



TIROS SPACE INFORMATION NEWS BULLETIN

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Eutelsat 115 West-B and ABS-3A stacked for launch

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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...

Following the small article on 2500 Kosmos spacecraft some months ago, and the recent 'problems' with the series sequential use, one reader did offer information and suggested an article on the Kosmos spacecraft.

In fact we have done this already. In articles in the February 1990 to January 1991 News Bulletins we covered 2100 Kosmos spacecraft. The DS subseries was further discussed in June 2003.

Following some 'soul searching' whether I should repeat the discussion of the Kosmos series from #1 again, perhaps with some updates on the old data, I decided that we should run a set of articles on the Kosmos-2101 to -2500 satellites only.

If you were not a subscriber to our News Bulletin in the February 1990 to January 1991 period, or have lost those issues, and you really want those Kosmos details, contact me and I will see what I can do. Bearing in mind that those issues were never originally written on a computer and that the pages were scanned, this will probably require some trickery but I am sure that can be arranged.

Which reminds me, old issues of the News Bulletin are available in electronic format. If you miss just a single issue, I can send that to you by e-mail. But if you want a large number as a result of a computer disaster you have experienced or if you just want to have them, you can buy the DVD at Aus\$ 50 and you get the whole lot, from September 1973 to the latest issue.

Jos Heyman

and

Several of you wrote back to me that John Young flew on Apollo-16, not -15 (Book review in the last issue). Of course I knew that but I am a lousy typist and an even worse proof reader. Apologies.

Es'hail-2

The Qatari government has booked a SpaceX Falcon 9 rocket for the launch of the Es'hail-2 communications satellite in late 2016.

The satellite is being built by Mitsubishi Electric Corp. using the DS2000 platform and will be located at 26°East.

Satellogic

Satellogic, now based in Palo Alto, California, expects to start the launching of the first satellite of a 16 satellite Earth observation constellation, in the second half of 2015. This would be followed by three batches of five at a later date. The company intends to provide real-time imaging of the entire planet on a daily basis with a 1 m resolution.

Through connections with Argentina, the company previously had the Bugsat-1 launched on 19 June 2014.

O3b 2nd generation

O3b is expected to order its second generation of broadband communications satellites to meet the expected demand. The current constellation of 12 satellites is expected to meet demand for the next few years whilst the future demand is anticipated to increase tenfold.

Kodiak launch site

The future of the Kodiak launch site in Alaska looks bleak after the Alaska Governor Bill Walker issued orders to state agencies to stop work on six public work projects, including the state-owned Kodiak Launch Complex. Walker took office on 1 December 2014 and is faced with a budget deficit caused by the falling oil prices. Oil is the principal state's revenue source. It is not clear whether this order impacts on a recent agreement with Lockheed Martin to upgrade the facility for the Athena 2S medium-lift vehicle.

Cross in Space

Arthur Bessitt, a Christian preacher from the United States, who has been carrying a 3.5 m cross around the world, at one stage planned to have a 10 cm cross cut from the bigger cross, flown in a satellite to be built by One Stop Satellite Solutions (OSSS). It was to be launched in 2001 with on a Russian Dnepr rocket but that was cancelled. Subsequently a 5 cm similar cross was placed on the Celestis-7 burial satellite that failed to orbit on 3 August 2008. Another 5 cm cross was placed on the Celestis-11 flight that was launched on 22 May 2012 and remained attached to the Falcon 9 upper stage until it re-entered on 27 June 2012..

(I ran across this bit of historic trivia by accident, and thought I would share it with you – JH)

