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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...

All of us have heard of the saga of the Ukrainian designed and Russian built RD-180 rocket engines that power the American Atlas V launch vehicles. Here are some facts related to this:

- Russia annexed the Crimea in early March 2014. *(Historically an independent territory, the Crimea was administratively transferred to Ukraine in 1954, a move initiated by then Communist Party General Secretary Nikita Khrushchev who was born in Ukraine)*
- US Congress subsequently imposed a ban on the further purchase of RD-180 rocket engines from Russia as a reprisal for the Russian annexation of the Crimea. Launch provider ULA has a small stock of RD-180 rocket engines that is sufficient to keep the Atlas V flying until 2017.
- Congress orders the development of a US built replacement with Blue Origin and Aerojet developing a replacement that will be available in 2019, so they claim. *(It is not clear if this date allows for the "customary" delays.)*
- The US Air Force has indicated that these replacement engines either need a new launch vehicle or major modifications to the Atlas V, something that may take some further years before the new/modified launch vehicles are certified for use on national security flights, indicating the replacement might not be available until 2022.
- The US Air Force and ULA want the ban lifted to fill that gap by allowing ULA to buy another 14 RD-180s, something that is strongly opposed by the Senate Armed Services Committee Chairman Sen. John McCain.

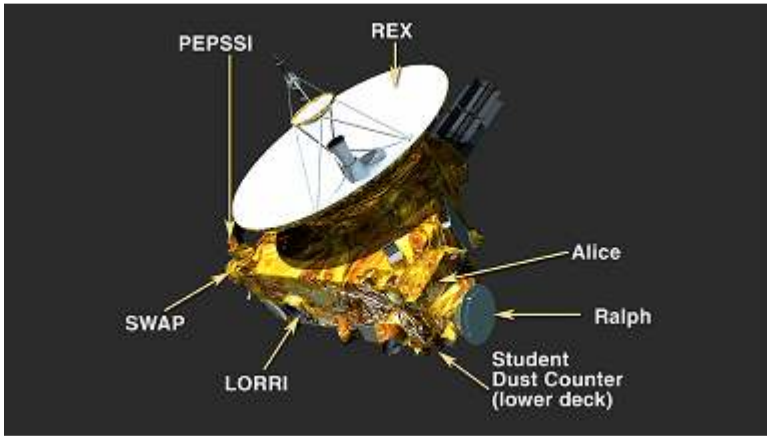
In my opinion this entire matter is a big shambles that points at severe shortcomings of all those involved – shortcomings that they should be resolved by dropping political grand standing, adopting non-competitive cooperative approaches and improving bureaucratic procedures.
And this all should happen very fast before the Russians decide they do not need any more dollars.

Jos Heyman

New Horizons

After travelling for more than nine years after its launch on 19 January 2006 and following an unexpected computer close down on 4 July 2015, the New Horizons spacecraft started its observation programme of Pluto on 8 July 2015.

The 478 kg spacecraft carries seven instruments which have been selected to meet the basic objectives of the mission to find out what Pluto's atmosphere is made of and how it behaves, what the surface of Pluto looks like and how the solar wind interacts with the atmosphere.



The instruments are:

