geostationary orbit.
The first use of the Sherpa is scheduled for 2015 when eight, as yet undefined, cubesats, will be attached to a Sherpa vehicle that will be launched as a secondary payload on the Japanese Astro H mission.
Upon deployment of the cubesats, Sherpa will test its avionics, attitude determination and control system, as well as communications and other key subsystems to enable future payload delivery and hosted payload missions.
The company plans to provide two Sherpa mission each year, one of the Sherpa 400 and another with the Sherpa 2200.

WorldVu

WorldVu Satellites Ltd. Has now received approval to use the Ku-band in a proposed constellation of 640 satellites in a non-geostationary orbit that will provide global broadband internet services.
The 125 kg satellites will operate at an altitude of 1200 m and will each have a 14 gigabits per second of throughput and a design life of seven years or more. Regulations require that the system should begin operating by 2020.
The company was established by former O3B Networks founder. Greg Wyler. He and others left O3B after it was acquired by Google in 2013.

WorldVu is now looking for a manufacturer and intends to buy into this satellite production facility. SpaceX has hinted it is interested in this joint venture..

Cancelled Projects: Constellation (part 2)

Edited by Jos Heyman

Mission Profiles

All launches in the Constellation programme were to be undertaken from Launch Complex 39B at Kennedy Space Center, the same launch complex that launched the Space Shuttle and from where the Apollo mission took place.
After having been brought to the Kennedy Space Centre the components required for a particular mission were to be assembled in the Vehicle Assembly Building. Once assembled the Crawler-Transporter would take the stacked launch vehicle and spacecraft to the launch pad where final checks were to be undertaken before the launch could take place.

Launch Abort System

The method of launch abort, either using the LES or the second stage of the Ares I booster, would depend on how far into the flight the spacecraft and crew were travelling.

- Mode One/Alpha would be used during the first 42 seconds of flight up to 3 km and would have involved the separation of the Orion CM from the rest of the rocket propelled by the Launch Escape System (LES), with small solid-fuelled engines at the top steering the capsule towards the east over the sea and away from the rocket. The tower was then to be jettisoned 14 seconds later and the hypergolic fuel on the Orion CM would be automatically released.
- Mode One/Bravo was to be used from 3 to 30.5 km, after the capsule had moved away from the rocket, canards were to be deployed by the tower to force the CM/LES combination into a CM-forward (blunt) position.
- Mode One/Charlie was to be used from 30.5 km until the LES would be jettisoned just after second stage ignition, the CM reaction control system would be used to force the CM/LES combination into the CM-forward position as the canards would have little effect in the thin air.
- Mode Two came into being after that the LES would have been jettisoned. In this Mode the Orion CM and SM would be separated as a whole from the Ares I rocket and either use its large engine or smaller control engines to manoeuvre from the rocket towards a CM landing in either western Spain or Morocco on "due east" (i.e. lunar) flights, or in Ireland or the United Kingdom on ISS-bound flights. A splashdown in the eastern Atlantic Ocean would only be a contingency.
- Mode Three would see the Ares I send the Orion into the initial orbit after which the spacecraft would separate immediately and perform a retrofire that would allow the CM to land at either Edwards Air Force Base in California or White Sands Space Harbor in New Mexico.
- Mode Four would be used when the Ares I would have a less-than-ideal performance during the initial orbit insertion. It would involve a restarting of Ares I after 45 minutes to place the Orion into the less than ideal orbit from where propellants on board of the spacecraft would be used to either reach the required orbit or to land at either Edwards or White Sands.

Low-Earth orbit

For a low-Earth orbit mission to the International Space Station the Orion spacecraft would fly to the space station over a period of two days. The Orion spacecraft would then have docked at one of the docking ports, where it would have stayed for a mission of about six months, although the mission could have been extended to eight months should this be required. Whilst being attached to the space station the Orion spacecraft would have served as a ‘lifeboat’ should an emergency departure be necessary.

After undocking for the return flight, the Orion spacecraft would turn around so that its main engine would face forward. It would then fire the Aerojet AJ-10 engine to start the de-orbit. On completion of the de-orbit burn, the service module (SM) would be jettisoned and allowed to burn up in the atmosphere.

The Command Module (CM) would then have entered the atmosphere at a speed of 28,000 km/h using the ablative shield to deflect the heat of the spacecraft and to slow it down to 480 km/.
After re-entry would have been completed the heat shield would be jettisoned and two drogue chutes were to be released. At an altitude of 6 km the main parachutes were to be deployed and the airbags to be filled with nitrogen, allowing the spacecraft to splashdown. The Orion would then have been returned to the Kennedy Space Centre for refurbishment.

Lunar flights

Whilst the Apollo lunar flights saw all components launched together on a single Saturn V rocket, the lunar missions in the Constellation programme would have seen separate launches pf the components and their assembly in low-Earth orbit.