Satellite Update

Launches in December 2014

Int.Des.	Name	Launch date	Launch vehicle	Country	Notes
2014 076A	Hayabusa-2	3-Dec-2014	H 2A-202	Japan	Asteroid encounter
2014 076A	MINERVA 2-1A	not yet deployed	---	Japan	Asteroid encounter
2014 076A	MINERVA 2-1B	not yet deployed	---	Japan	Asteroid encounter
2014 076A	MINERVA 2-2	not yet deployed	---	Japan	Asteroid encounter
2014 076A	Mascot	not yet deployed	---	Japan	Asteroid encounter
2014 076A	DCAM-3	not yet deployed	---	Japan	Asteroid encounter
2014 076B	Shin'en-2	3-Dec-2014	H 2A-202	Japan	Interplanetary
2014 076C	DESPATCH	3-Dec-2014	H 2A-202	Japan	Interplanetary
2014 076D	PROCYON	3-Dec-2014	H 2A-202	Japan	Interplanetary
2014 077A	Orion ETF-1	5-Dec-2014	Delta 4 Heavy	USA	Technology
2014 078A	Direct TV-14	6-Dec-2014	Ariane 5ECA	USA	Communications
2014 078B	Gsat-16	6-Dec-2014	Ariane 5ECA	India	Communications
2014 079A	CBERS-4	7-Dec-2014	CZ 4B	Brazil	Earth observation
2014 080A	YW-25A	10-Dec-2014	CZ 4C	Chiina	Earth observation
2014 080B	YW-25B	10-Dec-2014	CZ 4C	China	Earth observation
2014 080C	YW-25C	10-Dec-2014	CZ 4C	China	Earth observation
2014 081A	Trumpet FO2-1	13-Dec-2014	Atlas V-541	USA	Military
2014 082A	Yamal-401	15-Dec-2014	Proton M/Briz M	Russia	Communications
sub-orbital	CARE	18-Dec-2014	GSLV Mk III	India	Technology
2014 083A	O3b-FM10	18-Dec-2014	Soyuz ST	UK	Communications
2014 083B	O3b-FM11	18-Dec-2014	Soyuz ST	UK	Communications
2014 083C	O3b-FM12	18-Dec-2014	Soyuz ST	UK	Communications
2014 083D	O3b-FM09	18-Dec-2014	Soyuz ST	UK	Communications
2014 084A	Kondor E-1	18-Dec-2014	Strela	S. Africa	Earth observation
2014 085A	IPM	23-Dec-2014	Angara 5/Biz M	Russia	Technology
2014 086A	Kosmos-2502	25-Dec-2014	Soyuz 2-1b	Russia	Military
2014 087A	Resurs P-2	26-Dec-2014	Soyuz 2.1b	Russia	Earth observation
2014 088A	YW-26	27-Dec-2014	CZ 4B	China	Earth observation
2014 089A	Astra-2G	27-Dec-2014	Proton M/Briz M	Luxemb	Communications
2014 090A	Feng Yun 2-G	31-Dec-2014	CZ 3A	China	Meteorological

Other updates

Int. Des.	Name	Notes
1998 067EW	Flock 1b-25	Re-entered 14 December 2014
1998 067EZ	Flock 1b-16	Re-entered 13 December 2014
2012 006D	Goliath	Re-entered 31 December 2014

In 2014 a total of 242 new spacecraft were placed into space. Of these 47 were deployed from the International Space Station (ISS), one was deployed from the Rosetta spacecraft and the remainder were placed in orbit by 90 launches.

The number of spacecraft is the highest ever whilst 90 launches is the highest since 1992. Four launches failed.

Falcon 9

The Falcon 9 launch vehicle has been selected for the launch of the US Air Force's Space Test Program-2 satellite, to take place mid-2015. It is expected that the certification will be completed by then,

exactEarth

exactEarth Ltd. is a Canadian company established in 2009 to provide services related to the Automatic Identification System (AIS) navigation safety communications required by the Safety of Life at Sea (SOLAS) Convention. This Convention requires ships of 300 gross tonnage and upwards engaged on international voyages, cargo ships of 500 gross tonnage and upwards not engaged on international voyages, and all passenger ships irrespective of size, to be fitted with AIS transponders.

