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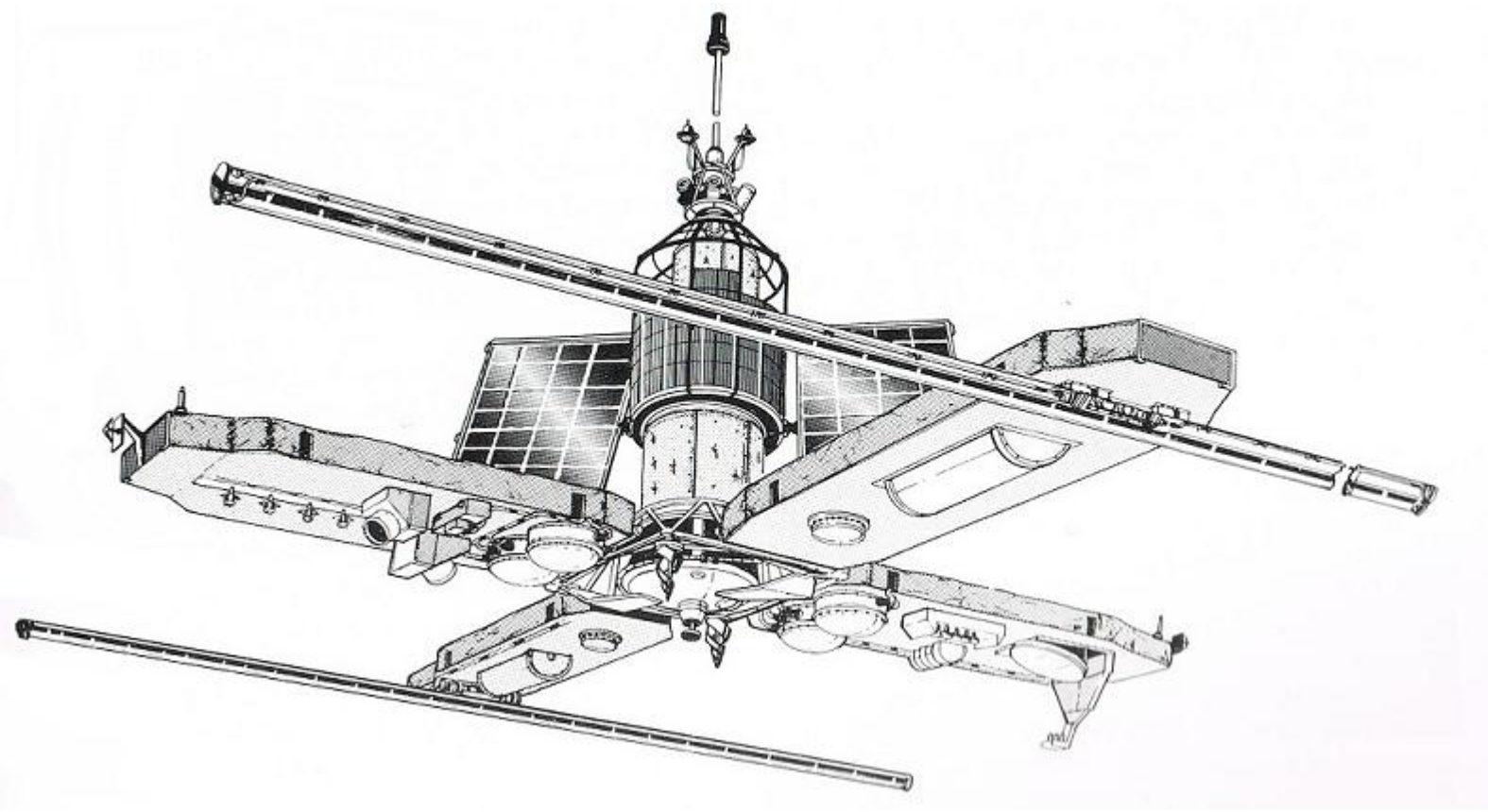

Okean M

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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...

With the successful fly-by of Pluto on 14 July 2015, all planets of the solar system have now been explored in some way.

One reader suggested that, instead of concentration on obscure cancelled satellites, I should run a series on the exploration of the solar system. Well, dear reader, we have done that in the News Bulletin issues from April 1989 to January 1990, and we would be glad to send those copies to any of our readers.
But, it is perhaps appropriate to give a very brief overview of the exploration of the solar system over the past 54 years.

The first planet in the solar system to be visited by a spacecraft was Venus. The spacecraft was the USSR's Venera-1 that performed a fly-by on 19 May 1961. Since then another 27 spacecraft have explored Venus in some way.
Mars was first explored by the USSR's Mars-1 on 19 June 1963. Since then another 31 spacecraft, fly-by, landers and orbiters alike, have explored that planet.
The first spacecraft to encounter Jupiter was Pioneer-10 that flew by that planet on 5 December 1973, as the first of six spacecraft investigating that planet.
The inner planet Mercury was first visited by Mariner-10 with a fly-by on 29 March 1974 and has since then been explored by one additional spacecraft.
The Pioneer-11 spacecraft made the first fly-by of Saturn with the closest encounter taking place on 1 September 1979. Since then another two spacecraft have explored Saturn.
Finally, Uranus and Neptune were first visited by Voyager-2 on, respectively, 24 January 1986 and August 1989. .
And then there have been numerous missions to comets and asteroids.

Jos Heyman

RD-180 saga continues.