A lunar mission would start with the launch of an Ares 5 vehicle carrying the Altair/EDS components and place these into a 360 km altitude orbit with an inclination of 28.5º. The launch would take place from launch Pad 39A.

Approximately 90 minutes after the Ares 5 launch, an Ares 1 launch vehicle with an Orion crewed spacecraft would be launched from Launch Pad 39B. The Orion would be placed in the same orbit as the Altair/EDS and the two spacecraft would dock.
When docking and other activities would have been completed, the EDS was to fire for five minutes to perform the translunary injection (TLI) burn to place the combined spacecraft into a trans-lunar orbit, accelerating the combination from 28,000 km/h to 40,200 km/h.
On completion of the TSI burn the EDS will be jettisoned and would be placed either into an orbit around the Sun or a slightly different translunary trajectory that would see it impact on the Moon.

The trans-lunar coast or the Orion/Altair combination was to last four days during which the four man crew were to monitor the Orion's systems, inspect their Altair spacecraft and its support equipment, and, if necessary, change their trajectory towards the selected landing site.

On approaching the lunar far side, the Altair's engines would be placed in the proper direction for the lunar orbit insertion (LOI) burn. Once in orbit, the crew would adjust the trajectory and prepare the Orion for unmanned flight. All four crew members would then transfer to the Altair and undock the Orion which would be placed in a 95 to 110 km high circular orbit around the Moon.

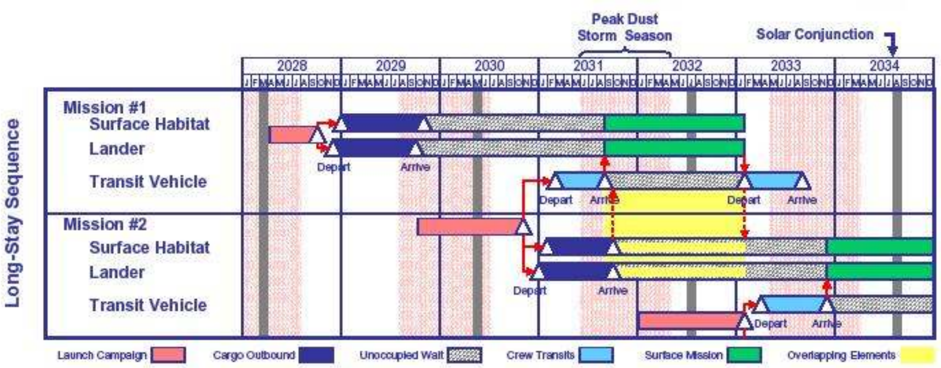
Following this the four RL-10 engines on the Altair's descent stage would fire and the crew would eventually land. Upon landing the crew would begin their activities on the Moon.

Once the lunar deployment operations had been completed, the crew was to enter the Altair's ascent stage and lift off from the Moon's surface, powered by a single ascent engine, using the descent stage as a launch pad. It was then docked with the Orion spacecraft that was left in lunar orbit. Once the crew had transferred from the Altair into the Orion, the Altair would be separated and allowed to crash into the Moon’s far side.

The Orion’s engines would then be fired for the return trip. This firing has been referred to as the Trans Earth Injection (TEI). Upon reaching Earth, the Orion Service Module would be jettisoned and a special re-entry trajectory established. This trajectory was designed to slow the Orion Command Module vehicle from its speed of 40,200 km/h to 480 km/h following which the landing would take place in a similar manner as for the Low-Earth orbit flights.