Owned by COM DEV International Ltd and HISDESAT Servicios Estratégicos S.A., exactEarth operates a number of small satellites or hosted payloads as listed in the table (note that other sources may show a different numbering)

Name	Launch	Notes
exactView-1	22-Jul-2012	
exactView-2	20-Apr-2011	Payload on Resourcesat-2
exactView-3	29-Jul-2009	Was AprizeSat-3
exactView-4	29-Jul-2009	Was AprizeSat-4
exactView-5	17-Aug-2011	Was AprizeSat-5
exactView-6	17-Aug-2011	Was AprizeSat-6
exactView-6R	21-Nov-2013	Was AprizeSat-7
exactView-7	2015	To be launched; payload on M3MSat
exactView-8	2015	To be launched; payload on Paz
exactView-9	2015	To be launched
exactView-10	2018	To be launched
exactView-11	19-Jun-2014	Was AprizeSat-9
exactView-12	21-Nov-2013	Was AprizeSat-8
exactView-13	19-Jun-2014	Was AprizeSat-10

Satellite AIS is a new technology that provides a complete and global picture of the world's shipping.

Kosmos-2101 to 2500 (part 1)

By Jos Heyman

This article provides an update to the series of articles in the February 1990 to January 1991 issues of the News Bulletin.

The discussion will concentrate on those types not covered in those articles and will conclude with a table linking Kosmos numbers to previously discussed types.

Since the launch of the first Kosmos satellite on 16 March 1962, the Kosmos designation has been used for a large number of satellites for diverse military and civilian purposes, as well as for precursors of other satellite programmes, such as Soyuz, and cover names for satellites which failed to achieve their desired orbit.

Glonass M



The Glonass M navigational satellite, was an improved version of the Glonass navigational satellite. Also known as Uragan M, the satellites had an increased lifetime of seven years.

The initial satellites were launched in batches of three by Proton K or Proton M launch vehicles with various upper stages, although sometimes there was a different satellite in the batch of three. These launches took place from Baikonour.

Commencing with Kosmos-2474 the Soyuz 2-1b/Fregat launch vehicle was introduced launching one satellite each time. These launches take place from Plesetsk.

Name	Int. Des.	Launch date	Name	Int. Des.	Launch date
Kosmos-2382	2001 053A	1-Dec-2001	Kosmos-2449	2008 067B	25-Dec-2008
Kosmos-2404	2003 056A	10-Dec-2003	Kosmos-2456	2009 070A	14-Dec-2009
Kosmos-2413	2004 053A	26-Dec-2004	Kosmos-2457	2009 070B	14-Dec-2009
Kosmos-2418	2005 050B	25-Dec-2005	Kosmos-2458	2009 070C	14-Dec-2009
Kosmos-2419	2005 050A	25-Dec-2005	Kosmos-2459	2010 007A	1-Mar-2010
Kosmos-2424	2006 062C	25-Dec-2006	Kosmos-2460	2010 007C	1-Mar-2010
Kosmos-2425	2006 062A	25-Dec-2006	Kosmos-2461	2010 007B	1-Mar-2010

Kosmos-2426	2006 062B	25-Dec-2006	Kosmos-2464	2010 041C	2-Sep-2010
Kosmos-2431	2007 052C	26-Oct-2007	Kosmos-2465	2010 041B	2-Sep-2010
Kosmos-2432	2007 052B	26-Oct-2007	Kosmos-2466	2010 041A	2-Sep-2010
Kosmos-2433	2007 052A	26-Oct-2007	Kosmos-2474	2011 055A	2-Oct-2011
Kosmos-2434	2007 065A	25-Dec-2007	Kosmos-2475	2011 064C	4-Nov-2011
Kosmos-2435	2007 065B	25-Dec-2007	Kosmos-2476	2011 064A	4-Nov-2011
Kosmos-2436	2007 065C	25-Dec-2007	Kosmos-2477	2011 064B	4-Nov-2011
Kosmos-2442	2008 046A	25-Sep-2008	Kosmos-2478	2011 071A	28-Nov-2011
Kosmos-2443	2008 046B	25-Sep-2008	Kosmos-2485	2013 019A	26-Apr-2013
Kosmos-2444	2008 046C	25-Sep-2008	Kosmos-2492	2014 012A	23-Mar-2014
Kosmos-2447	2008 067A	25-Dec-2008	Kosmos-2500	2014 032A	14-Jun-2014
Kosmos-2448	2008 067C	25-Dec-2008			

Glonass K



Kosmos-2470 was the first satellite in the Glonass K third generation navigational satellite system also known as Uragan K. The operational system will consist of 21 satellites in 3 orbital planes, with 3 on-orbit spares. The payload consists of L-Band navigation signals in 25 channels supported by on-board cesium clocks provide time accuracy to 1000 nanoseconds.