It has now been suggested that for United Launch Alliance (ULA) to effectively compete with SpaceX, it may need as many as 22 RD-180 rocket engines for the launch of the nine national security payloads that are coming up for bids this year, all of which are suited for the Atlas V. Furthermore another 28 missions will be put up for bids in 2018, of which 25 are suited for the Altas V.
Separately, it has been suggested that the US Air Force may have to take a different approach by guaranteeing a set number of national security launches to SpaceX and ULA to ensure that there is enough business for each of these companies.

RD-181

The Russian Energomash corporation has shipped the first two RD-181 rocket engines of an order for 60 by Orbital ATK. Two of these engines are to power the Antares launch vehicle's first stage, as a replacement of the AJ26 engines that caused the launch failure of 28 October 2014.
Because the Antares launch vehicle is not used for national security launches, the RD-181 is not subject to the same restrictions as the RD-180.

SpaceX v ULA

In what seems to be a clear case of politics and lobbying, a group of 17 members of Congress, all Republican and more than half of them representing states where United Launch Alliance (ULA) and its business partners are operating, have questioned the adequacy of SpaceX's investigation into the 28 June 2015 failure of a Falcon 9 launch vehicle. They also questioned whether SpaceX can be trusted with the critical military and intelligence payloads it wants to launch and wanted to know how tough NASA and the US Air Force are getting with SpaceX

Explorer Program

NASA has selected three proposals for further consideration as the next Astrophysics Small Explorer mission in its Explorer Program
They are:

- SPHEREx, an All-Sky Near-Infrared Spectral Survey that will perform an all-sky near infrared spectral survey to probe the origin of our Universe, explore the origin and evolution of galaxies and explore whether planets around other stars could harbor life;
- Imaging X-ray Polarimetry Explorer (IXPE) which will use X-ray polarimetry for the measurement and interpretation of the polarization of electromagnetic waves, in order to improve the understanding of how X-ray emission is produced in objects such as neutron stars, pulsar wind nebulae, and stellar and supermassive black holes; and
- Polarimeter for Relativistic Astrophysical X-ray Sources (PRAXyS), which will use X-ray polarimetry to characterize the geometry and behavior of X-ray sources including super-massive black holes, pulsars, magnetars and supernovae.

Satellite Update

Launches in July 2015

Int.Des.	Name	Launch date	Launch vehicle	Country	Notes
2015 031A	Progress M-28M	3-Jul-2015	Soyuz U	RUS	Cargo
2015 032A	DMC 3-1	10-Jul-2015	PSLV	UK	Disaster monitoring
2015 032B	DMC 3-2	10-Jul-2015	PSLV	UK	Disaster monitoring
2015 032C	DMC 3-3	10-Jul-2015	PSLV	UK	Disaster monitoring
2015 032D	CBNT-1	10-Jul-2015	PSLV	UK	Technology
2015 032E	DeOrbit Sail-1	10-Jul-2015	PSLV	UK	Technology
1998 067GE	Flock 1e-2	13-Jul-2015	ISS	USA	Earth observation
1998 067GF	Flock 1e-1	13-Jul-2015	ISS	USA	Earth observation
1998 067GG	Flock 1e-4	14-Jul-2015	ISS	USA	Earth observation
1998 067GH	Flock 1e-3	14-Jul-2015	ISS	USA	Earth observation
1998 067GJ	Flock 1e-7	14-Jul-2015	ISS	USA	Earth observation
1998 067GK	Flock 1e-8	14-Jul-2015	ISS	USA	Earth observation
1998 067GL	Flock 1e-5	15-Jul-2015	ISS	USA	Earth observation
1998 067GM	Flock 1e-6	15-Jul-2015	ISS	USA	Earth observation
2015 033A	Navstar 2F-10	15-Jul-2015	Atlas V-401	USA	Navigational
2015 034A	Star One C-4	15-Jul-2015	Ariane 5ECA	BRA	Communications
2015 034B	Meteosat-11	15-Jul-2015	Ariane 5ECA	EUM	Meteorology
1998 067GN	Flock 1e-9	15-Jul-2015	ISS	USA	Earth observation
1998 067GP	Flock 1e-10	15-Jul-2015	ISS	USA	Earth observation
1998 067GQ	Flock 1e-11	15-Jul-2015	ISS	USA	Earth observation
1998 067GR	Flock 1e-12	15-Jul-2015	ISS	USA	Earth observation
1998 067GS	Flock 1e-13	16-Jul-2015	ISS	USA	Earth observation
1998 067GT	Flock 1e-14	16-Jul-2015	ISS	USA	Earth observation
1998 067GU	Arkyd-3R	16-Jul-2015	ISS	USA	Technology
1998 067GV	Centennial-1	16-Jul-2015	ISS	USA	Technology
2015 035A	Soyuz TMA-17M	22-Jul-2015	Soyuz FG	RUS	Crewed
2015 036A	WGS-7	24-Jul-2015	Delta 4M+ (5,4)	USA	Communications
2015 037A	Beidou 3M-1S	25-Jul-2015	CZ 3B/FY-1	CHI	Navigational
2015 037B	Beidou 3M-2S	25-Jul-2015	CZ 3B/FY-1	CHI	Navigational

