INTERNATIONAL ASTRONAUTICAL FEDERATION

HIGHLIGHTS IN SPACE 2011

Updated version

A REPORT COMPLIED BY THE
INTERNATIONAL ASTRONAUTICAL FEDERATION (IAF)
IN COOPERATION WITH THE
SCIENTIFIC AND TECHNICAL SUBCOMMITTEE OF THE COMMITTEE
ON THE PEACEFUL USES OF OUTER SPACE, UNITED NATIONS.

connecting space people

INTERNATIONAL ASTRONAUTICAL FEDERATION

HIGHLIGHTS IN
SPACE TECHNOLOGY AND APPLICATIONS
2011

A REPORT COMPILED BY THE INTERNATIONAL ASTRONAUTICAL FEDERATION (IAF)

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UNITED NATIONS.

28 March 2012

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INTRODUCTION

This publication has been compiled from reports prepared for the United Nations Committee on the Peaceful Uses of Outer Space and covers the period from 1 January to 31 December 2011.

The report was prepared by the International Astronautical Federation (IAF) including input from the technical committees of the IAF.

Information within this publication has been partly prepared with information from outside sources. Where this is the case, a citation is provided which can be accessed by clicking on the link marked >> .

This publication is available in English only.

This 2011 review of latest developments in space science, technology, space applications, international collaboration and space law has the aim to inform a broad worldwide audience of recent advancements in the manifold field of outer space.

We hope that “Highlights in Space 2011” can significantly contribute to all the efforts undertaken by the United Nations family, in particular the United Nations Office for Outer Space Affairs, in attempting to disseminate information on space activities and on the benefits involved to all nations of the world.

I. OVERVIEW

The year 2011, which marked 50 years of human spaceflight, was a year of major changes and achievements in space. The year saw the retirement of NASA's Space Shuttle after its final flight in July 2011, and the launch of China's first space station module, Tiangong-1, in September. The Zenit-3F and Long March 2F/G carrier rockets made their maiden flights, while the Delta II Heavy made its last.

A total of 84 orbital launches were attempted in 2011, with 78 being reported as successful; 80 launches reached orbit. 35 launches were conducted using Russian and former Soviet rockets, whilst China conducted 19 launches, and the United States 18. Europe conducted five launches, India and Japan launched three rockets each, and Iran conducted one launch.

Seven manned spaceflights – four Soyuz and three Space Shuttle missions – were launched in 2011, carrying a total of 28 astronauts and cosmonauts into orbit.

Six orbital launches failed in 2011, four of which failed to achieve orbit and the remaining two reached lower orbits than expected.

The final flight of the space shuttle took place, marking a turning point in space transportation, with the bold announcement of a new Heavy Launch Vehicle by NASA. The Shuttle played a crucial role in the construction of the International Space Station.

After 13 years of construction work, the International Space Station reached a measure of completeness in 2011.

In March, the space shuttle Discovery delivered NASA's final contribution to the assembly of the orbiting lab, a new room called the Permanent Multipurpose Module. While Russia may attach one more module in the coming years, construction is now seen as over- the orbital outpost has become the most expensive structure ever built.

We can look forward to a decade or more of discoveries and innovations from the ISS laboratories operating in the unique environment of microgravity.

Looking at **NASA**, from ending its 30-year-old space shuttle programme, to launching another epic mission to Mars, 2011 was a historic year.

The space shuttle programme ended when Atlantis touched down shortly before dawn on July 21. Atlantis's flight was the 135th space mission for the shuttle programme which began to take shape in 1972 and first launched to orbit in 1981 – two other shuttles flew in the year: STS-133 Discovery and STS-134 Endeavour. The shuttle helped to make spaceflight more routine.

NASA is now dependent on Russian Soyuz vehicles to take its astronauts to and from low-Earth orbit. A new, private space race is taking off and the agency hopes private companies can take over this orbital taxi service by about 2017.

In March, NASA’s Glory spacecraft was launched, but failed to reach orbit after a mechanism failed to properly separate the fairing. The rest of the year was reasonably successful for the agency. It launched three different planetary missions, rendezvoused with the asteroid Vesta and executed a comet flyby.

The MESSENGER spacecraft began to orbit Mercury after spending three years navigating there. Also taking photos, the Lunar Reconnaissance Orbiter has provided images of the Moon's far side in much detail.

In June, NASA and Argentina's space agency CONAE launched Aquarius, a satellite that measures salt concentrations in our oceans from space, information needed to fill gaps for climate models.

NASA reported that its Dawn spacecraft had started to orbit around its targeted asteroid Vesta on July 15. This mission will help find out the processes that played a role in the formation of the early Solar System and has returned spectacular images from the massive asteroid.

The Juno mission took off in August. Its voyage to Jupiter will take five years.

NASA launched the twin GRAIL spacecraft on 10 September, both arriving in lunar orbit over the New Year.

26 November saw the launch of the Mars Science Laboratory – a major mission for NASA. MSL is carrying NASA's rover Curiosity to Mars to help aid scientists in research for future human missions. The rover will monitor radiation on the surface of Mars after it arrives in August 2012. Upon arrival in August 2012, Curiosity will hunt for signs of life in Gale crater. The rover carries 10 instruments to help it answer this question, including equipment designed to identify organic compounds.

NASA's budget was trimmed further in 2011. The agency may get just $17.4 billion in fiscal year 2012, down from $18.5 billion in 2011. After months of uncertainty, Congress later restored funding for the threatened James Webb Space Telescope (JWST). The telescope is slated to launch in October 2018.

The **ESA/NASA** Hubble Space Telescope logged its one millionth science observation during a search for water in an exoplanet's atmosphere. Closer to home, Hubble also discovered a new moon of Pluto.

The **European Space Agency**'s GOCE satellite reached its ambitious goal of mapping Earth's gravity with unprecedented precision. In two short years, the sophisticated satellite has collected the measurements needed to record the 'geoid' reference shape of our planet.

Otherwise, and aside from ISS activities including an ATV freighter launch and European astronauts on board the ISS, the European Space Agency had a notable year.

The 21 October 2011 liftoff of Soyuz flight VS01, marked the first Soyuz launch from Europe's Spaceport in French Guiana, carrying the first two Galileo In-Orbit Validation satellites - Europe's emerging global navigation system.

ESA missions Herschel, Cryosat, Proba-2 and Mars Express made important discoveries and observations. The Cluster mission suffered a near total loss but European software experts revived the craft.

The ERS satellite mission was declared complete after 20 years.

With continuing developments through 2011, the first ESA Vega launch campaign aimed at an early 2012 liftoff.

China conducted 19 launches in the year, a record for the nation and placing it second behind Russia in terms of liftoffs.

China published a white paper late in the year detailing its future plans and outlining its 2011 successes.

Talking about its Beidou satellite navigation system, the white paper said that it has become one of the world's four core system suppliers , and will gradually provide regional and global navigation and positioning service as well as strengthened compatibility and interoperability with other satellite navigation systems. Indeed many launches were aimed at building this navigation system.

In September, China launched its first space station module, Tiangong-1, which was placed into orbit by a Long March 2F/G carrier rocket flying from the Jiuquan Satellite Launch Centre. Although no manned missions to the space station were conducted in 2011, the unmanned Shenzhou 8, launched as November dawned, docked twice with the module to test its systems ahead of planned 2012 manned dockings.

China's experimental orbiter SJ-11-04, launched by a Long March II-C rocket in August, failed to enter the designated orbit due to a malfunction of the rocket. A small Chinese Mars probe was lost in the Phobos-Grunt mishap.

2011 was a tough year for **Roscosmos**, as a string of high-profile problems occurred.

The crash of the unmanned Progress 44 cargo ship in August temporarily grounded the only launcher that could take people to the International Space Station. Fortunately, investigators found the likely source of the failure - a problem with the third stage of its Soyuz rocket -and a crewed Soyuz rocket launched in November, averting an evacuation of the station.

Russia's Phobos-Grunt probe, which was supposed to return samples from Mars's moon Phobos, got stuck in Earth orbit after launching in November. The spacecraft's thrusters were supposed to fire to send it on a course for the Red Planet, but did not.

Despite these failures, 29 successful launches were conducted using Russian technology – the most by any nation this year. The Glonass navigation system was declared operational.

During 2011, **ISRO** launched eight satellites using its own rocket Polar Satellite Launch Vehicle (PSLV) and one communication satellite GSAT-8 through Ariane 5 from Kourou, French Guiana.

The launch of Indo-French satellite Megha Tropiques to study the tropical weather system made India only the second nation in the world to launch such a space mission.

Launches by other countries in 2011 included six by **Ukraine**, three by **Japan** and one from **Iran**.

Arianespace wrapped up a busy 12 months of commercial launch services - the company lofted a total of 29 payloads using the Ariane 5 and Soyuz members of its launcher family.

International Launch Services conducted 5 commercial Proton launches from Baikonur.

A private space race is developing among companies that hope to ferry NASA astronauts to and from low-Earth orbit. **SpaceX**, **Blue Origin**, **Boeing** and **Sierra Nevada** are all aiming to bring manned spaceflight to the ISS before 2016.

Private suborbital spaceflight also made progress. **Virgin Galactic** conducted more glide tests of its SpaceShipTwo vehicle. The research potential of suborbital spaceflight such as SpaceShipTwo and **XCOR Aerospace**'s Lynx vehicle was highlighted.

One of the most extreme psychological experiments ever – **Mars500** - drew to a close in November when six men emerged from a simulated Mars-bound spaceship after 17 months in isolation.

Two defunct satellites fell to Earth out of control within a month of each other. NASA's Upper Atmosphere Research Satellite (UARS), a climate satellite, plunged into the atmosphere above the Pacific Ocean on 24 September. Germany's Roentgen Satellite, or ROSAT, followed closely, falling back to Earth over the Indian Ocean on 23 October.

II. SPACE TRANSPORTATION

A. Current Launch Activities

The period marked the end of the United States' 30-year Space Shuttle programme and a notable number of emerging successes in the launch vehicle world, and brought vivid reminders to engineers, scientists, and programme managers around the world that spaceflight - despite more than 50-years of combined global experience - remains a challenging technical business.

Three Space Shuttle missions were executed by the United States and International partners during this time period, with the orbiters Discovery, Endeavour, and Atlantis making their final flights on STS-133 (24 Feb 2011), STS-134 (16 May 2011), and STS-135 (8 July 2011), respectively. For each of these missions, the destination was the International Space Station. STS-133 carried the ExPRESS Logistics Carrier, loaded with supplies and consumables for the ISS, a human-like robot called "Robonaut," as well as the Italian-built Leonardo Permanent Logistics Module (PLM), which remained attached to the ISS. STS-134 carried the Alpha Magnetic Spectrometer (AMS) physics experiment to the ISS, as well as the ExPRESS Logistics Carrier. STS-135, the final flight of the programme carried a crew of four, as well as the Raffaello Multi-Purpose Logistics Module. This final flight of the Shuttle program landed 21 July 2011 at the Kennedy Space Center in Florida, USA.

Transfer of human crew and cargo to the International Space Station was also accomplished through the launch of separate Soyuz / TMA missions from the Baikonour Cosmodrome in Kazakhstan. These missions accomplished the safe transit and return of three crew-members per mission to the ISS, facilitating crew-rotation and human access to the ISS independent of the Space Shuttle. Soyuz TMA-20 launched with its three person crew - one member each from Russia, NASA, and ESA - on 15 December 2010. This successful launch was followed on 4 Apr 2011 by Soyuz TMA-21, and on 7 June 2011 by Soyuz TMA-02M. This flight carried a Russian, American, and Japanese astronaut crew.

On 14 November, a Russian government Soyuz rocket launched from Baikonur a manned Soyuz spacecraft to the International Space Station with members of the next Expedition crew (ISS Expedition 29/30). TMA-22 was the final flight of a Soyuz-TMA vehicle, following its replacement by the modernized TMA-M series. The launch of Soyuz TMA-22 was originally scheduled for 30 September 2011, but was delayed until 14 November following the launch failure of the Progress M-12M resupply vehicle on 24 August 2011. Soyuz TMA-22 was the first manned mission to dock with the ISS since the retirement of the American Space Shuttle fleet at the end of the STS-135 mission in July 2011.

Finally, on 21 December 2011, a Russian government Soyuz rocket launched from Baikonur the manned Soyuz TMA- 03M spacecraft to the International Space Station with members of the next Expedition crew (ISS Expedition 30/31). The capsule will remain at the station for about six months, providing an escape pod for the crew.

An important development in international launch cooperation was achieved on 21 October 2011, through the first launch of the Russian Soyuz rocket from the European Launch Site in French Guiana. Carrying the first two Galileo Global Navigation to medium-Earth orbit, the Soyuz and Fregat-MT upper stages performed exceptionally, following a one-day launch delay due to ground equipment concerns.

The Chinese demonstrated major advancements in their independent human spaceflight capabilities

at the end of this time-frame, with the launch of the Tiangong 1 Chinese Space Station aboard a Long March 2/FG rocket on 29 September 2011.

This launch was followed on 31 October by the launch of a Long March 2F rocket from Jiuquan Space Launch centre, carrying the Shenzhou 8 unmanned space capsule, which subsequently docked with the Tiangong 1 space station, demonstrating autonomous rendezvous and docking capability.

Three independent cargo-delivery capabilities to the ISS were executed in this time frame, with launches from Japan, ESA, and Russia. On 22 January 2011, the HTV-2 transfer vehicle "Kounotori-2" was launched aboard an H-2B rocket manufactured by Mitsubishi Heavy Industries and JAXA, from the Tanegashima Space centre in Japan. The "Kounotori-2" carried supplies to the International Space Station, and was then loaded with waste from the ISS and allowed to burn up as it re-entered the Earths' atmosphere.

Less than one month later, on 16 February, ESA's "Johannes Kepler" ATV-2 resupply vehicle was launched aboard an Ariane 5ES rocket from French Guiana. This was the second successful launch and docking of the ATV in as many attempts.

Five uncrewed Progress missions, using Soyuz launch vehicles, were executed from the Baikonour Cosmodrome in Kazahkstan. Progress M-09M was launched on 28 January 2011, Progress M-10M was launched on 27 April, Progress M-11-M was launched on 21 June, and Progress M-12-M launched on 24 August 2011. This fourth flight suffered a launch failure, when the third stage engine was shut down prematurely, and the Progress vehicle failed to make orbit.

The third-stage of the Soyuz has operational commonality between the unmanned and the crewed versions, and therefore this failure had the potential to interrupt human access to the International Space Station until cause was found and corrective action taken. On 30 October, Progress M-13M was successfully launched from the Baikonour Cosmodrome, aboard Soyuz, and bringing back on-line the capacity to resupply and re-crew ISS using Soyuz.

Important scientific and engineering research launches were achieved successfully, a notable suvvess coming at the end of 2010 with a launch on 20 November of a series of satellites aboard a Minotaur IV launch vehicle from Kodiak Launch Complex, Alaska, USA. The launch carried multiple science and technology payloads, including the FastSat-HSV spacecraft. Once on orbit, the FastSat-HSV itself then deployed the separate NanoSail D2 spacecraft, as a test of housing and deploying small nano-satellites "on demand" from an orbiting spacecraft. NanoSail D2 carried an innovative deployable membrane, or "sail," tested as a means to more rapidly de-orbit small spacecraft.

A Ukranian-Russian Zenit-3SLB launch vehicle with Fregat upper-stage lifted off from Baikonour Cosmodrome in Kazahkstan on 18 July 2011 to deploy the Spektr-R Russian radiotelescope for high-resolution astronomical studies of objects through the radio emission they generate through space-based operations as well as joint interferometric observations with radio telescopes on the ground.

On 5 August, NASA launched the Juno probe to Jupiter, aboard an Atlas V launch vehicle from Cape Canaveral Air Force Station, Florida, USA. The second in NASA's "New Frontiers" programme, Juno will require five years to reach the largest planet in our Solar System, and embark on a detailed study of Jupiter, its moons, and near-space environment.

8 September 2011 marked the final scheduled launch of the Delta-II rocket from Cape Canaveral Air Force Station, Florida, USA, with the successful deployment of the Grail spacecraft to perform high-precision gravity measurements of the Moon for NASA.

The final scheduled flight of the Delta-II family occurred on 28 October 2011, with the launch of the United States' NASA/NOAA NPP Earth Observing and weather technology satellite, along with a wide range of smaller payloads for magnetospheric research and technology development.

With a suite of payloads, a Ukraninan-Russian Dnepr-1 rocket lifted off from Dombarovskiy Launch Site in Russia on 17 Aug 2011, carrying a host of experimental communications, navigation, earth observation, and remote sensing satellites from multiple nations. These included the Italian "EduSat" educational satellite, the NigeriaSat-2 remote sensing satellite, the Ukraninan Sich-2 remote sensing satellite, and the Turkish remote sensing satellite RASAT.

Other important Earth Observation and meteorological satellites were also launched during this timeframe. On 20 January 2011, the first launch of the year carried the Russian Elektro-L N1 meteorological satellite into orbit aboard a Zenit-3F rocket with Fregat upper stage from the Baikonour Cosmodrome in Kazahkstan. This was the maiden flight of the Zenit-3F booster. The Indian PSLV launch vehicle delivered its Resourcesat 2 payload to orbit from the Satish Dhawan Space centre on 20 April 2011. NASA's Aquarius/SAC-D mission was launched aboard a Delta-2 rocket from Vandenburg Air Force Base on 10 June 2011 to measure sea-surface salinity and perform other scientific observations of the Earth. Five days later, the Iranian Rasad-1 payload was launched aboard a Safir-B launch vehicle, to deploy this experimental Earth Observation nano-satellite. The Chinese oceanography satellite "HaiYang 2A" was launched on 15 August 2011 aboard a Long March 4B vehicle from the Taiyuan launch centre. The Japanese H-IIA launch vehicle delivered the IGS-4 imaging satellite to low-Earth orbit on 23 September 2011 from the Tanegashima Launch Complex. On 12 October 2011, the Indian PSLV launch vehicle was successfully launched from the Satish Dhawan launch site, carrying the Megha-Tropiques satellite, jointly developed by the Indian Space Research Office (ISRO) and the French National Space Agency (CNES), along with three smaller remote sensing, climatology, and communications payloads.

Commercial satellite launches continued at a notable pace in the time period. On 15 July 2011, India successfully launched its GSAT-12 communications satellite aboard an ISRO PSLV from Satish Dhawan Space Center, India.

Four more Ariane 5 commercial satellite launches took place in 2011, with the first launch delivering Intelsat New Dawn and Yahsat 1A to orbit on 22 April 2011. Less than one month later, on 20 May 2011, an Ariane 5ECA deployed the GSAT 8 and ST 2 commercial communications satellites to orbit. Astra 1N and BSAT 3c commercial communications satellites were lofted by a subsequent Ariane 5ECA launch vehicle on 6 Aug 2011. A final Ariane 5ECA launch in this time-period occurred on 21 September 2011, with the launch of Arabsat 5C and the SES-2 communications satellites, planned for geosynchronous operations.

On 17 December, an Arianespace Soyuz rocket, designated VS02, launched on a mission from the Guiana Space Centre in South America. The Soyuz carried the Pleiades 1 optical high- resolution Earth observation satellite, four CNES/DGA ELISA electronic intelligence satellites and the SSOT remote sensing spacecraft for Chile. The Soyuz 2 rocket used a Fregat upper stage. Arianespace oversaw the launch.

Russian launches within the commercial communications sector included a 20 May 2011 launch of a Proton M / Briz M launch vehicle and upper stage to deploy the Telstar 14R satellite from Baikonour, a 13 July 2011 launch of a Soyuz 2.1a with a Fregat upper stage to loft six satellites in the Globalstar satellite phone constellation, a Proton M/ Briz M combination on 15 July 2011 to orbit the Kazsat 2 and SES 3 payloads, a Proton M / Briz M launch of the Garpun communications satellite on 20 September, and an additional Proton M / Briz M vehicle only nine days later, on 29 September to loft

the QuetzSat-1 Satellite, from the Baikonour Cosmodrome. The next Proton-M /Briz-M launch in this period occurred on 19 October, with the successful launch of the United States' ViaSat-1 Geosynchronous Communication Satellite to orbit.

On 4 November 2011, Russia successfully launched three satellites for its global navigation system Glonass on a Proton-M rocket from its Baikonur cosmodrome in Kazakhstan. The satellites went into their fixed orbits later in the evening. Then on 8 November, the Russian Phobos-Grunt space probe lifted off from Baikonur aboard a Zenit-2SB rocket after a two year delay. Yinghuo-1 was also launched for China. It was the first Russian attempt at an interplanetary mission since 1996 and the first Chinese Mars probe. In its third November launch, Russia's Proton-M carrier rocket was launched from the Baikonur space centre in Kazakhstan on 25 November with a Chinese communications satellite AsiaSat-7. AsiaSat-7 is a new generation satellite designed to replace AsiaSat 3S at the orbital location of 105.5 degrees East. And on 28 November, Russia sent another Glonass-M navigation satellite into orbit. The Soyuz carrier rocket with the Kosmos 2478 (Glonass-M) satellite on board was launched from the Plesetsk space centre.

On 11 December, a Russian government Proton rocket and Breeze M upper stage launched the Israeli Amos 5 communications satellite and the Russian space agency's Luch 5A data relay satellite. The launch took place from Baikonur Cosmodrome, Kazakhstan.

A Ukranian-Russian Zenit-3 Sea Launch booster successfully lofted the Atlantic Bird 7 satellite from its floating Ocean Odyssey launch platform on 27 September 2011. This marked the thirty-first launch for Sea Launch since the programme began in 1999, and the first since 20 April 2009.

On October 6, a Ukranian-Russian Zenit-3SLB launch vehicle flawlessly injected the Intelsat-18 spacecraft into the calculated orbit. It was the fifth successful launch of the launcher from the Baikonur cosmodrome within the Land Launch Programme.

Chinese Long March 3B vehicles deployed the Chinasat-10 commercial communications satellite to orbit on 20 June 2011, the Paksat-1R spacecraft on an 11 August 2011 launch, the Chinasat-1A satellite on 18 September 2011, and Eutelsat W3C on 7 October 2011, each from the Xichang Satellite Launch Center. Additional Long March launches included: 06 July 2011, a Long March 2C from Jiuquan Launch Center, deploying the Shijian 11-03 science and technology satellite; a Long March 3C from Xichang Launch Center, deploying the Tianlian I-02 data relay satellite; and a Long March 2C from Jiuquan on 29 July to orbit the Shijian 11-02 spacecraft. Long March 3A vehicles were successfully launched on 9 April 2011, and 26 July 2011, each carrying BeiDou satellite navigation spacecraft to orbit from Xichan Satellite Launch Center in Sichuan Province, China.

On 9 November, China successfully launched the remote-sensing satellite Yaogan XII from the Taiyuan Satellite Launch Centre in the northern Shanxi province. The satellite will be used to conduct scientific experiments, carry out surveys on land resources, estimate crop yield and help with natural disaster-reduction and prevention. Then on 20 November 2011, China entered on the final phase of its 2011 launch schedule with the launch of two research satellites, the SW-4 Shiyyan Weixing and the Chuang Xin-1 (3), from the Jiuquan Satellite Launch Centre. The launch took place from the 603 (SLS-2) launch complex using a Long March (Chang Zheng) 2D launch vehicle.

A record breaking 16th successful launch of the year for China took place on 29 November, when a Long March 3A (Chang Zheng-3A) launch vehicle orbited a new navigation satellite - another for the BeiDou-2 Compass satellite navigation range - from the Xichang Satellite Launch Centre, in Sichuan Province. This launch broke the previous launch record of 15 successful missions in 2010.

On 19 December, Nigeria put a communications satellite into space to replace one that failed in 2008.

The satellite was launched by Long March 3B/E from Xichang in southwest China. NigComSat-1R, is expected to help boost communications, broadcasting and broadband multimedia services across large swathes of Africa. Then on 22 December, China successfully launched Ziyuan I-02C, a high-resolution remote-sensing satellite, from the Taiyuan Satellite Launch Centre in northern Shanxi province.

The United States launched a GPS 2F-2 spacecraft aboard a Delta IV launch vehicle from Cape Canaveral Air Force Station, Florida, on 16 July 2011, and the Russians successfully launched a Glonass satellite navigation spacecraft aboard a Soyuz 2-1a with Fregat upper stage earlier, on 26 February 2011 from Plesetsk Cosmodrome, Russia.

On 26 November 2011, the United Launch Alliance Atlas 5 rocket launched NASA's Mars Science Laboratory mission from SLC-41, Cape Canaveral Air Force Station, Florida. The centrepiece of MSL is the Curiosity rover, which will assess whether Mars ever was, or is still today, an environment able to support microbial life and to determine the planet's habitability. The rocket will fly in the 541 vehicle configuration with a five-metre fairing, four solid rocket boosters and a single-engine Centaur upper stage.

On 12 December, a JAXA H-2A rocket launched an Information Gathering Satellite (IGS Radar 3) for the Japanese government from the Tanegashima Space Centre.

In the final launch of the year, on 28 December, an Arianespace Soyuz rocket launched six second-generation Globalstar mobile communications satellites from Baikonur. The Soyuz rocket used a Fregat upper stage. Arianespace will oversee the commercial launch. The successful flight came less than a week after a similar rocket crashed somewhere in Siberia.

B. Development Activities

Blue Origin, an emerging space transportation company based in Texas, USA, continued development of their New Shepard launch vehicle, with a late-August 2011 test-flight to approximately Mach 1.2 and an altitude of 45,000 feet, before range safety concerns caused the flight to be terminated through a termination of thrust. In the subsequent crash of the vehicle, the hardware was destroyed.

NASA and aerospace company ATK conducted a full-scale test of a five-segment rocket motor in Utah, USA, on 8 September 2011. This test motor is a larger version of the booster rockets used as part of the Space Shuttle programme, and was originally intended to serve as the first stage of the proposed Ares-I and Ares-V launch vehicles that were a part of NASA's Constellation programme. This test was the third in a series of 5-segment motor tests designed to certify the boosters for flight.

NASA also continued testing and development of the J2-X liquid rocket engine, at the NASA Stennis Space Center in Mississippi, USA. This liquid oxygen/liquid hydrogen engine was selected as the upper stage engine for NASA's Ares-I launch vehicle, and is based on the heritage of the J2 engine design from Apollo. Initial tests were conducted in July 2011, including ignition tests of duration slightly less than 2.0 s.

On 15 December 2010, NASA's Ares Projects Office completed and released a comprehensive technical review of the Ares I-X data gathered during the vehicle's flight test on 28 October 2009. Engineers performed 23 vehicle integration tasks studying flight data in six technical discipline areas (structures, aerodynamics, thermal environments, acoustic environments, venting and vehicle control systems) and six first stage tasks.

This detailed review was aimed at correlating the actual conditions experienced during the test flight with Ares I vehicle design assumptions. The analysis concludes that current NASA engineering design and computer modeling techniques are effective in providing accurate predictions of actual flight conditions for future launch vehicles.

In 2010-2011, within the Ukrainian-Brazilian project on Cyclone-4 Space Launch System development, the access roads to Alcantara launch site were laid and the area for launch site in the jungles of Maranhao State (Brazil) was cleared. Concerning the launch vehicle itself, by the middle of 2011 ¾ of LV structure has been produced within cooperation of Ukrainian enterprises leaded by Yuzhnoye State Design Office.

In November 2010 developers of Taurus-II Integrated LV – Orbital Sciences Corporation (USA) and Yuzhnoye State Design Office (Ukraine) - initiated on-site operations at NASA Wallops Flight Facility (WFF) (Virginia, USA) and Integrated Systems Test Laboratory (Arizona, USA) with the purpose of supporting fire tests and first launch campaign as well as further launches of Taurus-II ILV. For the past year, Electrical Ground Support Equipment and two Core Structures were delivered to WFF; the Cores successfully went through incoming inspection, electrical and pneumatic checkouts. The third Core is currently on its way to WFF. Construction of Launch Pad is being completed; Mission Control Centre and Flight Control Center are being prepared for joint electrical tests. The first demonstration launch (without payload) and the second launch of Taurus-II ILV (with payload) are set for the beginning of 2012.

ESA continued development work on the Vega launch vehicle, with projected payload capacity of 1500 kg to a 90-degree inclination orbit of approximately 700 km in altitude. The first Vega launch from French Guiana, is scheduled for early in the year of 2012. In 2011, Yuzhnoye State Design Office of Ukraine has finished qualification tests of the fourth stage main engine unit for the Vega. The first flight model of the propulsion system was delivered to the customer.

In March 2011, United States' aerospace companies XCOR and United Launch Alliance concluded successful hot-fire demonstrations of a new, lighter-weight aluminium alloy rocket nozzle. The test nozzle is part of a technology and manufacturing pathfinder effort between the two organizations, with the objective of developing a larger liquid oxygen/liquid hydrogen upper-stage engine in the 25,000 to 30,000 lbf thrust-class.

Further development activities during 2011 are set out below.

January

It was reported in January that China was advancing its space capabilities by developing staged combustion, an engine technology that is likely to offer greater performance for the Long March 6 and 7, two of a family of launchers that the country will field around the middle of the decade. The smaller of the two, the Long March 6, may be the first to go into service, beating the flagship third member of the family, the Long March 5 heavy launcher. A new 18- metric-ton-thrust engine "is a high-altitude liquid oxygen and kerosene engine with a staged combustion cycle and has been indigenously designed by China," said national space contractor CASC. >>

NASA told the United States Congress that it did not have the budget to build a new heavy-lift rocket and spacecraft to replace the retiring space shuttle programme. >>

The private spaceflight company Virgin Galactic scored a successful drop test of its SpaceShipTwo

suborbital spacecraft, the latest in a series of solo glides over the California desert for the commercial spaceship. >>

U.S. Space and ATK announced the creation of ViviSat, a new satellite life extension venture. ViviSat provides geosynchronous satellite operators with flexible, scalable, capital-efficient, and low-risk in-orbit mission extension and protection services that can add several years to the revenue-producing life of a satellite. >>

SpaceX announced that it submitted a proposal to NASA last month to start an estimated $1 billion process upgrading the company's Dragon capsule, the first step in making the ship ready for crew rotation flights to the International Space Station. >>

To support the European ExoMars Mission to explore the Red Planet, an international project was launched with the aim of simulating the entry of spacecraft into the martian atmosphere. The project team is made up of German, Russian and Italian scientists and will be coordinated by the Supersonic and Hypersonic Technology Department at the German Aerospace Center (DLR) Institute of Aerodynamics and Flow Technology. Researchers are simulating the martian atmosphere in a wind tunnel at the DLR site in Cologne. >>

A Canadian satellite maker planned to launch a network of 78 small, relatively low- flying satellites designed to help relieve network congestion. The project has been developed by MSCI (Microsat Systems Canada Inc) and is called CommStellation. The company said that its approach of using small, inexpensive satellites in low orbit - about 620 miles above the Earth - means better coverage of the world's population, quicker launches and better network capacity. >>

Space researchers at the University of Surrey and Surrey Satellite Technology Limited (SSTL) announced the development of 'STRaND-1', a satellite containing a smartphone payload that will soon be launched into orbit around the Earth. STRaND-1 (Surrey Training, Research and Nanosatellite Demonstrator) is being developed by the Surrey team to demonstrate the advanced capabilities of a satellite built quickly using advanced commercial off-the-shelf components.

