TIROS SPACE INFORMATION
NEWS BULLETIN 68 ADEL

Vol. 41 No.8, May 2016
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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).
The News Bulletin can be received worldwide by e-mail subscription only. Subscriptions can be requested by sending an e-mail address to tirosspace@hotmail.com. Tiros Space Information reserves the right to refuse any subscription request without the need to provide a reason.

Calling card...

Last year four US owned Lemur satellites were launched on an Indian PSLV launch vehicle on 28 September 2015. Separately it has been announced that India has earned $ 101 million with the launching of 28 non-Indian satellites between 2013 and 2015.

This all has raised an issue in the US Department of Transportation's Federal Aviation Administration (FAA) as India is not a signatory to the US initiated Commercial Space Launch Agreement (CSLA).
The CSLA was introduced in 2005 as a way of protecting the emerging US small-satellite launch industry by obliging non-US rocket providers to set US commercial launch prices. It seems that CSLA was lobbied, at the time, by SpaceX to protect its Falcon 1 launcher against foreign launch service providers that did not have to worry about profitability and were priced to gain hard currency by undercutting US launch prices.
The fact that SpaceX has abandoned the Falcon 1, does not seem to have reduced the impact of the CSLA as, on 26 February 2016, the FAA endorsed a recommendation of its Commercial Space Transportation Advisory Committee (COMSTAC) that Indian launch services threaten to "distort the conditions of competition" in the launch-services market.

The mind boggles and I leave it to the readers to decide how dysfunctional the FAA is.

Based on this, it will be interesting to see how SpaceX will react to Arianespace's decision to undercut the Falcon 9 per-kilogram launch pricing, as mentioned elsewhere in this News Bulletin.

Jos Heyman

Cartosat 2-C + 21 other satellites

In May 2016 a PSLV CA rocket to be launched from Sriharikota will place the third Cartosat 2 cartographic satellite in orbit for India.
The same launch vehicle will also place 21 other satellites in orbit.

These are:

- SkySat-3, the first operational satellite in Terra Bella's constellation of 21 Earth observation satellites. The 120 kg satellite is fitted with a Ritchey-Chretien Cassegrain telescope with a focal length of 3.6 m, and a focal plane consisting of three 5.5 Mpixel CMOS imaging detectors. The satellite was built by SS/Loral using a Skybox-licensed design that incorporates a modular propulsion system. Terra Bella was formerly known as Skybox Imaging.
- The Berlin InfraRed Optical System (BIROS) is a German fire detection satellite based on the TET-X platform. It will operate alongside TET-1. The 130 kg satellite is fitted with the Firebird payload, an imaging instrument consisting of three pushbroom cameras, one in the VNIR (Visible Near Infrared) range and two imagers in the infrared region. The objective of this payload is to detect and analyse high temperature events like wildfires and volcanoes. BIROS also carries the Optical Space Infrared Downlink System (OSIRIS) to demonstrate three different laser systems for downlink communications and a four quadrant laser detector onboard for improved pointing accuracy and a beacon laser in uplink to support attitude control. It also carries the Autonomous Vision Approach Navigation and Target Identification (AVANTI), an optical navigation experiment to demonstrate autonomous rendez-vous operation with a target, in this case BeeSat-4 that will be deployed from BIROS using a spring mechanism. Deployment will take place after the successful check-out and commissioning of all relevant BIROS subsystems. The fourth payload is the Verification of Autonomous Mission Planning On-board a Spacecraft (VAMOS) software experiment with the objective to schedule and (re-)command tasks.
- The Maritime Monitoring and Messaging Micro-satellite (M3M) is a technology satellite built by the Canadian Com Dev company for the Canadian government. The 85 kg satellite will demonstrate two advanced Automatic Identification System (AIS) payloads to monitor maritime shipping.
- Lembaga Penerbangan dan Antariksa Nasional (LAPAN) A-3 is an Earth observation satellite developed in Indonesia. The payload consists of a Video camera (PAL RGB) for 80 km width coverage and a 3 band multi-spectral imaging camera with a ground resolution of 24 m and 154 km swath width. It also carries the Attitute Determination Instrument (AID) star tracker, an Automatic Identification System (AIS) payload to monitor maritime shipping and a radio amateur transponder.
- The Greenhouse Gas Satellite – Demonstrator (GHGSat-D) satellite, nicknamed Claire, is a 15 kg satellite to demonstrate an advanced miniature hyperspectral SWIR imaging spectrometer for monitoring targeted greenhouse gas emitters. It also carries an instrument to measure clouds and aerosols. The satellites was built by UTIAS Space Flight Laboratory (SFL).
- NIUSAT, also known as Keralshree, was developed by the Noorul Islam University;s Centre for Higher Education. The 12 kg is fitted a Miniature Wide Field Sensor (MWiFS) for agriculture and disaster management support applications.
- SathyabamaSat (SB Sat) is a 2U cubesat built at the Sathyabama Universit in India. The satellite will measure the densities of the greenhouse gases over the region over which it moves, using an ARGUS 1000 IR Spectrometer.