The system provided 100 meters accuracy with its civilian (deliberately degraded) signals and 10-20 meter accuracy with its P (military) signals.

The satellites have a mass of 935 kg and are launched by Soyuz 2-1b/Fregat launch vehicle from Plesetsk.

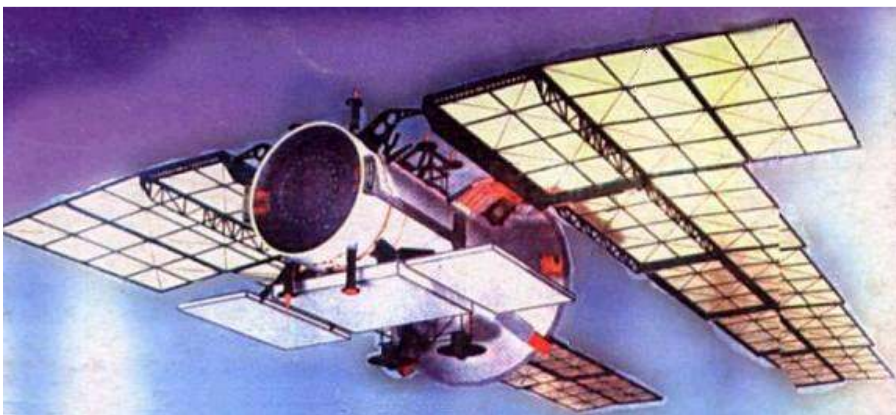
Name	Int. Des.	Launch date
Kosmos-2471	2011 009A	25-Feb-2011

Nadezhda/Kurs

Kosmos-2315 was a civilian navigational satellite in the Nadezda series and tested the new Kurs marine traffic location and control system. It was launched with a Kosmos 3M from Plesetsk.

Name	Int. Des.	Launch date
Kosmos-2315	1995 032A	5-Jul-1995

Obzor



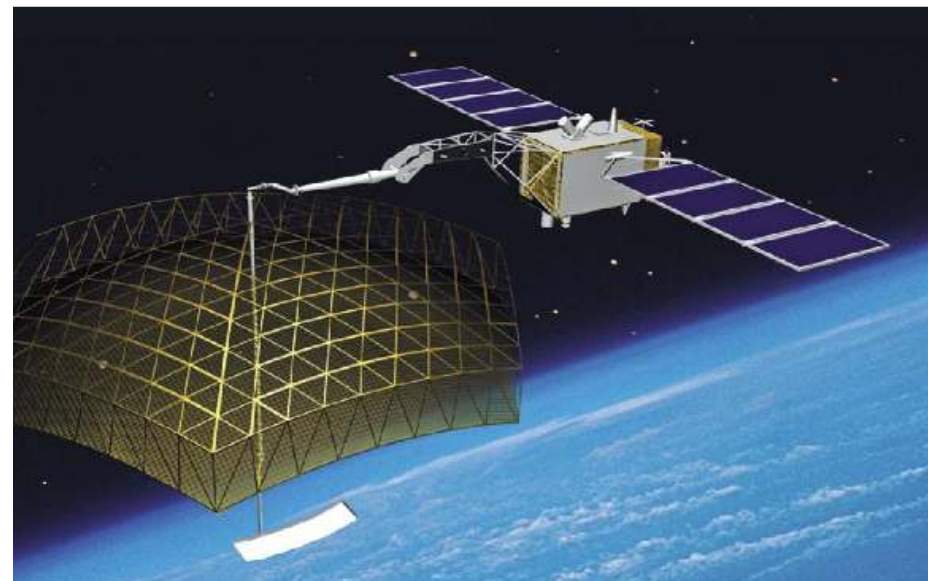
Kosmos-2285 was an experimental remote sensing satellite also known as Obzor-1. It had a mass of 900 kg. The satellite carried a 4-channel Travers synthetic aperture radar system that operated in the 5.7, 9.2, 23.5, and 65 cm wavelengths. The system observed a swath of 250 km with a resolution of 90 m or a 50 km swath with a resolution of 6 m.