February

It was announced that NASA's Mars Science Laboratory rover, Curiosity, would carry a next generation, onboard "chemical element reader" to measure the chemical ingredients in Martian rocks and soil. The instrument is one of 10 that will help the rover in its upcoming mission to determine the past and present habitability of a specific area on the Red Planet. >>

Europe has been given the go-ahead with the $4.6 billion project to build a next- generation weather satellite system. Eumetsat said that all participating nations had now agreed to the programme and its financing. The new system should bring a change in weather forecasting capability, guaranteeing European access to space- acquired meteorological data until at least the late 2030s. >>

Russia will launch probes to several planets and their satellites, Russia's Federal Space Agency (Roscosmos) said. The probes are expected to study the moon and the Martian satellite Phobos, as parts of a dozen of projects in astrophysical and solar research before 2023. >>

March

The European Space Agency selected four mission ideas for a launch that is scheduled for sometime in the early 2020s. The mission ideas include investigations of black holes and general relativity, near-Earth asteroid sample-return, and studies of far-away planets orbiting other stars. >>

A Mercury probe survived a scorching test run in a giant oven, showing that the craft can withstand the heat of the solar system's innermost planet. The BepiColombo mission is slated to launch in August 2013. >>

A Chinese senior space technology expert said that China is expected to launch its first space laboratory before 2016. As the second phase of China's manned space programme, the lab, likely to be named Tiangong-2, will gradually be developed into the core module or experiment module. >>

Roscosmos plans to deploy a constellation of weather satellites in the orbit in a couple of years, Roscosmos Deputy Head Anatoly Shilov told Interfax-AVN. >>

The joint Mars exploration - ExoMars - envisioned by the US and Europe was set for an overhaul, following an announcement by the Americans that their part of the budget is critically short of funds. NASA and ESA had agreed to send two rovers to the Red Planet in 2018. In Europe's case, this vehicle is already designed and about to be built. >>

Boeing announced that it had completed the Preliminary Design Review (PDR) for the Inmarsat-5 spacecraft and hosted payloads. Boeing is building three Ka-band satellites to add to Inmarsat's current mobile satellite services fleet. >>

Europe's largest telecom satellite is taking shape with final assembly and testing begining in Toulouse, France. Planned for launch in late 2012 on Ariane 5, Alphasat will provide advanced mobile communication links for commercial operator Inmarsat. The Alphabus platform, developed by Astrium and Thales Alenia Space under a joint ESA and French space agency (CNES) contract, is Europe's coordinated response to the increased market demand for larger telecommunication payloads. >> >>

Aerospace firm MDA announced plans to launch a service station satellite into orbit by 2015, to refuel and repair ailing spacecraft. The vehicle, named Space Infrastructure Servicing (SIS), will go up with a full tank of fuel to siphon off into other commercial and government satellites. When the pump runs dry, a fresh source of space-petrol will be sent up to the SIS. >>

NASA and DARPA are spending $1 million on project to help enable a starship ride in the 2100s. >>

It was reported that Thales Alenia Space will supply telecommunications equipment for Orbital's Cygnus Spacecraft. The Thales Alenia Spanish company currently provides advanced telecommunications systems worth more than 4 million Euros for International Space Station resupply vehicles >>

International Launch Services (ILS) and SES announced the launch of SES-6 in 2013 on ILS Proton. SES-6 is the sixth mission under the SES Multi Launch Agreement (MLA) signed in June 2007 between ILS and SES Satellite Leasing Limited, SES's satellite procurement and leasing company in the Isle of Man. >>

Test launches of Russia's new generation Angara booster rockets will begin no later than 2013, a spokesman for the Russian Space Forces said. >>

April

Almost a year after it was suggested that an exploration vehicle should be developed that would take crews from low Earth orbit to many solar system destinations such as asteroids and lunar circumnavigation, NASA proposed NAUTILUS-X, which stands for Non-Atmospheric Universal

Transport Intended for Lengthy US space eXploration. >>

Taiwan's Chunghwa Telecom Co and Singapore Telecommunications Limited (SingTel) announced that they would launch a second joint venture telecommunications satellite in May. The ST-2 satellite was built by Japan's Mitsubishi Heavy Industries. >>

The Turksat 4A and Turksat 4B telecommunications satellites under construction by Mitsubishi Electric Co. (Melco) will be launched on International Launch Services (ILS) Proton rockets in 2013 and 2014. Each satellite, based on Tokyo-based Melco's DS2000 satellite platform, is expected to weigh 3,800 kilograms at launch. ILS has said the satellites, which are far below the maximum weight that the Proton rocket can place into geostationary orbit, are likely to benefit from the extra power through a longer in-orbit service life. >>

Elon Musk of SpaceX unveiled the final specifications and launch date for the Falcon Heavy, the world's largest rocket. "Falcon Heavy will carry more payload to orbit or escape velocity than any vehicle in history, apart from the Saturn V moon rocket, which was decommissioned after the Apollo programme" he said. >>

Boeing was reported as bidding for work on NASA's Commercial Crew Development programme and heavy-lift rocket capability. >>

An interplanetary spacecraft for a flight to Mars will be created no earlier than 2025, and the maiden flight to the red planet is possible only after 2035, then Russian space agency Roscosmos chief Anatoly Perminov said. >>

Private rocket builder SpaceX is trying to speed up testing of its new Dragon spaceship to enable it to visit the International Space Station on the next demonstration flight. >>

A technology demonstration satellite project part-funded by the UK's national innovation agency is ready to start construction having passed its Preliminary Design Review (PDR). TechDemoSat-1 will function as a combined orbital testbed and showcase for some of UK industry's most promising space technology, aimed at winning substantial international business in the future. It will give participating companies early flight heritage - lack of which is a traditional barrier to market acceptance. >>

It was reported that launcher and pad preparations to boost the Ukraine-built Cyclone-4 from Brazil's Alcantara launch centre were entering their final phase, with the goal of completing the qualification liftoff in 2012. Discussions between Ukraine and Brazil to jointly work on a Delta II-class launcher and launch site in northern Brazil date back to the 1990s and have been officially underway since 2003. >>

Russia is planning to develop a new carrier rocket by 2015 while continuing the work on the Angara family of space boosters, Prime Minister Vladimir Putin said. The Rus-M carrier rocket is being developed by the Energia space corporation, to launch new- generation spacecraft from the Vostochny space centre currently under construction in the country's Far East. >>

India could be part of the 2016 NASA Lunar Mission with its space agency ISRO mulling a collaboration with the US-based Jet Propulsion Laboratory on study of farther side of the moon. "We are in the planning phase, for a joint mission with Jet Propulsion Laboratory (JPL) of the NASA. The mission involves getting samples from the moon and JPL wanted ISRO to get the communication module," ISRO Chairman K Radhakrishnan said. >>

Blue Origin is planning a reusable launch vehicle. The RLV would carry its biconic seven-seat capsule to low Earth orbit. >>

NASA agreed to pay approximately $100 million to Orbital Sciences Corp. for a test flight of the Taurus 2 rocket to reduce risk on future launches to resupply the International Space Station, company officials said. >>

Authorities in charge of the Chinese manned space programme unveiled plans to build a 60-ton space station, made up of three capsules, and develop a cargo spaceship to transport supplies. The China Manned Space Engineering Office said at a news conference that it also wants the public to get involved by suggesting names for the space station, due to completed around 2020. >>

Integral Systems, Inc., announced that it has received an Authorization to Proceed from Orbital Sciences Corporation to provide the major ground segment elements for the MEXSAT-3 satellite programme. MEXSAT-3 is being built by Orbital for Boeing Space & Intelligence Systems as a part of a three-satellite, turnkey geomobile satellite system awarded to Boeing in December. An Orbital STAR2 satellite will provide the complete Fixed Satellite Services (FSS) of the MEXSAT satellite system for the Federal Government of Mexico. >>

China started building a test satellite to detect electromagnetic anomalies in the atmosphere, as part of the country's proposed earthquake monitoring network, and hopes to launch it in 2014. The China Seismo-Electromagnetic Satellite (CSES) has been in development since 2003 and is the first spaced-based component of the network. Its data will be correlated with data from ground-based monitoring systems. The network is eventually intended to provide advance warning of earthquakes, such as the one off the coast of Japan in March. >>

Arianespace has confirmed the launch date for Asia Broadcast Satellite's (ABS) ABS-2 spacecraft, which will be orbited by a heavy-lift Ariane 5 in 2013. Manufactured by Space Systems/Loral using an LS-1300 platform, ABS-2 will weigh more than 6,000 kg. at launch. It is fitted with C, Ku, and Ka-band transponders, and is to provide optimized direct TV broadcast, multimedia applications, telecommunications and data transmission services for Asia, Russia/CIS, Africa and the Middle East. >>

Goodrich Corporation, the prime contractor for the Operationally Responsive Space-1 (ORS-1) satellite, announced that the pre-ship review was successfully completed and the satellite is being prepared for shipment to Wallops Island Flight Facility. >>

May

NASA has selected three science investigations for a potential 2016 mission that would look at Mars' interior for the first time; study an extraterrestrial ocean on one of Saturn's moons; and study in unprecedented detail the surface of a comet's nucleus. >>

Three ambitious space missions have made NASA's shortlist for a planned robotic planetary expedition to launch in 2016. The candidates include a mission to glimpse Mars' interior, a voyage to the extraterrestrial sea of Saturn's moon Titan, and a probe to take an unprecedented look at the surface of a comet's core. >>

Europe and the US could be building a spaceship together later this decade. It is one of the ideas being considered as Europe ponders the next evolution of its ATV orbital freighter. >>

Continuing its programme of commercial launch of foreign satellites, ISRO has lined up launch of an

image capturing satellite of France next year. The French satellite SPOT (Satellite Pour l'observation de la Terre) is a high-resolution, optical imaging, earth observation satellite system. Currently SPOT 5 is working in the space and is expected to be withdrawn by the end of 2013. India will launch the SPOT 6 satellite, which will provide continuous high definition images of earth. >>

ISRO decided to review the entire Geosynchronous Satellite Launch Vehicle (GSLV) programme that involved two crashes last year and one in 2006. As a result, all major launches, including the second moon mission - Chandrayaan 2 - are being rescheduled. The space agency had earlier announced that it would be using the last of the seven cryogenic engines it had sourced from Russia, but is now uncertain about it. >>

Titan, Saturn's largest moon, has numerous lakes and seas. But they're not bodies of water - Titan's reservoirs are full of liquid hydrocarbons such as methane. NASA is now considering building a boat to sail the seas of Titan. The space agency awarded a team of scientists $3 million to develop the idea. >>

NASA will launch a spacecraft to an asteroid in 2016 and use a robotic arm to pluck samples that could better explain our solar system's formation and how life began. >>

NASA announced it was seeking proposals for services from commercial suborbital flight providers and payload integrators to support the agency's Flight Opportunities Program. >>

The KSLV-II rocket with satellite is set for launch in 2021. The Korean Standard Launch Vehicle-II (KSLV-II) is tasked with carrying a 1.5 ton-class satellite at the top (phase 3 rocket) into space and placing it into a targeted orbit. The Education, Science and Technology Ministry plans to invest 1.5 trillion won (1.35 billion U.S. dollars) to launch the KSLV-II in 2021 at Naro Space Centre in Goheung, South Jeolla Province. >>

Thailand's Information and Communication Technology Ministry (ICT) has given Thaicom PCL the go-ahead to launch a new satellite, Thaicom 6. >>

June

ISRO scientists are revisiting the sequel to the country's prestigious moon mission - Chandrayaan-2. The space agency has realised that the advanced GSLV MK-III won't be available by 2014. The Plan B is to launch the mission using GSLV F-series once it clears its next mission. >>

ESA and NASA announced the scientific investigations selected for their 2016 ExoMars lander demonstrator. They will probe the atmosphere during the descent, and return the first ever data on electrical fields at the surface of Mars. >>

A European-built robot space plane could be flying in orbit before the end of the decade if the project's planning discussions come to fruition. >>

India will undertake the flight test of its indigenous cryogenic stage onboard homegrown rocket GSLV-D5 which will launch GSAT-14 by the middle of 2012, a top ISRO official said. >>

Russian Reshetnev Information Satellite Systems company and Kazakhstan's National Centre of Space Communications (RTSKS) signed a contract to develop the third Kazakh satellite KazSat-3. In addition, ISS and Thales Alenia Space signed a subcontract to produce KazSat payload items. >>

ESA and Thales Alenia Space Italia announced an agreement at the Paris Air & Space Show to begin

building the IXV Intermediate eXperimental Vehicle for its mission into space in 2013. >>

It was reported that test flights of the Virgin Galactic's commercial suborbital SpaceShipTwo space plane were proceeding smoothly toward its first passenger launches. >>

A NASA F/A-18 jet, with attached experimental radar to be used on the Mars Science Laboratory Mission, attempted to simulate what radar will see during entry into Martian atmosphere. Dives from 40,000 feet at angles of 40-90 degrees were completed. >>

Jean-Jacques Dordain, head of the European Space Agency, stressed that Europe won't design its own rockets or new spacecraft for manned missions, but may contribute to international efforts. >>

July

Mirror polishing was reported as complete for the James Webb Space Telescope (JWST). >>

Charles Bolden, NASA Administrator, said that he saw 2017 as a date for the first flight of Orion/SLS. >>

Through a new agreement, United Launch Alliance (ULA) will provide technical information to NASA about using the Atlas V rocket to launch astronauts into space. >>

Eutelsat has assigned the launch of its Atlantic Bird 7 communications satellite to Sea Launch. >>

Researchers at the University of Colorado completed NASA's "critical design review." Formally named the Mars Atmosphere and Volatile Evolution, or MAVEN, the mission's goal is to collect information about Mars' thinning atmosphere and its climate. >>

ViaSat said that the launch of its $400 million ViaSat-1 broadband Internet satellite has been delayed about six weeks because of additional testing on solar arrays. >>

It was reported that the Indian Space Research Organisation hopes to be ready to return its heavy-lift Geosynchronous Satellite Launch Vehicle (GSLV) to flight by March 2012. >>

August

NASA announced it was seeking proposals for small satellite payloads to fly on rockets planned to launch between 2012 and 2014. >>

ESA was considering a plan to scale back or eliminate the entry, descent and landing element of the Mars 2016 robotic mission. >>

Chinese space launcher builder CALT had made 170 modifications to the Long March 2F rocket that would loft the Tiangong 1 docking target, reported national space conglomerate CASC. >>

China will put into space a high-definition civil survey satellite, the first of its kind in the country, at the end of this year, said an official of the National Administration of Surveying, Mapping and Geoinformation. The satellite, ZY 3, would be launched from the Taiyuan Satellite Launch Centre in north Shanxi Province on a Long March 4B carrier rocket. >>

The European Space Agency's Don Quijote mission aims to smash an impactor into a small asteroid with enough force to change its trajectory. >>

A spaceship that could carry the next wave of astronauts to an asteroid or beyond is being prepared for a new round of tests at a Lockheed Martin facility near Denver. >>

ESA said a joint mission with Russia to the Red Planet was in the pipeline. >>

NASA selected three proposals as Technology Demonstration Missions to transform space communications, deep space navigation and in-space propulsion capabilities. >>

The Pressurized Cargo Module (PCM) for Orbital Science Corporation's Cygnus commercial cargo spacecraft for ISS resupply, arrived at NASA's Wallops Flight Facility. The PCM was built for Orbital by Thales Alenia Space in Torino, Italy. The first Cygnus cargo flight to ISS is expected in 2012.

Researchers from Beijing's Tsinghua University have revealed plans to divert the asteroid Apophis - which may well collide with Earth in a couple decades - by smashing a kamikaze solar sail into it. >>

Managers have concluded that the James Webb Space Telescope (JWST) will cost about $8.7 billion to finish in time for launch in 2018 and operate for five years. >>

Representatives of Brazil and China have scheduled for November 2012 the launch of a China Brazil Earth Resources Satellite (CBERS 3), the fourth Sino-Brazilian satellite in the space programme involving the two countries. Sixty technical officials from Brazil's INPE National Space Research Institute will be sent to China to ensure that the satellite is launched in November 2012. >>

September

ISRO plans to build a new class of powerful communication satellites that packs more capacity and new technologies, its chairman K Radhakrishnan said. This kind of spacecraft would handle larger amount of power and accommodate more number of transponders in the same satellite, he said adding ISRO planned to incorporate new technologies in them and get into higher bands. >>

The installation of high-temperature thermal blankets on the Structural and Thermal Model of the BepiColombo Mercury Planetary Orbiter has been completed. The spacecraft has been mounted on its Thermal Test Adapter and transferred to the Large Space Simulator in preparation for thermal-balance testing. >>

Hispasat will launch its Amazonas-3 telecommunications satellite atop an Ariane 5 rocket in late 2012 or early 2013. >>

The landmark maiden voyage of China's large-thrust Long March-5 carrier rocket is expected to take place in 2014 as Chinese scientists completed major part of its production. The Long March-5 rocket is scheduled to be put into service in 2014, said Liang Xiaohong, the deputy head of the China Aerospace Science and Technology Corporation (CASC) affiliated China Academy of Launch Vehicle Technology, which designs and produces the rocket. >>

The rocket design that will take humans to asteroids, Mars and beyond was unveiled by the US space agency. The Space Launch System (SLS), as it is currently known, will be the most powerful launcher since the Saturn V rockets that put men on the Moon. Atop it, NASA plans to use the Orion Multi-Purpose Crew Vehicle, a capsule not unlike those of the moonshots. The agency says the first launch of the SLS is expected to take place towards the end of 2017. >> >>

China will launch its lunar probe Chang'e-3 around 2013, which is expected to conduct the first soft landing of a Chinese spacecraft on an extraterrestrial body. The mission of Chang'e-3 is to land on the

moon safely and carry out a large number of experiments, according to sources with State Administration of Science, Technology and Industry for National Defence. >>

Russia's first Earth remote sensing satellite, the Kondor, may be launched in January 2012, a space official said. "We are developing the Kondor and Arkon [satellites]," deputy head of the Russian space agency Roscosmos Anatoly Shilov said. "Arkon is a distant future, but Kondor will hopefully fly in January." >>

NASA selected 11 science proposals for evaluation as potential future science missions. The proposals outline prospective missions to study the Earth's atmosphere, the sun, the Milky Way galaxy, and Earth-like planets around nearby stars. >>

October

The Canadian Space Agency is looking at making a case for launching a proposed pair of satellites that could improve weather forecasting and telecommunications in the Arctic. >>

A public-private partnership contract signed with Astrium means that ESA is moving ahead with an independent, European satellite system that will speed up the transmission of large quantities of data beginning in 2014. >>

The powerful influence of the Sun and the nature of the mysterious 'dark energy' motivate ESA's next two science missions. Solar Orbiter and Euclid were selected by ESA's Science Programme Committee for implementation, with launches planned for 2017 and 2019. >>

NASA selected nine proposals to demonstrate new technologies for the second set of payloads to fly on commercial suborbital reusable launch vehicles and the Zero-G commercial parabolic aircraft. >>

The development phase of a new synthetic aperture radar (SAR) satellite system has been completed, offering coverage of any spot on Earth in all conditions. Surrey Satellite Technology Limited (SSTL) has combined an adapted version of its SSTL-300 satellite, plus S-band SAR payload developed with Astrium, to create the 400kg NovaSAR-S system. >>

The Russian space agency has dropped plans to construct a new Rus-M carrier rocket by 2015, Roscosmos head Vladimir Popovkin said. "We have come to the conclusion that we do not need a new rocket, we can continue using those we already have," Popovkin said. >>

The U.S. is preparing to launch a developmental spacecraft designed to preview a long-delayed network of satellites for weather forecasting, storm tracking and climate-change studies. The satellite was developed as a pathfinder for the National Polar-orbiting Operational Environmental Satellite System (NPOESS) programme, an effort to marry civil and military weather satellite requirements into a single system. After years of delay and ballooning cost estimates, that programme was scrapped in 2010 and split once again into separate civil and military efforts, led by the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Air Force. >>

India and France eyed another milestone of a new satellite dedicated to environment monitoring. "The forthcoming launch of SARAL, a joint satellite to study sea surface altitude would be another milestone in space cooperation," a joint statement issued after the discussions said. >>

The Vega launch vehicle programme took several major steps towards operation: the decision has been made to start the qualification launch campaign; ESA and Arianespace have ordered four new launchers; studies for the launch of the LISA Pathfinder mission have started. >>

November

The Australian Optus 10 satellite will be launched into geostationary transfer orbit mid-2013 by an Ariane 5 from the Guiana Space Centre. >>

Iran will launch a locally built satellite into orbit in its next calendar year, which starts on March 20, the Iranian Students News Agency reported. The satellite, named Tolou, is intended to stay in space for three years, according to the report. >>

At the root of Earth's climate change is the amount of radiant energy both entering and leaving the planet. With so little known about the changing climate, a new space-based monitoring system promises to provide much more detail about the differences in that radiant energy. This system, which is being proposed by researchers at The Johns Hopkins University Applied Physics Laboratory (APL), is dubbed Earth's Radiation Imbalance System (ERIS). It would comprise small radiometers-each roughly the size of a red clay brick-integrated into each of the 66 satellites within Iridium's next-generation NEXT constellation (scheduled for deployment in 2015). >>

Once the pacing item for the defunct Ares I crew launch vehicle, the Saturn-heritage J-2X may not fly until well into the 2020s. >>

Up to four launches of Zenit-3SL rockets could be carried out in 2012 under the Sea Launch project, RSC Energia President and General Design Engineer Vitaly Lopota was quoted as saying. >>

Arianespace and DIRECTV announced a new launch contract for a satellite providing services for DIRECTV Latin America. The launch will take place in 2014 from Europe's Spaceport in French Guiana on an Ariane 5. >>

The Pleiades 1 Earth observation satellite payload for Arianespace's second Soyuz mission from French Guiana was undergoing pre-launch checkout at the Spaceport as this platform is readied for flight with five co-passengers. Built by prime contractor EADS Astrium for the French CNES space agency, Pleiades 1 will provide military and civilian users with very high resolution optical satellite images. >>

December

The UK government has awarded a contract to British firm Surrey Satellite Technology (SSTL) to launch an innovative radar Earth observation satellite based on the company's NovaSAR platform. >>

Shenzhou 9 is expected to lift off at some time in late March 2012. This will give China enough time to digest the results of the Shenzhou 8 mission and prepare the next spacecraft for launch. It also coincides with the time when Tiangong will fall from its currently raised orbit to a more accessible lower altitude. >>

ESA's Gaia star-mapper has passed a critical test ahead of its launch in 2013: the spacecraft's sunshield has been deployed for the first time. >>

China will develop the third-generation Fengyun series weather satellite to monitor meteorological changes more accurately and persistently to help tackle climate change. The new sets will be able to monitor the meteorological system and different layers of the atmosphere in a long-term and more consistent way to provide scientific evidence for research on climate change, Yu Rucong, deputy director of the China Meteorological Administration (CMA), said at a seminar on Monday >>

A new earth observation satellite is to be launched, tracing different gases and aerosols in the air. The compact satellite, known as Sentinel 5 Precursor (S5P), is a next- generation imaging absorption spectrometer that will trace chemical species from protective gases such stratospheric ozone to damaging pollutants like sulphur dioxide. The 45.5 million (40m) project is one of many satellites commissioned by the EU under the Global Monitoring for Environment and Security (GMES) programme. >>

The GSLV (Geo-Synchronous Launch Vehicle)-Mk (Mark)-III that is to be launched by ISRO for experimental purposes next year is designed to place a communication satellite in orbit, according to K. Narayana, honorary adviser and former director of the Sathish Dhawan Space Center (SDSC), ISRO, SHAR (Sriharikotta). >>

ESA and NASA have begun redesigning a two-pronged robotic Mars mission to accommodate greater participation by Russia. >>

NASA announced the launch target for Space Exploration Technologies' (SpaceX) second Commercial Orbital Transportation Services (COTS) demonstration flight as 7 February 2012. Pending completion of final safety reviews, testing and verification, NASA also has agreed to allow SpaceX to send its Dragon spacecraft to rendezvous with the International Space Station in a single flight. >>

O3b Networks Limited, the developer of a global, high-speed, satellite-based Internet network for telecommunications operators and ISPs, has exercised the first of the two options in its contract with Arianespace for an additional launch in 2014 for the O3b Networks' satellite constellation. >>

Andrews Space, Boeing and Lockheed Martin designs aim to cut by half the cost of space launches. >>

Europe's Arianespace launch consortium said it will launch two European Sentinel Earth observation satellites between 2014 and 2016 in the first two commercial contracts signed for the new Vega small-satellite launcher, which is still in development. Vega is expected to make its first launch in the first quarter of 2012, joining the European version of Russia's Soyuz rocket alongside Europe's heavy-lift Ariane 5 vehicle in operations from Europe's Guiana Space Center in French Guiana. >>

Software billionaire Paul Allen is teaming up with SpaceX and aerospace guru Burt Rutan to offer an air-launched orbital delivery system. >>

A $5.5 billion upgrade to the Global Positioning System moved a step closer to launch when a prototype arrived at a Lockheed Martin complex in Colorado to begin months of tests. >>

The launch of ESA's IXV Intermediate eXperimental Vehicle on Europe's new Vega rocket is now in detailed planning, a major step towards the craft's flight in 2014. >>

Belarus' Earth-imaging satellite is expected to be launched into orbit in the first half of 2012, Pyotr Vitsyaz, deputy chairman of the Belarusian National Academy of Sciences, told reporters in Minsk. >>

SSTL completed another milestone in the UK's technology demonstration satellite TechDemoSat-1 with the successful testing of the engineering model of the first payload, a novel charged particle spectrometer design. >>

NASA successfully conducted a drop test of the Orion crew vehicle's parachutes high above the Arizona desert in preparation for its orbital flight test in 2014. Orion will carry astronauts deeper into space than ever before, provide emergency abort capability, sustain the crew during space travel and

ensure a safe re-entry and landing. >>

China will launch its first-ever high-resolution geological mapping satellite for civil purposes next January, according to official sources. The Ziyuan III satellite will be launched aboard a Long March 4B carrier rocket from the Taiyuan Satellite Launch Center in northern China's Shanxi province. >>

Cryogenic testing is complete for the final six primary mirror segments and a secondary mirror that will fly on NASA's James Webb Space Telescope. >>

ILS has informed SES that the launch of the Proton launch vehicle with the SES-4 satellite was postponed for approximately 25 days for technical reasons with the avionics system of the launch vehicle's Breeze M upper stage. The additional time is needed due to the destacking and replacement of the affected avionics unit. The satellite was built by Space Systems/Loral. >>

Orbcomm Inc. and Space Exploration Technologies (SpaceX) announced the launch schedule for Orbcomm's second generation (OG2) satellites. >>

C. Launch failures and investigations

The first failure of the year occurred on 1 February, when a Rokot with a Briz-KM upper stage placed a Geo IK-2 N1 geodesy satellite (Kosmos 2470) into a wrong orbit after a launch from Plesetsk Cosmodrome. The failure was later traced to a software problem on the Briz-KM. On 28 February, Russian Space Forces grounded further launches of Rokot >>

On 4 March 2011, NASA's Glory mission launched from Vandenberg Air Force Base in California and failed to reach orbit. The new Earth-observing satellite was intended to improve our understanding of how the sun and tiny atmospheric particles, called aerosols, affect Earth's climate. Glory was also intended to follow Calipso as part of international constellation to study the climate change. It was the second straight failure for the Taurus XL rocket, which appeared to be connected to the rocket failing to release its payload. KySat-1, Hermes and Explorer-1 [PRIME] CubeSats were also lost in the failure.

On 9 March, NASA selected the members of the board that would investigate the unsuccessful launch. >>

Reporting in June, a failure analysis committee found no design problems with India's Geo-Synchronous Satellite Launch Vehicle (GSLV), despite two successive failures in 2010. "We had the opportunity to look at all aspects of [the] GSLV, at not only the missions that failed but also the successful missions," said G. Madhavan Nair, the chairof the failure analysis committee. "We could not find any design deficiency with respect to the GSLV."

India's GSLV programme suffered a major setback when the GSLV (D3) and the GSLV-F06 suffered back-to-back failures in April and December 2010, with the rockets plunging into the Bay of Bengal minutes after liftoff. >> >>

Korea and Russia planned to set up a joint investigation panel to determine the exact cause of the failed launch of a space rocket last year, the Korean government said. >>

On 24 August 2011, Progress M-12M (44P) blasted off from Baikonur. However, 325 seconds into the flight, the carrier's third stage engine automatically shut down due to failure of the gas generator,

causing the cargo craft to crash in the Altai mountains. The 2670 kg of cargo, fuel, air and water was lost.

The launch failure of Progress M-12-M was the third consecutive launch failure or anomaly world-wide, within the span of 13 days. On 17 August, A Proton M rocket with Briz M upper stage carried the Express AM-4 communications satellite to orbit. However the spacecraft failed to separate from the third stage of the launch vehicle, placing the spacecraft in an off-nominal orbit. Recovery actions were unsuccessful, and the satellite was declared to be totally lost. The following day, 18 August 2011, a Chinese Long March 2C rocket experienced a failure of the second stage upon liftoff from the Jiuquan Satellite Launch Center in Gansu Province, China. The Shijian 11-04 satellite payload was lost in the launch. It occurred due to a failure in the launcher's second stage attitude control system, Chinese space officials later announced.

