SPACE ALLIANCE

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Romania becomes the 19th member of ESA

On 20th of January 2011 Romania became officially the 19th member of the European Space Agency by signing the agreement of the ESA's convention.

The accord has been signed in Bucharest by M.I. Piso the director of the Romanian Space Agency, T. Baconschi the Foreign Affairs Minister and by J.J. Dordain for ESA.
This document marks the official acceding after in November 2010 at the conference of the European ministers it has been agreed the acceptance of Romanian candidature.
In February 2011 Romania ended the 5 years of preliminary collaboration with ESA as per the PECS agreement signed in February 2006.

The previous ESA membership has been signed in July 2008 when Czech Republic became the first East-European country to be part of ESA. On the waiting list there are Hungary, Poland and Slovenia.

Established in 1975, ESA had a budget of 3.74 billions euros for 2010- the biggest contributors being France (18.2%), Germany (16.7%) and Italy (9.9%).
The financial contribution of Romania will be some millions euros per year (most probably 5), money which will return to the national industry and to the Romanian companies as contracts.

ESA, with the headquarter in Paris, has several centers distributed across Europe: ESTEC-European Space Research and Technology Centre (Holland), ESRIN-ESA Centre for Earth Observation (Italy), ESOC-European Space Operations Centre (Germany), ESAC-European Space Astronomy Centre (Spain) or EAC-European Astronaut Centre (Germany).

Credit ESA

2011's first launches

2011 started with a double launch on 20th of January when an American and a Russian satellite have been placed in orbits around the Earth.

The first launch took place from complex 45 in Baikonur at 12:29 GMT. A Zenit 3F rocket has put in orbit, in a complex scenario which took over 9 hours, the first Electro-L satellite- a new series of high altitude meteorological observatories built in Russia.
Electro-L 1 weights 1766 kg and it will be parked in a GEO orbit above the Equator at 76 degrees East longitude -somewhere above the Indian Ocean, where, for at least 10 years the sensors will perform meteorological observations.
The satellite which will be operated by Russian Space Agency Roskosmos, has been built by NPO Lavochkin, but it will be integrated in the International Meteorological Satellite System.
It carries several onboard experiments:
-MSU-GS or Multispectral Scanner Geostationary
-GGAK-E or Heliogeophysical Complex on Electro-L a complex instrument which contains several modules:
  -SKIF-6 or Corpuscular Radiation Spectrometer
  -SKL-E or Solar Cosmic Rays Spectrometer
  -GALS-E or Detector of galactic cosmic rays
  -ISP-2M or Solar constant sensor
  -VUSS-E or Solar UV radiation sensor
  -DIR-E or Solar X-ray radiation flux sensor
  -FM-E or Magnetometer instrument
-GEOS&R or Geostationary Search and rescue system

The next Electro-L satellite will be launched somewhere in 2012 but the same technical platform will be used by several Russian missions including Phobos-Grunt which will fly to Mars.
At the present Russia is using the services of a single meteorological satellite-Meteor M1, but it has in plan to build a network of 3 SSO satellites and 3 GEO satellites.

The second launch took place from complex 6 of Vandenberg Air Force Base in California.
For the first time there, a Delta 4 heavy rocket left the ground at 21:10 GMT in order to carry to orbit a spy satellite for NRO- National Reconnaissance Office.

As with the precedent cases, very few information went to the press, however it is known that the new satellite called NROL L-49 is a Keyhole KH-11 class satellite and it will replace into operation the older, 2001 launched, USA-161 satellite.
NROL L-49 is a massive 15 tons satellite, sharing a lot from the design point of view with the Hubble Space Telescope but this time being used not for astronomic targets but for ground ones.

All the images (which can go to resolutions of 10 cm) are stored and processed by the operators of NGA- National Geospatial Intelligence Agency for collecting strategic information.

The satellites from this class operate from SSO orbits having the perigee at 200 km, the apogee at 1000 km and almost polar inclinations approximately 97.8 degrees.
The Keyhole series has started in the early 60s most of those platforms being built by Lockheed Martin at an individual price of 2 billions dollars.
It had to be replaced by the new FIA series based on a contract signed with Boeing Satellite Systems, but the entire program has proved to be a major management failure due to the successive delays encountered.
Under the time's pressure, NRO decided to cancel the Boeing contract and to sign a new one with the old partner Lockheed Martin- but until the new satellites will arrive (estimated to be earliest in 2017), the American agency has chosen to use the old reliable platforms.

In conjunction with the Keyhole satellite, NRO operates also some other classes: Lacrosse, DSP- Defense Support Program (which will be in a short time replaced by SBIRS- Space Based Infrared System), SDS- Satellite Data System, DSCS- Defense Satellite Communication System, Milstar or DMSP- Defense Meteorological Satellite Program.

This flight, numbered 352 in the Delta rocket history, was the third Delta 4 launch from the California base, but the first of the heavy version and the first to be used for testing this type of rocket in a LEO scenario. It is coming after the refurbishment of the Vandenberg spaceport- initially built in 60s for serving the space shuttle and the American medium class launchers.
The next NROL mission (L-66) will be launched in February from the same base aboard a Minotaur 1 rocket, while the next Delta 4 launch will happen in April from Cape Canaveral with the NROL L-27 satellite.
In 2010 USA performed only 15 launches, a negative trend compared with the previous years, being equaled for the first time by China- but we should also say that this was a record for the Chinese space program.

SPACE ALLIANCE

Russia fails again

On 1st of February Russia made an attempt to launch another satellite into orbit. This one, named GEO-IK2, is the platform of a new GEO-IK generation of satellites used in both military and civil geodesic applications.
The first satellites have been launched since the existence of USSR. They weighed 1.5 tonnes with a lifetime of 1 to 2 years, flying on circular orbits at 1500 km, with two possible inclinations of the orbital plane – 73.6 degrees and 82.6 degrees. Launchings were made from Plesetsk space base, with Tsiklon 3 rockets. A total of 14 satellites were launched, 13 of which made it to the orbit (the first flight was a failure) with the last launch being made in 1994.