- Swayam is an 1U cubesat developed at the College of Engineering, Pune (COEP), India. Essentially an educational project for students, it is fitted with a pair of hysteresis rods and a magnet to stabilize the satellite. It also carries a communications payload operating in the radio amateur frequencies.
- Finally, the launch vehicle will carry 12 Flock 2x Earth observation satellites.

Blagovest

Blagovest is a new communications satellite providing high-speed data transmission services, such as telephone and video conferencing and broadband Internet, to domestic Russian customers.
Four satellites in the series will be built by Reshetnev using the Ekspress 2000 platform that will be fitted with a Q band and Ka band payload provided by Thales Alenia.
The first satellite is expected to be launched towards the end of 2016 with a Proton M/Briz M launch vehicle.

Sea Launch

Energiya hopes to sell its interest in Sea Launch to Vladislav Filev, co-owner of S7 Airlines, one of Russia's biggest domestic airlines. If the sale goes ahead, Filev intends to adopt the Angara A3 launch vehicle in place of the Zenit 3SL. He also expects at least five launches each year to make the enterprise profitable.
As a consequence of this move, Boeing, one of the other partners in Sea Launch and being involved in a long-running legal dispute with Energiya, has filed a motion in US federal court to block the sale as it could hinder Boeing's ability to collect on a summary judgment issued last year against Energiya of at least $300 million. It is argued that if Energiya sells it share, it is unlikely Boeing will ever recover the $300 million.

Astro H

Astro-H, the Japanese space telescope launched on 17 February 2016 to enable high sensitivity observations of celestial sources across a wide energy range, from X-rays to gamma-rays, bands, has stopped operating.
On 27 March 2016 contact was lost with the spacecraft and five objects (catalogued as 2016 012F, G, H, J and K) had been detected in the vicinity of the spacecraft which was observed to be tumbling in its orbit. Brief signals were received on three occasions until 28 March 2016 but after that the spacecraft was completely silent – likely due to the depletion of its on-board battery as no power is generated with the vehicle in a fast spin. Optical and radar observations from the ground indicated that the roll rate on the spacecraft increased since the debris occurred.

Satellite Update

Launches in March and April 2016

Int.Des.	Name	Launch date	Launch vehicle	Country	Notes
2016 013A	SES-9	4-Mar-2016	Falcon 9 FT	Luxemb.	Communications
2016 014A	Eutelsat 65 West-A	9-Mar-2016	Ariane 5ECA	Eutelsat	Communications
2016 015A	IRNSS-1F	10-Mar-2016	PSLV XL	India	Navigational
2016 016A	Resurs P-3	13-Mar-2016	Soyuz 2.1b	Russia	Earth resources
2016 017A	ExoMars	14-Mar-2016	Proton M/Briz M	ESA	Interplanetary
2016 018A	Soyuz TMA-20M	18-Mar-2016	Soyuz FG	Russia	ISS crewed
2016 019A	Cygnus Orb-6	23-Mar-2016	Atlas V-401	USA	ISS cargo
2016 020A	Kosmos-2515	24-Mar-2016	Soyuz 2.1a	Russia	Earth resources
2016 021A	Beidou 2-IGSO6	30-Mar-2016	CZ 3A	China	Navigational
2016 022A	Progress MS-2	31-Mar-2016	Soyuz 2.1a	Russia	ISS cargo

Other updates

Int. Des.	Name	Notes
1998 067GE	Flock 1e-2	Re-entered 5 March 2016
1998 067GX	SERPENS	Re-entered 27 March 2016
1998 067GZ	AAUsat-5	Re-entered 15 March 2016
2000 050A	Zi Yuan-2A	Re-entered 11 March 2016
2015 043A	Soyuz TMA-18M	Undocked and re-entered 2 March 2013