Kazakhstan said, despite reports to the contrary, that it did not plan to ban launches of Russian rockets from its space centre in Baikonur after the accident with Progress M-12M space freighter. >>

Russia blamed a one-off production fault in a rocket engine for the crash but nevertheless ordered checks of all similar rocket motors. The Russian space agency Roskosmos said in a statement that the motor of the third-stage rocket blasting the craft into orbit failed because a blocked duct cut fuel supply to its gas generator. >>

On 14 September, a special commission investigating the causes of the launch recommended enhancing the control of the production of engines for Soyuz rockets, Russian space agency Roscosmos said. A Soyuz rocket engine failure resulted in the loss - the first loss of a Progress freighter in the history of Russia's space industry. >>

Also on 4 August, an unmanned spacecraft funded by Amazon.com CEO Jeff Bezos veered off course and had to be destroyed. The incident with the Blue Origin LLC-developed vehicle occurred at the company's spaceport in West Texas. >>

It was reported in September that the Akatsuki space probe's mission to Venus was close to failure because its engine is too damaged to manoeuvre it into an orbit close enough to observe the planet's atmosphere accurately, the Japan Aerospace Exploration Agency said. >>

An attempt in October by Iran to launch a rocket carrying a live monkey into space in September has met with failure, stalling the country's programme to pursue a human spaceflight capability, according to press reports. >>

On 8 November 2011, the Phobos-Grunt craft was successfully launched by a Zenit-2 booster rocket from the Russian-leased Baikonur cosmodrome in Kazakhstan. It separated from the booster about 11 minutes later and was to fire its engines twice to set out on its path to the Red Planet, but never did. >>

The spacecraft was stuck in Earth orbit instead, after its engine failed to ignite to send the probe on a trajectory to the Red Planet. The spacecraft, which was Russia's first attempt at an interplanetary mission since the 1996 Mars 96 mission, disintegrated over the Pacific Ocean on 15 January 2012. >> >> >>

On 23 December 2011, Russia's recent poor launch record continued with another Soyuz rocket failure. A Soyuz-2 vehicle failed to put a communications satellite into orbit after lifting away from the country's Plesetsk spaceport. Debris re-entered the Earth's atmosphere near the western Siberian town of Tobolsk. The rocket was carrying a Meridian-5 satellite, designed to provide communication

between ships, planes and coastal stations on the ground, according to RIA Novosti. The third stage engine malfunctioned 421 seconds after launch in the first launch conducted by the Russian Aerospace Defence Forces. >>

III. ROBOTIC EARTH ORBITAL ACTIVITIES

A. Remote Sensing

15 January 2011: The Nagpur state government announced that satellite images of Indian Space Research Organisation would be used to determine the areas that need to be given economic priority. ISRO's geo remote sensing (GRS) images would be used to find out availability of ground as well as surface water and its quantum at various locations. >>

27 January 2011: Warmer summers may paradoxically slow down the speed of glaciers flowing towards the sea, suggests new research. This investigation, using data from ESA's oldest environmental satellite, ERS, has important implications for future estimates of sea- level rise. >>

29 January 2011: A satellite project co-founded by actor George Clooney confirmed reports of company-sized deployments of Sudanese Armed Forces troops in the Abyei region of Sudan. The Satellite Sentinel Project spotted the troops on both sides of the volatile North-South border in numbers consistent with other sources that estimate as many as 55,000 SAF troops along the South Kordofan border. >>

5 March 2011: ESA's GOCE satellite has reached its ambitious goal of mapping Earth's gravity with unprecedented precision. In two short years, the sophisticated satellite has collected the measurements needed to record the 'geoid' reference shape of our planet. >>

6 March 2011: Researchers from the US have used remote-sensing data to put together the first- ever annual maps showing forest-cover loss on the islands of Sumatra and Kalimantan, Indonesia. >>

11 March 2011: The National Oceanic and Atmospheric Administration (NOAA), a US federal agency focused on the condition of the oceans and the atmosphere monitored a tsunami after the morning's deadly Japan quake, by using its satellite fleet. >>

13 March 2011: It was announced that micro-satellites specialist Surrey Satellite Technology Ltd. hoped soon to be preparing for launch of a new synthetic aperture radar payload that could bring a dramatic new capability to its Earth observation customers. A SAR-capable spacecraft has been in development by the company since 2009. SSTL partner Astrium and the Surrey Space Centre made payload tests on an airborne platform last year and the payload and platform this February passed its preliminary design review, so a spacecraft could be available for launch in 2013. >>

18 March 2011: The German Remote Sensing Data Center (Deutsches Fernerkundungsdatenzentrum; DFD) and the German Space Operations Center (GSOC), both of which are part of the DLR, were continuing to provide as much data as possible from the two German radar satellites, TerraSAR-X and TanDEM-X, for the assessment of damage caused by the tsunami in Japan. Radar data, in contrast to data from optical satellites, can be acquired independently of cloud cover or time of day and allow precise identification of the flooded and destroyed areas on the east coast of Japan. >>

29 March 2011: A NASA-funded study revealed widespread reductions in the greenness of Amazon forests caused by last year's record-breaking drought. >>

31 March 2011: ESA's Envisat satellite measured record low levels of ozone over the Euro-Atlantic sector of the northern hemisphere during March. >>

5 April 2011: It was announced that development of the first two satellites being built for Europe's broad Global Monitoring for Environment and Security (GMES) programme had fallen behind schedule by at least six months, forcing ESA to further extend operations of the Envisat environmental satellite. >>

6 April 2011: European Earth observation managers said the GOCE satellite measuring the Earth's gravity field has returned such exceptional data in the two years since its launch that its mission will almost certainly be extended through 2014, if not longer. >>

12 April 2011: It was reported that an American Lacrosse radar satellite had been recently destroyed when ground controllers ordered it to leave orbit and plunge towards Earth (where it burned up during reentry.) This particular Lacrosse bird served for two decades, more than twice as long as it was expected to last. After this deorbit, there were now three Lacrosse satellite in orbit, the oldest of them launched in 1997, while the most recent went up in 2005. The first Lacrosse went up in 1988, and was brought down (deorbited/destroyed) in 1997. The Lacrosse satellites fly a low orbit (about 700 kilometers up) to facilitate the use of their radar. Because of their large size and low orbit, they can often be seen, under the right light conditions, with the naked eye. >>

15 April 2011: Taiwan's FORMOSAT-3, a constellation of six weather microsatellites, will continue serving after its five-year designed life span ended that day, according to the National Space Organisation (NSPO). "Since it was launched in 2006, FORMOSAT-3 has accumulated 5.2 million data entries, serving 1508 registered users from 55 countries," NSPO officials said. "Given its value, the satellites will continue orbiting and providing information for the international community." >>

7 May 2011: UN Spider reported on satellite-based disaster response worldwide. >>

11 May 2011: India's latest advanced remote sensing satellite Resourcesat-2 has beamed high quality images distinctly showing the northern and western regions of the country, the space agency said. >>

12 May 2011: Japanese space officials gave up on recovering the crippled Advanced Land Observing Satellite, declaring the mission over after the craft lost power in April, the Japan Aerospace Exploration Agency announced. >>

18 May 2011: Satellite images collected by Indian Space Research Organisation's (ISRO) Resourcesat-1 show that 75% of Himalayan glaciers have on average retreated by 3.75km over a period of 15 years (1989-2004). >>

24 May 2011: As Iceland's Grimsvoetn volcano spewed ash high into the atmosphere, satellite observations were providing essential information to advisory centres assessing the possible hazards to aviation. >>

25 May 2011: Seventeen lost pyramids were among the buildings identified in a new satellite survey of Egypt. More than 1,000 tombs and 3,000 ancient settlements were also revealed by looking at infra-red images which show up underground buildings. >>

31 May 2011: Deforestation of Brazil's most threatened forest ecosystem dropped substantially during the 2008-2010 period according to new data released by Brazil's National Institute for Space Research (INPE) and Fundação SOS Mata Atlântica. >>

3 June 2011: Space assets, like telecommunication, location, navigation and remote sensing satellites can play a significant role in preventive and therapeutic medicine on a global scale. Earth Observation satellites are not able to map diseases directly but can monitor the indicators that are associated with disease outbreaks. This information can be processed using mathematical models and augmented by data from ground-based, seaborne and airborne observation systems. Thus, the risk factors of epidemics can be monitored, the spread of diseases can be better predicted and the appropriate preventive measures can be initiated. On the basis of this, students of the International Space University (ISU) identified 29 infectious and parasitic diseases that can potentially be monitored from space using indicators such as vegetation, wetlands, land surface temperatures, flooding etc. >>

6 June 2011: Using a combination of data sources, NASA produced the most accurate map yet showing exactly where the most carbon dense forest can be found in the tropical world. After analysing ground and satellite data from over 75 countries, the maps show that South America - principally the Amazon basin, presently stores more carbon in its forests than any other region on the planet. Brazil alone contains 61 billion tons of carbon in its biomass stock, almost as much as the whole of sub-Saharan Africa. >>

7 June 2011: Sustainable food production remains a pressing challenge, so scientists have been assessing the potential of the future Sentinel-1 mission to deliver new methods of monitoring crops grown around the world from space. Sentinel-1, expected to be launched in 2013, is one of the five missions that ESA is developing for Europe's Global Monitoring for Environment and Security programme. >>

8 June 2011: National Wetland Atlas and State Wetland Atlases, prepared by the Space Applications Centre (SAC) of Indian Space Research Organisation were released. >>

13 June 2011: Scientists from NASA's Goddard Space Flight Center, have produced ground breaking global maps of land plant fluorescence, a difficult-to-detect reddish glow that leaves emit as a by-product of photosynthesis. >>

19 June 2011: MacDonald, Dettwiler and Associates Ltd. announced that RADARSAT-2 information will be used by the Government of Russia to enhance their ability to provide critical information to support disaster relief, improve the safety of maritime navigation, and increase its ability to monitor, and respond to oil spills, etc. >>

23 June 2011: The first map of sea-ice thickness from ESA's CryoSat mission was revealed at the Paris Air and Space Show. This new information is set to change our understanding of the complex relationship between ice and climate. >>

11 July 2011: Some of the last images from ESA's ERS-2 satellite revealed rapidly changing glacial features in Greenland. In its final days, the veteran satellite gave frequent views of the Kangerdlugssuaq glacier and its advancing ice stream. >>

12 July 2011: ESA awarded a contract worth almost 150 million euros to Astrium to develop and build two satellite sensors that will monitor Earth's atmosphere as part of Europe's Global Monitoring for Environment and Security programme (GMES). >>

22 July 2011: Drought in Somalia, Kenya, Ethiopia and Djibouti was pushing tens of thousands of people from their homes as millions face food insecurity in a crisis visible from space. ESA's SMOS satellite showed that the region's soil is too dry to grow crops. >>

24 July 2011: The European Commission, in a surprise move, proposed that its satellite-based Earth

observation programme be removed from its seven-year budget starting in 2014 and instead be funded by voluntary contributions from individual European governments. >>

27 July 2011: ESA had sent letters to its member governments asking them to protest a decision by the European Commission to remove Europe's flagship GMES environmental programme from the commission's proposed multiyear financial envelope, ESA's director of Earth observation said. >>

3 August 2011: North east Africa continues to reel from the effects of the worst drought to strike the region in decades. The arid conditions are contributing to famines that the U.S. Department of State says are affecting more than 11.5 million people, particularly in Somalia, Ethiopia, Kenya and Djibouti. The current dry conditions are illustrated in a new map, created using nine years of data on surface relative humidity from the Atmospheric Infrared Sounder (AIRS) instrument on NASA's Aqua spacecraft. >>

5 August 2011: Deforestation in the Brazilian Amazon rose 17 percent in June compared to the same period a year earlier, reports Brazil's National Institute for Space Research (INPE). Using its rapid deforestation detection system INPE found 312.7 square kilometres were cleared in June. Nearly 40 percent of deforestation occurred in the state of Pará. The states of Mato Grosso (26 percent), Rondonia (21 percent), and Amazonas (13 percent) also saw significant forest loss. >>

11 August 2011: The Operational Land Imager (OLI), built by Ball Aerospace & Technologies Corp., Boulder, Colorado, was approved by NASA Goddard Space Flight Center for shipment to Orbital Sciences Corporation, Gilbert, Arizona for integration onto the Landsat Data Continuity Mission (LDCM) spacecraft. >>

19 August 2011: Imagery acquired from the Canadian satellite RADARSAT-2 enabled the landmark discoveries announced by University of California (UCI) researchers. Previously unmapped glaciers of Antarctica have been charted by accessing imagery collected from Canadian, European and Japanese satellites. Using NASA technology, the researchers have discovered unique terrain features that indicate the direction and velocity of ice in Antarctica. This will provide invaluable insight into ice melt and future sea rise due to climate change. >>

21 September 2011: A satellite will monitor Caspian seals, whose special collars have been installed with cameras. The projects will be launched in three to four months, the Head of the Iranian Ecology and Natural Resources Protection Department's Office for Sea Ecosystem Department Umid Sadiq was quoted as saying by IRNA. >>

25 September 2011: NASA has released the first global map of ocean surface salinity acquired by the Aquarius/SAC-D satellite, which was launched in June this year. Knowing the saltiness of seawater will improve scientists' understanding of some key climatic processes. Variations in salinity help drive ocean circulation and their measurement can also reveal how freshwater is moving around the planet. The mission is a joint venture with the space agency of Argentina (Conae). >>

19 October 2011: India's Space Application Centre (SAC) at ISRO in Ahmedabad is set to issue more accurate weather forecasts thanks to the recently-launched satellite Megha-Tropiques. >>

20 October 2011: NASA and JAXA published a new version of the world's most complete digital topographic map. It could potentially help people across the globe plan highways, search for natural resources and protect lands with cultural or environmental significance. >>

27 October 2011: DLR's ZKI produced detailed damage assessment map of affected areas after an earthquake in Turkey. >>

4 December 2011: A new, satellite-based survey released by the UN Food and Agriculture Organisation (FAO) provides a more accurate picture of changes in the world's forests, showing forest land use declined between 1990 and 2005. >>

5 December 2011: Researchers gathered for European Space Weather Week were presented with the latest results from ESA's own space weather station: the Proba-2 microsatellite. >>

17 December 2011: ESA's SMOS satellite is designed to observe soil moisture and ocean salinity, but this innovative mission is showing that it can also offer new insight into Earth's carbon and methane cycles by mapping soil as it freezes and thaws. >>

B. Global Navigation Systems

4 January 2011: It was reported that the Proton launch failure on 5 December 2011 destroyed three Glonass M spacecraft that would have ensured full operating capability. Glonass completion would now be expected during 2011. >>

5 January 2011: Japan is considering launching new satellites to establish its own global positioning system (GPS) in a bid to reduce its reliance on the US navigation network, officials said. In September 2010, Japan launched a rocket carrying its first satellite intended to improve GPS systems widely used by Japanese motorists for navigation as well as by aviation and maritime operators. >>

6 January 2011: The Indian Space Research Organisation said that it was planning to implement the Indian Regional Navigation Satellite System (IRNSS) to provide the PNT (Position Navigation and Timing) service to India and neighbouring countries, S.V. Kibe, Brahmprakash Professor in the ISRO Headquarters, Bangalore, said. Addressing the Space Summit at the 98th Indian Science Congress at Kattankulathur, Prof. Kibe said the government had approved the IRNSS project, which would be implemented in the next few years. The proposed system would comprise seven satellites initially and 11 later. >>

13 January 2011: The Governments of the United States of America and Japan convened a plenary meeting in Tokyo, Japan to review and discuss cooperation in the civil use of the Global Positioning System (GPS) and GPS augmentations, including Japan's Multi-functional Transport Satellite (MTSAT) Satellite-based Augmentation System (MSAS) and Quasi-Zenith Satellite Systems (QZSS). >>

3 March 2011: China will establish its own global navigation system, (GPS) by 2020 by launching about 12 to 14 satellites in the next few years to form a regional and autonomous navigation positioning system, a top Chinese official said. >>

3 March 2011: The EGNOS Safety-of-Life signal was formally declared available to aviation. For the first time, space-based navigation signals have become officially usable for the critical task of vertically guiding aircraft during landing approaches. >>

4 March 2011: The United States stood ready to use foreign satellite navigation systems as a complement to the U.S. GPS system for homeland security and other government services, including aviation-related safety-of-life applications, according to the head of the office coordinating satellite navigation systems for the U.S. government. >>

9 March 2011: Europe's Galileo satellite navigation project has sufficient funds to finance the launch of all 18 satellites now under construction and to maintain sufficient safety margin to cover

unanticipated problems, a senior Galileo program manager said. >>

1 April 2011: The Indian government approved a one-time grant-in aid as budgetary support for implementation of GPS-aided Geo Augmented Navigation system (GAGAN). The GAGAN system, it said, would make the skies from South-East Asia to Africa, including Indian airspace, much safer. >>

13 April 2011: A Swedish firm became the first known foreign company to use Russian positioning technology Glonass. >>

25 April 2011: EGNOS is a European system that is designed to improve the positioning information provided by GPS. >>

27 May 2011: QUALCOMM, the world leader in 3G and next-generation mobile technologies, announced product support for the Russian Glonass satellite system and the unique capability to utilize both the GPS and Glonass networks simultaneously for greater location performance. The supplementary signals from this extended satellite network provide more accurate location information for the growing number of location based applications and services. >>

27 May 2011: The European Space Agency, Arianespace and the European Commission announced that the launch of the first two satellites of Europe's global navigation satellite system is planned to take place on 20 October. >>

24 June 2011: The EC was reported to have identified 500 million euros in unanticipated savings for the Galileo programme through 2013. >>

26 June 2011: As Europe prepared for October's launch of the first Galileo satellites, details of a worldwide ground network were given. >>

11 August 2011: Russia has secured Nokia's backing of its Glonass satellite navigation system, a major step forward for the country's technology toward securing the number two global position after GPS. Glonass, as well as European space program Galileo and China's Compass, are set to break over 20 years of unrivalled dominance of Global Positioning System (GPS) as countries seek to cut their reliance on the U.S. technology. >>

13 August 2011: Logica announced the signing of two new contracts for the European Galileo satellite navigation Full Operational Capability (FOC) programme. >>

21 August 2011: The GPS 2A-22 spacecraft had been removed from active duty two years ago to accommodate the deployment of a fresh bird into the constellation. Now, the Boeing-built satellite is back in action to transmit the timing and location signals to users around the world. >>

22 August 2011: U.S. researchers working on the accuracy of GPS location say they have set their sights on the third dimension with software to improve altitude measurements. While most people are generally concerned with pinpointing their own location in two dimensions on Earth's surface, the third dimension of altitude has always been available through GPS - but the accuracy has always been lower. >>

13 September 2011: Some time in 2012 Qualcomm will start to release chips capable of using Glonass. This means, when combined with the GPS system, more satellites will be within reach of a device at a given time. More satellites clustered within range means more accurate location detection and less problems with typical sat-nav hurdles, like negotiating with urban canyons. >>

11 October 2011: Russia has completed the deployment of its Glonass global positioning satellite group, the head of the Russian Space Agency Roscosmos Vladimir Popovkin said. The system requires 24 operational and 2-3 reserve satellites in orbit to ensure global coverage. >>

17 October 2011: Thales Alenia Space has won a contract from ESA to lead a nine-month study regarding satellite communications solutions for Unmanned Aircraft Systems (UAS). >>

28 November 2011: The rapidly developing Glonass technology, the Russian alternative to GPS, will soon allow smartphone users to take a peek at a map anytime they want to. Aleksandr Gurko, Head of the Glonass distribution company, says he expects to have agreements with most smartphones producers such as ZTE, Huawei and HTC and to extend existing deals with Nokia, Apple and Motorola. >>

14 December 2011: Europe's Galileo system passed its latest milestone, transmitting its very first test navigation signal back to Earth. The first two Galileo satellites, launched on 21 October, were in the midst of their In-Orbit Test campaign. A detailed check-up was carried out by ESA's Redu ground station in Belgium to ensure their payloads were performing as specified. >>

29 December 2011: The Chinese Beidou navigation system has started providing services in China and the surrounding area. Beidou is offering services including positioning, navigation routes and time. >>

C. Nanosatellites

8 March 2011: South Africa's Cape Peninsula University of Technology was invited by the UK to build an S-band transmitter for the first satellite planned for launch by the UK Space Agency in December 2011. UKube1 is a collaboration between the UK Space Agency, industry and academia, and is envisaged as the pilot for a full UK CubeSat programme. >>

20 April 2011: The scientific satellite YouthSat, with a lift-off mass of 92 kg., was launched into orbit by an Indian polar satellite launch vehicle (PSLV). This spacecraft will collect information about solar flares and their influence on the Earth's upper atmosphere. The decision to implement the Russian-Indian YouthSat satellite project was taken in January 2007 during a visit by then President Vladimir Putin to India. The project is meant to develop contacts between young people in both countries. >>

27 April 2011: Scientists, researchers and students from Nanyang Technological University (NTU) established contact with X-SAT, Singapore's first micro-satellite in space, and obtained a healthy communication link which ascertains that all its core systems are working normally. >>

9 August 2011: NASA is seeking proposals for small satellite payloads to fly on rockets planned to launch between 2012 and 2014. These miniature spacecraft, known as CubeSats, could be auxiliary payload on previously planned missions. >>

24 August 2011: Small satellites show increasing potential to do more in space at lower costs than big satellites, but an on-going challenge has been finding cost-effective ways to launch them, the Space Review reported. >>

7 September 2011: De-orbiting can be a difficult and expensive exercise and, for tiny spacecraft such as CubeSats that weigh less than 10kg, it can sometimes be an impossible requirement to achieve within tight budget constraints. >>

25 November 2011: Cubesats are gaining attention beyond the academy as their capabilities grow and launch opportunities proliferate. >>

27 November 2011: The UK space Agency and Astrium have approved the final design of UKube-1 - the UK's first CubeSat mission. >>

D. Space Debris

8 March 2011: The space debris created by China's anti-satellite test in 2007 poses a threat to Indian satellites, the Indian government said. India's remote-sensing satellites are placed in low-earth orbit above 175 km (600 km to 900 km polar orbit). This has the highest density of debris cloud that was created after the test. >>

12 March 2011: To better meet the growing threat of space junk around Earth, the National Research Council said that it was taking a close look at NASA's orbital debris programmes to suggest improvements. >>

17 March 2011: NASA Ames Research Center described an idea to zap individual pieces of junk with a ground-based laser, thereby slowing them down so that they eventually de-orbit. >>

24 March 2011: The United States needs to team up with other countries and the private sector to track the huge volume of potentially dangerous space debris circling the Earth, according to a U.S. military official. More than 22,000 pieces of space junk are being tracked today as they zip around our planet, posing a collision threat to valuable satellites and other spacecraft. But there's far too much for the U.S. government to keep track of on its own, so cooperation is required to improve the country's space situational awareness (SSA) capabilities, said Lt. Gen. Susan Helms, commander of the U.S. Strategic Command's Joint Functional Component Command for Space. >>

29 April 2011: News sources reported that the Indian Space Research Organisation had joined sister agencies abroad to identify methods to pluck out at least three to five large junk objects from space every year. >>

10 May 2011: Dealing with the decades of detritus from using outer space -- human-made orbital debris -- is a global concern, but some experts are now questioning the feasibility of the wide range of solutions sketched out to grapple with high-speed space litter. What may be shaping up is an "abandon in place" posture for certain orbital altitudes -- an outlook that flags the messy message resulting from countless bits of orbital refuse. >>

22 June 2011: Since instituting a new policy to inform commercial and international satellite operators of collision threats, the U.S. Air Force has issued hundreds of notifications to Russia and China warning of possible crashes between their satellites and other objects in orbit, according to a U.S. State Department official. >>

28 June 2011: A piece of space debris made the closest approach to the ISS ever, coming within 850m. As a precaution, the six member crew of the ISS took a shelter in the Russian capsules until the debris passed by without incident.

15 August 2011: Scientists have proposed a viable solution to the growing problem of space junk. The idea involves launching a satellite to rendezvous with the largest space debris, such as spent rocket bodies. The satellite would then affix a propellant kit, driving the debris to its doom in the Earth's

atmosphere. >>

3 September 2011: Scientists in the US have warned that the amount of so-called space junk orbiting Earth is at tipping point. A report by the National Research Council says the debris could cause fatal leaks in spaceships or destroy valuable satellites. >>

23 September 2011: A space telescope specifically designed to resist heat will dump some massive components on the Earth when it re-enters the atmosphere later this year. >>

24 September 2011: The Upper Atmosphere Research Satellite (UARS) crashed into the Pacific Ocean. The 6.5 ton satellite was launched from Space Shuttle Discovery in 1991. UARS was a multi-instrumented satellite used to study key chemicals in the atmosphere. Moreover, the UARS played a huge role in providing data on how much light comes through the sun's UV and visible wavelengths. The satellite ceased operations in 2005.

12 October 2011: For the first time, observations coordinated by ESA's space hazards team have found an asteroid that comes close enough to Earth to pose an impact threat. The space rock was found by amateur astronomers, highlighting the value of 'crowd-sourcing' to science and planetary defence. >>

23 October 2011: Less than a month after NASA's falling UARS satellite grabbed the headlines, the German Roentgen Satellite (ROSAT) re-entered the Earth's atmosphere on 23 October. The ROSAT X-ray astronomy observatory was smaller and less massive than NASA's Upper Atmospheric Research Satellite, or UARS, which fell back to Earth on 24 September. >>

24 October 2011: The U.S. Department of Defense says it is looking for ways to recycle space junk thousands of miles above Earth into valuable new satellite parts. A programme called Phoenix, under the Defense Advanced Research Projects Agency, would recycle still- functioning pieces of defunct satellites and incorporate them into new space systems inexpensively. >>

31 October 2011: The London Institute of Space Policy and Law said that the cost of insuring spacecraft in Earth's orbit is likely to rise, according to a report by The Guardian. Legal experts said that the second unscheduled re-entry of a spacecraft into Earth's atmosphere within a month highlights the growing danger of space debris. >>

20 November 2011: Toxic fuel in the Russian Phobos-Grunt spacecraft, stuck in Earth orbit, was unlikely to survive re-entry and endanger life, a space debris researcher said. "The fuel inside the Russian Mars moon probe will have exploded as the probe breaks up during re-entry," said Han Zengyao, a researcher with the China Academy of Space Technology, who heads a team monitoring orbital debris. >>

3 December 2011: An orbital debris expert voiced a new concern: the increasing risk of collision between existing debris in Earth orbit, adding to the population faster than natural destructive descent. >>

13 December 2011: Russian space scientists abandoned efforts to save Phobos-Grunt, stranded in Earth orbit since early November. The robotic spacecraft carried some 7.5 tons of fuel and a small amount of radioactive cobalt. >>

IV. HUMAN SPACEFLIGHT

A. International Space Station Deployment and Operations

The first manned flight of the year was STS-133. The final flight of the Space Shuttle Discovery, it launched from the Kennedy Space Center on 24 February, carrying Leonardo; the final American pressurised module of the ISS. The module was successfully installed, with Discovery returning to Earth on 9 March.

On 16 March, Expedition 27 began aboard the ISS with the departure of the Soyuz TMA-01M spacecraft, which had been docked since October 2010. On 4 April, Soyuz TMA-21 launched to the space station, delivering a further three crew members. On 16 May, Space Shuttle Space Shuttle Endeavour launched to the station on its final mission, STS-134, delivering and installing the Alpha Magnetic Spectrometer, before returning to Earth on 1 June.

Expedition 28 began aboard the ISS on 23 May with the departure of Soyuz TMA-20, which had been launched in December 2010, and landed in the early morning of 24 May. Three more crewmembers were launched to the space station aboard Soyuz TMA-02M on 7 June.

The final Space Shuttle mission, STS-135, began on 8 July with the launch of Space Shuttle Atlantis, carrying supplies for the ISS aboard the Raffaello Multi-Purpose Logistics Module (MPLM). After resupplying the space station, Atlantis returned to Earth, landing at Kennedy Space Center's Shuttle Landing Facility on 21 July, and concluding thirty years of Space Shuttle operations. Two days before landing, Atlantis deployed PSSC-2, the last satellite to be launched from a Space Shuttle.

ISS Expedition 28 ended, and Expedition 29 began, with the undocking of Soyuz TMA-21 on 16 September. The launch of Soyuz TMA-22 did not take place until 14 November, having been delayed by reliability concerns surrounding the Soyuz rocket after an unmanned launch failure in August. A week later, Soyuz TMA-02M undocked, beginning Expedition 30, with the Soyuz spacecraft landing on 22 November. The final manned launch of the year took place on 21 December, when Soyuz TMA-03M was launched to bring a further three crew members to the ISS.

2011 International Space Station operations in detail

13 January 2011: In accordance with the International Space Station mission ballistics support programme, an ISS reboost was carried out. >>

21 January 2011: Expedition 26 crewmembers Kondratyev and Skripochka conducted a 5-hour 23-minute EVA. They installed a new high-speed radio communication system, removed an old plasma pulse experiment, install a camera for the new Rassvet docking module and retrieve a materials exposure package.

22 January 2011: The second Japanese H-II Transfer Vehicle (HTV), named Kounotori-2, was launched from Tanegashima, Japan. The unmanned resupply cargo craft, carrying 5,300 kg of cargo, was berthed to the ISS Node 2 nadir port on 27 January. On 18 February, Kounotori-2 was relocated to the Node 2 zenith port, to allow the STS-133 mission to deliver its Permanent Multipurpose Module, following which it was relocated back to the Node 2 nadir port on 10 March. After spending 65 days

in space, 60 docked to ISS, Kounotori-2 was unberthed on 28 March, and commanded to a destructive reentry over the Pacific Ocean the next day, carrying more than 1400 kg of discarded equipment and trash.

24 January 2011: Cargo vehicle Progress M-08M departed from the International Space Station. A departure command for the automatic cargo vehicle was issued from the ISS. Three minutes later the Progress separated from the docking port on the Pirs module. The vehicle had been attached to this port since 30 October 2010. Unburnt parts of Progress M-08M fell down in remote area of the Pacific. In parallel, preps for Progress M-09M launch continued at Baikonur. >>

27 January 2011: The Progress M09M (41P) cargo spacecraft launched from Baikonur and docked with the ISS 2 days later, carrying 2,666 kg of cargo, fuel, air, water and birthday presents for Expedition 26 captain Scott J. Kelly of the United States, who turned 47 on February 21. The spacecraft undocked on 22 April, and was deorbited over the Pacific Ocean 4 days later.

There were a number of notable cargoes aboard Progress, one of which was the Earth Artificial Satellite (EAS) "Kedr". It will be used for student space education programmes, and for this year's celebration of the 50th anniversary of Yuri Gagarin's spaceflight. Kedr was manually jettisoned overboard to free-fly from the ISS during EVA-28 on 16 February.

29 January 2011: The space freighter will deliver fuel, oxygen, food, books and birthday presents for Expedition 26 captain Scott J. Kelly of the United States, who turns 47 on February 21. There are a number of notable cargoes aboard Progress M-09M, one of which is the Earth Artificial Satellite (EAS) "Kedr". It will be used for student space education programmes, and for this year's celebration of the 50th anniversary of Yuri Gagarin's spaceflight. Kedr will be manually jettisoned overboard to free-fly from the ISS during Russian EVA-28 on 16th February. >>

10 February 2011: In accordance with the International Space Station mission ballistics support programme, an ISS reboost occurred. The manoeuvre was assisted by 8 attitude thrusters of the Progress M-07M cargo vehicle attached to the Zvezda instrumentation compartment. After the burn, which lasted 263 sec, the altitude of the station became 0.9km higher, and achieved 352.3 km. The operation was aimed at providing favourable conditions for the landing of Soyuz TMA-M crew vehicle scheduled for March 16. >>

16 February 2011: Expedition 26 crew members Kondratyev and Skripochka conducted a 4-hour 51-minute EVA. They retrieved materials science samples and conducted service operations on the external surface of the station.

16 February 2011: European Space Agency's second Automated Transfer Vehicle (ATV2), named Johannes Kepler, launched from Kourou, French Guiana. The spacecraft, carrying 7091 kg of cargo and fuel, docked with ISS on 24 February. On 18 March, the engines on Johannes Kepler were used for the first time to reboost the ISS stack. In conjunction with subsequent firings, an overall ISS reboost of 50 km was achieved. The spacecraft undocked from ISS on 20 June, and was deorbited over the Pacific Ocean on 21 June.