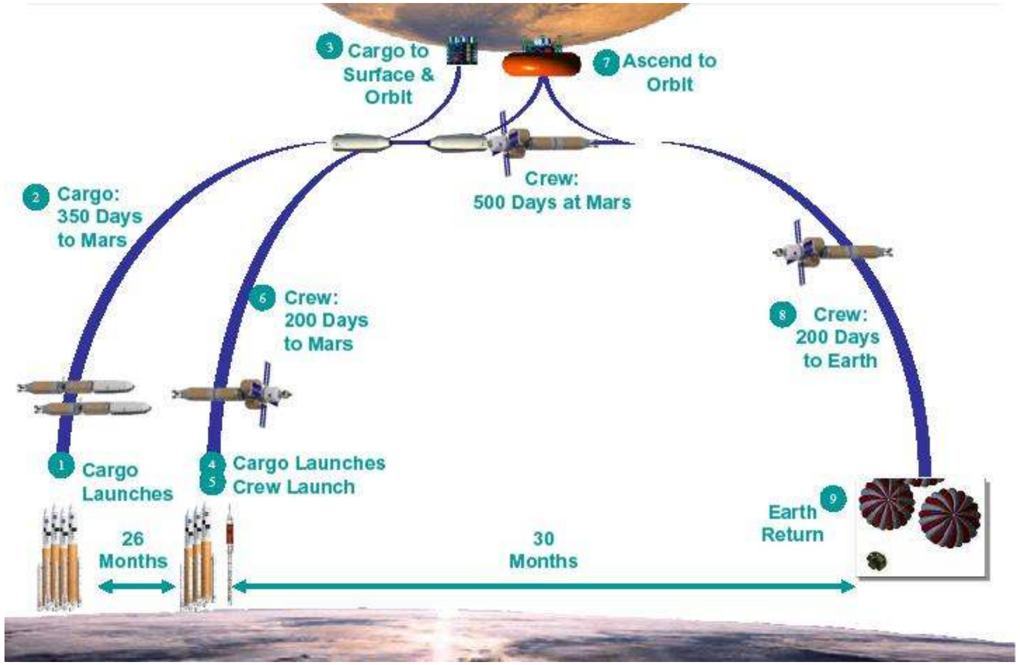
Mars and other crewed flights

At the time of cancellation no formal Mars mission profile had been determined yet, however it would have been most likely that it would have involved multiple missions, with a surface habitat and a lander vehicle being place on the surface of Mars before the crewed mission takes place.



The cargo missions would take 350 days to fly to Mars whilst the crewed missions, utilising a different mission trajectory, would take 200 days. The crew would stay on Mars for 500 days before returning to Earth on a 200 days flight (1).

(1) Drake, B.G., From the Moon to Mars (The Things We Most Need to Learn at the Moon to Support the Subsequent Human Exploration of Mars), LEAG Workshop on Enabling Exploration, 1 October 2007



Cancellation

When President Obama took office in January 2009, the Constellation programme came under scrutiny and Obama established the Augustine Committee to look at the programme in detail. The finding of this committee, as published in 2009, indicated that the Constellation programme could not be executed without substantial increases in funding.
Based on this Obama announced on 1 February 2010 his proposal to cancel the programme beginning with the 2011 fiscal year. On 15 April 2010, in response t critics, he modified this action by proposing changes to the proposed programme with a “bold new approach to human space flight that embraces commercial industry, forges international partnerships, and invests in the building blocks of a more capable approach to space exploration.".
In brief his plans were:

- cancellation of the Constellation programme and the Ares V launch vehicle;
- the modification of the proposed Orion crew capsule for use as an emergency crew escape vehicle for ISS;
- the use of commercial launch vehicles for the ferry flights to ISS;
- the development, by NASA of a heavy launch vehicle by 2015 that would be used for future deep space exploration with a crewed mission to an asteroid by mid 2020, a fly-by of Mars in mid 2030 and a crewed Mars mission in the late 2030s.

The Constellation programme was formally shelved on 11 October 2010.

At the time of the cancellation the planned flight schedule was:

Orion-1: December 2013
Orion-2: March 2014
Orion-3: June 2014
Orion-4: September 2014 (first crewed flight)
Altair-1: December 2018
Altair-2: June 2019
Altair-3: December 2019
Altair-4: June 2020

Also at that time some hardware had already been developed and had been tested.

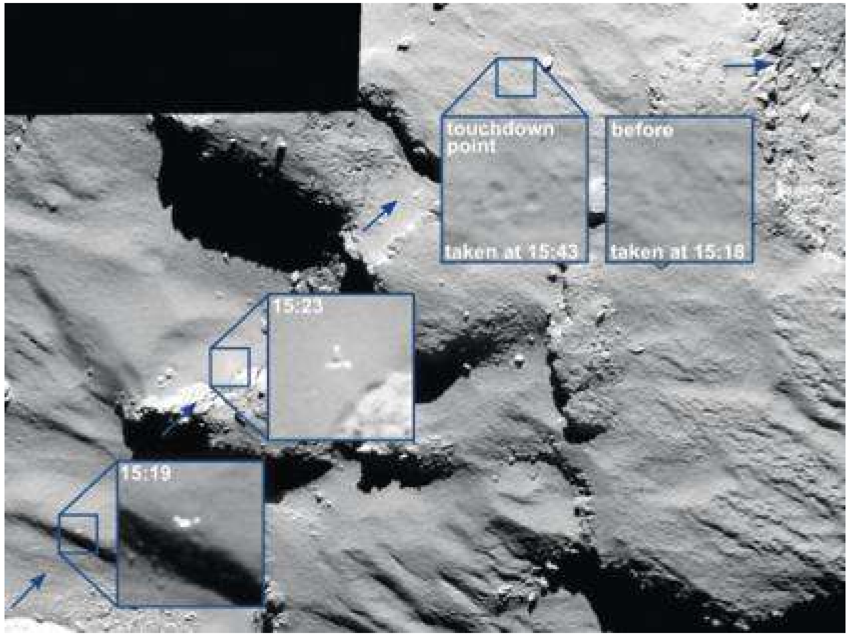
In the case of the Orion spacecraft the Lockheed Martin, at the Michaud facility, completed the Orion Ground Test Article (GTA) framework in June 2010. The Orion GTA was a forerunner of the crewed spacecraft and, at that point in time there were, however, no plans to reduce the GTA to a limited rescue spacecraft.
The GTA was a full sized manufacturing pathfinder to validate production processes and tools. After pressure testing the GTA framework was outfitted with internal and external mass and volume simulators for components like the crew seats and consoles, lockers, life support, environmental control, waste management, and more. Externally the GTA was fitted with simulators for the batteries, parachutes, compressed gases, propellants and thrusters, as well as a simulated TPS aeroshell.
The discussion of further tests with the Orion spacecraft is beyond the scope of this article.