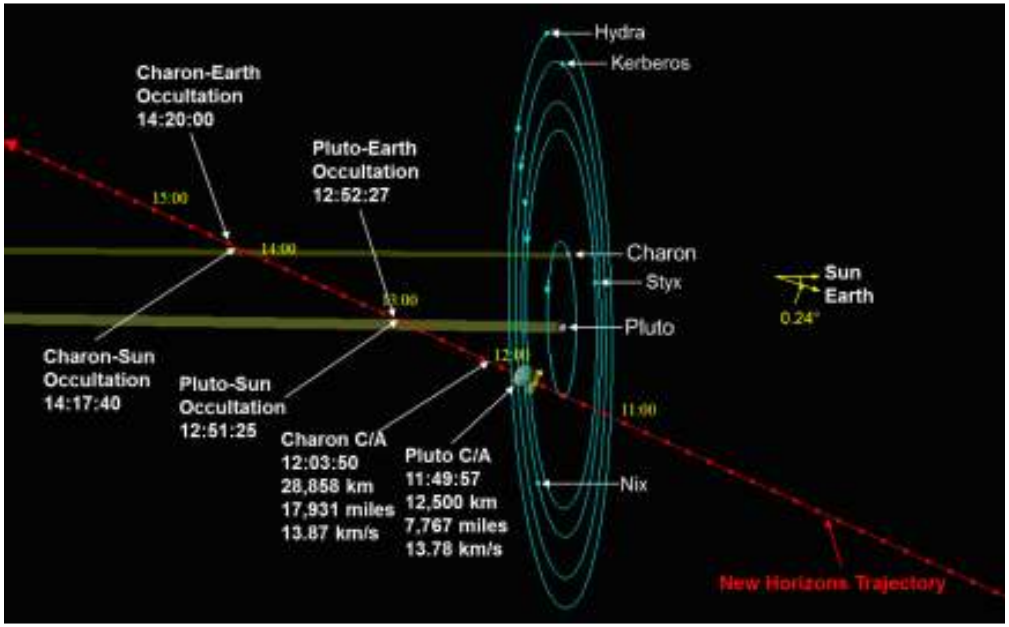
1. Ralph, a camera system comprising the Multispectral Visible Imaging Camera (MVIC) and the Linear Etalon Imaging Spectral Array (LEISA) to obtain high resolution color maps and surface composition maps of the surfaces of Pluto and Charon. The MVIC operates at visible wavelengths whilst the LEISA operates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

6. the Pluto Energetic Particle Spectrometer Investigation (PEPSSI) is a plasma sensing instrument that is to search for neutral atoms that escape Pluto's atmosphere and subsequently become charged by their interaction with the solar wind; and
7. the Student Dust Counter (SDC), an experiment to count and measure the sizes of dust particles along New Horizons' entire trajectory. These dust particles are believed to have been created by comets shedding material and Kuiper Belt Objects colliding with one another. SDC is managed and was built primarily by students at the University of Colorado in Boulder.

The payload also includes the ashes of Clyde Tombaugh, who discovered Pluto in 1930.

The spacecraft is powered by a radioisotope thermoelectric generator (RTG) which contains ceramic pellets of plutonium dioxide to be naturally decayed, while the heat produced from the radioactivity will be converted to energy.
The flight trajectory used a Jupiter gravity assist which occurred on 1 March 2007. A fly-by of Uranus took place on 18 March 2011 but no pictures were made as the instruments on board of New Horizons were in an electronic sleep mode. The next planetary encounter was with Neptune on 25 August 2014.

In December 2014 contact was established with the spacecraft.
Following some initial images taking during the approach phase, the first images of the observation programme were generated by the Long Range Reconnaissance Imager (LORRI) on 8 July 2015 at a distance of 8 million km from Pluto.



New Horizons' trajectory through the Pluto-Charon system. All times are UTC and tick marks equal 10 minutes. Credit: NASA

The closest approach took place on 14 July 2015 at 11.50 UTC at a distance of 12,500 km and a speed of 13.79 km/sec.
The best photographic image so far, by LORRI, was taken on 13 July and showed the entire sunlit disk of Pluto with a resolution of 3.8 km.

The observation programme continued until 15 July 2015 and included the moons Charon, at a range of 28,585 km, as well as the smaller moons Nix, Hydra, Kerberos and Styx.
As Nix and Hydra were discovered in 2005 whilst the other satellites were discovered until 2011 and 2012, their observation was limited as these had required changes to the observation sequence that had been planned for years in advance. This observation sequence, consisting of over 380 separate observations by all the instruments, required New Horizons to be in constant motion, swinging the spacecraft from target to target, alternating between observations of Pluto and Charon as well as the other moons.
At the point of the closest encounter there was a communications delay of 4 hours and 25 minutes (one-way). The real-time data relay was limited not only by the constant movement of the spacecraft to execute the observation sequence, but also the restricted data download speed of 1,900 bit/s. The large volume of data collected by New Horizons will be downloaded over nearly two months with the last data expected on 14 September 2015.

Microbes to Mars

With the potential of eventually having human settlements on Mars, it has been suggested that the terraforming process of Mars could be accelerated by sending microscopic bacteria to Mars that could biologically engineer the planet's ecosystem, making it more habitable.
These bacteria could be sent to Mars in small canisters attached to rover vehicles.