20 February 2011: The Progress M-07M cargo vehicle undocked from the ISS. Commanded for departure and undocked from the Zvezda's part in three minutes, it had been attached to the Station since 12 September 2010. Undocked to make way for the Johannes Kepler Automated Transfer Vehicle, filled with trash and spent equipment from the ISS, it was deorbited to a destructive reentry over the spacecraft cemetery in the Pacific Ocean. >>

22 February 2011: Astronaut Koichi Wakata will become the first Japanese captain of the

International Space Station, the Japan Aerospace Exploration Agency announced. Wakata, 47, will serve as head of the ISS during the last two months of a six-month mission to begin at the end of 2013. >>

24 February 2011: Space Shuttle Discovery launched from the Kennedy Space Center (KSC), Florida, USA, to begin the ULF5 mission to ISS. Discovery docked with ISS on 26 February, beginning nine days of joint operations. Shuttle crew members Steve Bowen and Al Drew conducted two EVAs totaling 12 hours and 48 minutes. During the mission, the Permanent Multipurpose Module (PMM) (an MPLM module modified by TAS in the frame of a NASA-ASI agreement) was delivered and attached to Node 3 module's nadir port, and the EXPRESS Logistics Carrier 4 (ELC-4), designed to hold science experiments as well as station spares, was attached to the ISS truss. The Shuttle landed at Kennedy Space Center on 9 March after a 13-day mission. >>

28 February 2011: Two US astronauts wrapped up the first spacewalk of the Discovery shuttle mission at the International Space Station after a robotic arm breakdown left one of them stranded for almost 20 minutes. >>

1 March 2011: Mission managers approved an extra day for the shuttle mission to set up the new Permanent Multipurpose Module that will be installed on the Unity module's Earth- facing port. >>

3 March 2011: In accordance with the International Space Station mission ballistics support programme, an ISS reboost was carried out. The manoeuvre was assisted by the thrusters of Discovery shuttle attached to the station. The manoeuvre brought the ISS 1.75 km higher, to the altitude of 352,8 km. >>

7 March 2011: Discovery, the world's most travelled spaceship, left the International Space Station for the last time, getting a dramatic send-off by the dozen orbiting astronauts as well as "Star Trek's" original Captain Kirk. >>

9 March 2011: Space shuttle Discovery made a successful landing at Kennedy Space Center after a 13-day mission, its final mission in a storied career. >>

12 March 2011: A Japanese cargo spacecraft that shuttle Discovery's last crew helped pack with trash was relocated on the International Space Station, setting the stage for its departure later in March. HTV-2 had been moved to the top of Harmony prior to space shuttle Discovery's arrival for the STS-133 mission. HTV-2 would be unberthed for the final time on March 28 and deorbited the following day. >>

14 March 2011: Russian space agency Roscosmos said Monday it had postponed the launch of a Soyuz spacecraft carrying members of a new crew to the International Space Station due to technical problems. >>

14 March 2011: NASA signed a $753 million modification to the current International Space Station contract with the Russian Federal Space Agency for crew transportation, rescue and related services from 2014 through June 2016. >>

14 March 2011: Command of the International Space Station was handed over by ISS-26 leader NASA's Scott Kelly to Roscosmos cosmonaut Dmitry Kondratiev. >>

16 March 2011: Aleksandr Kaleri, Oleg Skripochka and Scott Kelly landed in Kazakstan in their Soyuz TMA01M spacecraft, after having spent 159 days in space. The Soyuz capsule successfully tested a new digital control system.

18 March 2011: In accordance with the International Space Station mission ballistics support program, ISS reboost was carried out. The manoeuvre was assisted by the Orbit Control System (OCS) thrusters of ATV-2 vehicle attached to the station. The engines were started at 06:00:00 GMT, and shut down at 06:14:42. The manoeuvre brought the ISS km higher, to the altitude of 3.9 km. The operation was carried out in the view of upcoming arrival of Soyuz TMA-21 and Endeavour at the ISS. >>

19 March 2011: Europe formally endorsed the extension of operations at the International Space Station until 2020 and put the required financing in place, officials said. Member states of the European Space Agency made the decision at a two-day meeting of the European Space Agency at ESA headquarters in Paris. >>

20 March 2011: NASA named the personnel of International Space Station crews through to 2014. >>

21 March 2011: ISS astronauts unpacked a humanoid space robot. Robonaut 2 will serve as a technology demonstration, helping researchers develop more advanced bots in the future. >>

26 March 2011: It was reported that a prototype scanner aboard the International Space Station has been taking new images of Earth's coastal regions during the 16 months since it was launched, providing scientists with a new set of imaging tools that will help them monitor events from oil spills to plankton blooms. >>

29 March 2011: The Japanese HTV space cargo ship carried a device to "phone home" during its plunge into Earth's atmosphere. >>

31 March 2011: NASA signed a $36.9 million contract modification to space shuttle main engine manufacturer Pratt & Whitney Rocketdyne of Canoga Park, Calif., to provide continued shuttle main engine prelaunch and launch support from 1 April through 31 July. >>

3 April 2011: ISS mission controllers used ATV Johannes Kepler's thrusters to boost the ISS into a slightly higher orbit so as to avoid any possibility of intercepting a catalogued piece of space debris. The ATV's Orbit Correction System (ATV OCS) - a set of 4 thrusters mounted on the bottom of the vessel - was commanded to give the ISS a slightly faster orbital speed - 0.5 m/second. The Debris Avoidance Manoeuvre (DAM) was made necessary by the fact that a piece of debris from the February 2009 collision between Russia's COSMOS 2251 and the Iridium 33 satellite was making close passes by the Station. >>

4 April 2011: The international crew of Aleksandr Samokutyayev, Andrey Borisenko and Ron Garan launched from Baikonur on 4 April aboard the Soyuz TMA21 spacecraft. They docked with ISS two days later and joined Kondratyev, Coleman and Nespoli as the Expedition 27 crew. During their stay, they were visited by the STS-134, and -135 crews and resupplied by two Progress vehicles. They returned to Earth on 16 September after 164 days in space.

7 April 2011: Russian spaceship Soyuz TMA-21 - Gagarin- successfully docked to the International Space Station's Poisk module. >>

11 April 2011: Front-line ISS managers at NASA's Johnson Space Center (JSC) are inserting a week-long partial simulation of a deep-space exploration mission into regular station planning for next summer, using the orbiting laboratory as an analog for a long- distance spaceship. Under a programme called 'ISS as a Testbed for Analog Research' (Istar), the exploration, space station and mission operations organisations at JSC are using some in-house programs to see how well the station will work as a stand-in for a long-duration vehicle en route to Mars or an asteroid. >>

14 April 2011: Northrop Grumman said that it will use an experiment on the International Space Station to test a new way to cool military satellite payloads. The payload, the Massive Heat Transfer Experiment (MHTEX), will be taken to the ISS on-board the space shuttle Endeavour. >>

22 April 2011: Progress M-09M cargo vehicle undocked from the ISS. The vehicle was commanded for departure, and undocked from the Pirs module in 3 min. The cargo supplier had been docked to this port on 30 January. Progress M-09M would continue its autonomous mission until 26 April to be used for Radar-Progress scientific experiment to investigate reflection feature of the plasma generated by operations of the Progress propulsion, before being downed in the remote area of the Pacific. >>

27 April 2011: Progress M-10M (42P) left the Baikonur Cosmodrome, and docked with ISS two days later, bringing 2,645 kg of cargo, fuel and water. The cargo craft remained docked to ISS until 29 October.

27 April 2011: The Multilateral Coordination Board (MCB) for the International Space Station partner agencies met to discuss increased efforts to use the station as a test-bed for exploration. >>

16 May 2011: Space Shuttle mission STS 134 began with the launch of Endeavour from KSC. The ULF6 mission's main purpose was to deliver the Alpha Magnetic Spectrometer (AMS-02) physics experiment and the ELC-3 to ISS. Endeavour docked with ISS on 18 May, and during the next 12 days of joint operations, Shuttle crew members Drew Feustel, Greg Chamitoff, and Mike Fincke completed four EVAs totaling 28 hours and 44 minutes. The Shuttle mission ended on 1 June after a 16-day flight.

19 May 2011: The largest and most complex scientific instrument yet to be fitted to the International Space Station was installed. Taken into space by the Space Shuttle, the Alpha Magnetic Spectrometer will sift ten thousand cosmic-ray hits every minute, looking for nature's best-kept particle secrets. >>

25 May 2011: A Russian Soyuz TMA-20 space capsule landed about 150km south-east of the Kazakh town of Dzhezkazgan. The capsule delivered an international trio of astronauts back to Earth after six months on the International Space Station, parachuting through clear skies toward a safe landing on the Kazakh steppe. Russian cosmonaut and station commander Dmitry Kondratiev and flight engineers Catherine Coleman, an American, and Italian Paolo Nespoli touched down aboard the Soyuz TMA-20 craft at 02:27 GMT. >>

29 May 2011: With ATV Johannes Kepler in space and ATV Edoardo Amaldi almost built, the next Space Station supply craft coming off the production line has been named after the most famous scientist of all time: Albert Einstein. Launch is expected in early 2013. >>

29 May 2011: Astronauts Mike Fincke and Greg Chamitoff wrapped up the fourth and final spacewalk of Endeavour's STS-134 mission. >>

30 May 2011: The US space shuttle Endeavour undocked from the International Space Station and headed back to Earth after completing its mission. >>

1 June 2011: Space shuttle Endeavour brought its 19-year operational career to a close with a textbook landing in Florida. The vehicle swept into a night-time touch-down at the Kennedy Space Center after a successful trip to the International Space Station. Endeavour will now be prepared for public display at a science museum in Los Angeles. >>

3 June 2011: In accordance with the International Space Station mission ballistics support programme, an ISS reboost was scheduled. The manoeuvre was assisted by 8 attitude thrusters of ATV-2 Johannes Kepler. ISS spatial position was be supported by Zvezda and Progress M-10M

thrusters during the manoeuvre. >>

12 June 2011: In accordance with the International Space Station mission ballistics support programme, an ISS reboost was scheduled. Two manoeuvres were performed, assisted by attitude thrusters of ATV-2 Johannes Kepler. ISS spatial position was supported by Zvezda and Progress M-10M thrusters during the manoeuvre. >>

21 June 2011: The next resupply mission to the ISS got underway with the launch of Progress M-11M (43P) from Baykonur. The spacecraft docked with ISS on 23 June, carrying 2,673 kg of cargo, fuel and water. Undocking of 43P from ISS took place on 23 August, with the spacecraft being commanded into a destructive reentry over the Pacific on 1 September.

22 June 2011: Europe's unmanned ATV space freighter plunged on command into Earth's atmosphere to end its mission as a spectacular shooting star over the southern Pacific Ocean. >>

24 June 2011: An unmanned Russian spacecraft launched into space, carrying vital supplies to the International Space Station. The Progress 43 cargo ship blasted off from the Baikonour Cosmodrome in Kazakhstan in Central Asia. The robot resupply vehicle docked at the space station's Russian Zvezda service module on 23 June. >>

29 June 2011: In accordance with the International Space Station mission ballistics support programme, an ISS reboost was carried out. >>

7 July 2011: Aviation Week reported that some of the future external maintenance work will likely be turned over to Canada's Dextre robot as ISS spacewalk activity was expected to decline. >>

8 July 2011: Space Shuttle Atlantis began the STS 135 mission with a launch from KSC. ISS Mission ULF7 carried the Raffaello MPLM, which included more than 3,600 kg of resupply items. During the 9-day docked phase, Expedition 28 astronauts Fossum and Garan conducted one EVA lasting 6 hours and 31 minutes. Atlantis landed on 21 July after 13 days in space, ending the final mission of the 30-year Space Shuttle Program.

12 July 2011: Astronauts finished the last spacewalk of NASA's space shuttle era after retrieving a broken pump from the International Space Station and installing an experiment for a robot. >>

19 July 2011: The US shuttle Atlantis undocked from the International Space Station and two days later landed at Kennedy Space Center. This brought to a close Nasa's 30-year re- usable spaceplane programme. >>

21 July 2011: NASA mission STS-135 was completed, signalling the end of the Space Shuttle programme. This reinforced the policy decisions to rely solely on commercial providers for future earth-to-orbit transportation of cargo and crew to the International Space Station. The subsequent Soyuz flight on 24 August that was unsuccessful in completing its mission highlighted the critical nature of having multiple launch providers to the success of future ISS missions.

24 July 2011: Japan became the No. 3 nation in terms of number of days its astronauts have spent in space, behind Russia and the United States. According to data collected by the Japan Aerospace Exploration Agency, nine Japanese astronauts had by this date spent a combined total of 494 days in space, overtaking the 493-day total of 10 German astronauts. >>

26 July 2011: The Multilateral Coordination Board (MCB) for the International Space Station partner agencies met to discuss how to use the space station as a test bed for technologies that will enable

missions beyond low Earth orbit. >>

29 July 2011: Officials from the space station partner agencies examined technology initiatives that could aid future exploration missions. >>

3 August 2011: Expedition 28 cosmonauts Volkov and Samokutyayev conducted a Russian segment EVA. The main purpose of the 6-hour 23-minute EVA was to install new high-rate laser communication system, deploy and retrieve science samples on the exterior of the Zvezda Service Module, and to deploy a micro-satellite Kedr for educational radio amateur experiment ARISSat-RadioSkaf. >>

12 August 2011: NASA announced the creation of the Human Exploration and Operations Mission Directorate (HEOMD) at NASA Headquarters. The new organisation, combining the Space Operations and the Exploration Mission Directorates, will focus on ISS operations and human exploration beyond low Earth orbit.

29 August 2011: Russia decided to carry out two unmanned test launches of Soyuz carrier rockets in the coming months before using them to deliver crews to the International Space Station. One of the Soyuz rockets will be used to deliver a new Progress M-13M space freighter to the ISS. Furthermore, Russia delayed the launch of its next manned mission to the ISS, after the Progress crash. The return of the three crew members from the space station will also be delayed. The launch had been scheduled for 22 September. >>

31 August 2011: Special Purpose Dexterous Manipulator (SPDM) or 'Dextre', the Canadian Space Agency's robotic arm, successfully replaced a faulty circuit-breaker box on the orbiting lab. The robot swapped the failed component for a fresh one, thereby restoring part of the orbiting lab's backup electrical systems. The manoeuvre marked the first time Dextre replaced defective equipment on the Station. >>

2 September 2011: Russia's space agency Roscosmos was considering ending a permanent human presence in space, an agency official said following the previous week's crash of a supply ship delivering precious cargo to the ISS. "Perhaps in the future, we will not need a constant manned presence in the lower Earth orbit," Roscosmos deputy director Vitaly Davydov told journalists in Moscow. >>

9 September 2011: NASA announced that it has finalised a cooperative agreement with the Center for the Advancement of Science in Space (CASIS) to manage the science research aboard the portion of ISS that is operated as a US National Laboratory.

13 September 2011: Russia's space agency said that it had postponed the launch of the next manned Soyuz spacecraft to the International Space Station until 12 November, just days before the remaining astronauts on the orbiting laboratory were due to return to Earth. The launch schedule for manned Russian missions had been thrown into disarray by the 24 August crash of an unmanned Soyuz supply craft. Since the phasing out of the shuttle, NASA came to rely entirely on Russia to get its crew to the international space station. >>

16 September 2011: A Russian Soyuz capsule carrying three returning astronauts from the International Space Station touched down safely in the central steppes of Kazakhstan, but not without rattling nerves after a breakdown in communications. NASA astronaut Ron Garan and Russian cosmonauts Andrei Borisenko and Alexander Samokutyayev landed after 164 days in space. >>

19 September 2011: NASA and SpaceX both rejected a report that the Dragon freighter will not be

allowed to dock at the International Space Station on its next flight. The U.S. private space capsule Dragon will in fact conduct a flight near the ISS, but docking between them is not planned. >>

21 September 2011: NASA plans to spend $1.6 billion over the next two years bolstering industry efforts to develop space taxis to and from the ISS. >>

29 September 2011: The engines of the Zvezda service module fired for a two-minute, 49-second reboost of the International Space Station's orbit in a manoeuvre originally planned for the first week in October. The manoeuvre was performed at 12:45 p.m. EDT and raised the orbiting laboratory's altitude by 4.7 kilometres. >>

20 October 2011: The service life of the International Space Station may be extended until 2028, a Russian space official said. The service life of the ISS ends in 2015 but participants of the project - Canada, the European Union, Japan, Russia and the United States - have agreed to extend its operation until at least 2020. >>

22 October 2011: A start-up space company building inflatable habitats for commercial and government lease has laid off half its staff because of delays developing space taxis needed to fly people to the outposts, the company president said. Robert Bigelow, a hotel entrepreneur and founder of Las Vegas-based Bigelow Aerospace, had hoped space taxis, also needed by NASA to fly astronauts to the International Space Station, would be available by early 2015. >>

2 November 2011: The International Space Station received a cargo freighter when the Russian-made vessel loaded with three tons of supplies safely approached and docked on autopilot. The Progress M-13M spacecraft linked up to the station's Pirs module while orbiting 247 miles above northern China. >>

14 November 2011: Soyuz TMA-22 launched three Expedition 29 spaceflyers to the International Space Station from the Baikonour Cosmodrome. Commander Anton Shkaplerov, Flight Engineer Anatoli Ivanishin, (both Roscosmos) and Flight Engineer Daniel C. Burbank (NASA) were on board. >>

15 November 2011: NASA kicked off its application process for new astronauts. >>

16 November 2011: Russia's Soyuz spacecraft docked successfully at the International Space Station. >>

22 November 2011: A Russian Soyuz spacecraft landed safely in Kazakhstan, bringing three crew members back from the International Space Station (ISS). US astronaut Mike Fossum, Japan's Satoshi Furukawa and Russia's Sergei Volkov spent 165 days on the ISS. >>

25 November 2011: Two of the space station's crew stepped out on an EVA. Russian astronauts Dmitry Kondratyev and Oleg Skripochka installed a camera and an experimental radio system, and retrieved a pair of old science experiments. >>

26 November 2011: The launch of Japan's next space station resupply craft will likely be rescheduled for next June, giving engineers time to make up testing of the freighter's H-2B rocket after the deadly earthquake in March, according to NASA and Japanese space officials. >>

15 December 2011: NASA announced a modified competitive procurement strategy to keep on track the agency's plan to have U.S. companies transport American astronauts into space instead of outsourcing this work to foreign governments. >>

19 December 2011: Orbital Sciences rebranded its new commercial rocket that will ferry provisions

and equipment to the International Space Station starting next year -- changing the booster's name from the Taurus 2 to Antares. >>

21 December 2011: NASA astronaut Don Pettit, Russian cosmonaut Oleg Kononenko, and Dutch astronaut Andre Kuipers, part of the ESA, lifted off atop the Russian Soyuz TMA-03M spacecraft from Baikonur Cosmodrome in Kazakhstan. They are set to begin a five-month stay on the orbiting outpost as part of the station's Expedition 30 mission, and will return in May 2012. >>

B. Other Flight Operations

19 January 2011: A five-year programme to ready Chinese astronauts for long-term missions in space has been approved and would begin later is the year. The programme aims to establish astronauts' operational and decision-making abilities in space, along with any psychological and physical changes they undergo living in cramped compartments in weightless conditions. >>

8 March 2011: The then Roscosmos Head Anatoly Perminov told media that his country's engineers stood ready to help commercial space tourism and station operators domestically and in the United States make their vehicles safe and reliable. >>

26 April 2011: A privately built spaceship built by the space tourism company Virgin Galactic soared through its longest flight yet during a drop test over California's Mojave Desert.

The suborbital Virgin Galactic spacecraft, called SpaceShipTwo, manoeuvred through the skies over the Mojave Air and Space Port during the milestone test. The Mojave-based aerospace company Scaled Composites is overseeing construction and flight testing of SpaceShipTwo and its WhiteKnightTwo carrier plane for Virgin Galactic. >>

23 June 2011: ESA and NASA were reported as hashing out a plan that would combine the ATV service module with NASA's Multipurpose Crew Vehicle. >>

15 August 2011: JAXA announced that it wanted to evolve its ISS cargo craft into a capsule for astronauts. >>

16 October 2011: The astronauts who will perform the first space docking mission on the Chinese manned space engineering station will be selected soon. With the increase of activity space for astronauts in this task, there is a greater possibility that the astronauts will suffer from space sickness, according to the information from the official website of China Manned Space Engineering. >>

27 October 2011: From an intense selection process with more than 500 applicants including some of the best pilots in the world, Virgin Galactic has selected former USAF test pilot Keith Colmer as the first astronaut pilot to join the commercial spaceline's flight team. >>

6 November 2011: China is considering sending female astronauts into space during its space docking missions next year, a chief designer for the astronaut programme said. Two female astronauts have been selected for possible flights when spacecraft Shenzhou-9 and -10 are scheduled to dock with space lab module Tiangong-1 in 2012, said Chen Shanguang, director of the Astronaut Center of China (ACC). >>

9 November 2011: A China manned space program spokeswoman said that China is going to conduct another manned space mission by 2012. Spokeswoman Wu Ping said that China plans to launch a

manned mission in at least one of the 2012 spaceships Shenzhou-9 and Shenzhou-10, which are expected to dock with China's first space lab module, Tiangong-1. >>

C. Medical Issues

The Mars500 experiment concluded in 2011. In February, three crew members of the Mars500 virtual flight to Mars 'landed' on their destination planet after 244 days of virtual interplanetary flight, and two of them took their first steps on the simulated martian terrain. In March, the crew wrapped up the exploration of simulated Mars and started to "fly" back home to Earth. On 4 November 2011, the record-breaking mission to Mars ended with smiling faces after 17 months (520 days). Mars500's six volunteers stepped out of their 'spacecraft' to be welcomed by the waiting scientists. >> >> >> >>

16 April 2011: Drugs intended to treat minor illnesses of astronauts in space may need special handling to remain stable in the environment of space, NASA scientists say. Researchers at the Johnson Space Center in Houston, writing in the AAPS Journal, suggest that some of the pharmaceuticals stored on space flights may have shorter shelf-life than they do on Earth. >>

25 April 2011: Despite persistent rumours, astronauts have not yet experimented with sex in space, officials say. >>

15 May 2011: Some of our most intelligent invertebrates - squid - would be blasting off on the next shuttle flight it was reported. Their mission was to reveal whether good bacteria go bad in space. >>

22 May 2011: New research in the FASEB Journal suggests that flawed antibody production could potentially compromise resistance to infections during long-term missions and jeopardize the outcome of a space mission. >>

28 May 2011: Technology developed with ESA funding and drawing on long-running research aboard the International Space Station is opening up a new way to keep hospital patients safe from infections. >>

2 June 2011: NASA and NSBRI selected 12 proposals to support crew health on missions. >>

5 November 2011: A study sponsored by NASA finds that space flights lasting six months or more can cause a spectrum of changes in astronauts' visual systems. Some problems, including blurry vision, appear to persist long after astronauts' return to Earth. The results are affecting plans for long-duration manned space voyages, such as a trip to Mars. The researchers studied seven astronauts, all of whom were about age 50 and had spent at least six continuous months in space. All reported that their vision became blurry, to varying degrees, while on the space station. >>

12 November 2011: ESA has begun developing a new blood-testing device for astronauts on the International Space Station. A wide range of ailments from diabetes to heart disease should be diagnosable in moments from a single drop of astronaut blood. >>

24 November 2011: Igor Fierens, a United Kingdom paediatrician, recommends that space travel should be restricted to children over the age of 12.

13 December 2011: NASA's car-sized Curiosity rover began monitoring space radiation during its 8-month trip from Earth to Mars. The research will aid in planning for future human missions to the Red Planet. >>

D. Space Tourism

13 January 2011: An arrangement between Space Adventures, the Russian Federal Space Agency and Rocket Space Corporation Energia designated three seats on the Soyuz spacecraft for commercial passengers. >>

30 January 2011: At a conference in Munich, Space Adventure's Eric Anderson announced that one of two seats on a trip around the moon had been sold. The second seat, costing $150 million, is still open. Anderson declined to name who the person was, but indicated that he or she is very well-known. >>

24 February 2011: XCOR announced that Southwest Research Institute (SwRI) has purchased 6 rides on the Lynx Mk I for suborbital research projects.

28 February 2011: Virgin Galactic announced that Southwest Research Institute (SwRI) has deposits on 2 seats and options on 6 more seats for suborbital research projects.

18 April 2011: SXC (Space Experience Curacao) and XCOR signed a Memorandum of Understanding, in which the mutually exclusive agreements are officially documented. SXC will be the only party, besides XCOR, to make use of the first spacecraft. >> On 20 September, they jointly announced the wet lease of production Lynx tail number two for operation on the Caribbean island of Curacao, pending export licensing action. >>

5 May 2011: The American FAA announced a meeting to solicit comments and information from the public on its regulatory approach to commercial orbital human spaceflight. >>

5 May 2011: Space Adventures announced that it has sold one ticket for its two person trip around the Moon in a Russian Soyuz spaceship. It said that it was in negotiations for the second ticket. The company also outlined a forecast for commercial orbital spaceflight and announced details of how additional living space will be made available during the company's planned circumlunar mission. >>

6 May 2011: Space projects and organisations such as Excalibur, Galactic Suite, Bigelow's Space Complex Alpha and Russian Orbital Technologies plans have created increasing interest in orbital space tourism, and with that, a need for new data and research. >>

22 May 2011: The Virgin Galactic SpaceShip Two recently completed a "feather" test as the aerospace company inches closer to offering commercial flights to space. >>

19 August 2011: Russia announced ambitious plans to build a hotel in space. >>

26 September 2011: Virgin Galactic boss Sir Richard Branson hopes to launch a vessel into space within the next 12 months, kicking off an era of commercial space travel. >>

15 November 2011: Allianz Global Assistance and the International Space Transport Association (ISTA) have signed a partnership agreement in anticipation of the inevitable growth in space tourism and commercial space flight. The two partners are committed to accompanying travellers before, during and after their space flight to ensure that their unique galactic experience, as well as the experience of their families back on earth, will be as safe, serene and comfortable as possible.

Virgin Galactic recently announced that the first commercial flight is being scheduled for October 2012. In the next few months Allianz Global Assistance will start contacting space liners, space

scientists, travel agents, space travellers, and consumer organizations. It is for the first time ever that the space industry acquires insurance for this type of mission profile. Insurance companies and the space industry never came to a mutual agreement on insurance for commercial, sub-orbital space flights. >>

V. SPACE STUDIES AND EXPLORATION

A. Astronomy and Astrophysics

5 January 2011: Two ESA observatories have combined forces to show the Andromeda Galaxy in a new light. Herschel sees rings of star formation in this, the most detailed image of the Andromeda Galaxy ever taken at infrared wavelengths, and XMM-Newton shows dying stars shining X-rays into space. >>

9 January 2011: At the 217th American Astronomy Society Meeting, the Kepler science team announced Kepler-10b, the smallest exoplanet at 1.4 times larger than the earth, was discovered by the Kepler space telescope. As of February 2011, Kepler has identified more than 1,200 of potential exoplanets. Each of these must be reconfirmed by observations from other ground or space telescopes.