Just like the previous ones, the new generation of satellites is flying circular LEO orbits, but with different inclinations (because, for a global coverage, an inclination of 99.4 degrees is now used). The altitude also dropped to 1000 km.

The satellites which are now built by ISS Reshetnev (Information Satellite Systems Academician Reshetnev) on an Uragan-M platform are three axes stabilized, weigh 1.4 tonnes and are equipped with 3 scientific instruments:

- SADKO radar altimeter
- Laser retro reflectors
- GLONASS and GPS receiver

They will be capable, due to these instruments, to make measurements regarding Earth's shape, the evolution of the poles, the gravitational field and seismic activity. The results will be used, amongst others, in the creation of a better gravitational model, used in ballistic rockets' flight.
The launch took place Tuesday, 1st of February, using a Rockot KM rocket.
Rockot KM is a 2+1 stage rocket: a first stage powered by 3 RD233 engines and one RD234, a second stage powered by one RD235 and 4 RD236 engines and a third stage composed of a Breeze-KM ensemble, capable of flying 7 hours with 6 different injection maneuvers (corresponding to 6 “on-off” ignition sequences). Its performance of carrying 1950 kg in a LEO orbit or 1200 kg in a SSO one places it in the small international launchers class.
The rocket came into service in this configuration in 2000, as a derivation from the military version UR100N, and has made since then 15 flights. The flights are offered by Eurockot Launch Services at a price of 14 million dollars per launch.

The launcher was involved in another famous incident, in 2005, when ESA's first Cryosat mission was destroyed. The problems in that case appeared at a height of 200 km, because of a malfunction in the separation between stages two and three. Thus, the separation didn't occur, leaving the rocket in a ballistic trajectory. It disintegrated upon its entrance in the atmosphere at a speed of 5 km/s. The remains crashed some 100 km from the North Pole. After this incident, ESA gave up Rockot, replacing it with Dnepr.

Coming back to our article, being launched at 14:00 GMT from the Plesetsk Cosmodrome, the rocket should have placed the satellite in the orbit after 90 minutes. In the flight sequence there were included two activations of the Breeze-KM module.
After the rocket separation, at 15:35 GMT, when the first telemetry was collected, the launch team found out that there was no signal coming from the satellite. At the same time, the USTRACK and Russian radars (activated after an emergency has been declared) located the satellite in an unexpected position. Apparently the second activation of the Breeze-KM engines was not long enough (under the theoretical 150 seconds), so the satellite was launched into an intermediary orbit 319 km x 1053 km x 99.46 degrees inclination against Equator, different from the Breeze module which was located into an 356 km x 993 km x 99.45 degrees orbit. This means the separation occurred.

Unfortunately, because it was a relatively small satellite which was designed for a short period of operation, the hydrazine reserve on board (less than 100 kg according to some sources) was not enough for an apogee burn maneuver, a reshaping of the orbit towards a circular one – which needed an additional speed of 150-200 m/s. This means that the satellite will never be placed in the designated orbit and, because of the mission goal, if another use for it will not be found, it will be most likely abandoned in space. In commercial terms, the mission can be considered a total failure, although there are some aspects which confirm the recent conclusions of the evaluation committee which has just finished its activity in the case of the December 2010 accident when three Glonass satellites were lost by the Russian Space Agency Roskosmos.

According to these rumors, the Russian satellite used secret military technologies and because of this the insurance policy was partial and included compensations just for the launch complex destruction or for defects at the first stage of the rocket. In other words, if it is proven that the failure was caused by the Breeze-KM engine, the Russian Space Agency Roskosmos will not get any compensation. In this light, and after the last investigation, the position of the Roskosmos president Anatoly Perminov is seriously threatened.

The recently finished investigation, on the 5th December 2010 incident, when the Proton rocket, launched from the Baikonur cosmodrome, has carried three new Glonass satellites : Kosmos 2470, 2471 and 2472, found that the launcher exceeded with 1-1.5 tones the necessary quantity of Blok DM-03 oxidant, due to a serious error. Because of this overload, the final trajectory was wrong and caused the loss of the three satellites. This was possible due to a series of major deficiencies in the spaceflight preparation procedures.

As in the present case, political and corruption aspects were found, the loading being insured by Sputnik Insurance Center, in whose administration council are the sons of the Russian Space Agency’s leader. The investigation revealed more serious problems. After almost 50 years from Gagarin’s flight, the Russian space program suffers from major management deficiencies.

The Angara rocket is still in a project stage, the Svobodnyy cosmodrome is not open yet, the started projects are delayed and there is a lack of investments for new technology.
The worst case is actually the satellite navigation program Glonass, despite the large amounts of money invested. In a global market of navigation estimated at 60-70 billions of dollars yearly, Russia’s targeted 15% (that is 9-10 billions, even more than the weaponry sales), but it barely kept 1%, far under the expectations. Therefore it will be interesting to watch the evolution of the events and what other dismissals and changes will take place at the management level of the Russian Space Industry.

Credit: Roskosmos

2011 continues with a new military launch

A new military launch took place on Sunday, February 6th from the hangar no.8 of the Vandenberg airbase. The satellite which was launched this time is called Rapid Pathfinder Program and is owned by the NRO-National Reconnaissance Office American agency. The satellite is named NROL66 in the NRO’ s nomenclature.
The launch comes just two weeks after the previous launch on January 20th -a launch which SpaceAlliance reported at that time.

The official operational name of the new satellite will be USA225. Despite the fact that no public information was given, it’s known that the new satellite will be a small size spy satellite, launched by the smallest launcher of the American agency, Minotaur 1.

The orbit from which it will operate will be a SSO (Sun-Synchronous orbit) or a polar one.
The launching, which was initially scheduled on Saturday, February 5th, was postponed due to ground equipment technical issues. Finally the launch took place at 12: 26 UTC.