The operational system would have consisted of three satellites but no further satellites were launched.

Kosmos-2285 was launched from Plesetsk with a Kosmos 3M.

Name	Int. Des.	Launch date
Kosmos-2285	1994 045A	2-Aug-1994

Kondor E



Also known as Kondor E, this was an Earth observation satellite designed by NPO Mashinostroyeniya and fitted with an S-band synthetic aperture radar (SAR) to conduct both continuous swath surveys or detailed spot surveys. The swath width was 10 km and the resolution was up to 1-2 m in spotlight mode.

The satellite had a mass of 1150 kg and was launched from Baikonour with a Strela launch vehicle.

The satellite was launched as part of the so-called Arktika Earth observation satellite grouping to monitor the weather and environment of the North Pole and pinpoint hydrocarbon deposits on the Arctic shelf.

Two satellites in that programme were to be launched by Russia and it was hoped that another four satellites would be launched by other countries.

A further Kondor E satellite was launched on 18 December 2014 for South Africa.

Name	Int. Des.	Launch date
Kosmos-2487	2013 032A	27-Jun-2013

(to be continued)

DSCOVOR

The Deep Space Climate Observatory (DSCOVOR) is scheduled to be launched on 29 January 2015 by means of a Falcon 9.

The satellite began its existence as Triana, named after the sailor who first spotted land on Columbus's 1492 voyage on the Americas. The original mission was proposed by then Vice President Al Gore to provide continuously images of the sunlit side of Earth from the L1 point. The spacecraft was scheduled for launch on STS-107 in 2003 but was suspended in November 2001 by the Bush administration as irrelevant and due to rising cost. The fact that NASA had already spent \$97 million on the mission and that the spacecraft had been built, did not seem to be a consideration. It was removed from this flight and placed in storage.

In January 2003 it was renamed as DSCOVOR but was cancelled in January 2006. The spacecraft was resurrected in 2012 as a non-critical payload that could be flown on a test launch that posed a higher risk than other launches.

The 570 kg satellite carries three instruments:

- the National Institute of Standards & Technology Absolute Radiometer (NISTAR), a high accuracy set of three cavity radiometers to measure the Earth's energy balance;
- the Earth Polychromatic Imaging Camera (EPIC), a ten channel imaging spectroradiometer to measure the atmospheric ozone and aerosols, land and ocean surface changes, and cloud characteristics;
- the Pulse Height Analyzer (PHA) to monitor the effect of high energy particles on spacecraft electronics; and
- the Plasma-Mag instrument, a magnetometer, Faraday Cup, and an electron spectrometer to measure solar wind and magnetic field characteristics.

ARM

Two years ago NASA introduced the Asteroid Redirect Mission (ARM) spacecraft that was intended to either capture a free-floating asteroid about 10 meters wide or take a small boulder from the surface of a much larger space rock, and place this rock in a lunar storage orbit for inspection by astronauts during the 2020s.

NASA has now indicated that the actual redirection of the rock may be deleted from the mission, instead focussing on the technology required get a spacecraft to an asteroids and to capture such a rock.

The launch is planned for 2020.

Chang'e-5-T1

After arriving at L-2 on 27 November 2014 the Chang'e-5-T1 lunar technology spacecraft launched by China on 23 October 2014, returned to a lunar orbit of 200 x 5300 km on 8 January 2015. Over the next couple of days this orbit was modified to 200 x 200 km from where the spacecraft will conduct at least two tests of the trajectories and guidance techniques needed for the proposed Chang'e 5 mission which requires the Ascent Vehicle containing samples acquired from the lunar surface to automatically link up with its return craft. These two tests are expected to be conducted in February and March 2015.

Sicral-1

It was recently revealed that the aging Italian military communications satellite Sicral-1, launched on 7 February 2001, was relocated from its retirement orbit to the 21.5° East orbital spot allocated to Luxembourg. This move was necessary for Luxembourg to retain the orbital location after an expiry date of 18 December 2014 as well as the delay of the launch of Astra-2G that did not take place until 27 December 2014.