14 January 2011: The first scientific results from ESA's Planck mission were released at a press briefing in Paris. The findings focus on the coldest objects in the Universe, from within our Galaxy to the distant reaches of space. >>

17 January 2011: The Infrared Imaging Satellite "AKARI" and the X-ray Astronomy Satellite "Suzaku" have been observing remnants of a supernova commonly known as Tycho's supernova. Through their observations, a possibility of dust generation due to the condensation of elements released from the supernova was found for first time in the world. The finding became very helpful and contains important data that can help reveal the origin of a planet and life, as there are still lots of mysteries in how dust, one of raw materials to help create a planet, is formulated and destroyed by supernova explosions. >>

20 January 2011: NASA's Wide-field Infrared Survey Explorer (WISE) has captured a new view of two companion galaxies. The pair, named Messier 81 and Messier 82, had an encounter that occurred a few hundred million years ago. >>

28 January 2011: Astronomers have pushed NASA's Hubble Space Telescope to it limits by finding what they believe to be the most distant object ever seen in the universe-at a distance of 13.2 billion light years, some 3% of the age of universe. This places the object roughly 150 million light years more distant than the previous record holder. >>

1 February 2011: NASA's NEOWISE mission has completed its survey of small bodies, asteroids and comets, in our solar system. The mission's discoveries of previously unknown objects include 20 comets, more than 33,000 asteroids in the main belt between Mars and Jupiter, and 134 near-Earth objects (NEOs). >>

3 February 2011: NASA's Kepler mission has discovered its first Earth-size planet candidates and its first candidates in the habitable zone, a region where liquid water could exist on a planet's surface. >>

9 February 2011: NASA has selected 20 small satellites to fly as auxiliary cargo aboard rockets planned to launch in 2011 and 2012. >>

16 February 2011: NASA's Stardust spacecraft returned new images of a comet showing a scar resulting from the 2005 Deep Impact mission. The images also showed the comet has a fragile and

weak nucleus. >>

16 February 2011: It was announced that ESA's Herschel space observatory has discovered a population of dust-enshrouded galaxies that do not need as much dark matter as previously thought to collect gas and burst into star formation. >> >>

26 February 2011: It was announced that the Chandra Observatory found superfluid in a neutron star's core. >>

15 March 2011: NASA's Lunar Reconnaissance Orbiter (LRO) team released the final set of data from the mission's exploration phase along with the first measurements from its new life as a science satellite. >>

24 March 2011: The Stardust spacecraft sent its last transmission to Earth , shortly after depleting fuel and ceasing operations. >>

24 March 2011: X-ray observations made by the Suzaku observatory provided the clearest picture to date of the size, mass and chemical content of a nearby cluster of galaxies. Suzaku, the name given in 2005 to an ASTRO-E spacecraft, a joint venture of NASA and the Japanese Space Agency JAXA. >>

25 March 2011: ESA's Integral gamma-ray observatory has spotted extremely hot matter just a millisecond before it plunges into the oblivion of a black hole. But is it really doomed? These unique observations suggest that some of the matter may be making a great escape. >>

30 March 2011: MESSENGER captured a historic image of Mercury. This image is the first ever obtained from a spacecraft in orbit about the Solar System's innermost planet. Over the subsequent six hours, MESSENGER acquired an additional 363 images before downlinking some of the data to Earth. >>

2 April 2011: Kepler is giving astronomers such a clear view of changes in star brightness that they can now see clues about what's happening inside red giant stars. >>

7 April 2011: NASA's Swift satellite, Hubble Space Telescope and Chandra X-ray Observatory teamed up to study one of the most puzzling cosmic blasts ever observed. >>

8 April 2011: The Alpha Magnetic Spectrometer (AMS) to be launched on Space Shuttle Endeavour's final mission seeks to discover what the Universe is made of. Some scientists predict revolutionary findings in astrophysics. >>

9 April 2011: Resistant spores of bacillus subtilis have now spent 22 months in the 'EXPOSE-R' test container outside the International Space Station. For the first time during a long-duration mission, they were mixed with artificial meteorite dust and exposed to the harsh conditions of outer space. Scientists at DLR are now determining precisely how many of these spores have survived their stay in space. If it turns out that the meteorite dust was able to shield the spores from the hostile space environment, microorganisms may be capable of surviving in meteorites for long periods of time and travelling from one planet to another. >>

12 April 2011: The famous Crab Nebula supernova remnant has erupted in an enormous flare five times more powerful than any flare previously seen from the object. NASA's Fermi Gamma-ray Space Telescope first detected the outburst, which lasted six days. >>

13 April 2011: The Herschel space observatory has revealed that nearby interstellar clouds contain

networks of tangled gaseous filaments. Each filament is approximately the same width, hinting that they may result from interstellar sonic booms throughout our Galaxy. >>

16 April 2011: Astronomers across the globe can now sift through hundreds of millions of galaxies, stars and asteroids collected in the first bundle of data from NASA's Wide-field Infrared Survey Explorer (WISE) mission. >>

26 April 2011: Astronomers using NASA's Galaxy Evolution Explorer may be closer to knowing why some of the most massive stellar explosions ever observed occur in the tiniest of galaxies. >>

27 April 2011: Researchers have discovered 122 new eclipsing binary stars and observed hundreds more variable stars in an innovative survey using NASA's two STEREO solar satellites. The survey has been carried out by team from the Open University, University of Central Lancashire and the STFC Rutherford Appleton Laboratory. >>

28 April 2011: Late in 2010, astronomers noticed an asteroid named Scheila had unexpectedly brightened, and it was sporting short-lived plumes. Data from NASA's Swift satellite and Hubble Space Telescope this year showed these changes likely occurred after Scheila was struck by a much smaller asteroid. >>

1 May 2011: NASA's STEREO solar satellites ability to accurately monitor the brightness of variable stars is giving scientists an invaluable tool in discovering exoplanets and studying star inner structure. >>

9 May 2011: Herschel has detected raging winds of molecular gas streaming away from galaxies. Suspected for years, these outflows may have the power to strip galaxies of gas and halt star formation in its tracks. >>

12 May 2011: The camera system on board the Dawn spacecraft has acquired its first image of the massive asteroid Vesta. Although the mission's first target is still about 975,000 kilometres away, appearing as just a large white dot. >>

12 May 2011: New data analysis from NASA's Galileo spacecraft reveals a subsurface ocean of molten or partially molten magma beneath the surface of Jupiter's volcanic moon Io. >>

18 May 2011: Kepler has identified 1,235 possible planets around stars in our galaxy, astronomers at UC Berkeley, are aiming a radio telescope at the most Earth-like of these worlds to see if they can detect signals from an advanced civilization. >>

19 May 2011: Cassini and a Chilean ground telescope tracked the growth of a giant early-spring storm in Saturn's northern hemisphere so powerful it stretches around the entire planet. >>

23 May 2011: At a meeting of the American Astronomical Society, Bill Borucki , principal investigator for NASA's planet-finding Kepler spacecraft, provided an update on Kepler's hunt for distant worlds, especially those Earth-like planets that might be habitable. >>

24 May 2011: A new planetary member of the Kepler-10 solar system was announced. Using data from NASA's Spitzer Space Telescope, members of the Kepler science team confirmed a new planet, dubbed Kepler-10c. >>

25 May 2011: The Hubble Space Telescope has found a rare class of oddball stars called blue stragglers in the hub of our Milky Way, the first detected within our galaxy's bulge. >>

25 May 2011: An assorted mix of colourful galaxies was released by NASA's Wide-field Infrared Survey Explorer mission, or WISE. The nine galaxies are a taste of what's to come. The mission plans to release similar images for the 1,000 largest galaxies that appear in our sky, and possibly more. >>

26 May 2011: Tiny crystals of a green mineral called olivine are falling down like rain on a burgeoning star, according to observations from the Spitzer Space Telescope. >>

9 June 2011: Observations from NASA's Voyager spacecraft, humanity's farthest deep space sentinels, suggest the edge of our solar system may not be smooth, but filled with a turbulent sea of magnetic bubbles. >>

22 June 2011: The NASA/ESA/ASI Cassini-Huygens mission has directly sampled the water plumes jetting into space from Saturn's moon Enceladus. The findings from these fly-throughs are the strongest evidence yet for the existence of large-scale saltwater reservoirs beneath the moon's icy crust. >>

28 June 2011: The XMM-Newton space observatory has watched a faint star flare up at X-ray wavelengths to almost 10 000 times its normal brightness. Astronomers believe the outburst was caused by the star trying to eat a giant clump of matter. >>

30 June 2011: Integral's gamma-ray observatory has provided results that will dramatically affect the search for physics beyond Einstein. It has shown that any underlying quantum 'graininess' of space must be at much smaller scales than previously predicted. >>

2 July 2011: Galaxies once thought of as voracious tigers are more like grazing cows, according to a new study using NASA's Spitzer Space Telescope. >>

4 July 2011: The Hubble Space Telescope logged its one millionth science observation during a search for water in an exoplanet's atmosphere 1000 light-years away. >>

6 July 2011: Scientists analysing data from Cassini now have the first-ever, up- close details of a Saturn storm that is eight times the surface area of Earth. >>

7 July 2011: High speed plasma flows, often referred to as jets, are extremely common across the Universe. Such jets are observed in Earth's magnetosphere, in solar flares, and near various objects powered by black holes. New insights into the processes that modify these streams of ionised particles were provided by rare in situ measurements of plasma flows made by ESA's Cluster spacecraft. >>

7 July 2011: Herschel has discovered that titanic stellar explosions can be excellent dust factories. In space, the dust mixes with gas to become the raw material for new stars, planets and, ultimately, life. This discovery may solve a mystery of the early Universe. >>

16 July 2011: Dawn began the first extended visit to a large asteroid. The mission went into orbit around Vesta and began gathering science data in early August. Vesta resides in the main asteroid belt and is thought to be the source of a large number of meteorites that fall to Earth. >>

20 July 2011: NASA announced that Hubble Space Telescope discovered the fourth moon of Pluto with a temporary designation P4. The new moon is the smallest discovered around Pluto. It has an estimated diameter of 13 to 34 km. By comparison, Charon, Pluto's largest moon, is 1,043 km across, and the other moons, Nix and Hydra, are in the range of 32 to 112 km in diameter. The finding is a result of on-going work to support NASA's New Horizons mission which will arrive at the Pluto system

in 2015. >>

26 July 2011: Herschel has shown that water expelled from the moon Enceladus forms a giant torus of water vapour around Saturn. The discovery solves a 14-year mystery by identifying the source of the water in Saturn's upper atmosphere. >>

27 July 2011: Astronomers studying observations taken by NASA's Wide-field Infrared Survey Explorer (WISE) mission discovered the first known "Trojan" asteroid orbiting the sun along with Earth. The asteroid was designated 2010 TK7. Scientists had predicted Earth should have Trojans, but they have been difficult to find because they are relatively small and appear near the sun from Earth's point of view. 2011 TK7 was discovered because it has an unusual orbit that takes it farther away from the sun than what is typical for Trojans. >>

29 July 2011: The flow of hot gas toward a black hole has been clearly imaged for the first time in X-rays. The observations from NASA's Chandra X-ray Observatory will help tackle two of the most fundamental problems in modern astrophysics. >>

1 August 2011: Comet 103P/Hartley 2 was observed from the Solar and Heliospheric Observer (SOHO), better known for its observations of the sun. >>

2 August 2011: The Herschel Space Observatory's large telescope and state-of-the-art infrared detectors have provided the first confirmed finding of oxygen molecules in space. The molecules were discovered in the Orion star-forming complex. >>

19 August 2011: A pioneering instrument for the James Webb Space Telescope has completed testing in the UK. MIRI is a key European contribution to the mission, which will be a space telescope with a mirror seven times bigger in area than that of the Hubble Space Telescope >>

23 August 2011: Scientists using data from WISE have discovered the coldest class of star-like bodies, with temperatures as cool as the human body. >>

31 August 2011: Astronomers using Chandra discovered the first pair of supermassive black holes in a spiral galaxy similar to the Milky Way. >>

4 September 2011: Research led by astrophysicists at the University of Warwick (UK) has resolved a 40 year old problem with observations of turbulence in the solar wind first made by the probe Mariner Five. >>

13 September 2011: Herschel has discovered that galaxies do not need to collide with each other to drive vigorous star birth. The finding overturns this long- held assumption and paints a more stately picture of how galaxies evolve. >>

15 September 2011: Kepler has discovered a new planet that orbits around a pair of low-mass stars. >>

19 September 2011: Observations from the WISE mission indicate the family of asteroids some believed was responsible for the demise of the dinosaurs is not likely the culprit, keeping the case open on one of Earth's greatest mysteries. >>

29 September 2011: Astronomers using NASA's Wide-field Infrared Survey Explorer have captured rare data of a flaring black hole, revealing new details about these powerful objects and their blazing jets. >>

29 September 2011: A fleet of spacecraft including XMM-Newton and Integral have shown unprecedented details close to a supermassive black hole. They reveal huge 'bullets' of gas being driven away from the 'gravitational monster'. >>

5 October 2011: Herschel has found water in a comet with almost exactly the same composition as Earth's oceans. The discovery revives the idea that our planet's seas could once have been giant icebergs floating through space. >>

11 October 2011: Astronomers found visual evidence of two elusive exoplanets using old data from the Hubble Space Telescope. >>

15 October 2011: With its high powered eyes directed toward dwarf irregular galaxy Holmberg II, the Hubble space telescope viewed the remnants of a supernova explosion whose shock waves created glowing bubble-like gas features. >>

19 October 2011: Cluster MACS J1206.2-0847 (or MACS 1206 for short) is one of the first targets in a Hubble survey that will allow astronomers to construct the highly detailed dark matter maps of more galaxy clusters than ever before. >>

19 October 2011: Spitzer has detected signs of icy bodies raining down in an alien solar system. >>

20 October 2011: Using data from the Herschel Space Observatory, astronomers have detected for the first time cold water vapor enveloping a dusty disk around a young star. >>

26 October 2011: The Japanese infrared astronomy satellite AKARI measured the sky brightness at the wavelength of 1 ~ 4 micrometers and detected large spatial fluctuation that cannot be explained by the known sources. This fluctuation can be attributed to the clustering of the first stars of the universe, which were formed 300 million years after the Big Bang. >>

2 November 2011: NASA's prolific Kepler Space Telescope may get to extend its search for alien planets by a few years. Funding for Kepler is due to run out in November 2012. But mission managers are writing up a proposal for a mission extension, and they should know by next spring whether it's approved. >>

5 November 2011: An international team of scientists using NASA's Fermi Gamma-ray Space Telescope has discovered a surprisingly powerful millisecond pulsar that challenges existing theories about how these objects form. >>

11 November 2011: Saturn's moon Enceladus shows its icy face and famous plumes in raw, unprocessed images captured by the Cassini spacecraft during its successful flyby on 6 November. During this Enceladus encounter, the 16th of Cassini's mission, the spacecraft passed the moon at distance of about 500 kilometers. >>

27 November 2011: Scientists using NASA's Fermi Gamma-ray Space Telescope have detected beams of antimatter produced above thunderstorms on Earth, a phenomenon never seen before. >>

5 December 2011: Voyager 1 has entered a new region between our solar system and interstellar space. Data obtained from Voyager over the last year reveal this new region to be a kind of cosmic purgatory. >>

6 December 2011: Kepler confirmed its first planet in the "habitable zone," the region where liquid water could exist on a planet's surface. Kepler also has discovered more than 1000 new planet

candidates, nearly doubling its previously known count. Ten of these candidates are near-Earth-size and orbit in the habitable zone of their host star.

In the distant past they may have been able to support life and one of them may have had conditions similar to our own planet - a so-called Earth-twin - according to the research team. They have described their findings as the most important planets ever discovered outside our Solar System. One of the planets, named Kepler 20f, is almost exactly the size of the Earth. Kepler 20e is slightly smaller at 0.87 times the radius of Earth and is closer to its star than 20f. >>

10 December 2011: Only 15 planets and 30 moons could potentially support alien life, according to a new online catalogue of habitable planets launched by astronomers. The Habitable Exoplanets Catalogue (HEC) website describes the project as "an online database for scientists, educators, and the general public focused on habitable exoplanets discoveries." >>

15 December 2011: An international team of astronomers has identified a candidate for the smallest-known black hole using data from NASA's Rossi X-ray Timing Explorer (RXTE). >>

25 December 2011: The new and highly sensitive Cosmic Origins Spectrograph aboard the Hubble Space Telescope has discovered a strong ultraviolet-wavelength absorber on Pluto's surface, providing new evidence that points to the possibility of complex hydrocarbon and/or nitrile molecules lying on the surface. >>

29 December 2011: Astronomers exploiting six years' worth of data from the INTEGRAL mission have pinned down the individual processes contributing to the high-energy Galactic interstellar emission produced by cosmic-ray electrons. Deciphering each of the different physical mechanisms at play at hard X-ray and soft gamma-ray wavelengths represents a crucial step towards an increasingly detailed picture. >>

B. Plasma and Atmospheric Physics

17 January 2011: Scientists using Fermi have detected beams of antimatter produced above thunderstorms on Earth, a phenomenon never seen before. >>

21 April 2011: NASA's Mars Reconnaissance Orbiter discovered the total amount of atmosphere on Mars changes dramatically as the tilt of the planet's axis varies. >>

21 May 2011: An exotic experiment that could write the lasting scientific legacy of the International Space Station by probing the mysteries of physics was unloaded from the shuttle Endeavour and mounted atop the orbiting outpost. >>

9 June 2011: A U.N. plan to upgrade "space weather" forecasts can help the world cope with solar storms that might wreak up to $2 trillion in damage if the sun repeated a giant flare of 1859, experts said. >>

10 June 2011: ESA's Proba-2 small Sun-watcher was among the flotilla of satellites on watch as the Sun erupted spectacularly. >>

30 July 2011: NASA's SDO spotted extra energy in the solar corona. >>

7 August 2011: Antiprotons appear to ring the Earth, confined by the planet's magnetic field lines.

The antimatter, which may persist for minutes or hours before annihilating with normal matter, could in theory be used to fuel ultra-efficient rockets of the future. Piergiorgio Picozza from the University of Rome Tor Vergata, Italy, and colleagues detected the antiprotons using PAMELA, a cosmic-ray detector attached to a Russian Earth-observation satellite. The spacecraft flies through the Earth's inner radiation belt over the south Atlantic. >>

10 October 2011: NASA will begin development and testing of two science instruments, in cooperation with ESA, to be placed on ESA's newly selected Solar Orbiter mission. >>

19 November 2011: A new study based on data from ESA's Cluster mission has revealed that the bow shock formed by the solar wind as it encounters Earth's magnetic field is remarkably thin: it measures only 17 kilometres across. Thin astrophysical shocks such as this are candidate sites for early phases of particle acceleration. >>

C. Space Exploration

5 January 2011: In research related to the Mars Express mission, conditions favourable to life may once have existed all over Mars. Detailed studies of minerals found inside craters show that liquid water was widespread, not only in the southern highlands, but also beneath the northern plains. >>

7 March 2011: In which direction is the sun's stream of charged particles banking when it nears the edge of the solar system? To enable Voyager 1's Low Energy Charged Particle instrument to gather these data, the spacecraft performed a manoeuvre. >>

14 March 2011: In early March, Lockheed Martin was winding up thermal vacuum tests before shipping the Juno probe to Jupiter to Cape Canaveral. >>

25 March 2011: NASA's LRO provided an image of the Moon's far side in unprecedented detail.

1 April 2011: Mars Express has returned images of mist-capped volcanoes located in the northern hemisphere of the red planet. Long after volcanic activity ceased, the area was transformed by meteor impacts that deposited ejected material over the lower flanks of the volcanoes. >>

8 April 2011: It was reported that analysis suggests a mysterious deviation in the paths of NASA's twin Pioneer probes may be due to uneven radiation of their heat into space >>

20 April 2011: NASA released the first images and sounds of an electrical connection between Saturn and one of its moons. The data collected by the agency's Cassini spacecraft enable scientists to improve their understanding of the complex web of interaction between the planet and its numerous moons. >>

29 April 2011: The SETI Institute put its $50 million Allen Telescope Array (ATA) into hibernation because the organisation is unable to attract the $5m investment it needs to fund operation of the vast radio dishes that search the universe for extraterrestrial life. >>

Then on 8 December, astronomers rebooted their search for intelligent life on alien planets, and they've got thousands of targets to scan. After hibernating for more than seven months, a set of radio telescopes run by the SETI once again began listening for signals from the many alien planet candidates discovered by NASA's Kepler space telescope, researchers announced. >>

16 May 2011: After years of poring through images from space and debating where on Mars the next NASA rover should land, it was reported that the decision comes down to four choices. >>

26 May 2011: A team of NASA-funded researchers has measured for the first time water from the moon in the form of tiny globules of molten rock, which have turned to glass-like material trapped within crystals. >>

1 June 2011: Four decades after the first Moon landing, our only natural satellite remains a fascinating enigma. Specialists from Europe and the US have been looking at ESA's proposed Lunar Lander mission to find out how to seek water and other volatile resources. >>

8 June 2011: Mission controllers had the first opportunity to switch ESA's Rosetta comet-hunter into deep-space hibernation for 31 months. During this loneliest leg of its decade-long mission, Rosetta will loop ever closer toward comet 67-P, soaring to almost 1000 million km from Earth. >>

14 June 2011: NASA's Dawn mission to the doughnut-shaped asteroid belt between Mars and Jupiter, which launched in September 2007, was now approaching Vesta, a protoplanet that is currently some 143 million miles from Earth. >>

15 June 2011: Decision on the fate of the Chinese lunar probe: will go to the second Sun-Earth Lagrangian point this month. >>

17 June 2011: Approximately 163 million kilometres still separate ESA's spacecraft Rosetta from comet Churyumov-Gerasimenko, its 2014 target. Despite this remarkable distance, scientists from the Max Planck Institute for Solar System Research (MPS) in Germany have succeeded in obtaining the first images of the remote destination using the onboard camera system OSIRIS. >>

18 June 2011: Ten new exoplanets have been discovered by the European satellite, CoRoT. Confirmed via meticulous, ground-based observations, these exoplanets exhibit a wide variety of masses, densities, orbital parameters and other properties. >>

19 June 2011: NASA and the ESA have picked the experiments for a new international Mars lander that will launch toward the Red Planet in 2016. >>

20 June 2011: After nearly three months in orbit about Mercury, MESSENGER's payload is providing a wealth of new information about the planet closest to the Sun, as well as a few surprises. >>

26 June 2011: NASA declared full mission success for the Lunar Reconnaissance Orbiter (LRO). >>

17 July 2011: Two small NASA probes that had been used to study space weather now are orbiting the moon to study its interior and surface composition. The spacecraft, called Acceleration, Reconnection, Turbulence and Electrodynamics of the Moon's Interaction with the Sun (ARTEMIS), began their journey away from Earth's orbit in July 2009. The first spacecraft entered lunar orbit on 27 June, and the second on 17 July. >>

22 July 2011: NASA announced which crater it has picked for the 2.5 billion dollar Mars rover, Curiosity, to probe for signs of life when the unmanned vehicle is lowered onto the red planet next year. The six-wheeled mechanical science lab will explore a crater called Gale, which contains a mountain and will help scientists study clay and sulphate deposits at various heights. >>

28 July 2011: New evidence of Mars' watery past has surfaced, NASA scientists say, suggesting that telltale signs of the wet stuff may lurk under thin layers of rust seen scattered around the Red Planet,

in areas that mirror conditions found in Earth's desert regions. >>

30 July 2011: NASA scientists believe they may have found the final resting place of a 1960s space probe which crashlanded on the far side of the Moon. The information comes in new imagery from the Lunar Reconnaissance Orbiter (LRO), sent up to circle the Moon under the Bush administration's plan for a manned return to our satellite body as a precursor to Mars missions. >>

5 August 2011: Observations from NASA's Mars Reconnaissance Orbiter have revealed possible flowing water during the warmest months on Mars. NASA's Mars Exploration Program keeps bringing us closer to determining whether the Red Planet could harbour life in some form. >>

8 August 2011: After seven-years of stop-and-go driving, NASA's intrepid Mars rover Opportunity has covered just over 20 miles on the Red Planet - more than 50 times the rover's original distance goal. >>

18 August 2011: NASA's Dawn spacecraft, which arrived in orbit around the asteroid Vesta in July, officially began its year-long mission. >>

5 September 2011: A space mission to a nearby asteroid launched in 2005 has yielded some interesting clues about Earth's early formation. Japanese scientists on that mission reported in the journal 'Science' that despite retrieving a very small sample from the nearby Itokawa asteroid, the knowledge gained is huge. >>

23 September 2011: China's second moon orbiter Chang'e-2, which is drifting deep into space after completing its moon mission has sent back the first batch of data while orbiting the second Lagrange Point (L2) about 1.7 million km away from Earth. The orbiter is scheduled to travel around the L2 orbit until the end of 2012, according to the State Administration of Science, Technology and Industry for National Defence. >>

30 September 2011: Mercury is not just hellishly hot but apparently covered in brimstone. A vast part of the planet is covered with dried lava. These and other discoveries about Mercury were announced in seven papers released in the journal Science, a trove of knowledge from NASA's Messenger probe, covering everything from odd landscape to the planet's magnetic core. >>

2 October 2011: Far-out ideas on how to visit another star was discussed at the 100 Year Starship Symposium. >>

3 October 2011: New analysis of data sent back by the SPICAM spectrometer on board Mars Express has revealed for the first time that the planet's atmosphere is supersaturated with water vapour. >>

9 October 2011: ESA's Venus Express spacecraft has discovered an ozone layer high in the atmosphere of Venus. Comparing its properties with those of the equivalent layers on Earth and Mars will help astronomers refine their searches for life on other planets. >>

18 October 2011: Europe has formally invited Russia to participate in space missions to Mars in 2016 and 2018. A "yes" from the Russian space agency may be the only way of saving the missions which are at risk of cancellation due to lack of funds. >>

23 October 2011: Russian scientists at the Space Research Institute of the Russian Academy of Sciences have chosen six venues for landing the Luna-Glob probe. With the launch of the probe in 2014, Russia will resume its Moon-exploration programme using automatic stations, which was started by Lunakhods several decades ago. >>

26 October 2011: China's second moon probe is parked at a stable spot in deep space, called a Lagrangian point, as part of a new mission to study the sun and Earth's magnetic field. The multi-tasking spacecraft, called the Chang'e 2, completed its moon mapping mission earlier this year. Its new mission may be a signal of China's expanding prowess in space - not only for scientific purposes, but perhaps for showcasing strategic intentions, experts say. >>

18 November 2011: NASA has announced that it will extend the MESSENGER mission for an additional year of orbital operations at Mercury beyond the planned end of the primary mission on March 17, 2012. The MESSENGER probe became the first spacecraft to orbit the innermost planet on March 18, 2011. >>

23 November 2011: New results from Venus Express suggest that beneath the acidic cloak lies an extreme world that provides an important point of comparison for understanding Earth's evolution. >>

2 December 2011: NASA's New Horizons mission reached a special milestone on its way to reconnoiter the Pluto system, coming closer to Pluto than any other spacecraft. It has taken New Horizons 2143 days of high-speed flight - covering more than a million kilometres per day for nearly six years - to break the closest-approach mark of 1.58 billion kilometres set by NASA's Voyager 1 in January 1986. >>

9 December 2011: Mars rover Opportunity has found slivers of a bright material that looks very much like it is gypsum (calcium sulphate). If confirmed, it would be the most unambiguous signal of water activity yet found on Mars by this mission. >>

24 December 2011: Dawn has sent back the first images of the giant asteroid Vesta from its low-altitude mapping orbit. >>

D. Space Operations

3 January 2011: Space Systems/Loral announced that the Hispasat 1E satellite, designed and built for the HISPASAT Group, is performing post-launch manoeuvres according to plan. >>

11 January 2011: It was announced that Intelsat has regained control of its runaway Galaxy 15 telecommunications satellite, which stopped responding to commands in April 2010. The company was guiding it to a test location to determine whether it can be returned to commercial service, Intelsat officials said. >>

21 January 2011: During the last of a series of eight encounters with the martian moon Phobos, the DLR-operated High-Resolution Stereo Camera on Mars Express acquired a detailed view of the martian satellite. The orbiter flew past Phobos at a distance of only 100 kilometres on 9 January 2011 and imaged the southern hemisphere of the irregularly-shaped moon. Researchers at DLR planned the image acquisition and processed the resulting data. >>

21 January 2011: NASA's Marshall Space Flight Center confirmed that NASA had deployed the first solar sail in in NanoSail-D satellite. NanoSail-D was launched on November 19, 2010 from Kodiak Island, Alaska. After the deployment, NanoSail-D was expected to stay in orbit between 70 to 120 days. However, this estimate was later changed to 6 months to 1 year due to the low solar activity. As of August 31, 2011, NanoSail-D has descended over 140 km after the sail was unfurled for 222 days. This provides valuable data for de-orbiting mechanisms for future satellites. >>

22 January 2011: Russian weather satellite Electro-L, which had been launched by Zenith, shows fully nominal operations in orbit, Roscosmos Deputy Head Anatoly Shilov stated. Electro-L system status was checked after it reached the targeted orbit. Experts confirmed solar array deployment and nominal operations of the satellite. "Currently, we have two weather satellite in national orbital constellation - Electrol-L and Meteor-M. Electol will help improving weather prediction capabilities", the Roscosmos Deputy Head added. >>

14 February 2011: NASA's Stardust-Next made a flyby of comet Tempel 1. Stardust was launched in 1999 and captured particles from comet Wild 2 in 2004. On 24 March, the mission was officially terminated when the fuel in the propulsion tank was depleted and the last command was sent and acknowledged by the spacecraft, 310 million kilometers from earth.

15 March 2011: Engineers had expected NASA's Mars Spirit rover to wake up once there was maximum sunlight where it was trapped but that point came and went with no response. >>

17 March 2011: NASA's MESSENGER spacecraft successfully achieved orbit around Mercury. This marks the first time a spacecraft has accomplished this engineering and scientific milestone at our solar system's innermost planet. >>

24 March 2011: The Stardust spacecraft performed a final burn with its main engines, effectively ending the life of NASA's most travelled comet hunter. >>

26 March 2011: Kepler recovered from a glitch that took it offline for 144 hours. >>

1 April 2011: China's second lunar satellite, the Chang'e-2, had been safely operating for 180 days and reached its six-month designed life, according to the State Administration of Science, Technology and Industry for National Defense (SASTIND). Currently, the satellite system status is normal and stable, and the satellite has fully realized its given project targets and achieved a number of important scientific results.

15 April 2011: After more than 17 years of service, Meteosat-6 - the longest operating Meteosat First Generation satellite - was moved to a graveyard orbit. >>

22 April 2011: After five years in orbit, JAXA's Advanced Land Observing Satellite (ALOS) "Daichi" abruptly shut down while it was carrying out a mapping mission after Japan's March 11 earthquake and tsunami. Daichi was launched 24 January 2006 and was designed for 3 years. Without any success in resuscitating the satellite, JAXA officially terminated the rescue effort and ended the mission on May 12. >>

24 April 2011: The Russian Space Forces re-established contact with a military satellite, Geo-IK-2, which went missing in February, local media reported. According to a spokesman from the Defense Ministry, Interfax news agency said the Space Forces had already received telemetric information from the satellite and collection and analysis of the data were currently underway. >>

27 April 2011: NanoSail-D was reported as slowly descending after successfully orbiting the Earth's upper atmosphere for 95 days since deploying its 100-square-foot sail. The small satellite demonstration experiment continued its descent towards Earth, lending key sail data to the design of de-orbit mechanisms for future satellites. >>

3 May 2011: Dawn reached its official approach phase to the asteroid Vesta and will begin using cameras for the first time to aid navigation for an expected July 16 orbital encounter. >>

4 May 2011: NASA's Gravity Probe B (GP-B) mission confirmed two key predictions derived from Albert Einstein's general theory of relativity, which the spacecraft was designed to test. >>

10 May 2011: MESSENGER has completed its 100th orbit around Mercury. Since its insertion into orbit about the innermost planet on March 17, the spacecraft had executed nearly 2 million commands. by 10 May. >>

11 May 2011: Dawn obtained its first image of the giant asteroid Vesta, which will help fine-tune navigation during its approach. >>

18 May 2011: First Sbirs reached geosynchronous orbit. The satellite began deploying its solar arrays, antennas and a light shade to protect the infrared sensors.

25 May 2011: NASA said that it was ending attempts to regain contact with the long-lived Mars Exploration Rover Spirit, which last communicated on 22 March 2010. >>

8 June 2011: NASA has released unprecedented views of the International Space Station linked up with the shuttle Endeavour, as seen from a departing Russian Soyuz spacecraft. >>

9 June 2011: The Chang'e-2 lunar orbiter bid farewell to the moon on its way to a remote region of outer space to carry out further research. The country's second lunar orbiter thus became China's furthest travelled space probe on record. >>

21 June 2011: In a press release, NASA announced that using over four billion measurements made by the Lunar Reconnaissance Orbiter, the most precise and complete topographic maps to date of the moon's complex, heavily cratered landscape have been created.

30 June 2011: Using ingenuity and an unorthodox 'dirty hack', ESA recovered the four-satellite Cluster mission from near loss. The drama began in March, when a crucial science package stopped responding to commands - one of a mission controller's worst fears. >>

6 July 2011: After 16 years spent gathering a wealth of data that has revolutionised our understanding of Earth, ESA's veteran ERS-2 satellite was being retired. This pioneering mission has not only advanced science, but also forged the technologies we now rely on for monitoring our planet. >>

11 July 2011: Mission managers for Dawn were studying the spacecraft's ion propulsion system after Dawn experienced a loss of thrust on June 27. >>

16 July 2011: Dawn became the first probe ever to enter orbit around an asteroid. This asteroid, named Vesta, is in the main asteroid belt between Mars and Jupiter. Dawn will study the asteroid for a year before departing in July 2012 for a second destination, a dwarf planet named Ceres. Dawn was launched in September 2007 and will be the first spacecraft to orbit two solar system destinations beyond Earth.