CleanSpace One

The Swiss EPFL Center for Space Engineering and Swiss Space Systems (S3) intend to launch a probe designated as CleanSpace One to capture the SwissCube satellite that was placed in orbit on 23 September 2009 and to bring it down so that it can burn up on re-entry.
Also referred to as Pac-Man, CleanSpaceOne will be fitted with a mouth like retractable conical net that will capture SwissCube. Launch may be in 2018.

US Space War Center

The US military is considering the establishment of a space war center in order to protect US satellites from hypothetical attack by enemies. Over the next six months the tactics, techniques and procedures that would provide this protection are to be developed.

Russian space expansions

The Russian military intends to develop more than ten complexes of new-generation space surveillance systems to increase the precision of space observation and expand the range of controlled orbits and reduce the minimum size of space objects detected by 2-3 times.

In the meantime, Roscosmos hopes to expand the fleet of Earth observation satellites to about 20 as part of a project aiming at Russia becoming a major player in the delivery of remote sensing services.
The current fleet will be expanded by a Resurs-P satellite later this year and four Obzor-O satellites in early 2016.

Russia also hopes to place a lander on the south pole of the Moon in 2019. It has been suggested that this spacecraft will be named Luna-25.

In separate efforts, Russia is also courting China for joint manned space missions, including to the Moon, as well as synchronizing mutual hardware platforms and technological interfaces.

OneWeb

The bulk of the 900 OneWeb satellites (refer last month's News Bulletin) will be launched with twenty one Soyuz launch vehicles provided by Arianespace.
The first launch is expected to take place late 2017 and will carry only 10 satellites. Subsequent launches will carry 32 to 36 satellites each, depending on the mass of the satellites. Launches should be completed by the end of 2019.
In addition OneWeb has an option for another five Soyuz flights and three Ariane 6 flights.

To fill gaps in the overall constellation, OneWeb has also entered into a contract with Virgin Galactic for 39 launches to place a maximum of three OneWeb satellites in orbit on each flight using the LauncherOne. These flights will take place over a period of five years. OneWeb also has an option for another 100 launches.

Houston Spaceport

Houston Airport Systems intends to develop Ellington Airport as a licensed commercial spaceport for future reusable launch vehicles. Long term this could mean the transformation of the airport into a space hub where spacecraft would be manufactured, astronauts be trained and microsatellites could be launched.
Ellington Airport is located south of the city and was originally established as a military airbase before it became one of the airports extensively used by NASA. Its location is close to the Johnson Space Centre.

Satellite Update

Launches in

Int.Des.	Name	Launch date	Launch vehicle	Country	Notes
2015 027A	Kosmos-2505	5-Jun-2015	Soyuz 2-1a	Russia	Reconnaissance
2015 028A	Sentinel-2A	23-Jun-2015	Vega	ESA	Earth observation
2015 029A	Kosmos-2506	23-Jun-2015	Soyuz 2-1b	Russia	Reconnaissance
2015 030A	GF-8	26-Jun-2015	CZ 4B	China	Earth observation
failed	Dragon CRS-7	28-Jun-2015	Falcon 9 v.1.1	USA	Cargo transfer
failed	Flock 1f-1/8	28-Jun-2015	Falcon 9 v.1.1	USA	Earth observation

Other updates

Int. Des.	Name	Notes
1997 074A	TRMM	Re-entered 16 June 2015
1998 067FT	Flock 1b-9	Re-entered 28 June 2015
2014 074A	Soyuz TMA-15M	Undocked from ISS on 11 June 2015 and landed the same day

Soyuz TMA-18M

Kazakh cosmonaut Aldyn Aimbetov will fly to the ISS on Soyuz TMA-18M. He will occupy the seat previously assigned to Sarah Brightman.
It was initially thought that this seat would go to Satoshi Takamatsu, a Japanese advertising executive who had been training along Brightman as her back-up. It is, however, believed that an art project that Takamatsu would carry out in space would not have been ready in time. He may fly to the ISS on a later date.
Aimbetov first joined the cosmonaut corps in 2002 and trained in Russia from 2003 to 2009. He then returned back to Kazakhstan when the governments of Kazakhstan and Russia could not reach an agreement on a flight assignment.
Launch is scheduled for 1 September 2015 and the two other crew members will be Sergey Volkov and Andreas Mogensen, the latter an ESA astronaut from Denmark.