On 28 October 2009 the Ares 1-X test flight provided an opportunity for NASA to test hardware of the Ares 1 launch vehicle. The Ares 1-X was powered by only four segments of the first stage with the fifth segment being replaced by an inactive segment. The test rocket is rigged with more than 800 sensors - 377 on the first stage and 446 on the second - to record an enormous amount of engineering data on all phases of flight, from launch through motor burn out two minutes later, through stage separation, parachute deployment and ocean impact. At least four video cameras will be mounted on the rocket, two on the first stage looking up and two on the second stage looking down.
The vehicle also carried mock-ups of the upper stage and the Orion crew module (Orion Boilerplate-1) and the launch abort system. The flight took place from the Kennedy Space Centre and simulated the launch vehicle's first stage burn output and separation from the dummy upper stage. The altitude of the flight was 46 km. The upper stage mock up and the Orion mock-up fell back into the Atlantic Ocean and were not to be recovered. The first stage's parachute system brought the first stage back to Earth. It dropped into the Atlantic Ocean and was recovered.

This test programme will be followed by the Ares 1-Y tests flight in September 2013. This flight would have carried a five segment first stage and a live second stage. In addition it was to carry the Orion-Boilerplate-2 that was to have been placed into orbit. The flight, as well as subsequent test flights, were cancelled.

Philae

The Philae spacecraft landed successfully on Comet Churyumov-Gerasimenko on 12 November 2014 after it had been released seven hours earlier by the Rosetta spacecraft. It was released as a distance of 22.5 km from the surface.
The thruster system, one of the devices that was to keep the lander attached to the comet, failed during landing preparations. Also the harpoons failed to operate, leaving only the ice screws, although there is no evidence that these were deployed.
It appears that lander bounced after the landing and eventually came to rest hundreds of meters from the first touchdown point about two hours later. It is believed that the lander is trapped with one of its legs sticking up, in a crater's edge and in the shadow. There was insufficient sunlight in this location to charge the solar batteries and the reserve batteries ran out of power on 15 November 2014 after 56 hours of operation. Before it closed down the lander had transmitted all the science data it had collected via Rosetta.



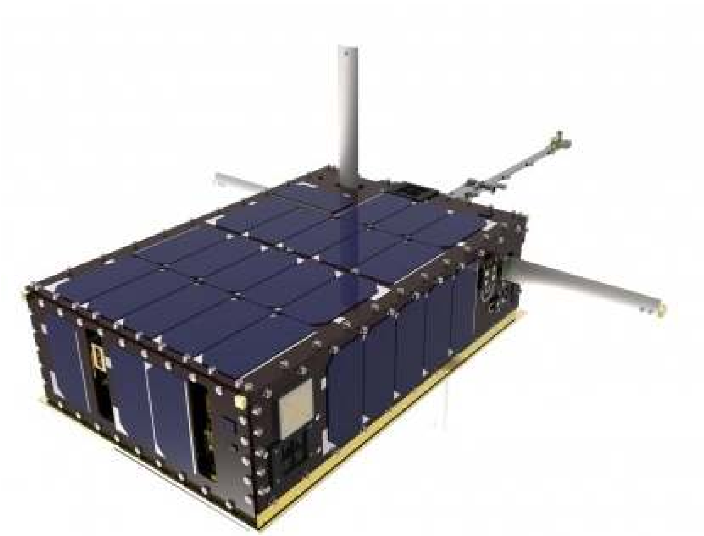
Philae moving across the comet

Rosetta was launched on 2 March 2004 and the landing took place at 510 million km from Earth. At that location radio transmissions took 28 minutes to reach Earth.