29 July 2011: The orbit of the retired ERS-2 observation satellite was lowered to reduce the risk of collision with other satellites or space debris. The goal is to leave it well below most operating polar satellites by the end of August. >>

11 August 2011: The Dawn spacecraft began collecting data about the asteroid Vesta. The NASA probe made its first detailed observations of the surface from a distance of 1,700 miles and would spend the next several weeks taking images from that altitude. Afterwards, it spiralled closer to the asteroid to get a better view. >>

25 August 2011: Chang'e-2 reached an orbit at L2, 1.5 million kilometres from Earth for an additional mission of deep space exploration. China became the third entity, after USA and ESA, to successfully put an object at a Lagrangian point. In October, the satellite would help test the capability of two large antennas being built for deep space exploration. An antenna with an aperture of 35 meters is being built at Kashgar in Northwest China and another antenna with an aperture of 64 meters is being built at Jiamusi in Northeast China. They are part of China's deep space network that will take shape in 2016. >>

1 September 2011: The departing Juno probe has looked back and pictured Planet Earth. NASA's Jupiter-bound spacecraft imaged the pale blue dot at a distance of 9.5 million km during an early check-out of its camera and other onboard systems. >>

6 September 2011: LRO captured the sharpest images ever taken from space of the Apollo 12, 14 and 17 landing sites. >>

7 September 2011: A Japanese Venus probe successfully fired its main engine for the first time since overshooting the planet in December, paving the way for a possible comeback bid in 2015. The Akatsuki spacecraft was slated to enter orbit around Venus on Dec. 6. But its engine failed during a crucial orbit-insertion burn, and the probe went sailing off into space. Officials with the JAXA haven't given up on Akatsuki. They want the probe to take another shot at Venus during the next available opportunity, which could come as soon as 2015. So they've started testing the probe's main engine, called the "orbit manoeuvre engine." >>

12 September 2011: After a final thruster firing to deplete its remaining fuel, the ERS-2 observation satellite was safely taken out of service. Ground controllers also ensured the space environment was protected for future missions. >>

21 October 2011: Russian scientists want to join European Space Agency's ExoMars (Exobiology on Mars) mission to study the Red Planet, a leading Russian space researcher said. >>

2 November 2011: Anomalies in the operation of the solid-state mass memory system on board Mars Express caused science observations to be temporarily halted. A technical work- around is being investigated that will enable the resumption of a number of observations and should evolve into a long-term solution. >>

4 November 2011: NASA's Deep Space Network personnel sent commands to the Voyager 2 spacecraft to switch to the backup set of thrusters that controls the roll of the spacecraft. Confirmation was received that the spacecraft accepted the commands. The change will allow the 34-year-old spacecraft to reduce the amount of power it requires to operate and use previously unused thrusters as it continues its voyage through the heliopause. >>

6 November 2011: ViaSat Inc. announced that ViaSat-1, the highest capacity satellite in the world, is now positioned in geosynchronous orbit where it would begin in-orbit testing. >>

7 November 2011: Europe's first two Galileo satellites have reached their final operating orbits, opening the way for activating and testing their navigation payloads. >>

7 November 2011: China's space industry will develop quickly over the next 10 years as the country pushes ahead with its space programmes after its first space docking. Lab modules, a space station and 10 to 20 spaceships will be launched into space over the next 10 years, the Shanghai Securities News said. >>

11 November 2011: Prime Minister Syed Yusuf Raza Gilani inaugurated the commercial operation of Pakistan's second communication satellite Paksat-1R in Lahore. Paksat-1R was launched on August 12 from Xichang Satellite Launch Centre by China Great Wall Industry Corporation (CGWIC). >>

14 November 2011: China completed its second space docking, state media reported, as it moves closer towards fulfilling its ambition to set up a manned space station. The move comes 12 days after the Asian nation successfully completed its first ever "kiss" in space, when the Shenzhou VIII spacecraft joined onto the Tiangong-1 experimental module 343 kilometres above the Earth. >>

17 November 2011: The Shenzhou 8 capsule landed in the Gobi desert, the final moments of its descent having being slowed by parachute. Chinese recovery crews retrieved two dummy astronauts and a German experiment aboard the Shenzhou 8 space capsule after landing. >>

19 November 2011: The U.S. Geological Survey (USGS) has stopped acquiring images from the 27-year-old Landsat 5 Earth observation satellite due to a rapidly degrading electronic component. Landsat 5 was launched in 1984 and designed to last 3 years. The USGS assumed operation of Landsat 5 in 2001 and managed to bring the aging satellite back from the brink of total failure on several occasions following the malfunction of key subsystems. There is now an increasing likelihood that the Landsat 5 mission is nearing its end. >>

21 November 2011: Japan's Akatsuki probe completed a three-part series of course correction manoeuvres, lining up the spacecraft for a second chance to reach Venus in late 2015 after an engine failure curbed plans to orbit the sweltering, cloud-covered planet one year ago. >>

22 November 2011: A ESA tracking antenna in Australia established communications with Russia's Phobos-Grunt spacecraft, which had been stuck in low Earth orbit since its launch following an unexplained engine failure, ESA and the Russian space agency, Roscosmos, announced. >>

24 November 2011: Following the first successful contact , ESA's tracking station in Australia again established two-way communication with Russia's Phobos-"Grunt spacecraft on 23 November. >>

27 November 2011: Controllers were making excellent progress in returning Mars Express to routine service. Some science activities have already resumed after being temporarily suspended in October following a series of faults related to the onboard data storage system. >>

28 November 2011: Japan's Akari infrared space telescope was switched off after five years of scanning the sky in search of star-forming dust clouds, ancient galaxies in the distant universe, and asteroids within the solar system. >>

2 December 2011: NASA's NanoSail-D successfully completed its Earth orbiting mission. >>

15 December 2011: The Dawn spacecraft successfully maneuvered into its closest orbit around the giant asteroid Vesta, beginning a new phase of science observations. >>

17 December 2011: The Curiosity rover began monitoring space radiation during its 8- month trip from Earth to Mars. The research will aid in planning for future human missions to the Red Planet. >>

VI. TECHNOLOGY - IMPLEMENTATION and ADVANCES

A. Propulsion

6 January 2011: NASA's Robotic Lunar Lander Development Project at Marshall Space Flight Center in Huntsville, completed a series of hot fire tests and taken delivery of a new propulsion system for integration into a more sophisticated free-flying autonomous robotic lander prototype. The project is partnered with the Johns Hopkins University Applied Physics Laboratory to develop a new generation of small, smart, versatile robotic landers to achieve scientific and exploration goals on the surface of the moon and near-Earth asteroids. >>

8 February 2011: ATK announced a partnership with Astrium to create a rocket from a solid rocket booster first stage and a Ariane 5 second stage to compete in NASA's commercial crew launch services programme.

26 March 2011: A joint venture that manufactures launch vehicles is partnering with an entrepreneurial space company to develop a new upper stage engine. United Launch Alliance and XCOR Aerospace said they plan to jointly develop a new liquid- oxygen/liquid-hydrogen upper-stage engine capable of producing 111,000-133,000 newtons of thrust. That engine could be a potential replacement for the RL10 engine by Pratt & Whitney Rocketdyne currently used on the upper stages of ULA's Atlas 5 and Delta 4 rockets. ULA and XCOR have previously worked together on engine technology development efforts, including recent testing of a lightweight aluminium nozzle on an XCOR engine. >>

6 April 2011: Aerojet and NEC Corporation announced that they had successfully operated a Japanese HAYABUSA low power microwave ion engine at Aerojet's facility in Redmond, Washington. These ion propulsion systems provide propellant efficiencies more than 10 times higher than those of conventional propulsion systems for use on low Earth orbit, geosynchronous and deep space missions. >>

25 May 2011: A revolutionary UK spaceplane concept has been boosted by the conclusions of an important technical review. The proposed Skylon vehicle would do the job of a big rocket but operate like an airliner, taking off and landing at a conventional runway. European Space Agency propulsion experts have assessed the details of the concept and found no showstoppers. >>

17 June 2011: NASA issued a Broad Agency Announcement (BAA) seeking proposals for mission concept studies of a solar electric propulsion system demonstration to test and validate key capabilities and technologies for future exploration missions. >>

21 June 2011: NASA tentatively selected a vehicle design featuring solid-fuelled, side-mounted boosters that eventually could be replaced with liquid-fuelled engines, according to U.S. industry and congressional sources. >>

22 June 2011: The new main engine to power Europe's successor to its Ariane 5 space launcher was brought a step closer when ESA signed a 60 million euro contract with a propulsion consortium at the Paris Air & Space Show. ESA is preparing the NGL Next- Generation Launcher to meet Europe's institutional needs and safeguard its guaranteed access to space into the long term, ensuring it will

continue to have effective and economic launchers at its disposal. >>

25 August 2011: Sometimes all it takes is fresh air to get a new lease of life. ESA's Proba-2 microsatellite is a good example: an influx of nitrogen has replenished its fuel tank, in the process demonstrating a whole new space technology. >>

4 September 2011: Last year, JAXA, Japan's space agency launched the world's first solar sail into interplanetary space; its metal-coated membrane unfurled and caught the light to begin sunjamming. And with help from tiny "nanosatellites" that allow scientists to pack folded-up sails in spacecraft no bigger than a loaf of bread, NASA this year sent its first sail skipping through Earth orbit. >>

8 September 2011: NASA and Alliant Techsystems conducted a full-scale test of a five-segment, solid rocket motor at the ATK Aerospace Systems test facility in Promontory, Utah. >>

19 October 2011: NASA, the National Reconnaissance Office (NRO) and the U.S. Air Force signed an agreement to establish clear criteria for certification of commercial providers of launch vehicles used for national security space and civil space missions. >>

18 November 2011: The NASA Marshall Space Flight Center is moving toward a more open-ended technology development portfolio, eyeing in-space nuclear propulsion. >>

27 November 2011: ESA and DLR fired a Texus rocket 263 km into space to test a new way of handling propellants on Europe's future rockets. >>

29 November 2011: Aerojet announced that it has successfully completed a major milestone in the development of a ground demonstrator for the Next Generation Engine (NGE) program. Aerojet, along with its partner Florida Turbine Technologies, Inc. (FTT), recently completed the Preliminary Design Review (PDR) of the turbopump assembly before an Independent Review Team comprised of third party turbomachinery experts. >>

15 December 2011: The Space Launch System needs new boosters to meet the 130-metric-ton capability that US Congress has ordered. >>

B. Power

15 April 2011: Russia's Federal Space Agency Roscosmos and NASA discussed the development of a nuclear-powered spaceship. >>

12 May 2011: Two of the robotic missions NASA has selected for further study would be powered by experimental nuclear generators, a new technology under development to boost the efficiency of electricity production in deep space.

NASA picked robotic missions to Mars, a comet and Saturn's moon Titan as finalists for a launch opportunity in 2016, and two of the probes would employ a cutting edge nuclear power source never tested in space. >>

5 July 2011: Astrium continued to prepare Europe's future propulsion technology by signing a euros 60 million rider with the ESA and its partners of the joint propulsion team consortium, Avio SpA (Italy) and SNECMA (SAFRAN Group) (France). >>

31 August 2011: Humans might not be living on Mars or the moon anytime soon, but scientists might have just overcome one major hurdle on the route to interstellar habitation: electricity. Proposals were made for a tiny nuclear reactor which could power a Mars colony. >>

C. Design, Technology and Development

19 January 2011: The draft design of a new docking compartment for the International Space Station has been approved by Rocket Space Corporation Energia's Scientific Board. The module for the ISS Russian segment is intended to provide attachment of the two scientific power modules, as well as additional docking ports for Soyuzes and Progresses. The module is to be attached to Multi-Purpose Module; both are expected to arrive at the ISS in 2012. >>

26 April 2011: Technology developed for space missions to study the most distant objects in the Universe is now finding a host of practical applications back on Earth. QMC Instruments Ltd., in partnership with the Astronomical instrumentation Group at Cardiff University (Wales), has built instruments for many major space missions, including Herschel and Planck. >>

10 May 2011: Pau Pyrénées in southern France has become Europe's first airport to use the new EGNOS Safety-of-Life Service, to guide aircraft in for landing using only this highly accurate space navigation signal. >>

14 May 2011: The Director of Vikram Sarabhai Space Centre (VSSC), Thiruvananthapuram, P S Veeraraghavan said India`s space scientists are designing a reusable space craft, which is likely to be launched in 2030. ISRO is currently working on Human Spacelift Project or the man mission in 2015 and Chandrayan-II in 2013, he said. >>

16 May 2011: Shuttle Endeavour's last flight delivered the first three one centimetre satellite prototypes to be mounted on the International Space Station. They're among many other experiments that will be carried to the ISS, including the $2 billion Alpha Magnetic Spectrometer-2 that has captured most of the science-related headlines as the mission approaches. >>

16 May 2011: JAXA successfully conducted the first phase of the "Drop test for Simplified Evaluation of Non-symmetrically Distributed sonic boom" (D-SEND) twice on 7 and 16 May at the Esrange Space Center in Sweden in cooperation with the Swedish Space Corporation (SSC). JAXA has, for the first time in the world, confirmed the validity of low sonic boom axisymmetric design by a balloon drop test. >>

26 May 2011: NASA announced a plan to develop a new deep-space vehicle, one based on an earlier capsule concept, in order to send astronauts on expeditions to an asteroid and then on to Mars. >>

26 May 2011: Arianespace Chief Executive Jean-Yves Le Gall urged European governments to begin work on a successor to Europe's heavy-lift Ariane 5 rocket without delay, saying Europe is the only major spacefaring region that is not building a new rocket. >>

8 July 2011: The largest digital camera ever built for a space mission has been painstakingly mosaicked together from 106 separate electronic detectors. The resulting billion-pixel array will serve as the super-sensitive 'eye' of ESA's Galaxy-mapping Gaia mission. >>

2 August 2011: Even while construction of the James Webb Space Telescope is underway on the most advanced infrared vision of any space observatory, its technologies are already proving useful to

human eye health here on Earth. >>

5 August 2011: NASA selected four companies to develop concepts for storing and transferring cryogenic propellants in space. >>

11 August 2011: NASA is awarding $100,000 grants to 30 teams for out-of-this-world ideas ranging from new kinds of spacesuits to space solar power and quantum communication. >>

28 August 2011: Moon Express, a Google Lunar X PRIZE contender, announced that it had successfully demonstrated a critical component of its lunar landing technology to NASA under its Innovative Lunar Demonstration Data (ILDD) Program contract. >>

10 September 2011: ATK conducted a third successful ground test of the next-generation solid rocket motor. >>

14 September 2011: NASA selected the design of a new Space Launch System that will take the agency's astronauts farther into space than ever before, create high-quality jobs here at home, and provide the cornerstone for America's future human space exploration efforts. >>

15 September 2011: NASA and Alliant Techsystems Inc., a leading rocket contractor, announced they will share data and expertise in helping design and develop the Liberty rocket, a U.S.- European launcher that could haul humans into Earth orbit by 2015. >>

20 September 2011: NASA is testing an element of the sunshield that will protect the James Webb Space Telescope's mirrors and instruments during its mission to observe the most distant objects in the universe. >>

22 September 2011: NASA completed the first in a series of flight-like parachute tests for the agency's Orion spacecraft. >>

1 October 2011: Space entrepreneur Elon Musk said that his company will try to develop an fully reusable orbital launch system -" and he sketched out a scenario for using such a system to send settlers to Mars. >>

31 October 2011: SpaceX founder and chief executive Elon Musk, along with other leaders in the private space industry, testified before US lawmakers, seeking to secure funding to develop a replacement for the Space Shuttles that were decommissioned earlier this year. SpaceX's launch abort system uses small rockets attached to the side of the Dragon spacecraft, which push the capsule to a high enough altitude to deploy the parachutes during any aborted launch. Because the rockets remain with the capsule, the risks of the tractor tower system unsuccessfully jettisoning is eliminated. >>

8 November 2011: NASA is relying on hardware developed for other programmes to flatten the development budget for the planned heavy-lift Space Launch System. >>

9 November 2011: NASA plans to add a $370 million unmanned test flight of a new deep-space capsule designed to send astronauts to asteroids, the moon, Mars and other destinations in the inner solar system, officials said. >>

15 November 2011: Sensors destined for ESA's LISA Pathfinder mission in 2014 have far exceeded expectations, paving the way for a mission to detect one of the most elusive forces permeating through space - gravity waves. >>

20 November 2011: A rocket engine planned for the upper stage of NASA's new heavy-lift launch vehicle passed a major firing test. A J-2X engine fired for 500 seconds during the afternoon test at NASA's Stennis Space Center in Mississippi.

The liquid oxygen/liquid hydrogen engine, previously planned for use on the upper stage of the Ares 1 and 5 launch vehicles that were part of the now-cancelled Constellation programme, is now slated for use on the upper stage of the Space Launch System (SLS) rocket. The first flight of the SLS, which will also use shuttle-heritage main engines and solid rocket boosters, is scheduled for 2017. >>

1 December 2011: With the need to understand global change one of today's most pressing scientific challenges, ESA is exploring novel techniques for future space missions. Firing laser pulses between satellites is promising a step up in tracking greenhouse gases. >>

5 December 2011: Astrium received confirmation from the European Space Agency following its Preliminary Design Review (PDR) that the Ariane 5 Midlife Evolution launcher project has been approved. >>

18 December 2011: NASA is developing a comet harpoon for sample return. The best way to grab a sample of a rotating comet that is racing through the inner solar system at up to 150,000 miles per hour while spewing chunks of ice, rock and dust may be to avoid the risky business of landing on it. Instead, researchers want to send a spacecraft to rendezvous with a comet, then fire a harpoon to rapidly acquire samples from specific locations with surgical precision. >>

D. Materials and Structures

6 August 2011: MADE IN SPACE, a start-up dedicated to providing solutions for manufacturing in space, announced the successful completion of testing 3D printers in zero-gravity. >>

28 August 2011: ESA is recreating the intense sunlight and sustained heat encountered around Mercury, the innermost planet of the Solar System, inside the largest vacuum chamber in Europe. >>

E. Information Technology and Datasets

10 January 2011: Signals from seismic sensors left on the lunar surface by Apollo astronauts in the 1970s have revealed new insight into the moon's core, thanks to a fresh analysis using 21st century computing power. >>

30 January 2011: The Space Application Centre, (SAC) part of the Indian Space Research Organisation (ISRO), launched new version of its indigenous software IGIS for analysis of GIS and image processing data. >>

11 March 2011: Researchers at DLR have recreated the Vesta asteroid in 3D. In the animation, the asteroid is irregularly shaped, has a slight indentation at its South Pole and numerous impact craters. In July 2011, after a four year journey, NASA's Dawn spacecraft would reach the asteroid, which circles the Sun in the main asteroid belt between the orbits of Mars and Jupiter. >>

15 March 2011: NASA's Lunar Reconnaissance Orbiter (LRO) team released the final set of data from the mission's exploration phase along with the first measurements from its new life as a science

satellite. With this fifth release of data, striking new images and maps have been added to the already comprehensive collection of raw lunar data and high-level products. >>

19 March 2011: Researchers in Japan hope to make rocket launches a smoother, less expensive process by equipping the next generation of launch vehicles with artificial intelligence (AI). >>

29 March 2011: The first Reentry Breakup Recorder (REBR), an instrument designed and constructed by engineers at The Aerospace Corporation, plunged to Earth. Two REBRs were carried to the International Space Station (ISS) onboard a Japanese Kounotori2 spacecraft, also known as the HTV2, on January 21. The REBR is a small autonomous device that is designed to record temperature, acceleration, rotation rate, and other data as a spacecraft reenters Earth's atmosphere. >>

31 March 2011: High-Res lunar maps were reported as ready. The data dump may wind up as the most enduring legacy of the Constellation programme. >>

31 March 2011: The GOCE science team released a GOCE image of the Earth's geoid. Due to the low solar activity, after two years in orbit, GOCE still has enough propulsion fuel to extend the mission for at least two years.

13 April 2011: Europe's future data-relay satellite system to speed Earth observation imagery to users took a concrete step toward realization when system manager Astrium Services formalized an initial contract with satellite builder OHB Technology. >>

3 May 2011: The European Space Agency announced that since 2006, ESA had been making satellite images of Earth available to anyone wanting to explore the planet in near- real time. ESA has now added nearly 13 000 radar images to the service, bringing the number of viewing possibilities to about 58 000. The MIRAVI service tracks ESA's Envisat satellite around the globe, generates images from the raw data collected by its instruments and provides them online free of charge within two hours. >>

26 May 2011: When Space Shuttle Endeavour launched on 11 February 2000 for the 'Shuttle Radar Topography Mission' (SRTM), it was carrying two radar antennas; one in the shuttle's payload bay and the other on the end of a 60-metre mast. Over the course of eleven days, researchers at the German Aerospace Center (DLR) acquired data for a three-dimensional terrain model of large areas of the Earth. Now, DLR is making these data available for scientific purposes free of charge. >>

31 May 2011: A NASA-led research team has used a variety of NASA satellite data to create the most precise map ever produced depicting the amount and location of carbon stored in Earth's tropical forests. >>

1 June 2011: When Space Shuttle Endeavour launched on 11 February 2000 for the 'Shuttle Radar Topography Mission' (SRTM), it was carrying two radar antennas; one in the shuttle's payload bay and the other on the end of a 60-metre mast. Over the course of eleven days, researchers at the German Aerospace Center (DLR) acquired data for a three-dimensional terrain model of large areas of the Earth. Now, DLR is making these data available for scientific purposes free of charge. >>

7 June 2011: Following three successful trials for improving the timeliness of Metop-A Global Data, EUMETSAT commenced an extended operational trial of the service. >>

28 June 2011: EUMETSAT is set to expand its support of the Cospas-Sarsat system for Search and Rescue (SAR) by flying a transponder onboard future Meteosat Second Generation (MSG-3, MSG-4) and Meteosat Third Generation (MTG) imaging satellites. >>

20 July 2011: It was reported that pooled satellite data for maritime surveillance is on the horizon. Satellite imagery can be used to locate and track vessels, monitor beaches and ports, and detect unlicensed fishing and illicit oil discharges. >>

12 August 2011: The Kepler science team announced the next release of data to the public archive - quarter three science data collected during the months of September to December 2009. >>

21 August 2011: Data from the Land Surface Analysis Satellite Application Facility (LSA SAF) archive, based on Meteosat Second Generation, are tracing the evolution of the fraction of vegetation cover (FVC) in the Horn of Africa continuously. >>

27 August 2011: Hoping to do for space communications what broadband has done for the Internet, NASA is planning to fly a laser communications system, paving the way for high-definition, live TV from Mars. >>

16 October 2011: A new computer simulation known as Bolshoi produces the grandest views yet showing how dark matter guides the creation of galaxy clusters. >>

17 October 2011: NASA and Japan released a significantly improved version of the most complete digital topographic map of Earth, produced with detailed measurements from NASA's Terra spacecraft. >>

23 October 2011: The Japan Aerospace Exploration Agency has made available to the public the world's largest database of asteroids in the solar system. >>

24 October 2011: Using a pair of satellites that monitor the Earth, NASA recorded over 10 miliion fires throughout the planet; they then took the recorded material and created an animation with it. >>

28 October 2011: Astrium Services, via its GEO-Information business, and the Agence Française de Développement (AFD) have launched a portal to provide satellite imagery of the forests in the Congo Basin to organizations working to conserve the region's forests. Over 600 SPOT satellite images will now be directly accessible. >>

21 November 2011: To enhance GPS accuracy, Skyguide, Switzerland's air navigation service provider, has adopted its first approach procedures using data from Europe's EGNOS satellite system. >>

25 November 2011: ESA hopes to promote more collaboration by open sourcing more of its software where possible. The effort is one of the facets of a recent case study of ESA by the Open Source Observatory and Repository (OSOR.eu). >>

26 November 2011: A software fix could save the Globalstar satellite. Over the coming months, Thales Alenia Space will develop and upload software to the satellite. >>

27 November 2011: The Planck mission released a new data catalogue from initial maps of the entire sky. >>

29 November 2011: In its archives, ESA holds around two million products that cover Europe and North Africa. The total amount of data available is worth about 450 terabytes. >>

F. Automation and Robotics

15 March 2011: The German Space Operations Center of DLR in Oberpfaffenhofen, Germany took over operation of the Swedish PRISMA satellite mission. The Swedish Space Corporation (SSC) implemented the transfer of control as part of a bilateral agreement. DLR will be responsible for mission operations for a period of five months and has the opportunity to carry out additional experiments. The PRISMA mission was launched on 15 June 2010 and consists of two satellites, Mango and Tango. The aims of the mission are the demonstration of autonomous satellite formation flying and preparation for future inspection and repair missions in orbit. >>

16 May 2011: MDA announced a $280-million US deal with world-leading satellite service provider Intelsat to build, launch and operate a remote controlled vessel that will be, in effect, a mobile service station in space. >>

3 November 2011: A pair of robotic Chinese spacecraft docked in orbit for the first time marking a key step toward China's goal of building a space station. >>

G. Space Research Facilities and Ground Stations

China improved its three existing launch sites in Jiuquan, Xichang and Taiyuan, enhancing their comprehensive test capabilities and high-intensity launching capabilities. China is building a new space launch site in Hainan to accommodate the launch of new-generation launch vehicles.

10 January 2011: China is ready to put in place a deep space monitoring network in 2016 to support the country's future space missions. The network will consist of two monitoring stations in China, one in northwestern region of Kashgar and the other in northeastern region of Jiamusi. A third station will be in South America, Qian Weiping, chief designer of the Chang'e 2 mission's tracking and control system, was quoted as saying. >>

26 January 2011: Russian Prime Minister Vladimir Putin ordered the government to complete the paperwork for the construction of the Vostochny spaceport as soon as possible so that work begins in 2011 as planned. >>

3 March 2011: Construction of the Vostochny space port in Amur region would begin in summer, 2011, regional Minister of Vostochny construction Konstantin Chmarov told Interfax. Chmarov also said that launch pad construction is slated for 2012. >>

7 March 2011: China was reported as setting up a new high-tech manufacturing base that will build the rockets for its ambitious space programme to put a man on the moon. >>

9 March 2011: SpaceX announced a major expansion to its test site facility in Texas.

25 March 2011: A new building designed to support upcoming launches of medium-class launch vehicles opened at NASA's Wallops Flight Facility in Virginia. The Horizontal Integration Facility (HIF) will be used to prepare Taurus 2 rockets developed by Orbital Sciences Corporation, which will then be rolled out and erected on the pad at Wallops for launch. Those launches, scheduled to begin later this year, will be used to launch Cygnus cargo spacecraft to the International Space Station. >>

28 March 2011: Japan reopened its primary mission control centre for part of the International Space

Station after it suffered quake damage. >>

2 April 2011: ESA reported that the Soyuz site at Europe's Spaceport in French Guiana was now ready for its first launch. ESA handed over the complex to Arianespace, marking a major step towards this year's inaugural flight. >>

19 April 2011: NASA says its Mission Control Center will be renamed to honour Christopher C. Kraft Jr., America's first flight director of human space missions. >>

7 May 2011: The official ceremony marking ESA's handover of the Soyuz launch site to Arianespace took place at Europe's Spaceport in French Guiana, after the site was declared ready for the first flight and the completion of a simulated launch campaign. >>

16 May 2011: The Indian Space Research Organisation plans to set up an advanced R and D centre in the field of spacecraft technologies in Karnataka's Chitradurga and rocket sub-systems integration facility near the spaceport of Sriharikota in coastal Andhra Pradesh. >>

26 May 2011: MacDonald, Dettwiler and Associates Ltd. announced that it has signed a contract for $2.5 million (CAD) with ScanEx Research and Development Center (ScanEx) to provide RADARSAT data information to multiple ground stations in Russia over three years. The information will be used by Russian commercial, academic, and government users for applications that include maritime navigation, environment effects, ice monitoring, mapping and emergency response.

13 June 2011: MacDonald, Dettwiler and Associates Ltd. (MDA) announced that it had signed a contract in excess of US$ 8 million (CAD) with a confidential customer to provide a multi-satellite ground station solution. >>

7 July 2011: ISRO is creating an artificial moonscape in Bengaluru to test its Chandrayaan rover. The Moon surface, being laid out at the new facility of the Isro Satellite Centre, will be complete with lunar ambience, including a terrain with the same mineralogical character. >>

13 July 2011: A ground-breaking ceremony was held at Vandenberg AFB, California, United States for the launch facility for the SpaceX Falcon Heavy.

16 July 2011: An unused pad at the US West Coast launch complex is being retrofitted to send up what would be the world's most powerful rocket. >>

7 August 2011: NASA closed the antenna station that tracked every space shuttle launch. The historic MILA tracking station was built in the Apollo era and used for all 135 shuttle flights. >>

15 August 2011: Russia is planning to build a 250 billion ruble (8.5 billion U.S. dollar) space center in its Far East, head of the Russian space agency Roscosmos told a local newspaper. >>

9 September 2011: Russia will spend over 5 billion rubles ($170 mln) on the development and expansion of the Plesetsk space centre in northern Russia this year. The money will be spent on "the construction and reconstruction of facilities at the Plesetsk space centre". >>

16 September 2011: The Indian Space Research Organisation is drawing up plans to develop the Satish Dhawan Space Centre at Sriharikota into a centre for assembling satellites and rockets in the near future. >>

18 October 2011: Sir Richard Branson has dedicated the launchpad for his space tourism venture in

the New Mexico desert. >>

30 October 2011: DLR's new facility in Goettingen will be able to conduct research on electric spacecraft propulsion systems under realistic conditions. >>

14 November 2011: China has invested in a space tracking station in remote Western Australia as part of its long-term plan for a space station. >>

21 November 2011: Space Exploration Technologies (SpaceX) is searching for a new launch site to meet increasing demand from commercial customers. >>

H. Space Environmental Effects & Medical Advances

28 May 2011: Technology developed with ESA funding and drawing on long-running research aboard the International Space Station is opening up a new way to keep hospital patients safe from infections. Using plasma - superheated, electrically charged gas - Max Planck Institute for Extraterrestrial Physics director Gregor Morfill is developing ways to kill bacteria and viruses that can cause infections in hospitals. >>

7 June 2011: Growing fresh vegetables may be the next great experiment in orbit aboard the International Space Station (ISS). Japanese astronaut and doctor Satoshi Furukawa would be growing cucumbers as part of ongoing studies on how future space explorers will be able to grow their own food. >>

9 September 2011: NASA is funding nine proposals from eight states to investigate space radiation's effect on human explorers. The proposals from researchers in California, Colorado, Florida, Georgia, Maryland, Massachusetts, New York and Texas have a total value of approximately $12 million. >>

30 November 2011: Worms have survived their first space mission in liquid form. The result, published in a Royal Society journal, means worm colonies can be established on space stations without the need for researchers to tend to them. The animals are helping scientists understand the effects of weightlessness and high radiation levels experienced in space. >>

VII. SPACE AND SOCIETY

A. Education

2011 education activities in Europe included: ESA's Summer Teacher 4-day workshops - sponsorship of 40 teacher applicants from all 19 Member State countries to give exposure to space education materials developed by ESA experts for direct classroom application; the Mission X Train like an astronaut program for 8-12 year olds, a multiyear international collaboration with NASA, other space agencies and science centres where astronauts are role models for younger children to gain skills in scientific reasoning as well as engage in physical exercise to keep fit.

Take your Classroom into Space focuses on using STEM topics in curriculum and utilisation of the ISS as a classroom where the unique conditions of Microgravity allow scientific phenomena to be better understood. The work of the crew member on board is extended as teacher on board the Station with In-Flight calls based around a specific education payload. Education lessons in several languages are made available on the website including recordings of the space demonstrations; and finally, "YouTube Space Lab"- ESA joins in on this challenge for students aged 14-18 from around the world to design a science experiment for the International Space Station, providing the largest science lesson streamed live via YouTube. Partners include YouTube, NASA, Space Adventures and Lenovo.