Other updates

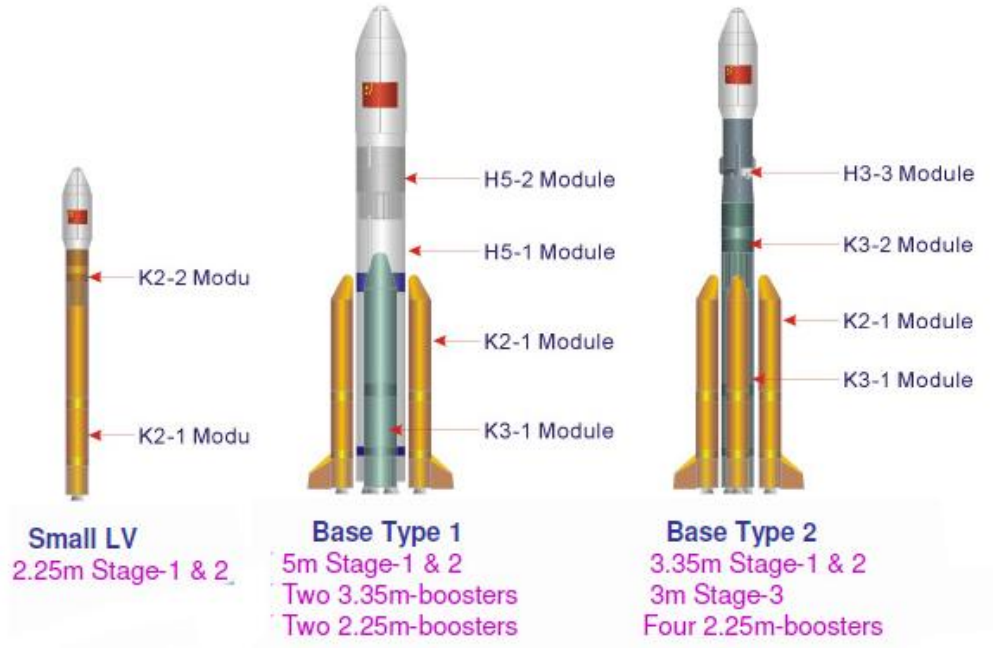
Int. Des.	Name	Notes
2013 064U	Black Knight-1	Re-entered 16 July 2015

Flock

The Flock satellites deployed from the Kibo module of the ISS during July 2015, have also been referred to as Dove, followed by a letter/number combinations. Similar Dove designations for the other satellites in the Flock series have also been mentioned in references. These Dove designations seem to be part of a numbering system and it would be appreciated if anybody could provide further insight into the workings of this numbering system.

CZ 6

The first launch of the Chang Zheng (CZ) 6 launch vehicle is expected to take place in September 2015.
CZ 6 is intended as a light capacity high response launch vehicle that will have a capability to place 1080 kg into a sun-synchronous orbit. The first stage is powered by a K2-1 (YF-100) liquid fuelled rocket engine whereas the second stage has a K2-2 (YF-115) liquid fuelled rocket engine.
It was developed by the China Aerospace Science and Technology Corporation and the China Academy of Launch Vehicle Technology.



Through the use of a variety of boosters and an upper stage the launch vehicle can be expanded.

ISS

Russia has announced that it will continue its partnership in the ISS until at least to 2024.
This follows several previous suggestions to the contrary. The United States and Canada have made similar commitments although the European Space Agency and Japan have not done so in a formal manner.
It is also thought that the ISS could remain operational without significant maintenance cost, to 2028 and beyond.

Cancelled Projects: Okean follow up

By Jos Heyman

On 28 July 1986 Russia launched the first operational Okean O1 satellites for oceanographic purposes. The satellite, identified as Kosmos-1766 had been preceded by a number of satellites designated in the Kosmos series, starting in 1978. It is believed these Kosmos satellites were a mixture of technology identified as Okean E and Okean OE.

The Okean O1 satellites were fitted with:
1. SM-5 magnetometer
2. RFA radiophysical instrument with: ◦RLSBO side-looking radar with a swath width of 450 km and a resolution of 1.3 x 2.6 km
3. RM-0.8 scanning radiometer with a swath width of 550 km and a resolution of 25 km
4. RTBK radio-television complex with: ◦MSU-M 4-band multispectral scanner with a swath width of 1900 km and a resolution of 1.8 km
5. MSU-S 2-band multispectral scanner with a swath width of 1100 km and a resolution of 410 m; and
6. A Concor-2 data collection and transmission system.

The Okean O1 was the operational version of which eight were placed in orbit as Kosmos-1766 on 28 July 1986, Kosmos-1869 on 16 July 1987, Okean-1 on 5 July 1988, Okean-2 on 28 February 1990, Okean-3 on 4 June 1994, Okean-4 on 11 October 1994, Sich-1 on 31 August 1995, and Sich-1M on 24 December 2004. The Sich satellites were Ukrainian satellites.

As a follow-up to the Okean O1 series, several different development versions were proposed but were never built.

The Okean AM was a version with a mass of 1200 kg and was to carry:
1. a MSU-SK(M) multi-zonal scanner with six channels, three in the visible band and three in the infrared band of the electromagnetic spectrum, with a resolution of 200 to 600 m;
2. an Ozone optical spectrometer;
3. an SLR-D side looking radar providing a 700 km swath on either side of the flight path;
4. a Delta-2 microwave scanner operating in eight channels; and
5. a Condor-2 data collection and transmission system.

The proposal envisaged the first launch in 1993 but was not proceeded with.