The orbital transfer sequence was short (near to 12 minutes), typical for the launcher. Minotaur 1 is a 4 stages rocket with the ability to carry a load up to 550 kilograms in a LEO orbit. It was converted by Orbital Sciences Corporation operator from the old Minuteman 2 ballistic missiles that were operated by the U.S. Army between 1964 and 1987. The first stage of the rocket is powered by a M55E1 engine, the second one by a SR19AJ1, the third by an Orion50XL and the last stage is powered by an Orion38 engine.

Orbital owns 3 other launchers: the second and third Minotaur series – 3 stage rockets used for suborbital test-flights and the fourth series, which has recently been introduced in operation for LEO orbit flights. The test-flight of this one took place on November 2010.

They are also designing a fifth series launcher, a commercial one, which will be capable of overcoming the LEO orbit border. If all goes according to plan, it will come into operation in 2013 when it will launch the LADEE platform owned by NASA.

NRO operates the Minotaur1 rocket- a much smaller one than the usual Delta 4 and Atlas 5 launchers. The operating centers of NRO are 4 facilities in total: Cape Canaveral, Kodiak Island, Vandenberg and Wallops Island. To this date, eight other launches have been made.

The next launch of a Minotaur 1 rocket will most likely occur in April when the on board passenger will be ORS1 or the Operationally Responsive Space Satellite 1, the first satellite of the new ORS program developed by the U.S. Army.

Last year, the NRO agency, under the jurisdiction of the Defense Department, had a budget of almost $15 billion, which is 19% of the total budget of $ 80 billion allocated to the U.S. intelligence agencies.

Credit NRO

The American satellite Wise ends the mission

On 17th of February 2011, after more than a year of space operation, the American satellite Wise ended officially the mission. At 20:00 GMT the command centre has sent a sequence of commands which have sent the satellite in hibernation state until further notice.

Despite the fact that the satellite is completely functional from the perspective of the onboard equipment, it is however useless from the scientific point of view. The entire mission is based on sensible infrared observations and for this the satellite needs to cool its detectors (using liquid hydrogen circulated through special cryogenic installation).

The mission was estimated initially to have a lifetime of 10 months, enough to perform 1.5 full scans of the celestial sphere and to produce approximately 2.7 millions images, but in Mai 2010, as the satellite was approaching the end of the liquid hydrogen provision and because the satellite was still working fine, a special commission took into account a possible extension of the mission for another 3 months. At that time, the commission considered inadequate to operate the mission in the classical scenario which would spend another 6.5 millions dollars but without a scientific importance. It found however a compromise by using 2 of the onboard detectors (able to work without cryogenic cooling) for the search of the near Earth asteroids.

This additional phase called “NEOWISE Post-Cryogenic Mission” costs NASA 400.000 dollars/month, the satellite being able to focus its attention on the comets and asteroids from our solar system. With this occasion it has found 20 new comets, more than 33500 asteroids (from which 134 have orbits potentially dangerous for the Earth).
The first catalog containing the data collected by the Wise mission (including the first 14 weeks spent in space) will be made public in April 2011, but more interesting will be the complete catalog from March 2012, because it will confirm or not the speculations in the astronomical world about the presence of the so called Tyche planet.

Bellow we will quote the original article published on SpaceAlliance in December 2009 when the Wise satellite has been launched.

The infrared observatories series has increased after the launch of the Wise satellite on 15th of December 2009.
The launch has been performed from the Vandenberg base at 14:09 GMT marking the 92nd consecutive success of a Delta 2 rocket starting with Mai 1997.

The first stage burned for 4 minutes and 39 seconds, followed by the burn of the second and then the third stage. This one worked until T0+10:26 bringing the satellite in an intermediate parking, 97.5 degrees inclination orbit, the apogee at 553 km and the perigee at 185 km. The second orbital correction has been done by a short 8.5 seconds burn at T0+51:40 followed at T0+55:57 by the separation and the confirmation of the mission's success.

The entire flight has been coordinated using the TDRS system (Tracking and Data Relay Satellite System).
For 16 days the satellite will keep the protection of the telescope's mirror, but in middle January, it will unfold it and after the entire instrument's calibration will take place, it will start to work and to deliver the first scientific data.

Wise or “Wide field infrared survey explorer” has started initially in 2004 as NGSS (Next generation sky survey) as the sixth satellite from the Midex class (Medium Class Explorer) which had to be developed by NASA and to be launched aboard the Taurus rocket.
Later on the launcher has been changed for a Delta 2 type 7320 rocket. This is equipped with 3 solid fuel type GEM-40 boosters and has two active stages: a RS-27A for the first stage and an AJ-10-118K-ITIP for the second one. The flight configuration 10C is able to carry into orbit a load of up to 2703 kg for a LEO and 1579 kg for a SSO.

The satellite, which is belonging to NASA, will be coordinated by the JPL on the technical side and by UCLA and Caltech on the scientific side- a team which has been involved previously in the COBE/WMAP/Spitzer projects. The first contractor is the Ball Aerospace division but the scientific instrumentation is built by Space Dynamics Laboratory.
The entire contract has a cost of 320 millions dollars and has been developed in less than 5 years (in August 2004 NASA selected the project and in April 2005 has started the design of the satellite).
The satellite is built on a RS300 spacecraft bus, is three axes stabilized, equipped with fixed solar panels attached directly to the structure and playing also a role in the thermal protection. It weights 661 kg and has a 2.85 m height x 1.73 m diameter Aluminum structure.

The system of attitude and orbit control has to precisely stabilize the in flight position during the observing periods. It is equipped with two star cameras mounted on opposite sides of the satellite in order to minimize the effect of perturbations induced by the bright objects near the satellite (Earth, Moon or Sun). The active control is realized using 4 reaction wheels.

The principal instrument is a 40 cm diameter telescope connected to 4 infrared detectors each of 1 million pixels. The telescope contains 10 curved mirrors and 2 plate ones each built from Aluminum covered by gold which increases the reflexive characteristic. One of the mirrors, called scan mirror, moves opposite the satellite's movement at a synchronized speed in such a way to compensate the rotational effect and to ensure precise successive images. The visual field obtained in this way is approximately 47 arcmin.