Elsewhere, throughout 2011, the Amateur Radio on the ISS (ARISS) programme has continued to inspire students worldwide to pursue careers in Science, Technology, Engineering, and Mathematics (STEM) through amateur radio contacts with the on-orbit crew of the ISS. The programme is maintained by a dedicated group of international amateur radio operators who have helped millions of people from around the world interact with astronauts and cosmonauts.

In Australia, the Inaugural International Space University (ISU) Southern Hemisphere Summer Space Programme conducted by the University of South Australia in partnership with the ISU started and lasted from 6 January until 4 February. From April-July, Discover SKA took place where hundreds of education and public outreach events were held across Australia and New Zealand to promote the Square Kilometre Array, the world's largest telescope. In July, the Victorian Space Science Education Centre (VSSEC) launched its Robotic Mission to Mars web-based programme, where students world-wide control a real rover on a simulated Mars surface from their school and collect data for further analysis.

NASA selected 101 of its high-performing interns and fellows for the agency's Student Ambassador Program. >>

NASA invited student teams to design and build experiments the agency will fly into the stratosphere, a near-space environment, more than 100,000 feet above the Earth. NASA's second annual Balloonsat High-Altitude Flight competition was open to student teams in ninth to 12th grades from the United States and its territories. >>

NASA and 14 international space agencies are challenging students to complete a nutrition and fitness programme known as "Mission X: Train Like an Astronaut." >>

The UK Space Agency announced a new round of its competitive scholarship scheme to support UK citizens who wish to attend the International Space University's nine-week Space Studies Programme and one-year MSc programmes. >>

The International Space University was given funding from industry and government agencies to help support MSc students who are unable to cover all of their tuition fees. This aid is available to selected applicants, and covers a portion of their fees. It is paid directly to ISU by the sponsoring organisation. >>

A team of Michigan Technological University students took first place in the University Nanosat 6 competition in February, earning the privilege of having the Department of Defense launch their custom-made satellite into orbit. >>

The student rocket REXUS 9 took aloft from Esrange Space Center in the northern part of Sweden on 23 February. The rocket, with its four experiments, reached an altitude of 80.6 km and landed after 11 minutes flight 40 km north of Esrange. >>

Teachers met in February at Morehead State University's Space Science Center for training to support the launch and operation of KySat-1, Kentucky's first satellite. The KySat-1 satellite was built by students from the Kentucky Space Consortium that includes the University of Kentucky and Morehead State University Space Science students. The student team is a part of the Kentucky Space programme, which is sponsored by the Kentucky Science and Technology Corporation. >>

12 March 2011: Mark Shuttleworth Fellowships were announced in South Africa to support ideas and turn them into successful initiatives. >>

Four teams of university students, it was announced on 16 March, will develop and perform experiments in hypergravity during ESA's second - 'Spin Your Thesis!' campaign. In May, the second series of flights in the 'Fly Your Thesis!' programme concluded. After many months of preparation, the 10-day campaign culminated with four student experiments making three parabolic flights aboard the Airbus A300 Zero-G aircraft. >> >>

It was further announced that four teams of university students will develop and perform experiments in hypergravity during ESA's second 'Spin Your Thesis!' campaign. The students will use the Large Diameter Centrifuge facility at ESA's European Space Research and Technology Centre (ESTEC) in Noordwijk, the Netherlands. >>

Al Yah Satellite Communications Company (Yahsat) launched 'A Nation's Pride in the Sky' school programme, in partnership with the Abu Dhabi Education Council (ADEC), to educate students about satellite technology. >>

84 teams from 22 U.S. states, Puerto Rico, Canada, Ethiopia, Germany, India, Pakistan and Russia competed in NASA's 18th Annual Great Moonbuggy Race at the Marshall Space Flight Center. The race challenges students to design, build and race lightweight, human-powered buggies that tackle many of the same engineering challenges dealt with by Apollo-era lunar rover developers at Marshall Space Flight Center in the late 1960s.

U.S. and NASA-based activities have continued to emphasize the International Space Station as an important role as a platform for students and educators and reaching out to international educational communities. The ISS EarthKAM programme (Earth Knowledge Acquired by Middle school students) allows middle school students and teachers to take pictures of the Earth from a digital camera on board the ISS. During SRS EarthKAM Mission ISS 11 07a in April 2011, over 14,000 students participated from 132 different U.S. schools and 39 from around the world.

NASA announced three winners in the Spaced Out Sports competition, which challenged U.S. students in fifth through eighth grades to create games for astronauts to play aboard the

International Space Station. >>

A host of Space Education events in 2011 centred around the 50th anniversary of human spaceflight (12 April 2011). In Samara, Russia, a celebration included more than 2300 students who met on the largest European square - Kuibyshev Square to form a live caption "Samara-Space-50," which was photographed with the GeoEye-1 remote sensing satellite. An educational session of the ASE (Association of Space Explorers) Planetary Congress was devoted to the anniversary and held at the Bauman Moscow State Technical University, Moscow, Russia on September 6-7, 2011. More than 40 astronauts and cosmonauts and more than 1500 university students and young aerospace professionals were involved in the educational session. >>

In the UK, YuriGagarin50 provided the framework for a variety of activities including First Orbit, a film made on the International Space Station providing a new view of the Earth, and in collaboration with ESA, NASA, Roscosmos and the Expedition 25 through 27 crews on board the ISS. Filmed over several weeks as the ISS passed over the same ground track at the same time of day as Vostok-1, the footage was edited together with the original voice recordings from Gagarin's mission and a new musical score by composer Philip Sheppard.

On 12 April, the film was premiered and screened at over 1600 venues in more than 130 countries around the world and was watched by over 200,000 people. In addition, "Rockets for Yuri" - resource packs for simple public rocket making, the gathering of "Memories of Gagarin" from people who met/saw him in 1961, numerous public talks and lectures as well as pieces of drama, public art and books, timelines for Gagarin's life, spaceflight and his visit to the UK respectively have been produced. The YuriGagarin50 programme was formally incorporated into the UK-Russia Space Year Agreement signed by Roscosmos and the UK Space Agency in February 2011. >>

The Japan Aerospace Exploration Agency International Top Young Fellowship (ITYF) was established as a prestigious new fellowship programme in 2009. The ITYF is designed to attract outstanding, highly motivated, early-career researchers in any of the space science fields covered by the Institute of Space and Astronautical Sciences (ISAS) to work in Japan for 3 (extendable to 5) years. >>

The annual Spirit of Innovation Awards kicked off a two-week People's Choice competition that challenges high school students to solve real-world problems by creating commercially viable science and technology based products. >>

NASA announced partnerships with nine organisations that would help the agency implement its 2011 Summer of Innovation (SoI) education programme. >>

NASA has selected six teachers to work with scientists aboard the Stratospheric Observatory for Infrared Astronomy (SOFIA) during research flights in May and June. >>

NASA's Wallops Flight Facility in Virginia became Rocket University June 18 - 25 as nearly 125 high school educators and university students and instructors spent the week learning about rocketry and conducting science experiments in space. >>

With a shared vision that education is a key driver for the development of Africa's social and economic landscape, MultiChoice Africa and Eutelsat Communications, supported by Mindset Learn, have assembled their expertise to initiate a pan- African student competition called the DStv Eutelsat Star Awards. The aim of the Awards is to inspire innovative thinking among secondary and high-school students, to create awareness on how science and technology can be applied to everyday life, and to show the many ways that satellites already impact on the development of the African continent. >>

The 2011 International Summer School on GNSS took place July 20 to July 30 at the GATE facility in Berchtesgaden, Germany. GATE is the German Galileo Test and Development Environment. >>

On 21 July, Australian Education Minister, Martin Dixon, officially launched VSSEC's Robotic Mission to Mars programme. This web-based programme engages students in rural and regional schools, allowing them to control a real Australian designed rover from their school. The web-based software turns any school computer lab into Mission Control. From there students can control the rover, analyse rock, soil and atmospheric samples and collect data for further analysis. "This incredible new programme will put Victorian students ahead of the world in a learning 'space race'," Mr Dixon said.

The VSSEC Mars Autonomous Science Laboratory (MASL) touched down on the VSSEC Mars surface on the 35th Anniversary of Viking 1 landing on Mars and the 42nd Anniversary of the first man walking on the moon. The VSSEC Robotic Mission to Mars programme maximises the effectiveness of web-based learning by applying the research-based strategies for effective teaching and learning to an on-line scenario program. Learning opportunities such as this help engage students in Science, Technology, Engineering and Mathematics, and build the skilled workforce Australia needs to tackle future challenges.

This project was made possible thanks to a grant from the Telematics Trust and the expertise of VSSEC's university and industry partners.

July 2011 marked the final Space Shuttle mission ending a 30 year Shuttle programme of more than 130 flights. Onboard the last Shuttle (Atlantis, July 8-21, 2011), 30 hands-on student designed microgravity experiments were flown as part of the Nanoracks/Biospace Experiments payload, one of which was the first Native American experiment to fly on the Space Shuttle, "Indigenous Star Seeds."

NASA has awarded grants to four universities and their partner institutions that serve large numbers of minority and underrepresented students to strengthen programs in science, technology, engineering and mathematics (STEM). >>

During the summer of 2011, NASA held a variety of internship programmes across the U.S. designed to educate post-secondary students in space-related careers and prepare them for future employment. Students from across the U.S., as well as from such countries as: Australia, Canada, France, and Japan worked directly with NASA scientists on space research as part of the NASA Academy internship programme.

NASA is accepting applications from teams of U.S. and international undergraduate and graduate students for the third annual Lunabotics Mining Competition. The event will be at NASA's Kennedy Space Center in Florida 21-26 May 2012. >>

Thales Alenia Space and Thales Australia announced their sponsorship of a new Masters degree programme in satellite systems engineering at the University of New South Wales, Australia. >>

30 November 2011: ESA astronauts joined Google and YouTube managers on to present highlights of the 'Space Lab' competition. Space Lab is challenging students around the world to design a science experiment for the International Space Station. Launched seven weeks before, Space Lab had already attracted 5500 experiment proposals by registered team and individual competitors - and the dedicated YouTube site has recorded 14 million views. >>

B. Public Awareness

24 January 2011: NASA formed a partnership with Spaceweather.com to engage the amateur astronomy community to submit the best images of the orbiting NanoSail-D solar sail. >>

28 January 2011: NASA announced that it was looking to the public for innovative ideas to spur space exploration. The first series of panels met to discuss 14 tech-related space topics from robotics, power and navigation to entry, descent and landing, including how to land on other worlds and asteroids. >>

1 March 2011: NASA launched the 2011 Nationwide Technology Space Competition. >>

10 March 2011: The SGAC released its long and short term strategy for the next year, 3-5 years, and 10 years. >>

7 April 2011: Eighty students from community colleges in 28 U.S. states and Puerto Rico were selected to travel to a NASA centre to develop robotic rovers. >>

17 April 2011: The European Commission launched a drawing competition aimed at raising the interest of children in space. The child with the best drawing in each Member State will have his or her name given to a satellite of the Galileo programme. >>

20 April 2011: NASA announced it was seeking partners to help achieve its strategic goals for education, including informal education done at museums, science centres, and planetariums. >>

23 April 2011: Three years after the success of the first "Symposium on Private Human Access to Space" held in Arcachon in May 2008, the International Academy of Astronautics (IAA) reconducted the Symposium in order to identify the progress made since three years on this promising and fascinating topic. The IISL is a partner organisation for this conference.

The Symposium aimed at addressing all subjects related to the "Space Transportation of Passengers on a Commercial Basis". The overall goal is to identify and evaluate the key topics associated to Private Human Access to Space, mainly concerning Sub- Orbital Missions. >>

23 April 2011: SGAC announced its fourth annual Move an Asteroid Competition. The prize of this competition, run by SGAC's Near Earth Object Working Group, was a fully paid scholarship to present the winning paper at the Space Generation Congress and the International Astronautical Congress in Cape Town, South Africa. >>

20 May 2011: NASA announced that it would give 150 of its Twitter followers a front-row seat at the historic final space shuttle launch. >>

24 May 2011: Bavarian Minister of Economic Affairs Martin Zeil joined with ESA Director General Jean- Jacques Dordain in launching the GMES Masters competition, seeking out innovative commercial uses of Earth observation data from Europe's flagship global monitoring initiative. >>

17 June 2011: NASA awarded $7.2 million in cooperative agreements to 14 minority-serving organisations across the United States to enhance learning through the use of the agency's Earth Science resources. >>

23 June 2011: The world is invited to help discover a potential new, icy follow-on destination for

NASA's New Horizons spacecraft, using the IceHunters.org website. New Horizons is currently en route to make the first flyby of the Pluto system, and is then capable of making additional explorations of bodies still farther out in the Sun's Kuiper Belt. >>

30 June 2011: The NASA Minority Innovation Challenges Institute (MICI) offered opportunities for minority serving institutions to apply for a $5,000 grant to enter the 2012 University Student Launch Initiative (USLI) or Lunabotics Mining Competition. >>

3 July 2011: University of Wisconsin students topped two other university teams to win the 2011 NASA eXploration Habitat (X-Hab) Academic Innovation Challenge, a competition to design and build a space habitat. >>

8 August 2011: NASA's first Future Forum of 2011 brought together agency officials and local business, science and education leaders to discuss the agency's role in advancing innovation, technology, science, engineering, and education and NASA's benefit to the nation's economy. >>

12 August 2011: Four years ago next month, the X PRIZE Foundation announced its newest space prize: the Google Lunar X PRIZE, or GLXP. Nearly four years later the prize has gone unclaimed, although not for a lack of interest. By the time the X PRIZE Foundation closed team registration at the end of 2010, 29 teams were registered to compete (one has subsequently dropped out) from around the world. >>

14 August 2011: The SETI Institute says it will revive its search for alien signals after receiving more than $200,000 in donations from supporters. >>

18 August 2011: Half a century after humankind entered outer space, an ESA-developed camera produced live-streaming 3D images for the first time in the history of space travel - showing the International Space Station like never before. >>

5 September 2011: The child with the best drawing related to space or aeronautics in each Member State had their name given to a satellite of the Galileo programme. The first two satellites to be launched on 20 October bore the names of the winning children from Belgium (Thijs) and Bulgaria (Natalia) where the competition already took place earlier this year. The European Commission has rolled out the competition in the other 25 Member States to give names to the satellites which will be launched until 2019. Children aged 9-11 can participate. >>

7 September 2011: Remarkable new images of the Apollo landing sites on the Moon were released by NASA. The pictures clearly show the hardware left on the lunar surface by American astronauts in the 1960s and 70s, including Apollo 17's "moon buggy". The images were acquired by the robotic Lunar Reconnaissance Orbiter (LRO), which has been circling Earth's satellite since 2009. >>

18 September 2011: DLR and ESA invited 60 Twitter followers to the first joint European SpaceTweetup. >>

30 September 2011: The 10th annual Space Generation Congress began in South Africa. >>

22 October 2011: The winners of the first European Earth-monitoring competition - the GMES Masters - have been awarded in Munich, Germany. The winning projects exploit social media to advance Earth observation applications. The new Global Monitoring for Environment and Security (GMES) Masters competition has proved to be a success in its very first year, with over 100 proposals submitted between July and September 2011, from 17 countries. >>

25 October 2011: The dreams of more than 40,000 people were stored as text and video on a chip and sent into space along with Shenzhou VIII spacecraft. >>

C. Cultural Aspects

9 April 2011: The U.N. General Assembly declared 12 April as annual International Day of Human Space Flight, the same date when Russian cosmonaut Yuri Gagarin was assigned in the first-ever aerospace mission in the history of humankind fifty years ago. >>

23 October 2011: NASA has begun drafting guidelines to protect the Apollo 11 and Apollo 17 landing sites, listing them as off-limits, and including ground-travel buffers and no-fly zones to avoid spraying rocket exhaust or dust onto aging, but historic, equipment.

Robert Kelso, NASA's director of lunar commercial services at Johnson Space Center in Houston, has taken a hard look at future revisits to the Apollo sites and how to protect U.S. government artifacts on the moon.

Kelso has carved out a set of guidelines intended to safeguard the historic and scientific value of more than three dozen "heritage sites" on the lunar surface. >>

VIII. GLOBAL SPACE DEVELOPMENTS

A. Government Programmes

17 January 2011: The ESA selected Astrium Services to manage development and operations of a European Data Relay System (EDRS) that would feature one dedicated satellite and one piggyback payload, both in geostationary orbit, linked by optical lasers to low-orbiting Earth observation satellites, ESA and Astrium officials said. >>

28 February 2011: It was announced that NASA is proceeding with plans to award roughly $200 million to commercial spaceflight companies bidding to carry humans to orbit. >>

13 March 2011: NASA shelved two high-priority climate satellite missions on White House orders to cut costs. >>

14 March 2011: Russia's Federal Space Agency Roscosmos and NASA signed an agreement which provides for the delivery of American astronauts to the International Space Station aboard the Russian Soyuz spacecraft until 2016. >>

18 March 2011: ESA members decided they will put an additional $339 million into the Ariane 5 programme so the rockets can continue to be used. ESA agreed to the funding during a two-day council meeting in Paris. The decision follows an assessment of the costs of running the rocket system. >>

22 March 2011: European space scientists said they were rethinking potential space missions after learning NASA won't be contributing significant funding to any of their efforts. Three proposed missions - the International X-Ray Observatory, a Europa-Jupiter probe known as EJSM-Laplace, and a space-based gravity wave detector called LISA - have been developed with NASA as a potential partner. >>

6 May 2011: ESA signed a contract with the French space agency, CNES, to ensure that Europe's Spaceport is ready to operate three launchers - Ariane, Soyuz and Vega. >>

8 May 2011: U.S. President Barack Obama views China as a potential partner for an eventual human mission to Mars that would be difficult for any single nation to undertake, a senior White House official told lawmakers. >>

11 May 2011: A clause included in the U.S. spending bill approved by Congress to avert a government shutdown a few weeks ago has prohibited NASA from coordinating any joint scientific activity with China. The clause also extends to the White House Office of Science and Technology Policy (OSTP). >>

23 June 2011: Roscosmos Head Vladimir Popovkin held a working meeting with CNES President Yannik d'Escatha during the 49th Aerospace Salon in Le Bourget. The parties discussed space cooperation issues, including progress with the Soyuz at Guiana Space Centre. >>

29 June 2011: NASA awarded a follow-on contract to Lockheed Martin Space Systems Corporation (LMSSC) for Mission Operations, Systems Engineering and Software (MOSES-II) for the Hubble Space Telescope. >>

9 August 2011: NASA has selected seven companies to integrate and fly technology payloads on commercial suborbital reusable platforms that carry payloads near the boundary of space. >>

25 August 2011: NASA picked a deep space atomic clock, a giant solar sail design and a novel laser communications system as the must-have technologies to help future space exploration, agency officials announced. >>

30 August 2011: DARPA, the US Defense Advanced Research Projects Agency, plans to award $500,000 in seed money to begin studying what it would take - organisationally, technically, sociologically and ethically - to send humans to another star, a challenge of such magnitude that the study alone could take a hundred years. >>

7 September 2011: The EU-funded GalileoCast project is bringing together three small companies to develop innovative weather-related services that use satellite positioning technologies. 'GalileoRoads' is one such service being launched by this project, using hybrid methods that combine fixed and mobile meteorological observations to produce very-high-resolution road condition models and weather forecasts. >>

27 October 2011: A heads-up car navigation display and a new approach to rainforest conservation were announced as the winners of the eighth Galileo Masters European Satellite Navigation Competition and the new GMES Masters European Earth Monitoring Competition, both supported by ESA. >>

17 November 2011: A compromise spending plan for NASA preserves the over-budget James Webb Space Telescope and halves President Barack Obama's request for money to spur development of commercial space taxis. >>

23 November 2011: The Russian Federal Space Agency Roscosmos and its French counterpart, Centre National d'Études Spatiales (CNES), are expected to work out a roadmap for bilateral space cooperation. >>

2 December 2011: The European Commission proposed to finance the GMES programme (Global Monitoring for Environment and Security) for Earth observation for the period 2014- 2020 outside the EU financial framework, for which an estimated budget of 5.8 bn euros is deemed necessary. The Commission proposes to set up a specific GMES fund similar to the model chosen for the European Development Fund, with financial contributions from all 27 EU Member States based on their gross national income (GNI). This will require an intergovernmental agreement between the EU Member States meeting within the Council. The programme will be coordinated by the Commission and its financial management could be delegated to the Global Navigation Satellite System Agency (GSA). >>

27 December 2011: CNES, contracting authority for technical facilities at the Guiana Space Centre, and Arianespace, industrial prime contractor for launch operations, signed industry contracts that took effect on 1 January 2012. >>

B. Commercial Enterprises

7 January 2011: Surrey Satellite Technology Limited (SSTL) won a 10.69m euros contract from the European Space Agency via Dutch Space to provide a Short Wave Infra-Red (SWIR) spectrometer as part of the TROPOMI instrument for the Sentinel 5 Precursor atmospheric monitoring mission. The SWIR spectrometer will be used to measure carbon monoxide (CO) and methane (CH4). >>

9 January 2011: GeoEye announced that it has won a contract from the Republic of the Maldives for a vessel monitoring system that is being developed for fisheries management and safety. >>

12 January 2011: Space Adventures announced a deal with the Federal Space Agency of the Russian Federation and Rocket Space Corporation Energia in which they will expand production of Soyuz vehicles to allow for one seat for commercial paying passengers beginning in 2013.

26 January 2011: Mexican satellite operator Satmex signed an agreement with US launcher ILS to set in the space its new satellite from Kazakhstan's space base Baikonur. >>

6 February 2011: Astrobotic Technologies, a competitor in the Google Lunar X PRIZE, reserved a SpaceX Falcon 9 launcher to send its spacecraft to the Moon.

23 February 2011: Despite losing the W3B mid-flight, satellite operator Eutelsat reported robust revenue growth up 13.3 % at 575.9 million euros for the first half 2010-2011. >>

23 February 2011: Four of the six second-generation Globalstar mobile communications satellites launched in October are ready for service, and the company plans to send six more spacecraft into orbit in May. >>

1 March 2011: Sir Richard Branson's Virgin Galactic, LLC, the world's first commercial spaceline, announced the first ever commercial contracts to fly scientists into space for the purpose of conducting research experiments. >>

1 March 2011: Thales Alenia Space will build up its German base allowing TAS to bid more effectively for German and European institutional awards. >>

8 March 2011: Satellite operator SES and Sea Launch have signed a framework agreement regarding possible cooperation on the future launch of SES satellites on Sea Launch's launch vehicles.

Under the framework understanding, Sea Launch has agreed to provide SES with detailed technical information regarding its launch vehicle system on a regular basis. In turn, SES has agreed to consider Sea Launch as an SES recognised provider for future launch missions. >>

11 March 2011: SpaceX and the City of McGregor in Texas signed a lease agreement allowing SpaceX to expand the size of its rocket development facility. >>

14 March 2011: SES announced a contract with SpaceX to launch a medium sized communications satellite in 2013, using the Falcon 9 rocket.

17 March 2011: A $280 million MDA-Intelsat accord includes launch of a servicing spacecraft and a test mission on a disused communications satellite. >>

25 March 2011: ILS International Launch Services, citing the recurring subsidies provided to its primary competitor, Arianespace, is waging an aggressive protest and intends to pursue "all avenues of recourse to stop such inordinate and direct subsidization of Ariane's commercial operations," said ILS President Frank McKenna. >>

3 April 2011: SpaceX described the Falcon Heavy as being capable of lifting more than 32,000 kg to low Earth orbit. >>

4 April 2011: A new industry group has launched to help promote the benefits of hosting government

payloads on commercial satellites. By piggybacking on civilian spacecraft, federal agencies can save money and still carry out a range of missions such as communications, earth observation, remote sensing and research and development of new technologies. >>

9 April 2011: Mexican fixed satellite services provider Satelites Mexicanos S.A. de C.V. (Satmex) filed for bankruptcy protection in a Delaware court as part of a prepackaged plan with creditors to reduce its debt. >>

13 April 2011: MDA said it has signed a contract in excess of C$40 million with a confidential customer to provide technology support for a satellite communications and information service. >>

14 April 2011: SES announced that it had chosen Arianespace for the launch of its Astra 2E satellite. The new satellite will be launched in the second quarter of 2013, and will be positioned at 28.2 degrees East, from where it will deliver high-power broadcast services across all of Europe and Africa.

In the frame of the "Multi Launch Agreement" with Arianespace, the Luxembourg operator of satellites SES confirmed ASTRA 2E would weigh more than 6,000 kg. at launch and placed into geostationary transfer orbit by an Ariane 5 launcher from the Guiana Space Center, Europe's Spaceport in French Guiana. >>

17 April 2011: United Space Alliance, the space shuttle prime contractor, will eliminate half its remaining workforce -- up to 2,800 jobs -- this summer, soon after NASA launches its final two shuttle missions in April and June, the company announced. >>

19 April 2011: NASA announced that four proposals had won grants in the Commercial Crew Development, Phase 2 competition: Blue Origin, Boeing, Sierra Nevada, and SpaceX.

26 April 2011: NASA extended its contract with Science Applications International Corp. of Houston to provide support for safety and mission assurance activities at the Johnson Space Center. >>

28 April 2011: Hispasat Group and Pittsburgh International Telecommunications, Inc. (PIT), one of the world's largest privately-owned and operated teleports and global distributors of audio and video signals, announced a partnership to launch a new DTH platform on Amazonas-2 satellite titled *New Winds*. >>

1 May 2011: Global satellite operator SES S.A. has announced that it is operating under a new management structure. The move is part of a strategy that brings the market facing entities - SES ASTRA and SES WORLD SKIES - under a streamlined management structure and consolidates its activities in order to meet the increasing needs of its customers around the world. >>

13 May 2011: Russian engineering corporation Energomash sold rocket engines to the United States at half production cost, losing $32 million as a result, the Russian Comptroller's Office said. It did not say how many RD-180 engines were sold, only saying the loss was sustained in 2008-09, constituting 68 percent of the firm's total losses. >>

16 May 2011: NASA selected Honeywell Technology Solutions Inc. to provide safety audits, technical assessments and mission assurance support services for the agency. >>

19 May 2011: Space Florida awarded a $400,000 contract with Masten Space Systems to carry out launches with their Vertical-takeoff, Vertical landing rocket at the Cape Canaveral.

21 May 2011: Industry sources reported that Northrop Grumman would begin to layoff personnel

working on the James Webb Space Telescope in June for budgetary and scheduling reasons. JWST was originally supposed to have been launched in 2007. According to sources, NASA Associate Administrator Chris Scolese told a group of aerospace executives this week that running JWST at a rate of $375 million a year would result in a launch date of 2022-2024. >>

22 May 2011: The NASTAR Center conducted its latest set of Suborbital Scientist space training for future scientist-astronauts and educator-astronauts. Participants learned how to design and fly scientific research experiments onboard commercial suborbital spacecraft such as those operated by Virgin Galactic, Blue Origin, XCOR Aerospace, and Armadillo Aerospace. >>

2 June 2011: THAICOM Public Company, operator of the THAICOM / IPSTAR satellite fleet, announced that an agreement has been signed with a subsidiary of MEASAT Global Berhad ("MEASAT") for the Malaysian payload of the THAICOM 4(IPSTAR) satellite. >>

2 June 2011: Germany's pioneering RapidEye Earth imagery provider, which has taken the privatization of satellite Earth imagery perhaps further than any other company, has filed for bankruptcy protection after breaching several of its loan covenants, RapidEye Chief Executive Wolfgang Biedermann said. >>

2 June 2011: The Intelsat 18 telecommunications satellite would be launched by Sea Launch Co. from the Russian-run Baikonur Cosmodrome in September or October following Sea Launch's agreement to donate rocket hardware previously intended for a future Intelsat launch campaign, officials with the two companies said. >>

3 June 2011: Amid growing world demand for satellite-based communications, television, weather forecasting and geographical data, STMicroelectronics, a global semiconductor leader serving customers across the spectrum of electronics applications, introduced the first member of a family of power transistors that are fully qualified for use in electronic subsystems on board satellites and launchers. >>

4 June 2011: Thales Alenia Space announced that it has delivered to Orbital Sciences its first Pressurized Cargo Module (PCM) developed to transport cargo to the International Space Station. This first PCM will be used for the Cygnus demonstration mission, under NASA's Commercial Orbital Transportation Services (COTS) research and development initiative with Orbital. >>

7 June 2011: Boeing has issued 60-day advance layoff notices to approximately 510 employees in its Space Exploration division, resulting primarily from the planned completion of the Space Shuttle programme. >>

8 June 2011: MEASAT Global Berhad ("MEASAT") selected Astrium to build MEASAT-3b, a new satellite to augment its core Ku-band business in Malaysia, India and Indonesia. >>

13 June 2011: SpaceX and Thaicom announced that a Falcon 9 will launch a Thaicom satellite (to be built by Orbital Sciences) to geostationary orbit in 2013.

14 June 2011: Thales Alenia Space España has been awarded important contracts summing up to a value of more than 7.5 million Euros. These contracts are for the MUSIS programme for Earth observation. The company will be entrusted with the design, development, manufacturing, qualification, supply of electronics for the focal plane of the optical instrument (FPPB), and the service module (MSI) for the two first high optical resolution CSO satellites of the European MUSIS program, while having the option of a third one. >>

14 June 2011: Virgin Galactic is pushing its private spaceliner SpaceShipTwo ever further on more ambitious test flights. >>

18 June 2011: Orbital Sciences Corporation report that THAICOM Plc. has awarded the company a firm contract for the Thaicom 6 communications satellite. Based on Orbital's GEOStar-2 satellite platform, the Thaicom 6 satellite will be designed, manufactured and tested at Orbital's satellite manufacturing facility in Dulles, VA. The Thaicom 6 satellite is planned to be launched in mid-2013. >>

21 June 2011: The European space and technology group OHB AG acquired the Space Systems Division from Swedish Space Corporation via an asset deal and integrated this business within the newly incorporated company OHB Sweden AB, Stockholm. With 50 employees, this division generated sales of around EUR 21 million last year. Later in the year, this division become known as SSC.