Kosmos-2499

Launched on 23 May 2014 along with three Rodnik communications satellites, and identified at that time as space debris with the designation 2014 028E, Komos-2499 (as it is now identified) has recently undertaken some unusual maneuvers
An article in the British Financial Times published on the internet on 17 November 2014 has reported that in the past few weeks amateur satellite-trackers have followed the unusual manoeuvres that culminated in a rendez-vous with the rocket stage that had launched it.
The objective of these tests is not known. It could be a test in Russia's plan to clean up space junk or it could be a test leading towards of repairing and refuelling satellites. However, as Russia did not declare the launch of this satellite, and judging by the object's peculiar and very active movements across the skies, it could be part of an anti-satellite weaponry programme, something that the then USSR abandoned in 1982 but may be revived by Russia, based on a 2010 statement by Oleg Ostapenko, then commander of Russia's space forces, and now head of its space agency, said Russia was again developing "inspection" and "strike" satellites.

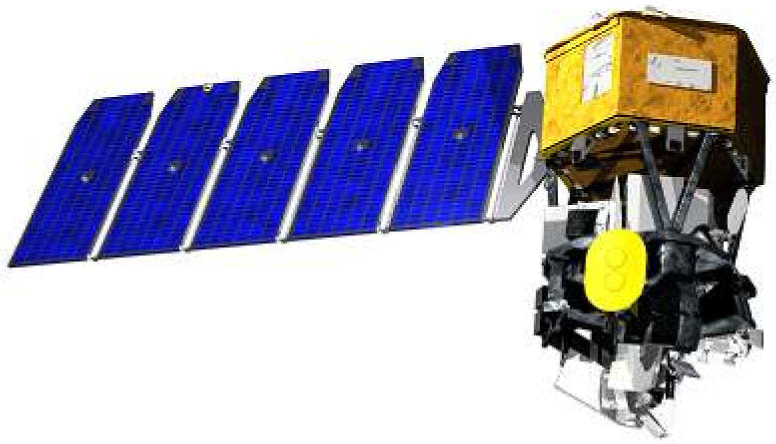
Dellingr



NASA has developed the first 6U cubesat and hopes to send it to ISS early next year for deployment from the space station in January 2016. To be known as Dellingr, after the Norse god of the dawn, the satellite will carry three heliophysics-related payloads.

The development of this larger cubesat takes the utilization of the cubesat technology into a new phase. Previous cubesats did not always provide scientists with the payload volume they desired. This larger size does that, whilst it also allows more space for systems that increase the success rate of the cubesat.

ICON



NASA's Ionospheric Connection Explorer (ICON) will be launched with a Pegasus XL launch vehicle in 2017. The launch will take place after the carrier aircraft takes off from Kwajalein.
The satellite will investigate the boundary region between space and the atmosphere in order to study the connection between Earth's weather and space weather.
For this the satellite will carry four science instruments to measure the movements and temperatures of neutral particles, the thickness of the ionosphere, the composition of the atmosphere, and electric fields around the satellite.
The previous flight of Pegasus XL was in June 2013.

PSN-6

Indonesia's Pasifik Satelit Nusantara (PSN) has order it PSN-6 communications satellite from Space Systems/Loral (SSL). To be fitted C-band and Ku-band transponders, the satellite will provide voice and data communications, broadband Internet, and video distribution throughout the Indonesian archipelago. To be launched in early 2017 the satellite will be located at 146° E.
The company currently uses the PSN-5 satellite which was originally launched as Xinnuo-1 on 18 July 1998 and was acquired by PSN in 2013.