ORS-5

The US Air Force's has contracted with Orbital ATK for the launch of the Operationally Responsive Space (ORS)-5 satellite with a Minotaur rocket in the second quarter of 2017.
ORS-5, also known as SensorSat, is being built by the Massachusetts Institute of Technology's Lincoln Laboratory and will be fitted with instrumentation to scan the geosynchronous-orbit belt from low Earth orbit. It will provide services currently provided by the SBSS-1 satellite that was launched on 26 September 2010 and is expected to re-enter in 2017. ORS-5 will also demonstrate the technology for a trio of new space surveillance satellites expected to be launched by 2021.

Cancelled Projects: ESA lunar programmes

by Jos Heyman

Many cancelled space projects were little more than a brilliant idea that never got from the drawing table, never had detailed design considered, let alone hardware constructed, but instead ended up in the rubbish bin to be forgotten forever.
But some of these brilliant ideas did spawn other ideas and the European Space Agency (ESA)'s drawn out quest for a lunar orbiter is a typical example of that.

The Europeans first considered a lunar payload in the days of its precursor, ESRO, but the idea was not further explored because there was no European launch vehicle that could have handled it.

It was not until April 1978 that space scientists, in particular British scientists, suggested that ESA should enter the field of lunar exploration and they advanced the idea of the Polar Lunar Orbiting Observatory (POLO) that would undertake geochemical and geophysical mapping of the whole surface of the Moon, including the far-side and the polar regions. The POLO mission was intended to capitalise on the expertise that had been built up by European scientists and institutions that had been involved in NASA's lunar programme and POLO was seen as a precursor as its instrumentation could be adapted for future missions to Mars or Mercury, as well as future lunar exploration missions.
The mission involved two spacecraft: an orbiter and a relay satellite. The two spacecraft would have had a total mass of 1050 kg and were to be launched either by a Space Shuttle with a PAM-A upper stage, or an Ariane launch vehicle.

At the same time, a mission to two comets or asteroids, either as a joint mission with the United States, or as a purely ESA mission, was being advanced. The cometary/asteroid mission, in cooperation with NASA, was subject to a time constraint imposed by a 1985 launch window and, with only one proposal being able to be funded, it was considered that the lunar POLO mission could easily be postponed for a year or two as there was no launch window constraint and the cometary/asteroid mission was selected in 1979.
The joint mission with NASA was to be launched in 1985 and would have involved an encounter with comet Tempel-2 in 1988. The ESA component would be a passive probe that would be separated from the main spacecraft towards an encounter with Comet Halley towards the end of 1985. The Tempel-2 spacecraft was eventually cancelled and the ESA component evolved into the Giotto mission that was launched on 2 July 1985 and encountered Comet Halley on 13 March 1986. It then continued on to Camoet Grigg-Skellerup, which it flew past on 10 July 1992.

The postponed POLO proposal was considered again in 1981. However, during 1981, the US cancelled its participation in the joint ESA/NASA International Solar Polar Mission (ISPM) and, faced with attempts to reverse this decision and negotiations developing during most of 1981, the initial study to determine the feasibility of the POLO mission was cancelled in June 1981. Eventually the ESA part of ISPM was launched on 6 October 1990 as Ulysses.

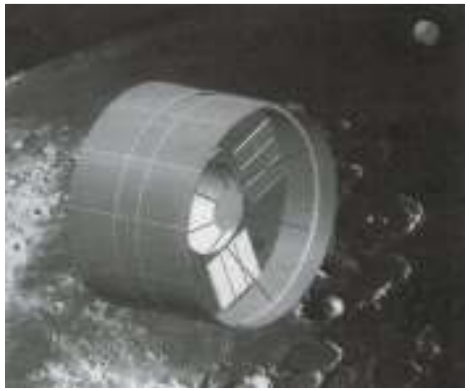
In 1982, POLO surfaced once again. This time two additional options were advanced. The first one envisaged a free-flying sub-satellite that would be separated from the main spacecraft by about 100 km, whereas the second option was a tethered sub-satellite, flying vertically below the main spacecraft, about 50 to 100 km lower. At that time the German Max-Planck Institute, that was to fund the scientific instruments for POLO, stated that if the mission was not included in the 1982 programme, there would be an unacceptable delay in the development of the satellite and they would cease their studies. Support for the proposal was, however, rejected and a further potential consideration for the 1984 project selection was eventually abandoned.