Philea

Philea, the small landing craft that was released from Rosetta on 12 November 2014 and landed on Comet Churyumov-Gerasimenko on the same day, remains inoperable due to depleted batteries and insufficient sunlight.

Mission controllers are hopeful that the spacecraft may be revived when more solar energy can fall on the solar panels. However it will not be until August 2015 before the comet will be in a location that there will be more sunlight.

Multi-satellite launch system

Boeing has patented a means to place one electric-powered satellite on top of another within the rocket fairing without the need for a support structure. The deletion of this support structure allows an extra 700 kg in payload, which will make it possible to launch multiple satellites with smaller (and cheaper) launchers like the Falcon 9.

The concept will first be used for the launch of two all-electric 702SP satellites on a Falcon 9 to be launched in February 2015. These satellites are Eutelsat 115 West-B and Hong Kong's ABS-3A.

ISS

Russia has delayed a decision on the continued use of the International Space Station beyond 2020 as a consequence of the current economic problems that has forced the Roscosmos space agency to review its budget for the 2016-2025 space programme.

NASA has already made the commitment to operate ISS until 2024 but can only do so with Russian cooperation.

EDRS-C

It is becoming more and more likely that the European Data Relay Satellite (EDRS)-C, to be built by Airbus and OHB for ESA, may be cancelled as a result of financial problems.

The satellite was to be launched in 2016 to relay data, at high speed, between Earth observation satellites in low orbit and satellites in higher geostationary orbit using laser communications terminals. A similar payload is expected to be launched this year on Eutelsat-9B.

OneWeb

OneWeb, formerly known as WorldVu, intends to launch a constellation of 48 small satellites into a low-Earth orbit to provide worldwide broadband and telephone services. The project is sponsored by investors Qualcomm and the Virgin Group.

The OneWeb constellation will integrate with existing mobile networks and be an extension of a mobile operator's network. The whole system will have more than 8 terabits in terms of total capacity and will have latency of less than 30 milliseconds.

The launches will be conducted with Virgin Galactic's LauncherOne rocket that is expected to be introduced in 2016.



LauncherOne is a two stage rocket that will be air-launched from White Knight Two. It will be able to deliver 225 kg payloads into a low-Earth orbit.

South Korea

South Korea plans to deploy five military reconnaissance satellites by 2022. The satellites are to be fitted with high resolution synthetic aperture radar or electro-optic-infrared (EO-IR) surveillance devices that will be able to detect objects as small as cars.

ESA and China

The European Space Agency and China are discussing the possibility of ESA astronauts flying to the proposed Chinese space station. In addition ESA and China are discussing possible joint scientific and astronomical missions.

Sarah Brightman and Soyuz TMA-18M

It has been announced that singer Sarah Brightman will fly to the International Space Station in October 2015 on board of Soyuz TMA-18A.

She will be the first 'space participant' since 2009 and she will accompany Commander Sergey Volkov and Danish ESA astronaut Andreas Mogensen. Sarah will stay in space for 10 days and will return to Earth on Soyuz TMA-16M. It has been reported that she paid \$52m for the flight.

The seat was available because Soyuz TMA-18M is required to support the one year mission of Scott Kelly and Mikhail Korniyenko who will be taken to ISS on Soyuz TMA-16M in March 2015 and need TMA-18M as an emergency evacuation spacecraft.

Sarah Brightman's pre-flight training started on 12 January 2015.

Mega constellations

SpaceX is proposing to establish a global satellite based Internet network that will include some 4000 satellites in low-Earth orbit. This proposal was recently released by SpaceX CEO Elon Musk. The systems has not been given a name as yet and it seems that so far only documentation has been submitted to the International Telecommunication Union (ITU), the Geneva-based United Nations agency that regulates orbital slots and the radio spectrum. The satellites would operate at an altitude of 1100 km and initial services could start within five years.

The SpaceX satellites are expected to have a mass of several hundred kilograms at launch and will use ion-electric thrusters for in-orbit maneuvering. They are to be built at a new plant SpaceX hopes to establish in Seattle.

However, SpaceX is not the only one that has lodged documentation with the ITU although a number of these proposals are hidden in secrecy and the ultimate promoter is not clear.