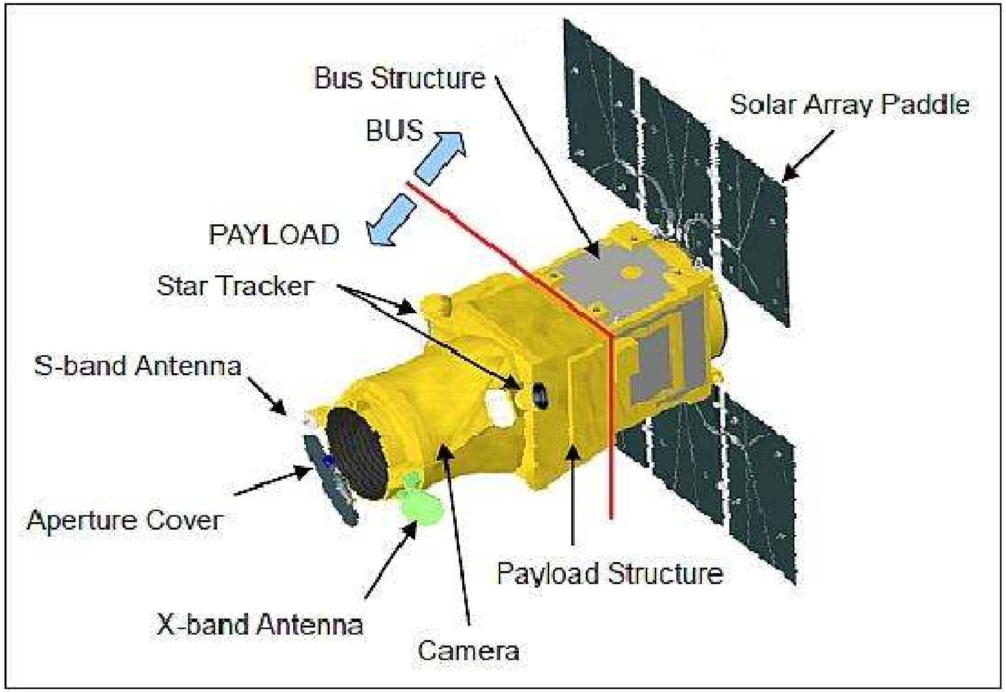
Astra-2G

The launch of the Astra-2G satellite with a proton M/Briz M launch vehicle, scheduled for end November 2014, has been delayed until mid-December 2014 due to problems with the Briz M upper stage.

ASNARO and some more

On 6 November 2014 a Dnepr 1 launch vehicle placed five Japanese satellites in orbit.

The Advanced Satellite with New system ARchitecture for Observation (ASNARO) is a spacecraft developed for the Japanese Institute for Unmanned Space Experiment Free Flyer (USEF) a non-profit organisation founded by the Japanese government as a separate organisation from the Japanese space agency JAXA.
The ASNARO project, which was started in 2008, involved the development of a next generation high performance mini satellite platform based on open architecture technologies and manufacturing methodologies to drastically reduce the cost and the development period using up-to-date electronics technologies.
Apart from the technology demonstration, the objective of ASNARO-1 was to undertake Earth observation.
For this the 495 kg satellite was fitted with the Optical Sensor (OPS), a compact pushbroom instrument comprising an optics subsystem using Three Mirror Anastigmat (TMA) telescope and a primary mirror made of New Technology Silicon Carbide (NTSIC).
The satellite was also known as Saske.



ASNARO

ChubuSat-1 is a technology satellite developed by the Nagoya University and Daido University, both of which are in the Chubu region of central Japan, which is the core region of Japan's aerospace industries.
In particular the 50 kg satellite demonstrated Earth observation technology and the observation of space debris, as well as radio amateur communications.
For this it carried the Visible Camera (VIS) and the Thermal Infradred Camera (TIR) to observe Earth's surface with a resolution of 10 m for the VIS camera. The TIR is sensitive in the wavelength region of 7.5-13.5 μm and enables observations of the ground temperature profile. It can also be used to observe space debris.
The communication subsystem consisted of two amateur radio transceivers
The satellite was also known as Kinshachi, meaning golden grampus, the symbol of the Chubu region.

Hodoyoshi-1 is an experimental earth-observing micro-satellite built by the University of Tokyo. Apart from demonstrating the construction of a small satellite, the 60 kg satellite provided high-resolution imagery of Earth's surface using an optical pushbroom imager with a ground resolution of 6.7 m with a swath width of about 28 km.
Hodoyoshi means 'Reasonably Reliable Systems' in Japanese.

Kyushu Satellite for Earth Observation System Demonstration (QSAT-EOS) was an Earth-observing micro-satellite built by the Kyushu University.
Originally the satellite was referred to as QSat and had as primary objective the observation of the polar plasma regions to study Earth's auroral zones but in August 2008 the objective was changed to Earth observation, warranting the new name QSAT-EOS.
These observations include natural disaster monitoring, Earth magnetic field observation, micro debris detection and water vapor observation in the upper atmosphere.
The instruments of the 50 kg satellite were:

- A Two-band VNIR Camera with a resolution of 5 m
- A fluxgate magnetometer to measure the magnetic field variations caused by field-aligned currents in the polar and equatorial regions;
- A Debris Sensor for in-situ debris measurement.

At the end of the mission the re-entry of the spacecraft will be accelerated by the deployment of a 3 m kapton film drag augmentation device fitted to a deployment boom.

Tsubame (meaning ‘swift’) was built by the Tokyo Institute of Technology, Tokyo University of Science to demonstrate satellite bus technology for microsatellites and verification of COTS components such as micro-processors, memory and Li-ion batteries as well as the newly developed Micro Control Moment Gyroscopes (CMGs)
The 50 kg satellite also carried instrumentation to measure the polarization of hard X-ray photons from gamma-ray bursts. These two detectors were the Wide-field Burst Monitor (WBM) and the Hard X-ray Compton Polarimeter (HXCP).
In addition the satellite carried a high-resolution optical camera with a resolution of 14 m.