The Okean B development had a mass of 1600 kg and would have carried:
1. a MSU-M multi-spectral scanner operating in 4 channels;
2. a MSU-SK multi-zonal scanner with five channels, two in the visible band and three in the infrared band of the electromagnetic spectrum;
3. a MSU-B multi-zonal scanner operating in eight bands, three in the visible band and five in the infrared band of the electromagnetic spectrum;
4. a MSU-E scanner operating in three bands;
5. a Video optical spectrometer with a resolution of 1 km;
6. an SLR-D side looking radar providing a 700 km swath on either side of the flight path;
7. a Delta-2 microwave scanner operating in eight channels; and
8. a Condor-2 data collection and transmission system.

Like the Okean AM, the proposal was not proceeded with.

Finally the was the Okean M development which was to carry:
1. a MSU-SK(M) multi-zonal scanner with six channels, three in the visible band and three in the infrared band of the electromagnetic spectrum;
2. Ozone, an ultraviolet scanner;
3. a RLS-BO(D) real aperture side looking radar; and
4. a Delta-2 microwave scanner operating in eight channels.

Earlier designs for an Okean-M spacecraft, with dual side-looking radars and other improved Earth observation sensors, were apparently shelved in favor of a second generation system now known as the Sich-2 satellite.

OneWeb

Intelsat has decided to invest $25 million in OneWeb in return of which, Intelsat receives exclusive distribution rights in aeronautical and maritime markets, major US government sectors, the oil and gas industry and cellular backhaul accounts, as well as certain exclusive distribution rights for connected cars,
OneWeb has also agreed to integrate Intelsat's Epic Ku-band high-throughput capacity with OneWeb's constellation, a move that gives OneWeb early access to its future markets, using the Intelsat Epic satellites.

Jabiru-1

The administrators of the failed NewSat corporation, are negotiating the sale of the nearly completed Jabiru-1 communications satellite to Malaysian operator Measat. The sale is expected to include the launch contract with Arianespace. Jabiru-1 was to be launched in 2015.
NewSat had earlier business arrangements with Measat as it leased transponders on the Measat-3B satellite. In a similar arrangement Measat would have leased transponders on Jabiru-1 and would have operated them as Measat-3C.

NASA crewed spaceflight

On-going funding cuts in NASA's Commercial Crew Program imposed by Congress, has now forced NASA to buy another six seats from Roscosmos for Soyuz flights in 2018. The cost for the seats has increased by 7%, ie $ 81.7 million per seat, giving a total cost of $ 490 million.
With the first tests of the new US crewed spacecraft expected to start in 2017, this will, hopefully, be the last year that Soyuz spacecraft will be used for routine US crewed flights to the ISS.

EchoStar-19

EchoStar has booked an Atlas V for the launch of its EchoStar-19/Jupiter-2 communications satellite. The satellite was originally booked for an Ariane 5 launch but, with increasing customer demand forcing a satellite launch in the second half of 2016, Arianespace did not have an launch opportunity in that time frame.

Cubesats update

By Jos Heyman

Since the launch of the first batch of so called cubesats, on 30 June 2003, a total of 294 of these tiny satellites have been placed in orbit either through a launch vehicle or deployed from ISS. At the time of writing 18 cubesats were aboard the International Space Station awaiting deployment.

Year	Launched	ISS deployed	Failed
2003	6		
2004	0		
2005	2		1
2006	4		15
2007	7		
2008	6		2
2009	9		
2010	16		
2011	7		3
2012	18	5	
2013	80	4	
2014	36	46	30
2015*	15	33	14
Total	206	88	65

Number of cubesats launched/deployed (as at 15 August 2015)*

The idea of these 10 x 10 x 10 cm structures (or multiples thereof) was first advanced in 1999 by the California Polytechnic State University (Cal Poly) in San Luis Obispo, California and the Stanford University. They were seen as a modern and fun way of teaching science and engineering in a multi-disciplinary environment. The objective was to build a satellite within a 2 to 4 year academic career period using commercially off-the-shelf components. The advancement was principally possible through the miniaturization of electronic components, a trend that is continually being witness at a greater and greater pace.

The early cubesats were primarily for educational purposes. In fact, if the satellite was launched this was considered as a bonus.
Whilst the early cubesats were just that, 10 x 10 x 10 cm cubical structures referred to as 1U, it did not take long before combinations were introduced, 2U and 3U but also 1.5 U and 0.5 U. These differently sized units provided scientists with a structure that was optimized for the payload volume required for a specific project.

To promote and to a certain extent coordinate the development and launch of cubesats in the United States, NASA introduced the CubeSat Launch initiative (CSLI) programme in 2010. Satellites developed as part of this programme were eventually launched through the complementary Educational Launch of Nanosatellite (ELaNa) Program.

Year	Selected	Launched to date
2010	14	13
2011	22	10
2012	35	10
2013	27	2
2014	16	1
2015	14	0
Total	128	36

CSLI programme

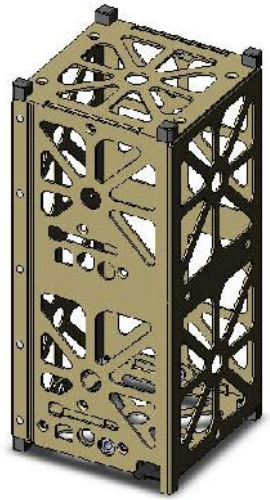
The cubesat, sometimes also referred to as ‘nanosatellite’, was, however, a concept that also caught on outside the academic world. They provide excellent platforms that can be used to test technological concepts in space, as a part of a developmental process of some instrumentation or techniques for missions with larger structures.
And we are now at the beginning of the commercial use of cubesats for communications, Earth observation and meteorological purposes. Also there are early proposals to use cubesats on interplanetary missions.