New Shepard Test-4

On 2 April 2016 Blue Origin conducted another test of the New Shepard sub-orbital launch vehicle from its test facility at Van Horn, Texas.
The Propulsion Module used for this flight was the same as the one used for the two test flights conducted on 23 November 2015 and 22 January 2016. It reached an altitude of 103.4 km.
The dummy Crew Capsule successfully separated from the Propulsion Module and descended back to Earth by parachute.
The flight also carried two experiments into a sub-orbital trajectory without deploying them:
- Collisions Into Dust Experiment (COLLIDE), an experiment developed at the University of Central Florida consisting of a marble being launched into a bed of dust in microgravity conditions. The impact of the marble on the dust was filmed to possibly reveal mechanisms of dust collisions in the early solar system and interactions of particles within planetary rings, also looking at dust on bodies with insignificant gravitational fields; and
- Box of Rocks Experiment (BORE), a pair of boxes filled with small rocks prepared by the Southwest Research Institute Experiment to better understand the behavior of loose rocky soil on asteroids and other bodies.

Cancelled Projects: Project A119 and E-4

By Jos Heyman

In 1958 the US Air Force advanced a plan to detonate a nuclear bomb on the Moon.
Referred to as Project A119, a study known as "A Study of Lunar Research Flights", felt that the detonation of such a device could help in answering some of the mysteries in planetary astronomy and astrogeology. It was also expected that the detonation would produce a flash of explosive light would have been faintly visible to people on Earth with their naked eye.
This was seen as a show of force and boosting the morale in the capabilities of the United States.

The US was not alone in suggesting such an effort. The USSR had something similar as Project E-4.

Both projects were eventually cancelled primarily out of the realization that there could be a negative reaction from the public. Furthermore, in both the USA and the USSR, it was realised that the proposed crewed moon landing would be a much better space advocacy tool than the militarization of space

The Armour Research Foundation (ARF), based at the Illinois Institute of Technology, began studying the effects of nuclear explosions on the environment in 1949. The team was led by Leonard Reiffel and other members included, amongst others, the astronomer Gerard Kuiper and his PhD student Carl Sagan. The latter was responsible for the mathematical projection of the expansion of a dust cloud in space around the Moon, an essential element in determining its visibility from Earth.

The selected bomb was a W25 warhead, a small, lightweight warhead with a relatively low 1.7 kiloton yield. It would be carried on a rocket to the far side of the Moon where it would explode on impact.

The W25 warhead was used for the Douglas MB-1 Genie missile (later AIR-2) that was used with US fighter aircraft. The warhead measured 44 cm in diameter and 68 cm in length and had a mass of about 100 kg. Which missile was to be used for Project A119 is not known.

The Air Force cancelled the project in January 1959.

The USSR's E-4 plan involved a 400 kg spacecraft and was conceived in January 1958 and was part of a multi-phased plan by the USSR to conquer the Moon.

The first phase, E-1, was simply an effort to reach the Moon. After three failed launches on 22 September 1958, 11 October 1958 and 4 December 1958, Luna-1, launched on 2 January 1959, flew past the Moon at a distance of 5955 km on 4 January 1959. The flight is generally considered as a partial failure and the spacecraft went into a solar orbit of 443 days. A further attempt on 18 June 1959 failed but Luna-2, launched on 12 September 1959, was considered a success. The two latter flights have also been identified as E-1A.

The second phase E-2 was to be a 280 kg spacecraft intended to fly around the Moon with a scientific payload and an attitude control systems but this version was cancelled in favour of the E-2A that carried an improved photographic system to make images of the far side of the Moon. This was successfully performed by Luna-3 that was launched on 4 October 1959. A follow-up on 15 April 1960, failed to orbit.

The third phase was labelled as E-3 and was, like the E-2A, to fly around the Mon. A launch on 16 April 1960 failed to orbit.

As far as the E-4 was concerned, a full scale mock-up was built but the development was cancelled because of the high risk and the absence of any visual evidence of an explosion on the Moon.

There were further phases in the USSR lunar plan, labelled E-5, E-6, E-7 and E-8, but these are outside the scope of this discussion.

The Partial Nuclear Test Ban Treaty in 1963 and the Outer Space Treaty in 1967 brought an end to the concept of detonating a nuclear device on the Moon although it did not stop the US from testing high altitude nuclear explosions.