The 4 detectors function at different wavelengths (3.4, 4.6 and 12 µm with a resolution of 6 arcsec and respectively 22 µm with a resolution of 12 arcsec) and at 4 predefined scenarios: “one frame”, “one orbit”, “two orbits” and “many orbits”.

The detector itself incorporates the last generation technologies. For example the ones from the 3.4 and 4.6 gammas are made from Te, Hg and Ca alloy which radiates electrons under the light coming from the stars. These electrons are further captured by the electronics of the instrument. The detectors from the 12 and 22 gamma are based on an As doped Si semiconductor.

Because Wise is going to capture the infrared radiation coming from cold space objects it is important that the telescope and the detectors to be kept at a cold temperature and not to be contamined by its own radiation emission. Therefore they have very strict requirements: 12K for the telescope, 8K for the 12&22 detectors and 32K for the 3.4 & 4.6 detectors.
For keeping the operating conditions, both the telescope and the detectors have been placed in a giant thermal recipient- a cryostat system built by Lockheed Martin and supplied by two containers containing liquid hydrogen. The temperature is later regulated by circulating the cryogenic agent through a special pipes system or if heating is wanted, by activating a system of thermistors.

Wise will ensure a complete observation of the sky hoping to create a specialized infrared catalog after more than 25 years since the precedent NASA experiment – the IRAS (Infrared Astronomical Satellite) mission. In comparison with the previous missions the sensitivity increased by approximately 500 times compared with COBE (which observes in the 3.5-4.9 µm), and some hundred times more comparing with IRAS (12-25 µm) (probably the best characteristic which reflects the technological advancement is the number of pixels on the detector which increased from 62 for IRAS to 1 million in Wise's case). The data collected by Wise will be further used by the future JWST mission.

So how is cataloged the new satellite within the infrared observatories already in the orbit taking into account that its instruments are modest compared with some other satellites?
Wise is a wide view surveyor so a sky mapper – generating permanent observations of the celestial sphere. Based on this information the astronomers can ask for detailed punctual investigations (only on a specific target) with more powerful instruments. One of them is the huge telescope installed onboard the European satellite Herschel.
This is equipped with a 3.5 m diameter mirror which is 4 times bigger than the previous infrared telescopes and 1.5 times bigger than the one of Hubble.
With these characteristics the Herschel telescope is able to capture 12 times more light than its predecessor the ISO satellite.
This is not the only difference with Wise but also the spectral range which varies from 60 to 670 µm.
The two platforms have also two different orbits: a Lissajous 800.000 km amplitude orbit around the Lagrange point L2 for Herschel and a circular sun-synchronous 500 km altitude orbit around Earth for Wise.
The Lissajous orbits around the L2 point are today preferred against the orbits around the Earth because they ensure a better thermal stabilization (up to some degrees Kelvin compared with 30-40 K for the other) and a smaller orbital drift (0.1 AU/year for a heliocentric observatory). A mission around L2 is however much more expensive but for its niche (medium resolution space observer) Wise was preferred to make a compromise and to be placed in a LEO orbit.

Wise will orbit around the poles following the separator line between eclipse and illumination, with the telescope placed in the direction opposite to that of the Earth. The side exposed to the solar radiation will be protected by a thermal shield while the other one will benefit from the low natural temperature in the eclipse condition.

The satellite will have around 15 orbits per day, 4 being used to download the data produced by the instruments.
Flying around the Earth and following it in its natural orbit around the Sun, it will take half of the orbital period i.e. 6 months to completely scan the sky. For comparison the cryogenic reserve is calculated for 10 months so the satellite is able basically to perform 1.5 scans during the predicted lifetime (and to cover eventually gaps).

Wise will find the brightest galaxies in the Universe, it will perform observations on the closest stars to the Sun, on the near Earth asteroids and comets (in total 100.000 new objects are expected), it will allow studies over the planetary evolution or how the stars formed in the galaxies, it will do investigations over the cold stars so called “brown dwarfs”.

With an image acquired every 11 seconds, the specialists expect a number of 1.500.000 pictures for the end of the mission.

Six months after the mission ends the first consolidated data should be offered to the astronomers (the first version of the expected infrared atlas) while the final version will appear 17 months latter.

Credit NASA

The Russian satellite navigation system Glonass reaches generation K

The first prototype of the Glonass system- the version K, has been successfully sent to orbit in the weekend confirming the decision of the Moscow authorities for establishing a global navigation system.

Since 2001 Russia spent on the Glonass system more than 4.7 billions dollars and despite this amount of money and the fact it is a strategic element for the Russian government, the system has not reached yet the maximum capacity.
In a global navigational market estimated at a value of 60-70 billions euros, Russia has targeted a niche of 15% but it succeeded to achieve only 1% far under the expectations.
For being in line with the latest technical innovations and with the competitors, the Glonass system will benefit from a 2.6 billions euros investment, hoping to reach a number of 30 operational satellites by 2011.

This launch comes at the right time and it saves the honor of the Russian space agency Roskosmos who failed twice in the past few months.

On 3rd of December 2010, SpaceAlliance was speaking about an accident on a Baikonur launched Proton Block DM3 rocket when 3 Glonass satellites were lost.
Two months latter, on 1st of February 2011 we were commenting about the incident involving the GEO-IK2 1 satellite- the first platform of a new GEO-IK satellites used for geodesic observations. That launch has been performed from Plesetsk using a Rockot Breeze KM rocket.
Both incidents were followed by very serious investigations over the Russian space agency activity and also on the collaborators from the aerospace industry and the contracts- investigations which, we were speculating, seriously threaten the position of the Roskosmos president Anatoly Perminov.