Also there is currently a move towards 6U units, comprising two 3U units next to each other, as well as 12U units.

NASA hopes to send the first 6U cubesat, named Dellingr, to the International Space Station (ISS) later in 2015 for deployment from the space station in January 2016.

Dellingr

There are now various commercial suppliers in the market for cubesat components, such as Innovative Solutions In Space (ISIS) of Delft, The Netherlands, who operate the on-line CubeSatShop.com as a one-stop-shop for all your cubesat and nanosat systems. A similar service is provided by Clyde Space of Glasgow, Britain.



Clyde Space 2U frame

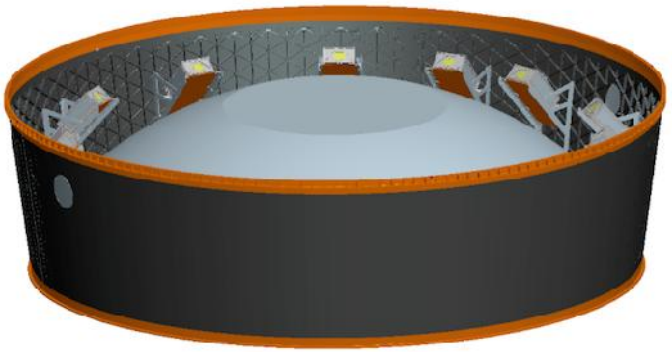
UK based Alba Orbital markets the PocketQube Kit. The kit consists of the Alba Orbital Skeletonized structure that comes in 1p, 2p or 3p sizes. The 1p version is 5 x 5 x 5 cm and has a structural mass of 0.069 kg.

Pumpkin, a San Francisco based company, offers, amongst others the CubeSat Kit, an affordable off-the-shelf hardware and software development and deployment solution that includes complete, finished and ready-for-launch cubesat structures in 0.5U, 1U, 1.5U, 2U or 3U size.

But these projected large numbers of satellites, coupled to the readily availability of components, as well as the increasing size, poses certain problems that have to be overcome.

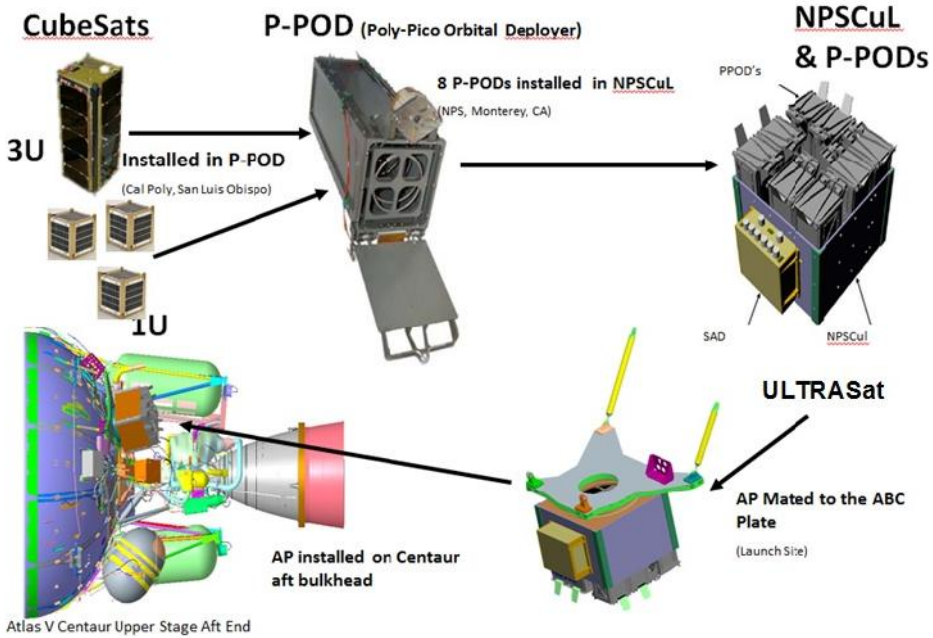
Launching the cubesat

The earliest cubesats were launched as additional payloads with a larger primary payload, occupying some spare space in the rocket's payload bay and with a random release into orbit, resulting into an orbit somewhat similar to the primary payload,
This is expected to continue and proposed launch vehicles, such as NASA's Space launch System (SLS) will most likely be fitted for future deployment of cubesats In the case of SLS, these cubesats will be placed inside the upper stage adapter where they will be exposed once the main payload, the Orion spacecraft, has been released 10 minutes after the launch. When the Orion is at a safe distance, the cubesats will be deployed.



Cubesats on SLS

To gain some control over the release, devices such as the Poly-Picosatellite Orbital Deployer (P-POD) were developed as a means to deploy cubesats from a range of launch vehicles.
The P-PODs can be mounted in small empty space of the launch vehicle, such as on a recent Atlas V launch where a total of ten cubesats of varying sizes were fitted in eight P-PODs, which themselves were mounted in the Ultra Lightweight Technology and Research Auxiliary Satellite (ULTRASat) which was positioned at the aft end of the upper stage of the launch vehicle.



ULTRASat configuration

But the P-POD has only a volume to hold 10 x 10 x30 cm payloads, meaning that it can only deployed three 1U cubesats, a 1U and 2U combination or a single 3U cubesat. It cannot accommodate the proposed 6U and 12U combinations.