The existence of Project A119 remained largely secret until the mid-1990s, when writer Keay Davidson discovered the story while researching the life of Carl Sagan for a biography.

Mayak

Students at the Moscow State University of Mechanical Engineering have proposed that satellites be fitted with a drogue chute that is deployed once the satellite has finished its operational life. The 20 km wide drogue chute would serve as a brake bringing the satellite down quicker.
It is proposed to test the concept on the Mayak satellite, Russia's first crowd funded satellite that would be sent into a 550 km orbit and would take one month to de-orbit.

Phoenix

Russia plans to develop a new medium class launch vehicle. Identified as Phoenix, its first flight is planned for 2025. Phoenix may also become the first stage of a new super-heavy launch vehicle.

Atlas V

The first stage RD-180 engine of the Atlas V launch vehicle that placed the Cygnus Orb-6 in orbit shut down 6 seconds too early. The mission was saved by firing the Centaur upper stage for about one minute longer, placing the spacecraft in the correct orbit towards docking with ISS. The problem was traced to an anomaly with the first stage fuel system.
As a consequence, the next launch of an Atlas V (to place MUOS-5 in orbit) has been delayed indefinitely.

Shi Jian-10

On 5 April 2016 a CZ 2D launch vehicle placed the Shi Jian-10 recoverable satellite in orbit after a launch from Jiuquan.
The 3600 kg recoverable satellite carried twenty different scientific experiments:

1. Space Experiment of Evaporation and Fluid Interfacial Effects (EFILE) to study the thermocapillary effects at the liquid-gas phase change interface in an evaporation process;
2. Phase Separation and dynamic clustering in granular ga, an experiment to study the physics behind granular transportation in microgravity;
3. SOBER-SJ10 (Single bubble pool boiling experiment aboard SJ-10), to study local convection and heat transfer on an isolated local vapor bubble during nucleate boiling on a simple flat plate heater outfitted with a number of sensors to measure the temperatures underneath the bubble;
4. Space experiment on surface wave of thermocapillary convection using thermal sensors, infrared imagers and a displacement sensor to gain knowledge on flow patterns, oscillations, and transition issues of thermocapillary convection;
5. Study on the colloidal assembling (SJY305-10), an experiment to look at self-assembly processes in colloidal media to uncover mechanisms behind the creation of colloidal crystals;
6. Study on ignition, soot emission and smoke distribution of wire insulations by overload, to investigate the pre-ignition characteristics of wire insulation in microgravity;
7. Investigation of the coal combustion and pollutant formation characteristics under microgravity, comprising two investigations to uncover fundamental processes and mechanisms in combustion of solid materials as single particles or pulverized clouds of typical coals found in China;
8. Ignition and burning of solid materials in microgravity to study flame propagation using eight fuel samples, in order to develop fire safety systems for future spaceflights;
9. Solidification and crystal growth in space, to synthesize large semiconductor crystals with uniform composition and virtually no defects, and high quality metal alloys that can not be obtained in gravity;
10. Synthesis and characterization of high-performance thermoelectric semiconductors with favorable thermal/electrical properties to permit a study of their microstructure;
11. Soret coefficients of crude oil (SCCO), a joint Chinese/ESA experiment to study the Soret Coefficient of crude oil which has implications for the understanding of Earth's oil reservoirs;
12. Molecular biology mechanism of space radiation mutagenesis, using plant samples located in three different radiation environments inside the satellite to extract information on biological changes undergone by the organisms as a function of radiation dose;
13. Roles of space radiation on genomic DNA and is genetic effects, using radiation-sensitive mutant mammalian cells and fruit flies that are exposed to the space radiation environment to examine the quantitative effects of radiation on the stability of the species' genomes;
14. Effects of space environment on silkworm embryo development and mechanism of mutation;
15. Biological Effects and the signal transduction of microgravity simulation in plants in order to understand how plants sense microgravity;
16. Biomechanics of mass transport of cell interactions under microgravity in order to understand how mammal cells can sense microgravity;
17. Photoperiod-controlling flowering of arabidopsis and rice in microgravity, to study the mechanisms behind the light-induced flowering signal traveling from the leaf to the shoot apex;
18. an experiment to study the three-dimensional cell culture of neural and hematopoietic stem cells in space;
19. Development of mouse early embryos in space, to study the effects of the space environment on mammalian reproductive systems using mouse embryos; and
20. an experiment to study potential and molecular mechanism of osteogenic differentiation from human bone mesenchymal stem cells.