Coming back to the weekend’s event, differently from the launch of the block M satellites, which were performed from Baikonur aboard Proton rockets (typically 3 per launch), the K type platforms, due to a modern design concept and also due to the decreased weight, can be launched aboard the lighter version Soyuz2-1b/Fregate from the Plesetsk launch site.
Because of this, the Russian Space Agency can save up to 50% of the launching cost by sending them in pairs of 2 satellites at a time.

The first launch of the K generation (Kosmos 2470) has been delayed initially for two days and took place finally Saturday 26th of February at 03:07 GMT, the satellite being placed in the desired orbit (19100 km x 19100 km x 64.8 degrees) a few hours latter at 06.41 GMT.
The success of the mission has been confirmed shortly when the ground antennas succeeded to receive the first telemetry.
The satellite is built by ISS Reshetnev on an Ekspress-1000A spacecraft bus, is three axes stabilized and weights approximately 750 kg. Together with the classical navigation signals it will provide auxiliary emergency services for the Cospas-Sarsat program.

Despite the fact that onboard has been carried a single satellite (and not two as we mentioned it will happen in the future) the rocket flew in a complete configuration, with a fairing adapted to the volume of 2 satellites, just to give to the flight engineers the necessary exercise for the time when the Glonass flights will become a routine.

Another K type test satellite will be flown this year, but currently it is under development and the final date of the flight it is not known.
After these first two platforms will be successfully tested and will confirm their capabilities in the orbit, Russia will go to the second phase of the project, when it will try to replace all the block M with newer block K satellites. Formally to make a difference with the test platforms, these new satellites will be named generically K2.

The Glonass system has today (officially) 26 satellites in orbit (plus the one just launched now). Theoretically the number is enough for a complete coverage of the Russian Federation’s territory (a minimum of 18 satellites is required) and even for an extension to the global scale (where 24 satellites are required to operate simultaneously). It should be said however that from the 26, 4 are in technical maintenance and another 2 are kept for the moment as backup (all minimum 2 years old) – so it will only remain 20 fully operational.

The Glonass system (“Globalnaya Navigationnaya Sputnikovaya Sistema”) or “Global Orbiting Navigation Satellite System” has started first time in September 1993 with a group of 12 satellites and has reached the predicted number of 24 satellites for a global coverage in December 1995. However due to the financial problems encountered at that time and due to the lack of new investments, a part of these satellites have been retired without replacing them.

The systems consisted from three orbital planes, separated at 120 degrees and with the satellites within the same orbital plane separated by 45 degrees. Each satellite describes a circular, 19100 km height by 64.8 degrees inclination orbit, having an orbital period of 11 hours and 15 minutes. The satellites are uniquely identified by the “slot number”: the first orbital plane contains the slots 1-8, the second 9-16 and the third 17-24.
In 2007, it has been decided however a modification to the total number of satellites contained by the Glonass constellation from 24 to 30- meaning it will have 8 operational satellites plus 2 spares for each orbital plane.
This should increase the robustness and reliability of the system, lowering the risk induced by malfunctions or failures.

Each satellite transmits two types of signals: a standard one for commercial applications and an encoded high-precision one for military applications.
There are actually 25 different channels separated by 0.5625 MHz in the L1 frequency bands: 1602.5625-1615.5 MHz and respectively L2 band: 1240-1260 MHz.

When the system will be complete, it is estimated to reach an accuracy of 70 m for the position and 15 cm/s for speed (for the civil applications) and an equivalent of 10-20m for military applications.

Credit Roskosmos

The scientific program of NASA suffers another loss

Friday, 4th of February, the scientific program of NASA suffered an important loss as the Glory satellite failed to reach an operational orbit.
NASA did not handle directly the Glory mission but it had subcontracted it to Orbital Sciences Corporation- for the designing and building of the spacecraft, while the launch was coordinated by Orbital Launch System Group.
The entire program costs the American agency 424 millions dollars with a part of 54 millions for the launch.

This is not the first incident of this kind, but the second one involving the Orbital company, after the one from 24th of February 2009 when NASA lost the 273 millions dollars OCO (Orbiting Carbon Observatory) satellite due to a launcher failure. The same rocket failed also in the past, to be more precise in 2001, when other 4 satellites were completely destroyed: OrbView4, QuickTOMS, SBD and Celestis05.
Statistically this does not look very good- from 8 performed flights 3 were failures.
The rocket used now is the same configuration as in the past – a Taurus XL- and the failure is apparently caused by the system which is responsible for the separation of the fairing capsule by the rocket's final stage. As the separation has not occurred, the orbital injection was impossible, all the onboard satellites falling down to the Pacific Ocean.
After the 2009's incident, as a contra-measure, Orbital changed completely the solution used for this separation system, borrowing the one from the Minotaur 4 rockets. It appears however that without much success, as the new solution, despite the intensive ground tests performed, was not better and dramatically affected the company's image.

Taurus XL is the ground launched version of the air missile Pegasus, sharing the same 3 stages configuration (powered by Orion 50SXLG, Orion 50XL and respectively Orion 38 engines) all helped by a supplementary stage used for take off (powered by a Castor 120 engine). All these engines use solid fuel. The rocket made its debut in 1994 and has counted, as we said before, 5 successful launches with 10 satellites placed into orbit.
Weighting 73 tons and having a height of 28 meters, the rocket is able to carry in a LEO orbit, payloads up to 1300 kg.

We should also provide some details about the Glory satellite. This is a medium size 1.9 x 1.4 m satellite, weighting 545 kg and being built on an Aluminum octagonal structure.
As part of the "Earth observation" program, it should provide from a LEO 705 km altitude SSO orbit, scientific data for the study of the atmosphere and climate changes.

Orbital has built the satellite on a LEOStar platform taken from another program which was cancelled in 2000- the VCL (Vegetation Canopy Lidar) satellite.
The electrical system of the satellite is served by 3 solar panels (2 external and another one mounted on the satellite's structure) and is able to offer up to 766 W, more than enough for the onboard consumption estimated as 400 W (150 W used for the scientific instruments).