For instance a Canadian group has submitted documentation for a 79 satellite constellation in eight planes with nine satellites per plane in low and highly elliptical Earth orbit. Identified as CANPOL-2, it would operate in the VHF, UHF, X and Ka band, frequencies usually associated with military networks.

There is a submission from Liechtenstein for the 3ECOM-1 project that will consist of 24 satellites in each of 12 orbital planes, a total of 264 satellites. They will be operating in the Ku and Ka bands.

COMSTELLATION is another Canadian proposal for a constellation that envisages 794 satellites operating in the Ka band in a low Earth orbit distributed over 12 orbital planes.

And then there is a Norwegian submission for a network called STEAM. STEAM-1 will operate in the Ku band whilst STEAM-2 will use the Ka band. The constellation will consist of 4,257 satellites distributed over 43 orbital planes.

Dream Chaser

NASA has provided feedback on why it did not select Sierra Nevada's Dream Chaser to fly astronauts to the space station.

Summarised these are:

- the Dream Chaser had the lowest technical evaluation rating and the design had the lowest level of maturity, with significantly more technical work and critical design decisions to be accomplished, in particular the Dream Chaser's propulsion system and the abort system that required additional verification;
- the Dream Chaser had a higher schedule uncertainty than the other two proposals;
- the SpaceX proposal had the best price coupled to a high confidence level that the work could be completed;
- although the Boeing price was higher than the Sierra Nevada price, it was the strongest of the three proposals in both mission suitability and past performance; and
- Boeing was considered to have the best management approach, with very comprehensive and integrated program management, and an effective organizational structure.

Iridium

It has been suggested that several Iridium communications satellites have been hit by tiny fragments of space debris that is present in their orbit.

Iridium-47 (1997 082C) may have been hit on 7 June 2014 whereas Iridium-91 (2002 005A) was hit on 30 November 2014. Both satellites somehow continue to operate.

The debris may come from two sources. Iridium-33 (1997 051C) collided with a Russian military satellite in February 2009 resulting in 620 trackable pieces of debris in its orbit.

Also the Feng Yun-3 (1999 025A) Chinese satellite that was used for an anti-satellite test on 11 January 2007 left a close to 3400 trackable pieces of debris in orbit.

In addition one can expect a large number of smaller, untrackable, pieces as a result of both events.

Antares

Orbital Sciences has signed a contract with Energia for the delivery of 60 RD-181 rocket engines for the Antares launch vehicle first stage which will carry two of these instead of the two AJ26 rocket engines which malfunctioned during the 28 October 2014 launch failure.

The AJ26s were Russian NK-33 engines left over from the N1 moon rocket programme of the 1970s. They had been modified by Aerojet Rocketdyne.

Beagle 2

The HiRISE camera on the Mars Reconnaissance Orbiter has located the Beagle 2 lander on the surface of Mars. Images taken in 2013 with a resolution of 30 cm per pixel, indicate that at least two of the four solar panels unfurled. The area where the lander came down is known as Isidis Planitia.



Beagle 2 was flown to Mars on board of the Mars Express spacecraft and was released on 19 December 2003 to land on 25 December 2003. Beagle 2 did not have a communication system during the entry, descent and landing phase as there was no orbiting spacecraft that could relay those communications. Instead the first signals were supposed to come direct from the lander, but after the landing.

Moon Express

Moon Express, a company established in 2010 for the purpose of sending commercial spacecraft to the Moon, will use Cape Canaveral's launch complex 36 for the tests of its Moon Express MTV-1X, a test version of the proposed Moon Express MX-1 lunar lander.

Moon Express MX-1 is an entrant in the Google Lunar X prize competition that awards a \$20 million prize to the first privately-funded spacecraft to land on the Moon and move at least 500 meters above or along the lunar surface, beaming high-definition video images back to Earth. However, in the long term, Moon Express hopes to sell its services for commercial purposes. The company also has a contract with NASA as part of the Lunar CATALYST initiative.

The Moon Express MX-1 is designed to be taken to a geostationary orbit as a secondary payload on a commercial launch. From there it will use a hydrogen peroxide engine to fly to the Moon and land there. No flight date appears to have been set yet.