SJ-10 was originally to be launched a few years after SJ-8 (2006 035A) but was delayed until a restructure the Chinese space research program in 2011 following which the China Academy of Sciences was handed authority over scientific missions.
The spacecraft was successfully recovered on 18 April 2016.

Vostochny

The first launch from the new Siberian Vostochny launch facility, took place on 28 April 2016 when a Soyuz 2.1a/Volga placed a number of satellites in orbit.

The main payload was the Mikhail Vasilyevich Lomonosov (MVL)-300, developed by the M. V. Lomonosov Moscow State University and named to honour the 300th birthday of the Russian scientist with the same name.
The satellite uses a surplus platform of the Kanopus V programme and is equipped for the observation of ultra-high energy cosmic rays and studies of transient phenomena in the Earth's upper atmosphere.
The instruments are:

- The Tracking Ultraviolet Set Up (TUS) orbital telescope to observe UV radiation bursts in the night atmosphere of the Earth;
- BDRG, an instrument for monitoring and locating of gamma-sources at the celestial vault within the gamma-range;
- UFFO, an instrument for the study of gamma-bursts with a 20-cm UV-optic telescope and X-ray camera;
- Dosimeter of Electrons, PROtons and Neutrons (DEPRON) for the measurements of the absorbed doses and linear energy transfer spectra from high-energy electrons, protons and nuclei of space radiation, and for detecting of thermal and slow neutrons flux;
- ShOK an instrument consisting of two stationary fast wide-angle cameras;
- The Electron Loss and Fields Investigator for Lomonosov (ELFIN-L) consisting of a Flux Gate Magnetometer (FGM), an Energetic Particle Detector for Electrons (EPDE), and an Energetic Proton Detector for Ions (EPDI); and
- IMISS-1, an instrument to test the performance quality of microelectromechanical inertial measuring modules in space.

In addition the launch vehicle carried:

- Aist-2D, a 531 kg technology satellite developed by TsSKB Progress in partnership with Samara State Aerospace University, to demonstrate a new small spacecraft design; and
- SamSat 218, a 3U cubesat designed and built by students at Samara State Aerospace as an educational and technology demonstration.

BEAM

Launched on 9 April 2016 on board of the Dragon CRS-8 resupply spacecraft that docked at the nadir Harmony port of ISS, the Bigelow Expandable Activity Module (BEAM) is an expandable module that will remain attached to the ISS for a period of two years as part of a test of an expandable space habitat in the actual mission environment over a longer time scale. The module is 4.4 m long and has a diameter of 3.2 m once it is deployed, providing a volume of 16 m^2. It consists of a central rigid cylindrical structure housing spacecraft equipment around which the flexible hull made of Vectran shielding fabric is stowed. It also has a Common Berthing Mechanism (CBM) that allows it to be docked with ISS, as well as a rigid forward bulkhead that provides the mounting structure for two grapple fixtures for the Station's robotic arm to allow the module to be handled in space.

On 16 April 2016 the Canadarm2 robotic arm took the pallet that carried BEAM and attached it to the aft Common Berthing Mechanism on the Tranquility module (Node-3). The space station crew is expected to activate the BEAM's pressurization system to inflate it on 26 May 2016.
During the next two years a range of instruments will monitor the structural integrity and leak rate, along with temperature and radiation levels. During this time the hatch leading into the module will remain closed except for periodic visits by crew members for inspections and data collection. At the end of the two years, the BEAM will be detached and jettisoned from the station.

RLV-TD

The Indian Space Research Organisation (ISRO) is expected to launch the first Reusable Launch Vehicle-Technology Demonstration (RLV-TD) into a sub-orbital trajectory during May 2016.
The RLV-TD, is a scaled-down prototype of a future uncrewed single-stage reusable spaceplane, known as Avatar, and this flight will evaluate various technologies needed in the development of Avatar. In particular the test will concentrate on powered cruise flight, autonomous landing and hypersonic flight using an air-breathing propulsion system and has also been identified as the Hypersonic flight Experiment (HEX).
RLV-TD will be launched with a two stage Rohini sounding rocket and will achieve an altitude of 70 km. Recovery will be in the Bay of Bengal.