The AOCS (Attitude and orbit control system) ensures a three-axis stabilization of the spacecraft making use of a monopropellant propulsion system (with a reserve of 45 kg of fuel) composed of 4 thrusters, 4N each.
For at least 3 years (the guaranteed lifetime) and going up to 5 years (what the designers expects) the satellite should work as part of the A-train NASA's constellation together with Aqua, CloudSat, Calipso and Aura.

The Glory satellite carries 3 scientific experiments: APS (Aerosol Polarimetry Sensor), CCS (Cloud Camera Sensor) and TIM (Total Irradiance Monitor) inherited from the SORCE (Solar Radiation and Climate Experiment) satellite.
APS, built by Raytheon Inc. from El Segundo, California, is a sensor able to produce observations about aerosols and clouds, observations used by the scientific community to determine the global distribution of natural or industry created aerosols, their impact to the radiation's level and their effect for the climate change.
CCS, built by Ball Aerospace and Technologies Corporation (BATC) from Boulder, Colorado, is a high resolution radiometer which calculates the distribution of the clouds in atmosphere. The measurements are used together with the ones coming from the APS.
TIM, built by University of Colorado's Laboratory for Atmospheric and Space Physics in Boulder, Colorado, is a radiometer which counts the solar radiation. It is mounted on a platform which can move independently from the spacecraft movement and by this ensuring a permanent pointing of the instrument to the Sun. Therefore in the illuminated halve of the orbit it will measure the solar energy and latter on these measurements will be used to establish a daily average.

Going back to the launch itself, this took place at 10:09 GMT from the complex 576E of the Vandenberg space centre in California. It came almost 2 weeks from the initial launch date (23rd of February 2011) which was cancelled because of some ground equipment problems. The flight, at least in theory, was a short one, only 15 minutes.

The first stage should carry the entire ensemble for approximately 85 seconds. Then the second stage is powered on for another 85 seconds, followed by the third stage for 79 seconds.

At the moment T0+02:58 the fairing should be jettisoned and at T0+04:11 the third stage should stop functioning leaving the ensemble in an intermediate transfer orbit.
At T0+09:58 the fourth stage should activate in order to increase the perigee's height and to circularize the orbit, and latter on at T0+11:10 the Orion 38 engine should separate from the rocket.
Immediately should follow the orbital injection of the principal payload (the Glory satellite) and at T0+13:05 the separation of the adjacent payload (3 small Cubesats).
Unfortunately, the plans have been ruined dramatically when the flight engineers have seen the failure of jettisoning followed in a short time by the atmospheric re-entry.

Which is the auxiliary payload which accompanied the Glory satellite? They are 3 experimental platforms called: E1P, Hermes and KySat1.
E1P or Explorer 1 Prime is a Cubesat nanosatellite built by SSEL- Space Science and Engineering Laboratory of Montana State University celebrating the 50 years from the Explorer 1 mission (which discovered the electrons captured by the Earth's magnetic field).
Hermes is another Cubesat, this time built by Colorado University, while KySat1 is a Cubesat built in Kentucky.

After this incident, the Taurus XL rocket is not planned to be back into operation too soon- the next launch is programmed at this moment somewhere in 2013 when it should go to orbit with a replacement for the OCO satellite lost in 2009.
Orbital will have however another launch in Mai, when its Minotaur 1 rocket will carry the ORS-1 satellite.

Credit NASA

First Romanian page on ESA’s website

ESA’s website has now, as for the rest of the agency’s members, a special section of news and articles in Romanian.
The readers from Romania can from now on follow the most important events of the aerospace industry (European or national) in their own language.

Credit ESA

esa România știri locale
European Space Agency

ESA Știri Locale România

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National News

România: Bine ați venit la Agenția Spațială Europeană

România a făcut un pas înainte în cadrul colaborării sale cu Agenția Spațială Europeană, prin semnarea acordului de aderare la convenția acesteia. Prin urmare România este pe punctul de a deveni cel de-al 19-lea stat membru cu drepturi depline al Agenției Spațiale Europene.
Ceremonia semnării acordului a avut loc joi, 20 ianuarie 2011, la sediul Ministerul Afacerilor Externe din București.

Ce este ESA

Agenția Spațială Europeană (ESA) este poarta de acces către spațiu a Europei. Misiunea sa constă în configurarea dezvoltării capacităților spațiale ale Europei și în garantarea faptului că investițiile în cercetarea spațială vor continua să asigure avantaje cetățenilor din Europa și din lume.

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USA launches another military satellite

Friday, 11th of March 2011, at 23:38 UTC, US have launched from the complex 37 of the Cape Canaveral space centre a new military satellite. This holds the NROL-27 indicative and it is the newest platform of National Reconnaissance Office.

Despite the fact that as with all the programs of this kind very few information are made public, it is known that the new satellite is a geostationary platform part of the SDS-“Satellite Data System” which is facilitating the transmission of the data collected by the NRO satellites back to the ground stations when no direct visibility is possible.

SDS has reached today the third generation.
The first SDS 1 satellites (7 in total) have been launched between 1976 and 1987 aboard Titan 3 rockets, they were weighting 628 kg, have had a cylindrical shape and were relatively simple spin stabilized platforms.
Built on an Intelsat 4 spacecraft bus they were using from a Molnyia orbit (500 km x 39200 km x 57 degreees inclination) a 12 channels communication system with the ground station from Fort Belvoir, Virginia.

The second SDS generation had 4 launched satellites between 1989 and 1996, 3 aboard the Space Shuttle, and the fourth aboard a Titan 4 rocket. In this version, the platform has taken some design elements from Intelsat 6 spacecraft bus and weighted up to 3000 kg.
It was also operated an orbital change – 3 of the satellites were still flying in a Molnyia orbit (slightly modified compared with the previous generation 368 km x 39700 km x 63 degrees inclination) while the fourth has been sent to operate from a GEO orbit.