P-POD

A large number of deployments have taken place with the JEM-Small Satellite Orbital Deployer (J-SSOD) in the Kibo module of ISS. In these instances the cubesats are brought up to ISS on one of the cargo spacecraft and are then deployed in a more or less controllable orbit.

Nanorack deployer (J-SSOD)

But, with the number of nanosats or cubesats expected to be launched in the coming years, it is evidently clear that a dedicated launch vehicle will be required. Such a launch vehicle should be able to place a large quantity of cubesats, say 50 or more at a time, in orbit, to make it cost effective.

It has also been argued that such a launch vehicle would allow cubesats to placed into orbits that are better suited for their payload although, a large number of cubesats on a single launch vehicle would still require a compromise orbit for some cubesats.

One launch vehicle that, in the past, deployed large numbers of satellites on a single launch is the Russian/Ukrainian Dnepr 1. It is, however, unlikely that this launch vehicle will be available for much longer. Apart from the fact that it is a converted missile, the political situation between the two countries make it unlikely that it will be available much longer.

Sherpa

Although not a launch vehicle in its own right, Spaceflight Inc. is developing the Sherpa space tug which allows secondary payloads, such as cubesats, to be accommodated on a range of launch vehicles and, rather than being placed in the same orbit as the primary payload, place these in different orbits.
For this the space tug has five ports and a series of adapters to attach the various payloads with a maximum capacity of 1500 kg. It will also have a propulsive system.

Sherpa will be built in two versions. The first one, Sherpa 400, will accelerate a payload to a 400 m/s change in velocity, whereas the second, and larger version, known as Sherpa 2200, will accelerate to 2,200 m/s. The Sherpa 400 is optimised for low-Earth orbits, whereas the Sherpa 220 will bring small satellites from a low-Earth orbit to a geostationary orbit.
The first use of the Sherpa is scheduled for 2015 when eight, as yet undefined, cubesats, will be attached to a Sherpa vehicle that will be launched as a secondary payload on the Japanese Astro H mission.
The company plans to provide two Sherpa mission each year, one of the Sherpa 400 and another with the Sherpa 2200.

Closer to a dedicated cubesat launcher is the LauncherOne proposal advanced by Virgin Galactic.Using the same infrastructure for its SpaceShipTwo, the WhiteKnightTwo can carry the LauncherOne to altitudes of up to 15 km where LauncherOne is released. Briefly free falling before the first stage ignites, the two stages vehicle will deliver payloads into a low-Earth orbit.

LauncherOne

In May 2015 NASA requested industry proposals for its Venture Class Launch Services (VCLS) programme which seeks to launch 60 kg of cubesats at the same time at a fixed price. It is expected that a contract will be granted by 30 September 2015 and that the launch will take place before 15 April 2018.
Only time will tell if any of the above launch proposals will be selected or if a new contender in this increasingly important market niche will be selected.

Applications

As stated before, the applications of cubesats is becoming more and more varied.

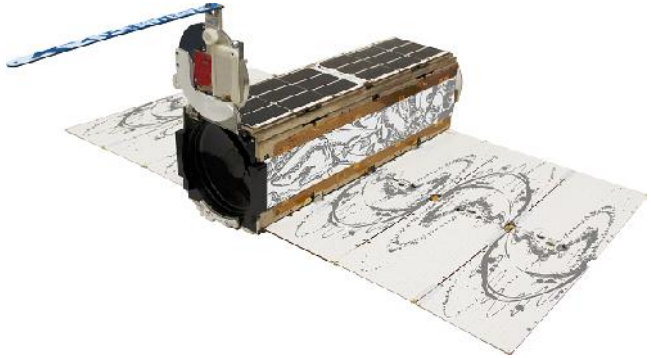
Planetary scientists have already proposed that that a number of cubesats of varying sizez be carried on missions to the Moon, asteroids, comets or other planets. Once the main spacecraft is in the vicinity of the celestial body, it will deploy a number of nanosatellites to undertake a wide range of exploratory objectives. Deployment could be as individual satellites or as constellations.
The low cost and the large number will reduce the risk of failure of the entire mission whilst it also allows, through the establishment of a constellation of cubesats, to explore a much greater area.

In fact, NASA has already started the Cube Quest Challenge, a competition for the developments of cubesats to fly to the Moon and beyond on the first Orion flight to be launched by the SLS rocket.

NanoSwarm is a University of California Santa Cruz proposal for a swarm of more than 30 cubesats around the Moon to observe its interaction with the solar wind, study strange localized magnetic swirls, and track the movement of water across the airless lunar surface. If accepted it could be launched in February 2020 for a 10 months mission.

The European Space Agency (ESA) has announced it will accommodate two 3U cubesats on the proposed Asteroid Impact Mission (AIM) scheduled for launch in October 2020. It is expected that the cubesats eventually selected, will boost and complement the main mission. In addition it is intended to use the cubesats to test intersatellite communications networking.

In a similar manner NASA's Europa Clipper, scheduled for launch in 2022, may carry a number of cubesats that will be deployed in orbit around the Jovian moon in due course.



Flock

In the Earth observation application Planet Labs has taken the lead with its Flock series of satellites that form a constellation of 28 Earth observation cubesats operated by Planet Labs. These 5 kg 3U satellites provide 3 to 5 m resolution images of the Earth from the equator to 52^{o} latitude.
To date 77 of these satellites have been deployed. 11 were launched on a Dnepr 1 launch vehicle, the remainder from the facilities on ISS. 14 satellites remain on ISS to be still deployed, whilst 34 satellites did not orbit as a result of the failures of the Antares and Falcon 9 launch vehicle on 28 October 2014 and 28 June 2015 respectively.