This test will be followed by another three RLV-TD flights identified as the Landing Experiment (LEX), the Return flight Experiment (REX), and the Scramjet Propulsion Experiment (SPEX).

Australian Space Capabilities

Recently the Australian Department of Industry, Innovation and Science commissioned Asia Pacific Aerospace Consultants Pty. Ltd. (APAC), an Australian based consultancy on space with a history going back to 1994, to prepare a report on Australia's space capabilities with an emphasis on the Australian space industry's capability in the global commercial space industry, concentrating on domestic and global supply chain opportunities and growth opportunities in space applications for domestic and international markets.

The 111 page report with the title 'A Selective Review of Australian Space Capabilities', discards the notion that 'space' is associated solely with large government space projects involving rockets and satellites, instead advocating that such projects are now dwarfed by the commercial activity taking place in the global space industry which now generates 70% of space economic activities worldwide. In particular it notes that the three current largest space revenue streams – Satellite Direct to Home (DTH) TV, Global Navigation Satellite Systems (GNSS) equipment and services, and Satellite DTH Broadband & Mobile equipment - did not exist 30 years ago.

The study has excluded government and not-for-profit space activities as well as the research and academic sectors. Instead it focussed on the purely commercial space marketplace in Australia and the findings provided in the report, which included 30 informative tables, are based on interviews with 46 Australian companies active in the space industry.

The study confirmed that Australian companies have the relevant capabilities and world class skills to participate in the rapidly growing global space economy; and that a number of Australian firms are already actively involved in international markets.

Key findings include:

- Globally, commercial space activities are continuing to outpace government activities, growing by 9.7% in 2014 and now representing 76% of the global space economy.
- The use of space systems, space-derived data and space enabled services generate 70% of space economic activities worldwide.
- Commercialisation of space activities is being driven by an emerging consumer market in areas such as satellite broadband, and navigation/positioning technologies, such as GPS-enabled applications.
- Australian firms have greatest capabilities in ground systems and related space enabled services and applications, driven by the extensive use of satellite communications and navigation in Australia.
- Space-related products and services are used in every sector of the Australian economy.
- Annual revenue from the Australian space industry sector is estimated at $3 $4 billion - 92% domestic and 8% export activity.
- Employment in the sector is estimated to be between 9,500 and 11,500 full-time equivalent.

The report can be viewed through the website of the Space Industry Association of Australia website (spaceindustry.com.au).

Ariane 6

Arianespace is expected to go head-on with SpaceX when its Ariane 6 launch vehicle will commence operations in 2020 by advertising per-kilogram prices below that of SpaceX's Falcon 9.
The Ariane 6 will come in two versions, Ariane 62 with two solid-fueled strap-on boosters providing a launch capability of 5000 kg, and Ariane 64, with four strap-on boosters and a launch capability of 10,500 kg.
By reducing per-kilogram launch prices by 40 to 50% compared to today's Ariane 5, Ariane 6 will have twice the mass and twice the volume of the Falcon 9, at less than twice the price.

VACCO MiPS

The US based VACCO Industries has developed Micro Propulsion Systems (MiPS) for cubesat using high-performance cold gas, warm gas and green monopropellant systems.
To date 14 have been produced in support of a variety of US missions.

In addition the company is providing the MiPS for the two 6U Mars Cube One (MarCO) cubesats being developed by the Jet Propulsion Laboratory as part of the Mars InSight lander mission to assist in the communications with the InSight lander.