Finally, the third generation entered the service in 1998 and accumulated 5 launches until now: NROL 5 (USA 137) launched in 1998, NROL 10 (USA 155) launched in 2000, NROL 12 (USA 162) launched in 2001, NROL 1 (USA 179) launched in 2004 and NROL 24 (USA 198) launched in 2007. The first four have been launched aboard Atlas 2 rockets, while the last one has been put into orbit by an Atlas 5.
Satellites numbered 1, 4 and 5 use high Molnyia orbits but number 2 and 3 are geostationary platforms.
The command and control centre remains in Fort Belvoir, Virginia.

The flight from Friday, with the indicative 353, used a medium Delta 4 launcher. This is a two stages rocket- the first stage being powered by a RS 68 type engine and the second stage powered by a RL-10B2 engine.
They are helped for take off by a booster system composed from 2 solid fuel GEM-60 engines.
The medium Delta 4 rocket can carry up to 10430 kg in a LEO orbit, 5845 kg in a GTO orbit or 1611 kg in a GEO orbit.

NROL-27 is the third military satellite launched by United States since the beginning of the year. On 20th of January, another Delta 4 rocket, this time flown as a heavy version, left the Vandenberg space centre to put into orbit the NROL-49, a massive 15.000 kg satellite from the Keyhole KH-11 class.
On 6th of February, a Minotaur 1 rocket used the same Vandenberg base to launch in a SSO orbit the NROL-66 or Rapid Pathfinder Program- another small spy satellite.

The previous Delta 4 medium launch dated from Mai 2010 when the passenger was GPS 2F 1 (USA 213).
The next launch will be on 23rd of June when another GPS satellite- GPS 2F 5- will find its way to orbit.

Credit NRO

STRaND the world's first smartphone satellite

SSTL (Surrey Satellite Technology Limited) together with University of Surrey builds the first "smartphone" mission who will fly in space.
The new satellite called STRaND-1 or "Surrey Training, Research and Nanosatellite Demonstrator" wants to be an experiment which incorporates COTS components (commercial off-the-shelf) and will try to prove that a normal smartphone can be used in the un-favorable conditions outside the Earth's atmosphere.

This is not the first experiment of this kind, if we recall the event from summer 2010 when a solar balloon built by a student team flew in the high atmosphere and succeeded to produce a series of spectacular pictures using a usual commercial camera. Also, in 2006, the Japanese mission Cute-1.7 succeeded to fly in space 2 electronic boards coming from normal PDAs.

It would be however the first time when a complete functional smartphone would be used in a LEO orbit.

SSTL has a long tradition in building small platforms and part as the market strategy permanently tries to push the limits set by the aerospace industry.
It should be said from start that from the technical point of view the new platform brings no major innovations but an eventual success would add an image capital to the British company and will open a niche on the nanosatellite experimental market which was dominated for a long time by the Cubesats.

The Cubesat platform is preferred today by the vast majority of the Universities for their educational programs, however they have major constraints for the technologies that can be incorporated- constraints imposed by the dimensions which push the limits of the miniaturization but which together with the cost cutting philosophy limit the possibility to choose the components.
The idea is simple. Today's smartphones incorporate a lot of components and they reached the maturity, being able to execute almost all the operations a normal computer can do. The processors have surpassed the 1 GHz frequency barrier but at the same time they lowered the power consumption. The cameras have now very good resolutions, wireless or GPS are standard components in an actual smartphone. Also, due to the aggressive competition between companies, their cost is continuously decreasing and miniaturization went to extreme cotes reducing the weight and size. The market of smartphone applications is also very dynamic and brings considerable incomes every year being a factor which stimulates the development of this segment.

So, the question the designers of STRaND project have addressed – could a smartphone be operated successfully from space and could bring commercial benefits for the future – is absolutely justified.
Considering that the solar cell technology reached 30% efficiency, the MEMS (micro-electro-mechanical systems) are more and more present, the new nanosatellites seem ready to incorporate the smartphones of today.

How appears the new nanosatellite from the technical point of view?
STRaND is a 4kg nanosatellite, 30 cm cub shaped. It is a complete satellite incorporating all the classical systems despite the fact that SSTL claims it will not exceed the cost of a normal automobile.

It has an active flight control system- using reaction wheels and thrusters- and GPS sensors for determining the position.
What is new, as we said earlier, is that the spacecraft will contain a normal smartphone (costing some hundred euros) with a 1 GHz ARM processor and running the Android operating system. As everybody knows, this is an “open source” system and the engineers from SSTL will have to create an interface between Android and the satellite’s operating system, interface which should solve the communication problem between the two.

The three major tests the satellite has to surmount in space are the radiation dose, the temperature (which should remain within the normal allowed limits) and the launching characteristics (vibration or acceleration induced by the launcher).
The third one has been guaranteed through special intensive tests in the laboratory. For the first two engineers have placed the smartphone inside the spacecraft’s body hoping the special insulation will do most of the protection job.
The optics of the camera however, will not be obstructed but it will have a clear view of the Earth as seen from a LEO orbit.
The battery’s temperature will be continuously monitored and if decreases a special intensive computing software routine will be ran – forcing the processor to work at the full capacity and by that to overheat and to dissipate extra heat to the battery.

In the first phase the satellite will be operated in a classical manner- the onboard computer will be used for performing the satellite’s vital functions, but the smartphone will be used as a backup scientific instrument.
The onboard computer will execute the special activities necessary to operate the smartphone in space, it will collect the data from it, it will monitor it and it will send it to the ground station as telemetry.

In the second phase of the mission, if everything goes smoothly and if the processor of the smartphone proves to be reliable enough and stable, it will take the lead for flying the spacecraft. The onboard computer will go in stand-by and all the functions will be executed through the smartphone.

As we said at the beginning of the article, SSTL does not bring any technical progress with this application but it gains a huge image capital and can attract considerable amount of money on the future from this kind of missions, in the perspective of an increased interest for space access and adjacent technologies in the past years.