One of the problems with the Flock series is, however, that they do not stay in orbit for too long. As at of the time of writing 40 Flock satellites have re-entered with an average in orbit time of 135 days.
To maintain the constellation many more launches will be required.

San Francisco based company Spire, formerly known as NanoSatisfi Inc., intends to establish a constellation consisting of up to 100 cubesats to provide data on weather and climate changes on a global basis.
The satellites will be fitted with High Resolution Sensors that measure the GPS signals through Earth's atmosphere to calculate temperature, pressure, and humidity with a high accuracy and resolution.
It is expected that the satellite constellation will be upgraded every two years to keep pace with changing technology.
Once operational the system is expected to provide 5 times more data than current systems provide by the end of 2015, 10 times by the end of 2016, and over 100 times the data by the end of 2017.

The space communications industry has also advanced some proposals for the commercial use of cubesats.
The US company Outernet has teamed up with Clyde Space to develop a 200 1U cubesat telecommunications constellation to provide low-cost broadband to remote regions of the world. The cooperation is sponsored by the UK Space Agency that will provide funding through its International Partnership Space Program (IPSP) which funds British companies to work with international partners developing satellite technology.

Dunvegan Space Systems (DSS) has signed a contract with Deep Space Industries (DSI) for the construction of 24 3U cubesats for a communications constellation.

Specific mention should be made of the QB50 project proposed by the von Karman Institute for Fluid Dynamics (VKI) in Belgium. The QB50 project consists of 50 2U and 3U cubesats in a worldwide programme for long-duration measurements in the lower thermosphere to greatly increase the knowledge and understanding of the E and F layers of the ionosphere. In addition the satellites will carry out experiments on re-entry research and perform in-orbit demonstration of the newly developed technologies. The Project was kicked off officially in November 2011.

The cubesats are to be constructed by universities all over the world. It is planned that all 50 satellites will be launched in 2015 with a single launch vehicle and be placed in circular orbit of between 350 and 380 km altitude with an inclination of 98.6°. The satellites will be separated in orbit naturally by atmospheric drag forces and they will form a uniform network around Earth within about 3 weeks.
It was envisaged that 34 cubesats would be provided by European universities in 19 countries, 11 by universities in the US, 2 by universities in Canada and 3 by Japanese universities. After the call for proposals made in February 2012 the VKI received proposals for 81 cubesats from 41 countries.

Cubesats and pocket-cubes, with their relatively low cost, provide opportunities to institutions and individuals that, without cubesats and pocket cubes, would not be able to develop satellites. For instance, the Superior Institute of Technologies and Applied Sciences (InSTEC) and of the Polytechnic Superior Institute José Antonio Echeverría (Cujae), Havana, Cuba, have started with the construction of the CubaSat-1 cubesat. And in Australia a single individual is developing the OzQube-1 satellite. Unfortunately, in any of these cases, the limited availability and the high cost of launch opportunities, may see these projects remain Earth bound.

However, the increasing number of cubesats has also raised concern about the increase of space debris in frequently used orbits, such as the polar orbits and the ISS orbit. As these secondary payloads are being placed in the same orbit as the primary payload, and cannot be removed from those orbits, they pose, at the end of their operations, a threat to the primary payloads in the similar orbit. And, indeed some cubesats are now testing de-orbit devices that will reduce the cubesat's orbital parameters.

Small satellites like cubesats and pocket cubesats are with us and they can be expected to increase in number. In fact, there are some estimates that up to 2,750 cubesats could be built and launched over the next 5 years.

NISAR

The NASA-ISRO Synthetic Aperture Radar (NISAR) satellite is a joint mission of NASA and the Indian space agency ISRO that will make global integrated measurements of the causes and consequences of land surface changes.
To be launched in 2019/20 with a GSLV Mk2 launch vehicle, the satellite will be fitted with an L-band synthetic aperture radar (SAR) provided by NASA whilst ISRO will provide the I-3K satellite bus and an S-band synthetic aperture radar.

Sky-B1

Sky-B1 is a proposed communications satellite for DirecTV's Latin American division. Formerly known as Intelsat-32e, will be located at 43.1ºW. Being built by Airbus Defence and Space it will be launched early 2016 with an Ariane 5ECA.
It will carry 60 Ku band transponders as well as a Ka band payload provided by the United Arab Emirates' Yahsat operator.

Cygnus Orb-5, -9 and -10

Orbital ATK has ordered an Atlas V the launch of its Cygnus Orb-5 cargo spacecraft to be launched in March 2016. This is in addition to the Atlas V launch vehicle for Cygnus Orb-4, due later in December 2015.
Meanwhile NASA has ordered the Cygnus Orb-9 and -10 spacecraft.

New Horizons

With the Pluto fly-by now completed, a new target for the New Horizons spacecraft is being considered.
The possible targets are 2014 MU69 and 2014 PN70 two objects which are located in the Kuiper belt, a ring of icy objects that are believed to be remnants from the solar system's creation. Both were discovered by the Hubble Space Telescope in 2014 and they are located some 7 billion kilometers from Earth. Once a target has been selected, the spacecraft will perform a series of rocket burns to get it onto the right trajectory. It would fly past the object in early 2019.

and a correction:

In last month's News Bulletin I suggested that the download of data generated by New Horizons could take nearly two months, ending in September of this year.
I now understand that this referred to a selected set of data and the total download will last until late 2016, when New Horizons will be well on its way to a target in the Kuiper Belt, as its secondary mission.