The POLO spacecraft never got beyond a so called Phase-A study, in which the scientific objectives were being considered without the constraints of budgetary considerations. As such no realistic design studies were undertaken and illustrations of what POLO might have looked were either never made or are hidden in archives.

But the objectives eventually spawned the Moon Orbiting Observatory (MORO), a spacecraft that was to map the lunar topography, mineralogy, geochemistry and gravity from which it would be possible to study the Moon's origin, its thermal evolution and geological history, to measure quantitatively the lunar surface processes relevant for solar system studies such as impact cratering, volcanic activity, tectonics, erosion and volatiles, and to survey resources for further lunar exploration.
It was expected that this mission would be conducted in cooperation with the Clementine, Lunar Prospector and Lunar-A missions that had been proposed. Clementine was launched on 25 January 1994, Lunar Prospector on 7 January 1998 whilst Lunar-A, a Japanese proposal scheduled for 1996, was eventually cancelled (refer TSI News Bulletin, May 2015).
The spacecraft was 'downsized' several times, eventually resulting in a 636 kg spacecraft to be based on the Cluster design. It was to be launched by an Ariane 5 in 2003, along with a commercial payload. At separation at GTO it would have used its own engine to fly to the Moon.
In the payload was to consist of:

- the Lunar Stereo Camera for stereo imaging of the surface;
- the Lunar UV-VIS-IR mapping spectrometer;
- the Lunar Gamma Ray Spectrometer;
- the Lunar Microwave Instrument, to measure altitudes of the surface; and
- the Lunar Sub-Satellite Experiment, a 9 kg, 40 cm diameter satellite released in a lunar orbit to study the gravity field.

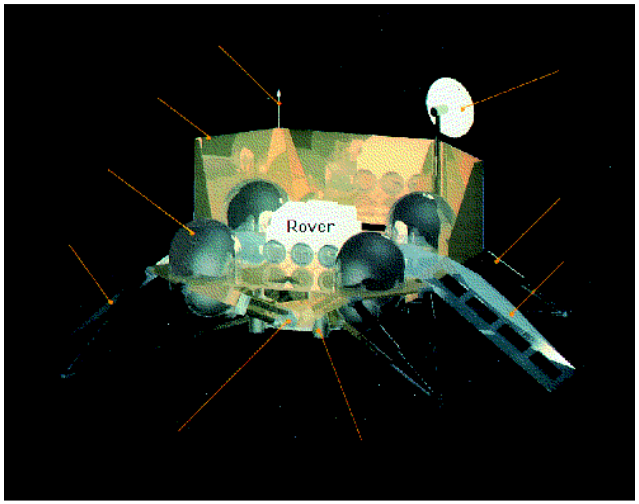
The MORO spacecraft would have been placed in a polar orbit of 100 km.



MORO

MORO was rejected but it resurfaced as the Lunar Polar Orbiter (LUPO), an Italian proposal for a 250 kg spacecraft that would have carried a camera that could take pictures and record spectra, along with a radiometer, a radar altimeter and a sub-satellite. Launch would have taken place with a Russian Tsyklon launch vehicle and an Italian Research Interim Stage (IRIS) upper stage would have driven the spacecraft to its lunar orbit.

With the LUPO proposal also rejected, a 1994 proposal for a Lunar European Demonstration Approach (LEDA) for a 1007 kg spacecraft that would enter a lunar polar orbit in 2002 and then land near the lunar south pole, had little hope of succeeding. LEDA would have used an experimental robotic arm to collect samples and would have deployed a French designed rover. Other instruments would have included a instrumented drill, geomechanical instruments and synthesizers to release oxygen from lunar material as well as an experiment to detect ice.
The spacecraft would have selected an appropriate landing site whilst in its lunar orbit.



LEDA

LEDA was submitted to ESA in 1995 but was overtaken by the Euromoon 2000 proposal that had been sponsored by ESA and combined the MORO and LEDA proposals. It envisaged a 2900 kg spacecraft that would have been launched by an Ariane 4 towards the end of 2000.

Once it had entered a 200 km lunar orbit, a 400 kg MORO derivative would have been released. After a few months in orbit a suitable landing site was to be selected for a 1000 kg lander that possibly would have deployed several rovers.
The proposal was revamped several times but eventually rejected by ESA in March 1998.