Navstar identification

With the recent launch of Navstar 2F-8, designated as 2014 068A, it is perhaps useful to discuss the manner in which the Navstar satellites are being identified in a range of reference sources. I prefer to use Navstar 2F-8, which indicates that this is the 8th satellite in the 2F generation of Navstar satellites.
But all Navstar satellites are launched in support of the Global Positioning System (GPS), so 2014 068A is also known as GPS 2F-8. In addition the satellite has been included in the military

USA series, so that it is also known as USA-258. Finally, the satellites in the latest generation, have been given fancy names, so that 2014 068A is also known as Spica. These alternative names have been omitted from the following table for space reasons.

NORAD, the organisation that tracks satellites, has applied a sequential number to the satellite and identified 2014 06A as Navstar-72. Recently NASA's websites tend to use the same name, ie Navstar-72.
The satellite is also identified by the space vehicle number' (SVN), referring to, what seems to be, the actual spacecraft construction number. The spacecraft are not launched in a neat SVN order, so that 2014 068A is SVN-69. It is this 69 that is used in some reference sources in combination with the word Navstar that gives 2014 068A also the identification as Navstar-69.
The SVN numbers are recorded in Jon McDowell's website whereas the use of the SVN number with Navstar, has been adopted for Gunter Kreb's Space Page website.

Apart from the matters referred to above, NORAD has not always applied its numbering in a neat date sequence, whereas NASA has had instances where they used a different number than NORAD, or no number at all. Also NORAD misses the numbers -12, -42, -44 and -45. Navstar-42 would have been the SVN-42 satellite that failed on 17 January 1997. Navstar-12 was never launched. I cannot find an explanation why they missed the other two numbers.
All these differences are listed in the following table.

Before the USA series was started Navstar satellites were also identified by an Ops- number.
Also, some satellites had a 'pseudo-random noise' (PRN) number that allows each satellite to differentiate itself from other satellites in the active constellation. I would not consider this operational identification as an alternative satellite name.