Vega C

The European Space Agency has endorsed the construction of the Vega C launch vehicle. The Vega C (C for 'Consolidated'), will have the P80 first stage motor replaced by the P120C Whilst the second stage will get a Zefiro Z40 instead of the Zefiro Z23. There will be no change to the third stage whilst the AVUM upper stage will get update as AVUM+.
The first flight is expected in 2018.

HTV-5

On 19 August 2015 Japan launched the HTV-5cargo spacecraft that docked with the Harmony module of the ISS on 24 August 2015.

The spacecraft, also known as Kounotori-5, carried 6057 kg of cargo/supplies of which 4500 kg was in the Pressurized Logistics Carrier and 1000 kg on the Unpressurized Logistics Carrier.

The pressurised cargo include, apart from water, food and other supplies, UPA Fluids Control and Pump Assembly (FCPA), WPA Multifiltration Beds (WFB), a galley rack to be placed in Unity, Simplified Aid for EVA Rescue (SAFER), Mouse Habitat Unit (MHU), Electrostatic Levitation Furnace (ELF), Multi-Purpose Small Payload Rack (MSPR-2), Exposed Experiment Handrail Attachment Mechanism (ExHAM 2) and NanoRacks External Platform (NREP).

In addition it carried eighteen the cubesat which are to be launched through the Kibo module at a later date. These satellites were fourteen Flock 2b Earth observation cubesats, SERPENS, S-CUBE, AAUSAT-5 and GOMX-3.

SERPENS is a 3U Cubesat built by the SERPENS (Sistema Espacial para Realização de Pesquisa e Experimentos com Nanossatélites) university consortium from Brazil. It carries a transponder to test VHF and S-band communications for store and forward messaging as well as a UHF transponder for store and forward messaging and a pulsed plasma thruster (PPT).

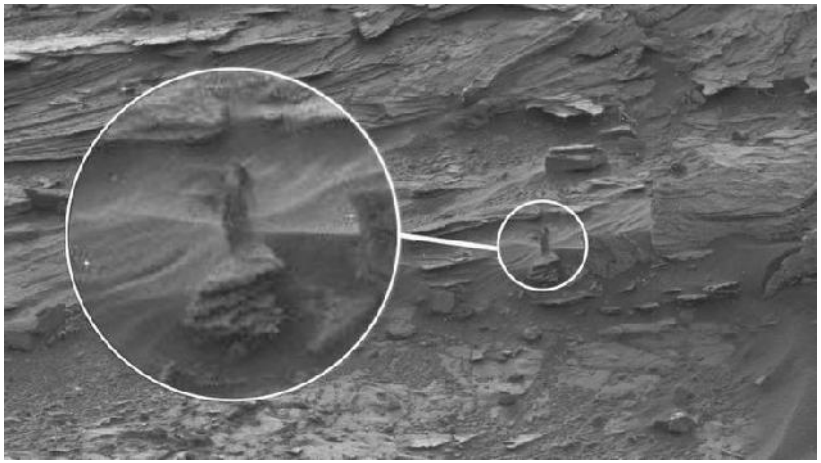
S-CUBE or Shootingstar Sensing Satellite (S3), is a 3U cubesat built by the Planetary Exploration Research Center of Chiba Institute of Technology and the Tohoku University, Japan. It carries a CCD camera and a photomultiplier tube (PMT) to observe meteors from low-Earth orbit.

AAUSat-5 is a 1U cubesat designed and built by students at the University of Aalborg in Denmark to test an improved receiver for detecting Automatic Identification System (AIS) signals emitted by ships.

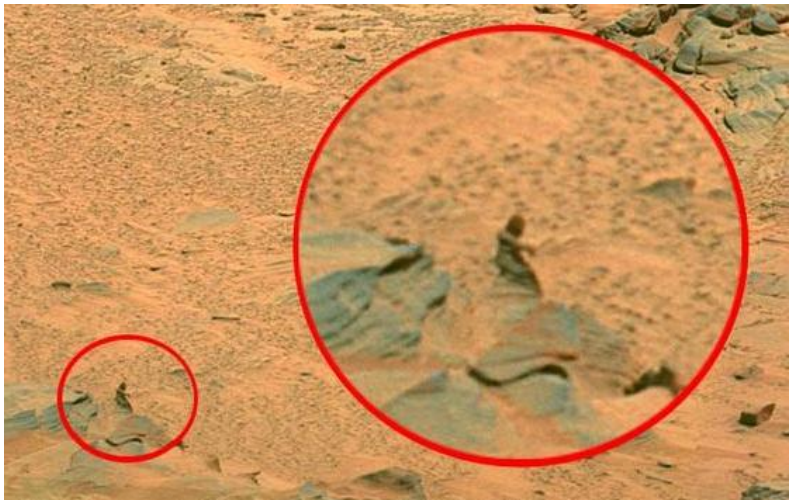
Led by Gomspace in Denmark, GOMX-3 is a 3U cubesat developed by Gomspace to demonstrate aircraft ADS-B signal reception and geostationary telecommunication satellite spot beam signal quality.

Lady on Mars

Finally this picture of a Lady on Mars, eagerly awaiting the arrival of the first humans.



This is the second time the lady has been seen on a picture, the first time being in late 2007.



Fortunately nobody in his right mind has suggested that these picture, taken by the Curiosity and Spirit rovers, depicts a real lady, especially considering that the camera's on these rover vehicles are only about 2 meters above the surface.