Eventually Europe went through the Moon with the Small Mission for Advanced Research and Technology (SMART)-1 spacecraft. This 367 kg spacecraft's primary objective was to test a solar electric primary propulsion unit which had applications for future interplanetary missions. Once in lunar orbit, the spacecraft undertook observations to investigate the origin of the Moon.

Gao Fen-8 and CHEOS

On 26 June 2015 China launched the Gao Fen-8 satellite as part of the China High-Resolution Earth Observation System (CHEOS) series of civilian remote sensing satellites fitted with high resolution equipment in which each satellites carries different equipment directed towards a specific remote sensing requirement.
With official plans of the system consisting of seven satellites, the out-of-sequence designation may indicate that the programme may have been expanded.
Gao Fen (GF)-8 hosts an electro-optical imaging payload for applications in land surveys, urban planning, road network design, crop yield estimation, disaster management and other purposes within the civilian sector.

The first satellite in the series, Gao Fen-1, was launched on 26 April 2013. It was an optical satellite based on the CAST-2000 platform and was fitted with two High Resolution Cameras and four Wide Field Imagers to deliver imagery with a swath width of 69 km and a resolution of up to 2 m in the panchromatic band and 8 m for multispectral images.

Gao Fen-2 followed on 19 August 2014 and was based on the CS-L3000A platform and carried a single High-Resolution Optical Imaging Payload with a ground resolution of 80 cm in panchromatic mode and 3.2 m in multi-spectral mode, covering a swath of 48 km.

Gao Fen-3 is scheduled for launch in 2015 and will carry a C-Band Synthetic Aperture Radar Payload with a ground resolution of around 1 m.
Planned to launch in 2015/16 is Gao Fen-4 that will operate from a geostationary orbit to deliver real-time imagery at a resolution of 50 m and an imaging area of 7000 by 7000 km.
Gao Fen-5, planned for 2016, is expected to carry six payloads that include a hyperspectral camera covering visible and shortwave infrared wavelengths, a spectral imager, a greenhouse gas monitoring payload and an infrared detector, a trace gas spectrometer and a multi-angle polarization detector.
Gao Fen-6 will be identical to Gao Fen-1 which will have reached the end of its planned in-orbit life in 2016.
Finally, Gao Fen-7 will be launched in 2018 with a hyper-spectral stereographic cartography camera system.

DMSP-20

The US Air Force wants to place the last DMSP meteorological satellite in orbit by 2017. The twentieth satellite in that series dating back to the 1960s, and built in the 1990s, DMSP-20 has been held in storage and Congress has previously denied funding for the launch. The 2017 launch date has now been suggested to off-set the loss of Middle East coverage now provided by a civilian European satellite that is due to be retired in 2017.

Dragon CRS-7

On 28 June 2015 the Dragon CRS-7 cargo spacecraft failed to orbit after the Falcon 9 launch vehicle exploded 2 minutes, 27 seconds into the flight due to a faulty strut in an upper stage propellant tank that failed at a fraction of its rated strength.
The spacecraft was expected to dock with the nadir port of the Harmony module of ISS on 30 June 2015 and carried 1952 kg of supplies internally, including more than 35 experiments for ISS and eight Flock 1f Earth observation satellite. It also carried externally the first International Docking Adapter (IDA) that was to be installed on PMA-2 to establish the first docking port on ISS that could be used by Commercial Crew Vehicles.
The spacecraft was intended to undock after five weeks at which time it would have carried 675 kg of cargo.
The failure poses no difficulty to the day-to-day operations on ISS or the supplies on board of ISS. Apart from Progress M-28, that was launched on 3 July 2015, the space station will be visited by the Japanese HTV-5 cargo spacecraft in August 2015 whilst the Cygnus Orb-4 is expected to be launched in December 2015, although this launch might be brought forward..

IDA-1

Less clear is the long term impact on ISS, and in particular the deployment of the International Docking Adapters. It is likely that IDA-2, which will fly to the ISS on Dragon CRS-9 may be placed on PMA-2 instead of the PMA-3 port, as originally intended. It is understood that parts for a replacement IDA are available.