SSTL has a long tradition in the small satellite segment. This tradition begins in the early 70s with the founding of a small research group, consolidated later in 1979 with the establishment of SSC (Surrey Space Center) in the Surrey University, continues in 1981 with the separation from the academic world and the establishment of the company (1985) and goes to present when SSTL has a list of 34 launched satellites and another 7 in development. The company with the base in Guildford, UK, and which has today 300 employees (and another 80 collaborators/researchers in the university) has been bought in 2008 (99% of the shares) by the EADS Astrium, the University of Surrey keeping only a symbolic part of 1% from the shares. Since then, as part of a new management strategy, to ensure the mark of the company as a global actor, SSTL owns also a subsidiary in US – Surrey Satellite Technology LLC with the central office at Denver/Colorado.

SSTL has production, integration and testing facilities, its own commanding centre and since 2006, when it bought the SIRA Electro-Optics company, its own optics department.

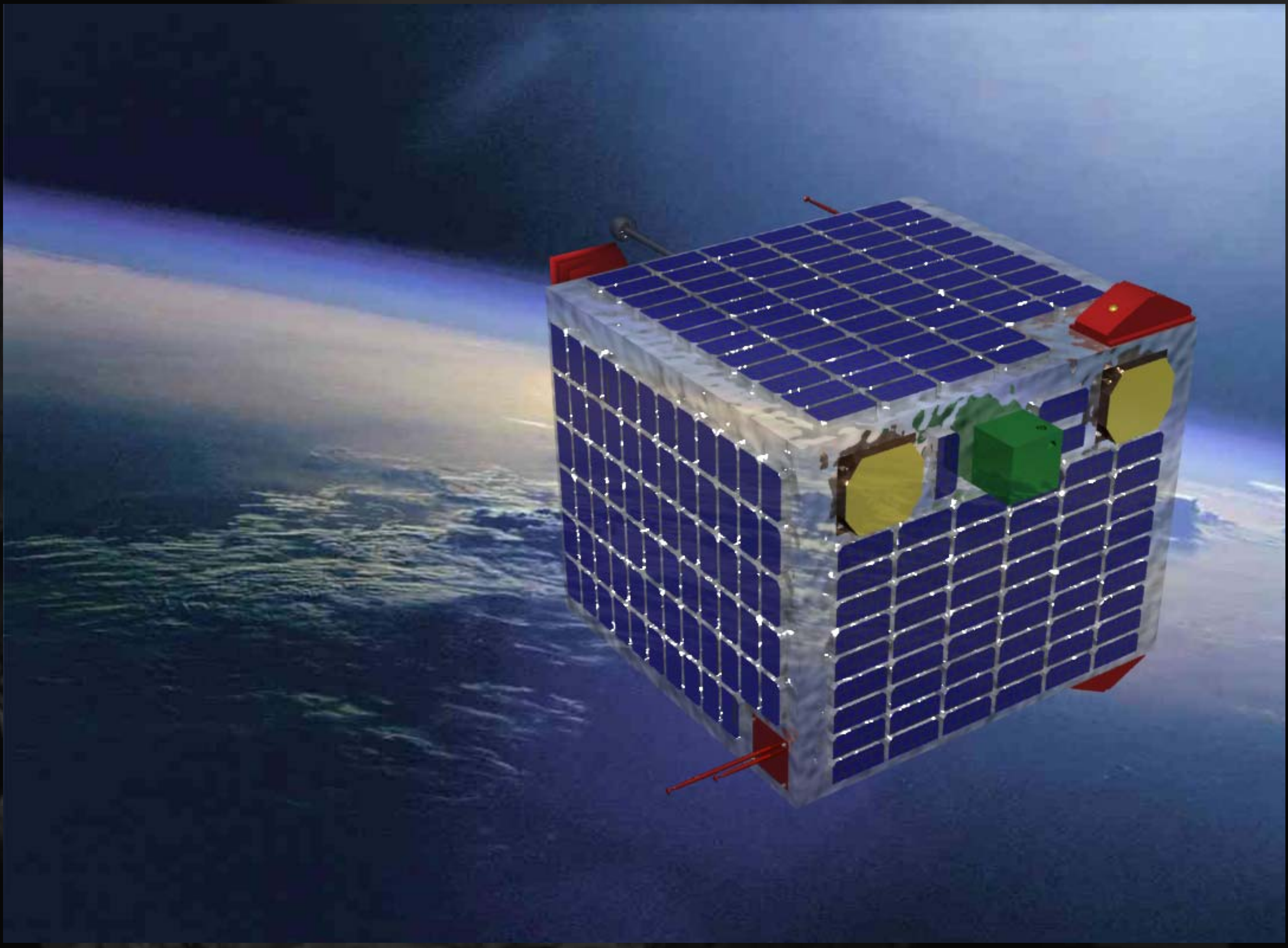
During the collaboration with the academic world we mentioned before, SSTL managed to build some advanced technologies used to fly the “University of Surrey satellite” UoSAT-1 in 1981, UoSAT-2 in 1984 (both built and launched with NASA support) series continued latter in the 90s with the platforms 3,4,5 and 12, or SNAP-1 (Surrey Nanosatellite Applications Platform) in 2000. Other experimental programs which should be mentioned are PalmSat and PCB-Sat.
SSTL has also some research projects ran together with the big space agencies as NASA and ESA.

Romania is also involved in 2 student space programs: ESEO and ESMO.
camera and a new type of reaction wheels).

ESEO or European Student Earth Orbiter is the third satellite developed within the "Education Satellite Program" a micro-satellite intending to capture Earth images from a LEO orbit, to measure the level of radiation and to test new space technologies (a star camera and a new type of reaction wheels).

ESMO or "European Student Moon Orbiter" will be the first educational satellite sent to the Moon, with a technology inspired by the one of Smart 1, and the fourth satellite from the "Education Satellite Program".
In both missions, sponsored by ESA, SSTL has the leading role of the university consortium and should coordinate the activity of collaborators and to report back to ESA the actual situation/ the progress of the project.

Credit SSTL



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