Int.des.	Name	Ops/USA	SVN	NORAD	NASA	Space Page
1978 020A	Navstar-1	Ops-5111	SVN-1	Navstar-1	Navstar-1	Navstar-1
1978 047A	Navstar-2	Ops-5112	SVN-2	Navstar-2	Navstar-2	Navstar-2
1978 093A	Navstar-3	Ops-5113	SVN-3	Navstar-3	Navstar-3	Navstar-3
1978 112A	Navstar-4	Ops-5114	SVN-4	Navstar-4	Navstar-4	Navstar-4
1980 011A	Navstar-5	Ops-5117	SVN-5	Navstar-5	Navstar-5	Navstar-5
1980 032A	Navstar-6	Ops-5118	SVN-6	Navstar-6	Navstar-6	Navstar-6
18-Dec-1981	Navstar-7	---	SVN-7	Navstar-7	Navstar-7	Navstar-7
1983 072A	Navstar-8	Ops-9794	SVN-8	Navstar-8	Navstar-8	Navstar-8
1984 059A	Navstar-9	USA-1	SVN-9	Navstar-9	Navstar-9	Navstar-9
1984 097A	Navstar-10	USA-5	SVN-10	Navstar-10	Navstar-10	Navstar-10
1985 093A	Navstar-11	USA-10	SVN-11	Navstar-11	Navstar-11	Navstar-11
cancelled	Navstar-12	---	SVN-12	---	---	Navstar-12
1989 013A	Navstar 2-1	USA-35	SVN-14	Navstar-13	---	Navstar-14
1989 044A	Navstar 2-2	USA-38	SVN-13	Navstar-14	---	Navstar-13
1989 064A	Navstar 2-3	USA-42	SVN-16	Navstar-15	---	Navstar-16
1989 085A	Navstar 2-4	USA-47	SVN-19	Navstar-16	---	Navstar-19
1989 097A	Navstar 2-5	USA-49	SVN-17	Navstar-17	---	Navstar-17
1990 008A	Navstar 2-6	USA-50	SVN-18	Navstar-18	---	Navstar-18
1990 025A	Navstar 2-7	USA-54	SVN-20	Navstar-19	---	Navstar-20
1990 068A	Navstar 2-8	USA-63	SVN-21	Navstar-20	---	Navstar-21
1990 088A	Navstar 2-9	USA-64	SVN-15	Navstar-21	---	Navstar-15
1990 103A	Navstar 2A-1	USA-66	SVN-23	Navstar-22	---	Navstar-23
1991 047A	Navstar 2A-2	USA-71	SVN-24	Navstar-23	---	Navstar-24
1992 009A	Navstar 2A-3	USA-79	SVN-25	Navstar-24	Navstar-25	Navstar-25
1992 019A	Navstar 2A-4	USA-80	SVN-28	Navstar-25	---	Navstar-28
1992 039A	Navstar 2A-5	USA-83	SVN-26	Navstar-26	---	Navstar-26
1992 058A	Navstar 2A-6	USA-84	SVN-27	Navstar-27	---	Navstar-27
1992 079A	Navstar 2A-7	USA-85	SVN-32	Navstar-28	---	Navstar-32
1992 089A	Navstar 2A-8	USA-87	SVN-29	Navstar-29	---	Navstar-29
1993 007A	Navstar 2A-9	USA-88	SVN-22	Navstar-30	---	Navstar-22
1993 017A	Navstar 2A-10	USA-90	SVN-31	Navstar-31	---	Navstar-31
1993 032A	Navstar 2A-11	USA-91	SVN-37	Navstar-32	---	Navstar-37
1993 042A	Navstar 2A-12	USA-92	SVN-39	Navstar-33	Navstar-39	Navstar-39
1993 054A	Navstar 2A-13	USA-94	SVN-35	Navstar-34	---	Navstar-35
1993 068A	Navstar 2A-14	USA-96	SVN-34	Navstar-35	---	Navstar-34
1994 016A	Navstar 2A-15	USA-100	SVN-36	Navstar-36	---	Navstar-36
1996 019A	Navstar 2A-16	USA-117	SVN-33	Navstar-37	---	Navstar-33
1996 041A	Navstar 2A-17	USA-126	SVN-40	Navstar-38	---	Navstar-40
1996 056A	Navstar 2A-18	USA-128	SVN-30	Navstar-39	---	Navstar-30
1997 067A	Navstar 2A-19	USA-134	SVN-38	Navstar-44	Navstar-38	Navstar-38
17-Jan-1997	Navstar 2R-1	---	SVN-42	---	---	
1997 035A	Navstar 2R-2	USA-132	SVN-43	Navstar-43	Navstar-43	Navstar-43
1999 055A	Navstar 2R-3	USA-145	SVN-46	Navstar-46	Navstar-46	Navstar-46
2000 025A	Navstar 2R-4	USA-150	SVN-51	Navstar-47	Navstar-47	Navstar-51
2000 040A	Navstar 2R-5	USA-151	SVN-44	Navstar-48	Navstar-48	Navstar-44
2000 071A	Navstar 2R-6	USA-154	SVN-41	Navstar-49	Navstar-49	Navstar-41
2001 004A	Navstar 2R-7	USA-156	SVN-54	Navstar-50	Navstar-50	Navstar-54
2003 005A	Navstar 2R-8	USA-166	SVN-56	Navstar-51	Navstar-51	Navstar-56
2003 010A	Navstar 2R-9	USA-168	SVN-45	Navstar-52	Navstar-52	Navstar-45
2003 058A	Navstar 2R-10	USA-175	SVN-47	Navstar-53	Navstar-53	Navstar-47
2004 009A	Navstar 2R-11	USA-177	SVN-59	Navstar-54	Navstar-54	Navstar-59
2004 023A	Navstar 2R-12	USA-178	SVN-60	Navstar-55	Navstar-55	Navstar-60
2004 045A	Navstar 2R-13	USA-180	SVN-61	Navstar-56	Navstar-56	Navstar-61
2005 038A	Navstar 2R-14	USA-183	SVN-53	Navstar-57	Navstar-57	Navstar-53
2006 042A	Navstar 2R-15	USA-190	SVN-52	Navstar-58	Navstar-58	Navstar-52
2006 052A	Navstar 2R-16	USA-192	SVN-58	Navstar-59	Navstar-59	Navstar-58
2007 047A	Navstar 2R-17	USA-196	SVN-55	Navstar-60	Navstar-60	Navstar-55
2007 062A	Navstar 2R-18	USA-199	SVN-57	Navstar-61	Navstar-61	Navstar-57
2008 012A	Navstar 2R-19	USA-201	SVN-48	Navstar-62	Navstar-62	Navstar-48
2009 014A	Navstar 2R-20	USA-203	SVN-49	Navstar-63	Navstar-63	Navstar-49
2009 043A	Navstar 2R-21	USA-206	SVN-50	Navstar-64	Navstar-64	Navstar-50
2010 022A	Navstar 2F-1	USA-213	SVN-62	Navstar-65	Navstar-65	Navstar-62
2011 036A	Navstar 2F-2	USA-232	SVN-63	Navstar-66	Navstar-66	Navstar-63
2012 053A	Navstar 2F-3	USA-239	SVN-65	Navstar-67	Navstar-67	Navstar-65
2013 023A	Navstar 2F-4	USA-242	SVN-66	Navstar-68	Navstar-68	Navstar-66
2014 008A	Navstar 2F-5	USA-248	SVN-64	Navstar-69	Navstar-69	Navstar-64
2014 026A	Navstar 2F-6	USA-251	SVN-67	Navstar-70	Navstar-70	Navstar-67
2014 045A	Navstar 2F-7	USA-256	SVN-68	Navstar-71	Navstar-71	Navstar-68
2014 068A	Navstar 2F-8	USA-258	SVN-69	Navstar-72	Navstar-72	Navstar-69