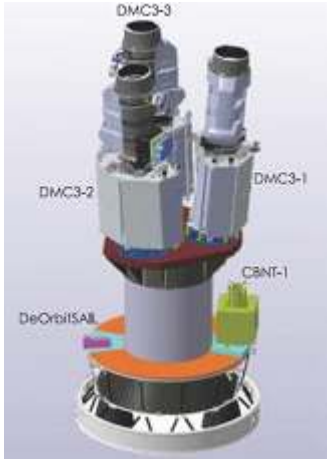
CCT

NASA has selected astronauts Robert Behnken, Eric Boe, Douglas Hurley and Sunita Williams to train for launches aboard the new Commercial Crew Transportation (CCT) spacecraft being built by Boeing and SpaceX. They will work with the companies in the development of the new spacecraft and will eventually fly the test missions.

Spire

Spire has obtained sufficient funding for the launch of first 20 satellites for its proposed weather satellite constellation of 100 satellites.

The 3U cubesats will be fitted with sensors to collect weather data using a technique called GPS radio occultation. The sensors observe the GPS signals as they pass through the atmosphere, measuring refraction from which temperature and humidity profiles can be derived. The satellites are being constructed by Clyde Space in the UK.
It is expected these will be launched later in 2015 as a secondary payload on the Falcon 9 launch of the Formasat-5. If indeed so, it would be deployed with a Sphere space tug that has a capacity for up to 87 cubesats.



DMC-3, CBNT-1 and DeorbitSail

On 10 July 2015 a PSLV XL launch vehicle from Sriharikota placed five British satellites in orbit. The first three were imaging satellite for DMC International Imaging (DMCii) that formed a constellation of three to provide 1 m high resolution imagery as part of the Disaster Monitoring Constellation. The 447 kg satellites were built by Surrey Satellite Technology Ltd (SSTL) using the SSTL-300S1 platform.
The other two satellites were also built by SSTL and were the 91 kg CBNT-1 satellite to demonstrate optical Earth observation technology and the DeorbitSail 3U cubesat fitted with a deployable sail to demonstrate rapid deorbiting throught the increased aerodynamic drag generated by the 4 x 4 m sail.

Kaitorete Spit, Electron

Rocket Lab Ltd., the US-New Zealand company that is developing the Electron small launch vehicle, has selected Kaitorete Spit, a narrow strip of land between a Lake Ellesmere and the Pacific Ocean on New Zealand's South Island, as the launch site.

By selecting its own site, the company intends to avoid the launch scheduling conflicts that exists on other multi-user sites. Rocket Lab expects the first launch to take place later this year whilst, once fully operational, they expect weekly launches.

The location has previously been used for NASA sounding rockets as well as amateur rockets and launches would be flying south in orbits with an inclination ranging from 45^{o} to sun-synchroneous.
Rocket Lab will be building its own infrastructure comprising the launch pad, a vehicle transporter and erector, fuel tanks, and a hangar.

North Korean space efforts

In a recent interview with CNN, North Korean space officials indicated that the country's space programme has huge ambitions, including, further down the line, manned space travel, space stations, even the possibility of going to the moon.
They also suggested that their only orbiting satellite, Kwangmyongsong-3-2 which was launched on 12 December 2012, is working perfectly well, with occasional lapses in communications.

iSTEM

by Ken Silburn

I am writing to members of the Australian Aerospace Industry for support in increasing the number of students participating in tertiary STEM courses and to increase the general awareness of the community for aerospace technologies.

The iSTEM (invigorating Science Technology Engineering and Mathematics) program was established in 2010 as an enrichment program for high school students and their families allowing like minded students to network and develop positive attitudes to STEM related careers. Enrichment activities include visits and workshops with museums, universities, observatories and government scientific organisations including ANSTO, the Sydney Observatory and a tour to Korea and the US for teachers and students to participate in the Advanced Space Academy Program at the US Space and Rocket Centre in Huntsville. The success of the iSTEM program was recognised by the Australian Institute of Physics for with the 2014 NSW Physics Outreach Award.

As with any program that includes overseas travel the cost of the space academy program is not cheap. The cost per participant is $7050.
Since 2010 more than 200 teachers and students have participated in the program and made the trip to the United States. This year we anticipate another 25 students and teachers participating in the program. Students and teachers predominantly come from south West Sydney. This program will be increased to a national level in 2016 and the expected program size will increase dramatically.
The program is a once in a life time opportunity. The personal growth of students during the course is amazing. And from a teacher's viewpoint it is incredible to witness the personal growth of students throughout the program.