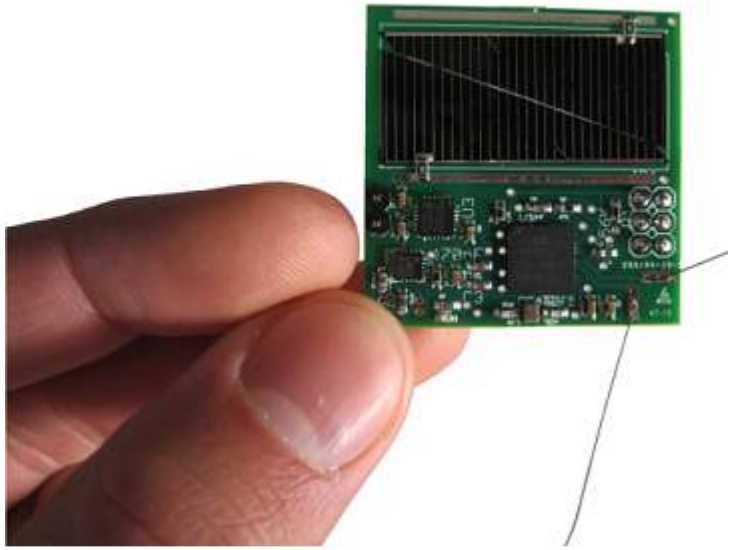
The propulsion module is constructed from all-welded aluminium and has a system-in-a-tank design with propellant storage and feed system, thrusters and a controller and sensor suite.
The 2U units have a mass of 3490 grams and are fitted with eight 25mN thrusters, four of which are axial thruster that can modify the velocity of the satellite and thrust vector control during maneuvers. The other four are Reaction Control System (RCS) thrusters for provide spacecraft stability, pointing control and unloading of the reaction wheels.

Electron

Following the successful qualification of the Rutherford engine for the Electron rocket, Rocket Lab expects to start a series of test flights later this year.
Electron will use nine Rutherford engines on its first stage, and a vacuum variant of the same engine on its second stage.
The launch vehicle will be capable of delivering a 150 kg payload to a 500 km sun-synchronous orbit, the orbit selected for the high-growth constellation-satellite market.

StarChip

The Russian entrepreneur Yuri Milner will spend $100 million over the next few years to start the development of the technology needed to build a giant laser array to propel swarms of postage stamp-size spacecraft off on 20-year-long interstellar flights to Alpha Centauri.



The tiny 1 gram nanocraft, named StarChips, will be fitted with small, ultra-thin light sails and will be accelerated, one at a time, to 20% the speed of light by a powerful half-mile-wide array of ground-based lasers, boosting them to a cruise velocity of some 60,000 km/sec within a few minutes.

From there on the tiny spacecraft will sail on their own to the Alpha Centauri system, something that will take about 20 years.
Each surviving StarChip would then snap pictures and beam the data back to Earth using tiny on-board lasers, the faint signals arriving four years later.

Irazu

The Costa Rica based Central American Association for Aeronautics and Space (ACAE) is seeking funding from the public to complete the Irazu 1U cubesat. The total programme is privately funded and the final crowdsourcing of $75,000 is seen as a means of creating public interest in the satellite industry across Central America.
The Irazu satellite will be used as a communications platform for a network of ground-based sensors used to measure forest biomass.

Surplus ICBM rocket engines

The head of Air Force Space Command has suggested that surplus rocket engines from decommissioned intercontinental ballistic missiles, should be made available to US launch operators for the use on commercial space launches.
To date these engines were only allowed to be used on some missions affecting national security.
The reactions to this proposal are mixed. Whilst Orbital ATK sees it as an advantage in that it would allow them to effectively compete with cheap foreign launch services, eight other small launch companies, and in particular Virgin Galactic, say that Orbital ATK would get and unfair advantage over them.

VLS-1 cancelled, VLM-1

Further development of Brazil's VLS-1 has now been cancelled.
The first flight of this launch vehicle failed on 2 November 1997 when one when one of the four first stage motors failed to ignite. The second flight on 11 December 1999 ended with a failure of the second stage. A third flight was planned in 2003, but this vehicle exploded during launch preparations on 22 August 2003, three days before the planned launch, killing 21 people and destroying the launch pad. A further test launch had been planned for early 2016.
Attention will now be focusing on the Veículo Lançador de Microssatélites (VLM)-1 launch vehicle that is being developed in collaboration with Germany's DLR.

This three stage launch vehicle is powered by:

- Stage 1: 1 S50 solid rocket engine with a thrust of 400 kN;
- Stage 2: 1 S50 solid rocket engine with a thrust of 400 kN; and
- Stage 3: 1 S44 solid rocket engine with a thrust of 33.24 kN.

The first flight is scheduled for 2018 and will take place from Alcantara

ULA Cubesat Competition

United Launch Alliance (ULA) has invited applications from colleges and universities in the US to compete for six free 1U cubesat launch slots aboard two upcoming Atlas 5 rockets scheduled for 2017 and 2018.
Submission will have to be entered before 1 June 2016 and a selection committee will assess each submission based on their mission objective (25%), technical requirements (25%), outreach component (25%), proposal credibility (15%) and quality of proposal (10%).