As you would expect the financial cost of such programs is high and we are always investigating ways to reduce the overall cost and to ensure that the program continues into the future. Whatever assistance you can give us would be greatly appreciated.

We would of course be able to express our thanks for any support through our newsletters, website and media releases.

More details are available on our websites www.spacecamp.com.au and www.istem.com.au.

Planet Labs

Planet Labs, the operators of the Flock constellation of Earth observing cubesats, has acquired the German RapidEye constellation of five medium-resolution imaging satellites that was launched on 29 August 2008. The purchase includes a large archive of imagery.
Starting on 13 July 2015 the 14 Flock 1e cubesats were released from ISS in batches of two over a period of 4 days.
Another 14 satellites will be sent to the ISS as part of the cargo on HTV-5, to be launched in August 2015.

CPOD

The CubeSat Proximity Operations Demonstration (CPOD) mission, undertaken by Tyvak Nano-Satellite Systems, is a proposed demonstration of the rendezvous, proximity operations and docking of two 3U cubesats on behalf of NASA's Small Spacecraft Technology Program, and Space Technology Mission Directorate.
The development of the techniques to operate two satellites in close proximity to each other is seen as enabling on-orbit inspection and servicing of satellites and allows multiple satellites to operate together in space.
To be launched in 2016 the two CPOD cubesats will be placed in a common orbit. They will maintain an inter-satellite link to share data. Many of the operations will be performed autonomously using on-board processors and flight software for guidance, navigation and control. Using on-board navigation systems, one of the satellite will perform a series of circumnavigation maneuvers relative to the other satellite.
The long term application of this technology is seen in the field of debris inspection/removal, resupply, spacecraft inspection, along with formation flying activities as an extension of the host satellites.

Falcon Heavy

SpaceX expects the first flight of the Falcon heavy launch vehicle to take place in April 2016 from Cape Canaveral.
Consisting of three Falcon 9 boosters strapped together and being able to place 6,400 kg payloads into a geostationary transfer orbit, the Falcon Heavy was originally planned to fly for the first time in 2013.
The first launch will be a demonstration flight only and is not expected to carry a payload.
The second flight is expected to a number of payloads for the US Air Force and NASA whilst future flights have been booked for Arabsat, ViaSat, Inmarsat and Intelsat/

MicroSat-1

Intelsat has asked the US Federal Communications Commission (FCC) to block the launch of SpaceX's MicroSat-1a and -1b satellites to test the technology for Space X's future low-orbiting internet constellation because of potential frequency interference in the Ku and Ka bands.
The two satellites are expected to be launched from Vandenberg and be placed in a circular orbit with an altitude of 625 km and an inclination of 86.6°.
Six to eight further prototype satellites may follow.

SBIRS GEO-4

The SBIRS GEO-4 satellite will launched in 2016 ahead of SBIRS-GEO-3 which has been placed in storage for a launch after September 2017. No reason for this decision has been disclosed.

Soyuz TMA-17M

Soyuz TMA-17M, with Oleg Kononenko, Kjell Lindgren (USA) and Kimiya Yui (Japan), was launched on 22 July 2015 and docked with the Rassvet docking module on 23 July 2015.
But everything did not go 100% perfect as one of the solar panels of the spacecraft failed to deploy. Although this did not impact on the execution of the flight, it is understood a similar problem occurred previously on the Soyuz TMA-14M flight.
The three crew members will join the EX-44 crew on the space station, bringing it back to a crew of six.

Cubesat lifetimes

NASA has reported that one of every five cubesats launched between 2003 and 2014 is in violation of international guidelines calling for satellites to deorbit – by force of nature or their on-board systems – within 25 years of retirement.
Cubesat operating in orbit below 600 km are expected to meet this 25 years deadline but those in higher orbits will exceed that deadline.

Finally…

Some years ago I visited my 'home base' aviation museum in Bullcreek, Western Australia, and reported that the Terrier Sandhawk replica that was displayed there, was seriously deteriorated. I am glad to report that on a recent visit, I noticed that the sounding rocket was once again in a pristine state.

On 20 June 1974 two Terrier Sandhawks sounding rockets were launched from Lancelin, Western Australia to observe the solar eclipse. One of the launch structures was donated to the museum and the Midland Technical College built a replica of the sounding rocket.

The Astronautical Society of WA recorded that unique launch in Western Australia on a video. This video is still available from Tiros Space Information.