30 June 2011: NASA's industry partners have met all their initial milestones in developing commercial crew transportation capabilities to reduce the gap in U.S. human spaceflight capability. >>

2 July 2011: Surrey Satellite Technology Ltd signed a 110m pound contract with satellite imaging provider DMC International Imaging (DMCii) to provide three SSTL-300S1 satellites, a new smallsat design which provides unparalleled 1 metre high resolution imagery with high speed downlink and 45 degrees off-pointing. >>

5 July 2011: Telenor Satellite Broadcasting (TSBc) has announced it has signed a contract with Arianespace for the launch services of its Thor 7 satellite. The satellite will be launched into geostationary transfer orbit in Q4 2013 on an Ariane 5 launcher from the Guiana Space Centre in French Guiana. >>

6 July 2011: Thales Alenia Space España was awarded contracts for more than 9 million Euros for its line of Telecom Systems in the first months of 2011. The company, a leader in Telecommunication Systems and equipments within the Spanish space sector, reinvests 35% of its sales into the national industry. >>

6 July 2011: Gilat Satellite Networks has announced that it has been selected by Spanish satellite operator HISPASAT, to provide a new broadband satellite IP network based on Gilat's advanced SkyEdge II System. >>

21 July 2011: O3b Networks Limited announced the successful completion of the Critical Design Review (CDR) of the Constellation Space Segment. >>

24 July 2011: The Galileo Mission Segment (GMS) is the heart of the Galileo satellite navigation system. >>

3 August 2011: Inmarsat plc, the leading provider of global mobile satellite communications services, announces that Inmarsat SA, one of its subsidiary companies, has signed a contract with International Launch Services (ILS) for the launch of three Inmarsat-5 satellites. >>

6 August 2011: Test flights of The Boeing Co.'s future crew-carrying spaceship would be conducted starting in as early as 2015 on United Launch Alliance's Atlas 5 rocket, executives announced. >>

8 August 2011: The Boeing Company announced it has selected the United Launch Alliance (ULA) Atlas V rocket to launch the Boeing Crew Space Transportation (CST)-100 spacecraft from Florida's Space Coast. >>

14 August 2011: Virgin Galactic has been selected by NASA to provide flight opportunities for engineers, technologists and scientific researchers to fly technology payloads into space. >>

17 August 2011: SpaceX is ramping up plans to become the world's largest producer of rocket engines in less than five years, manufacturing more units per year than any other single country. >>

23 August 2011: A small Belgian company's victory over larger French and British competition to provide an Earth observation satellite to Vietnam has added a third European company into the international mix of small-satellite providers as demand for these spacecraft appears to be growing. >>

28 August 2011: An estimated 1,145 satellites will be built for launch over the next ten years, representing a 51% increase over the previous decade. Paris-based EuroConsult estimates the market for the manufacture and launch of the satellites will be worth some $196 billion (136 billion euros) worldwide, of which commercial satellites represent $50 billion, with the vast majority of the remainder taken up by government based projects. >>

30 August 2011: Orbital Sciences' first Cygnus cargo ship will fly to the space station in February 2012. >>

3 September 2011: Orbital Sciences has received a Commercial Space Transportation Launch License from the Federal Aviation Administration (FAA) to conduct the Commercial Orbital Transportation Services (COTS) programme demonstration mission in early 2012. >>

5 September 2011: A Canadian distributor of optical satellite imagery has purchased Germany's RapidEye company out of bankruptcy and is looking to develop the now debt-free RapidEye into a major player in the commercial Earth observation market. >>

7 September 2011: Satellite operators Gazprom Space Systems of Russia and SES of Luxembourg announced a strategic partnership. >>

14 September 2011: The Asia-Pacific region is set to be a growth market for satellite launch company Arianespace as it looks to Optus and NBN Co to expand its business opportunities. >>

20 September 2011: Astrium Services has signed a three-year contract with the European Space Agency for the delivery of satellite images under the terms of the European GMES programme. This contract, initially worth 17 million euros, is being funded by the European Commission. >>

29 September 2011: SpaceX has put Falcon 1 on ice. The softness of the small-sat launch market has forced production of the launch vehicle to be suspended. >>

29 September 2011: Bigelow Aerospace laid off about 40% of its workforce due to expected delays in development of commercial orbital space transport systems. They will concentrate on the joint project with Boeing on the CST-100 crew capsule project and return later to the BA-330 habitat development.

1 October 2011: Three pilots will make up the first crew who will fly both the SpaceShipTwo suborbital vehicle and WhiteKnightTwo mother ship. >>

3 October 2011: ESA has extended its existing contract with OHB AG of Germany to develop a telecommunications satellite platform for commercial use to reduce the time and cost of the platform's construction, Bremen-based OHB announced Sept. 29. >>

6 October 2011: Al Yah Satellite Communications Company PrJSC (Yahsat), announced that it has signed Memorandum of Understanding (MoU) with DSEI Thales, a global technology leader for the Defence & Security markets. >>

11 October 2011: Surrey Satellite Technology Limited announced completion of the development phase of its new low-cost Synthetic Aperture Radar (SAR) satellite system. Called NovaSAR-S, the system offers customers coverage of any spot on Earth in all conditions - seeing through cloud cover across both day and night. >>

15 October 2011: Virgin Galactic confirmed an order from NASA for up to three charter flights on its privately-built spacecraft to provide opportunities for engineers, technologists, and scientific researchers to conduct cutting-edge experiments in suborbital space. >>

16 October 2011: Thales Alenia Space España won major contracts worth more than 7 million Euros for the supply of equipment for S-Band data communications systems for two CSO optical satellites, for MUSIS program, with an option for a third, and for three RADARSAT satellite observation program of the Canadian Space Agency (CSA). >>

24 October 2011: MacDonald, Dettwiler and Associates Ltd announced that its U.S. operation MDA Information Systems Inc. had signed two contracts to provide advanced technology solutions for future NASA-funded lunar and planetary science missions. >>

26 October 2011: Kongsberg Defence & Aerospace AS, a wholly-owned company in the Kongsberg Group (Kongsberg), has entered into an agreement to acquire 100% of the shares in Horten-based company Norspace AS. >>

31 October 2011: NASA announced a partnership with Space Florida to exclusively occupy, use and modify Kennedy Space Center's Orbiter Processing Facility-3, the Space Shuttle Main Engine Processing Facility and Processing Control Center. >>

2 November 2011: The Boeing Co. will process its proposed CST-100 commercial manned spacecraft in a now-vacant space shuttle processing hangar in a first-of-a-kind deal valued at up to $50 million in state incentives, facility upgrades and financing, officials said. >>

14 November 2011: Thales Alenia Space has announced that it had signed a contract with O3b Networks Limited to deliver four more satellites for their Medium Earth Orbit constellation. These satellites are in addition to the eight already ordered from Thales Alenia Space. >>

18 November 2011: The first-ever detailed guide for certifying companies seeking to compete for U.S. government launches has been signed. >>

18 November 2011: Satellite manufacturers Thales Alenia Space of Europe and ISS Reshetnev of Russia signed an agreement intended to lead to a joint venture to build commercial telecommunications satellites. The agreement, signed in Moscow in the presence of the French and Russian prime ministers, calls for the joint venture to "jointly develop, produce and integrate new communications satellite platforms offering more than 12 kilowatts of power, as well as components and subassemblies for satellite platforms and payloads". >>

20 November 2011: Thales Alenia Space announced that it has signed a contract with O3b Networks Limited to deliver four more satellites for their Medium Earth Orbit constellation. These satellites are in addition to the eight already ordered from Thales Alenia Space. The first group of eight satellites successfully passed their Critical Design Review in May of this year and the system is on track for an

initial launch in the first quarter of 2013, with service expected to start in the second quarter of that year. >>

29 November 2011: NASA selected 300 small business proposals to enter into negotiations for possible contract awards through the agency's Small Business Innovation Research and the Small Business Technology Transfer programmes. >>

8 December 2011: Furthering Europe's capacity to monitor atmospheric pollution, ESA has awarded a contract worth 45.5 million euros to Astrium UK to act as prime contractor for the Sentinel-5 Precursor satellite system. >>

11 December 2011: The Boeing Company has received a US$ 2 million contract from the U.S. Air Force Research Laboratory (AFRL) to define requirements and design concepts for the Reusable Booster System (RBS) Flight and Ground Experiments program. >>

18 December 2011: SES has announced that it further increases the focus on emerging and growth markets and introduces four global sales regions with a dedicated management leading the strong SES teams in each region. The regions are: Americas, Europe, Africa, and Asia-Pacific/ India/ Middle East. >>

25 December 2011: NASA has selected 85 small business proposals to enter into negotiations for Phase II contract awards through the agency's Small Business Innovation Research (SBIR) Program. >>

26 December 2011: SpaceX founder, Elon Musk, says that he can get to Mars on a shoestring within 20 years - thanks to the fully reusable rockets he's determined to build. >>

IX. INTERNATIONAL COOPERATION

A. Global Developments and Organisations

China committed itself to stick to all basic principles provided in outer space treaties, conduct all explorations and use of outer space for the benefits of the all humanity, said a Chinese envoy to the United Nations. Li Baodong, the Chinese permanent representative to the UN made the remarks at a plenary meeting of the General Assembly 65th session, in which a resolution was adopted to designate April 12 as the International Day of Human Space Flight. Furthermore, China cooperated with the space institutes of various countries through the mechanism of the "International Charter on Space and Major Disasters." Through this mechanism, satellite data support was provided to the Wenchuan earthquake, the forest fire in Australia and other major disaster relief work. >>

Satellite images could be used to track and quantify long-term recovery efforts in regions stricken by natural disasters. But longer term recovery - including the rebuilding of infrastructure and amenities such as schools and hospitals - can take decades, depending on the extent and the location of the disaster. A group based at the University of Cambridge, United Kingdom, working with industrial partners Cambridge Architectural Research Ltd. and ImageCat Inc., says it has developed the first systematic approach to monitoring and evaluating this process. The method, which has been submitted to Disasters journal, involves tracking a region using high-resolution satellite images, which have become more abundant and affordable in recent years. >>

Recognising the value of using Earth observation satellite data to support development activities, ESA and the World Bank will work together on several projects through the 'eoworld' joint initiative. >>

The fifty-fourth session of the Committee on the Peaceful Uses of Outer Space was held from 1-10 June 2011 at the United Nations Office at Vienna, Vienna International Centre, Vienna, Austria. >>

As the world marked the 50th anniversary of humankind's first flight into outer space, the United Nations reaffirmed the importance of international cooperation in developing norms of law to ensure adherence to treaties that promote peaceful and beneficial uses of outer space. In an adopted declaration, the UN Committee on the Peaceful Uses of Outer Space (UNCOPUOS), which is also marking 50 years since its first session in 1961, voiced its conviction that space science and technology and their applications, including satellite communications, Earth observation systems and satellite navigation technologies, provide indispensable tools for sustainable development. >>

13 June 2011: The United Nations Committee on the Peaceful Uses of Outer Space (UNCOPUOS) concluded its fifty-fourth session and its deliberations over ways and means to maintain outer space for peaceful purposes and to ensure that space technology and its applications continue to benefit many areas critical to all humanity. >>

ESA-ESTEC, the Netherlands, in June hosted the 6th meeting of the Control Board for Tripartite Space Dialogue between the European Commission, European Space Agency and Roscosmos. The delegation of the Federal Space Agency led by Roscosmos Head Vladimir Popovkin took part in the meeting to discuss achievements and future of the Russian-European space cooperation. >>

7 July 2011: South Korea's space agency has joined its international counterparts in putting satellite data at the disposal of rescue authorities following major disasters such as earthquakes and tsunamis. The Korea Aerospace Research Institute (KARI), under the Ministry of Education, Science and

Technology, formally became the newest member of the International Charter -'Space and Major Disasters'. >>

28 July 2011: The European Organisation for the Exploitation of Meteorological Satellites, EUMETSAT, held the main celebratory event for its 25th anniversary at its headquarters in Darmstadt, Germany. >>

7 August 2011: Gregory L. Schulte, US deputy assistant secretary of defense for space policy, recently told reporters that the United States has proposed to establish regular dialogue with China in an effort to create rules and reduce the risk of accidents and miscalculations in outer space. >>

30 August 2011: Senior managers representing 10 space agencies from around the world met in Kyoto, Japan to advance the Global Exploration Roadmap for coordinated space exploration. During the past year, the International Space Exploration Coordination Group (ISECG) has developed a long-range human exploration strategy. It begins with the International Space Station and expands human presence throughout the solar system, leading ultimately to human missions to explore the surface of Mars. The roadmap flows from this strategy and identifies two potential pathways: "Asteroid Next" and "Moon Next." >>

30 September 2011: NASA is releasing the initial version of a Global Exploration Roadmap (GER) developed by the International Space Exploration Coordination Group. This roadmap is the culmination of work by 12 space agencies, including NASA, during the past year to advance coordinated space exploration. >>

15 October 2011: Understanding more about space science and that benefits that such technology has brought to everyday life is essential to helping the world address its most urgent problems, the United Nations said as the Organisation kicked off World Space Week. >>

1 November 2011: Thailand's Geo-informatics and Space Technology Development Agency (GISTDA), which is supporting FROC information management, has won the United Nations ESCAPs' permission to access near real-time flood data from the global constellation of earth observation satellites. >>

25 November 2011: An expert group of scientists, reporters, and risk management specialists have taken part in a Near Earth Object Media/Risk Communications workshop. Output from these professionals is helping to draft a report for the United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS) Scientific and Technical Subcommittee. >>

25 November 2011: UN-SPIDER Programme, with the support and cooperation of the Government of Austria and Secure World Foundation, successfully conducted the second Expert Meeting on Crowd Sourcing, which was held in Geneva, back-to-back with the International Conference on Crisis Mapping (ICCM 2011). The meeting focused on exploring possible ways of contributing to better coordination of the crowd source communities with the space technology community and an overall improvement of its involvement to facilitate the preparation and processing of space-based products used by the disaster risk reduction and emergency response community.

The discussions targeted opportunities that make space-based information available for disaster risk reduction and emergency response, including their access and use, as well as the further involvement of existing mechanisms to ensure increased coordination and cooperation of all three communities. >>

16 December 2011: More than 90 companies involved in the commercial satellite sector are strongly opposing a draft international protocol that they say would add unnecessary bureaucracy and costs.

The draft "Space Assets Protocol" was developed by the International Institute for the Unification of Private Law (UNIDROIT). Based in Rome, Italy, the organisation operates under a 1940 multilateral statute to which 63 countries, including the United States, are signatory. Its purpose is to harmonize and coordinate private law between countries and groups of countries. >>

B. Europe

25 February 2011: Europe's Eumetsat meteorological organisation said it has secured the backing of all 26 of its member governments for the six-satellite Meteosat Third Generation (MTG) system, an investment of more than 2.37 billion euros ($3.2 billion). >>

4 April 2011: The European Commission proposed to strengthen the EU's space policy with the aim of increasing the bloc's capability "to pursue independent missions". >>

6 April 2011: The EU wants to improve its co-operation with China in space technology and "share open frequencies in satellite navigation". >>

1 May 2011: The UK assumed leadership of the International Charter: Space and Major Disasters at a meeting in London. The Charter is an organisation that coordinates space agencies worldwide in gathering vital satellite images of disaster-stricken regions - providing the images to civil protection authorities to inform their response efforts and save lives. >>

4 May 2011: Eurisy's 2010 Position Paper advocated for better framework conditions to support the demand for satellite services among local, regional authorities and SMEs. In 2011, the European Commission recognises the necessity to encourage "new user communities" to adopt such services. >>

9 May 2011: The impact of geohazards such as flooding and volcanoes on our everyday lives will soon be better understood, thanks to a new EU-funded project involving all 27 Member States. 'PANGEO' (Enabling access to geological information in support of Global Monitoring for Environment & Security (GMES)), which received funding to the tune of EUR 2.5 million under the 'Space' Thematic area of the Seventh Framework Programme (FP7), will work towards the pooling of European geological data to form an information portal for public policymakers. >>

27 May 2011: The European Environment Agency (EEA) and the European Commission (EC) signed an agreement to provide information on land cover in Europe, compiling data from land, air, sea and space. Land monitoring will be carried out under the Global Monitoring for Environment and Security (GMES) initiative for Earth Observation launched by the EC and the ESA. The objective of GMES is to monitor the state of the environment on land, at sea and in the atmosphere, improving the security of citizens in a world facing an increased risk of natural and other disasters. On 15 June, *t*he European Commission signed an agreement confirming the transfer of GMES funds to ESA. >> >>

1 June 2011: The European Commission adopted the Communication "Towards a space strategy for the European Union that benefits its citizens", which sets out the main priorities for the EU. The affirmation spotlighted ESA's Space Situational Awareness Preparatory Programme as a strategic European necessity and a cornerstone of Europe's future in space. >> >>

20 June 2011: ESA Director General Jean-Jacques Dordain met EDA Chief Executive Claude-France Arnould at the Paris Air & Space Show to sign an Administrative Arrangement on cooperation between ESA and the European Defence Agency. >>

21 June 2011: The European Commission signed an agreement confirming the transfer of funds to ESA for the initial operations of the space component for the Global Monitoring for Environment and Security programme. >>

27 June 2011: Europe's meteorological satellite organization, Eumetsat, spent three months trying to persuade its member nations to finance a next-generation polar-orbiting satellite constellation following its inability to win unanimous approval for the work. >>

3 November 2011: Secure World Foundation and the Mission of Canada to the European Union partnered to organise the 2011 Space Security Index Launch in Europe. The event was held in Brussels, Belgium, and was part of Secure World Foundation's Brussels Space Policy Round Table. The gathering convened leading authorities from Canada, the European Union, the European Space Agency, the Non-Proliferation and Disarmament Directorate of the European External Action Service, as well as the European Satellite Operators Association and the Société européenne des satellites (SES). >>

10 November 2011: Under pressure to reduce spending, the institutions responsible for setting and financing European space programmes, a meeting trashed out space funding priorities against a backdrop of tremendous financial turmoil in Europe. The European Commission (EC) had already kicked off months of wrangling among the 27 members of the European Union after a draft budget plan abandoned its future funding for the Global Monitoring for Environment and Security (GMES) project. >>

8-9 November 2011: After the recent launch of the first Galileo satellites - an event of paramount political importance for Europe - politicians, policymakers, space agency managers, industrialists, satellite operators and members of civil society gathered at the European Parliament in Brussels on 8-9 November for the 4th Conference on EU Space Policy. >>

11 November 2011: ESA's internal spending will be cut by 2015 in response to the on-going financial turmoil in Europe. >>

21 November 2011: Responding to the growing interest within Europe in space matters, ESA has invited 10 more countries to participate in meetings of its governing Council. Delegations from 10 EU member states that are not members of ESA will have the opportunity to sit as observers on the Council as the future of European space programmes is debated and defined. >>

23 November 2011: Eight member states have raised concerns about future funding for the EU's GMES space programme. The countries used a letter to the commission to lodge a formal protest against what some believe could be possible funding reductions for the EU-wide scheme. The move comes after the commission proposed funding for GMES 'outside' of the multiannual financial framework for the spending period from 2014-2020. >>

6 December 2011: The ministers of the ESA-EU Space Council underlined the importance of space systems for security. They drew attention to the role of satellite systems particularly Galileo, EGNOS and GMES as the backbone for improving Europe's response to emergencies. >> >>

17 December 2011: The European Commission unveiled plans to establish a cross-border surveillance system which will allow border guards to share information and intelligence, helping in the fight against crime. The so-called Eurosur framework will allow border guards to track small boats - often used in smuggling operations - using satellite imagery, ensuring this information is passed between member states. >>

Armenia

In April, Armenian Minister of Transport and Communications Manuk Vardanyan received the delegation of the Russian Federal Space Agency led by Roscosmos Deputy Head Sergey Saveliev. The parties discussed possible ways of space cooperation, including transport monitoring and bilateral data exchange. >>

Austria

The Austrian parliament passed a new law governing outer space activities by its citizens. >>

Azerbaijan

Azerbaijan's second satellite will be launched into the orbit with the republic's own funds. Launching the second satellite will be urgent once the first Azerbaijani telecommunication satellite Azerspace is placed into orbit. >>

The Information Technology Institute under the Azerbaijani National Academy of Sciences (ANAS) has been given the task of examining experience with small satellite programmes. >>

Azerbaijan is going to launch its second national satellite to the orbit in the next 3 years. Head of Azercosmos Rashad Nabiyev has reported that tender announcement for satellite production is expected in the nearest future. Azercosmos is also ready to start construction of a reserve above-ground satellite management center in 2012. >>

Belarus

China will build a communication satellite for Belarus and bring it into orbit. A contract was signed in Minsk in September during the visit of a Chinese delegation. The communications satellite will use the Dongfanghong-4 satellite platform and has a designed lifespan of 15 years. It will be launched from the Xichang Satellite Launch Centre in southwest China's Sichuan province two years and a half after the contract takes effect. China will also build a ground station in Minsk for Belarus to monitor the satellite, and provide training to Belarusian technicians. Belarus is China's first client on the European market. >>

Belgium

Vietnam and Belgium agreed cooperation. This partnership will manifest itself specifically in the form of the delivery of a satellite system for the observation of the Earth. This satellite system - from a company called Spacebel, which sits at the head of a consortium of Belgian companies - will help Vietnam to manage its natural resources and its environment. >>

Bulgaria

Bulgaria will take all necessary measures to join the European Space Agency, the country's Council of Ministers announced. Bulgaria has a prepared a project to produce a microsatellite over the next couple of years, it was made clear during the meeting. It will give back detailed information about the surface and environment of Bulgaria and the Balkan peninsula. >>

Czech Republic

Since there is no national space agency in the Czech Republic and the relevant competences for space were carried out by different ministries, the Government of the Czech Republic, being aware of this fact and importance of space activities, decided in April 2011 on the unified coordination and management of space activities in the Czech Republic.

According to this decision, the Government of the Czech Republic entrusted the Ministry of Transport of the Czech Republic with the coordination role over space activities in the Czech Republic. For this purpose, the Ministry of Transport of the Czech Republic established a coordination body under its leadership with a clear structure to get involved other respective ministries and transparently and efficiently coordinate and manage space activities in the Czech Republic.

Separately, ESA recommended for implementation 17 of the 63 projects Czech companies and institutions have submitted in reaction to the ESA incentive programme's second call, Czech Space Office director Jan Kolar has told the media. >>

Estonia

Estonia's first orbital satellite will likely blast off next year from India. The satellite developed by a group of Tartu and Tallinn students is to test a solar sail. >>

Estonia will become full member of the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) as of 2012. The Ministry of the Environment signed the accession memorandum today. Becoming a member of the organisation gives Estonia access to the satellite data, contributing to the accuracy of weather prediction. Member states also have a say in the shaping of the methodology and policies in European meteorological studies. >>

Ireland

Discover Science & Engineering (DSE) has partnered with the European Space Agency to set up the European Space Education Resource Office in Ireland as a new space education resource, so students can capitalise on the career opportunities. Ann Fitzpatrick, who is managing ESERO in Ireland, says it will act as a resource for teachers in order to help them embrace a more interactive way of learning in the STEM (science, technology, engineering and maths) subjects. >>

Isle of Man

The first satellite to be launched using an Isle of Man licensed orbital filing successfully went into geostationary orbit over the equator. ViaSat-1 is a major milestone for the Isle of Man's space industry and ViaSat Isle of Man Limited, Telesat (IOM) Limited, ManSat Limited, and the Isle of Man Government. >>

Latvia

Latvia announced was planning to launch its first telecommunication satellite, Venta-1 within a year. Initially set for launch in 2009, the new satellite was designed to automatically identify and facilitate the geographical spotting of objects. The project whose value is around $700,000 has the support of Latvia's Ministry of Education and Science. As for the manufacturing, the craft has been totally

designed in Latvia and will be put into operation by the German company OHB-System AG. >> >>

Lithuania

RapidEye, a leader in wide area, repetitive coverage of Earth through its constellation of satellites announced that a second full coverage of Lithuania has been delivered and accepted by the Institute of Aerial Geodesy (AGI) in Kaunas, Lithuania. >>

Luxembourg

SES announced it will invest EUR 34 million in a new Luxembourg Satellite Control Facilities and Business Centre >>

The Netherlands

At an ISTA Event commemorating the 50th anniversary of human spaceflight, a public- private partnership announced an initiative to begin the process of bringing commercial spaceflight to The Netherlands and the Amsterdam Region. >>

Norway

3 December 2011: Norwegian and Spanish military authorities expect to select a builder of a large X- and Ka-band telecommunications satellite by the beginning of 2012 as part of a bilateral effort in which Norway is investing around $200 million, the project's Norwegian manager said. >>

Poland

Polish Prime Minister Donald Tusk signed a degree, which will begin the accession negotiations between Poland and the ESA. Depending on the results of these negotiations, Poland might become a 20th ESA member as soon as late 2012 or beginning of 2013. >>

Romania

Romania took a step further in its relations with ESA by signing the Accession Agreement to the ESA Convention to become the 19th ESA Member State. >>

Russian Federation

Prime Minister Vladimir Putin said that Russia will boost its efforts to explore the solar system and seek a bigger share of the market for space launches in the next decade. >>

In April, Prime Minister Putin dismissed Russian space agency chief Anatoly Perminov after a series of high-profile setbacks in the space programme. Perminov was replaced as head of Roscosmos by First Deputy Defence Minister Vladimir Popovkin. >>

The Russia-Belarus Union has drafted a joint space exploration programme entitled Monitoring-SG, Russian Federal Space Agency (Roscosmos) Director Vladimir Popovkin said at a meeting with

Belarusian Prime Minister Mikhail Myasnikovich in Minsk. >>

Roscosmos said it was considering returning the federal space programme to the framework of the state defence order to ensure steady financing and reduce the number of accidents with space launches. >>

Roscosmos prioritised commercial use of its satellites as part of the federal space programme until 2015. >>

Spain

Spain is on track to become the first European country to have a dual Earth observation system, radar and optical, for both civilian and military use. Defense Minister Carme Chacon said radar technology installed on the satellite, which is totally of Spanish design and manufacture, will enable up to 100 images of the Earth's surface to be taken per day. >>

Spanish information-technology company Indra will provide the ground control segment for Spain's Paz radar Earth observation satellite under a contract with the Spanish Defense Ministry valued at 9 million euros ($12.1 million), Indra announced. >>

Sweden

Russia and Sweden agreed to improve cooperation in the space industry, including their intention to launch Swedish satellites using Russian carrier rockets. >>

NASA and the Swedish National Space Board (SNSB) are collaborating to develop powerful low-cost satellites for advanced space missions. >>

Switzerland

After spinning for a year, the first ever Swiss satellite is now sending images of the airglow phenomenon thanks to a collaboration between EPFL and TU Delft. SwissCube follows the Cubesat standard which was developed by Standford and CalPoly (USA) and allows universities and research centres to build their own satellites. SwissCube was mainly built by students from different universities under the supervision of the Space Centre EPFL in Lausanne, Switzerland. >>

Turkey

Turkey plans to send its first home-made communications test satellite into orbit in September next year, the semi-official Anatolia news agency reported. The satellite, 3USAT, will provide wireless voice transmission over an amateur band between two groups of people at two distant locations. >>

Turkey signed a 571 million-U.S. dollar deal with Japanese technology firm Mitsubishi Electric Corporation here to procure and launch two communications satellites by 2014. Turkey plans to place Turksat 4A into orbit by the last quarter of 2013 and launch Turksat 4B in 2014, with the two satellites having a lifespan of 30 years. >>

ILS and MELCO (Mitsubishi Electronics) announced the contract for the launch of Turksat 4A and Turksat 4B on Proton. >> Then MELCO awarded GMV a contract for developing the ground segment

for the 4A and 4B satellites of the Turkish satellite operator Turksat. GMV is the leading ground systems supplier for commercial telecommunications satellite operators. >>

On 18 August, Turkey's first national earth observation satellite, RASAT, was launched to space successfully. Designed and manufactured by the Scientific and Technological Research Council of Turkey - Space Technologies Research Institute (TUBITAK-UZAY), the satellite was launched by a Dnepr space launch vehicle. The vehicle also carried six more satellites from Nigeria, Ukraine, Italy and the USA. >>

JAXA Vice President Kiyoshi Higuchi said he would contribute to the space institution which Turkey was planning to set up as well as share his and his country's experiences in space sector. >>

Ukraine

Ukraine should participate in the construction of the Vostochny Space Centre in Russia's Far East, Prime Minister Vladimir Putin said in Kiev. Russia currently uses two launch sites: Baikonur in Kazakhstan, which it has leased since the end of the Soviet Union, and Plesetsk in northwest Russia. Putin said construction work at the new space centre had already started. >>

It was reported that launcher and pad preparations to boost the Ukraine-built Cyclone-4 from Brazil's Alcantara launch centre were entering their final phase, with the goal of completing the qualification liftoff in 2012. Discussions between Ukraine and Brazil to jointly work on a Delta II-class launcher and launch site in northern Brazil date back to the 1990s and have been officially underway since 2003. >>

The Ukrainian government has widened the range of goods involved in Ukrainian-Russian space cooperation, with regard to the creation of space rocket and rockets that are exempted from customs duties and value-added tax in line with an agreement signed between their two governments in 2001. >>

Ukraine and Japan are altering their current plans of cooperation in the space sector due to internal problems in Japan resulting from the natural disasters that hit the country in March. The signing of a cooperation agreement between the space agencies of the two countries, which was previously scheduled for the fall of 2011, will be postponed until 2012 at the request of Japan, Interfax-Ukraine learned in the State Space Agency of Ukraine. >>

United Kingdom

It was announced in January that British engineers were planning to put a mobile phone in space. The team at Surrey Satellite Technology Limited (SSTL) in Guildford wanted to see if the sophisticated capabilities in today's phones would function in the most challenging environment known. Launched later in the year by the Space Shuttle, the phone ran on Google's Android operating system and was used to control a 30cm-long satellite and take pictures of the Earth. >>

8 May 2011: As part of the Astrium-led Earth Observation (EO) Hub project at the International Space Innovation Centre (ISIC) in Harwell, SSTL has completed the installation of key groundstation equipment. The ISIC groundstation can be used to operate existing and future UK space missions.

This comprehensive new system provides everything needed to plan mission operations, communicate with the satellites and downlink the images and other information for a broad spectrum of missions. It will initially be used to operate the SSTL-built TechDemoSat-1 satellite, which

is being developed through a grant from the UK's Technology Strategy Board (TSB), and planned to be launched next year. >>

24 May 2011: Three British teams have been asked to spec key instrumentation for Europe's proposed Moon lander. >>

29 June 2011: Chinese and UK companies agreed a deal that will result in three high-resolution Earth observation spacecraft being built to map China's extraordinary growth from orbit. >>

10 July 2011: Using 70 satellite images taken between 2005 and 2008, scientists have developed a digital map of Britain that shows in remarkable detail the mosaic of vegetation and land-cover types that makes up the British landscape. >>

13 July 2011: A meeting of Roscosmos and the UK Space Agency took place in London. The Head of the Russian Federal Space Agency Vladimir Popovkin and David Williams, CEO of the UK Space Agency, discussed current status and future of the bilateral space cooperation. >>

1 August 2011: A new generation of high definition cameras for the International Space Station are being designed in Oxfordshire, UK at the Rutherford Appleton Laboratory >>

6 September 2011: A group of scientists and engineers is working on an ambitious project to revive a unique UK satellite - still in orbit after almost 40 years. When the Prospero spacecraft was launched atop a Black Arrow rocket on 28 October 1971, it marked the end of an era. A very short era. Prospero was the first UK satellite to be launched on a UK launch vehicle; it would also be the last. >>

21 October 2011: The UK Space Agency is making 1.6M pounds available in support of projects to further explore our neighbouring planet Mars and keep the UK at the forefront of ESA's Aurora Programme - a European long-term plan for the robotic and human exploration of the solar system. >>

1 December 2011: The UK government is to kick-start an innovative project to fly radar satellites around the Earth, with an initial investment of 21 million pounds. Radar spacecraft can see the planet's surface in all weathers, day and night. >>

C. Africa

An unparalleled collection of high-resolution satellite imagery covering sub-Saharan Africa in a single season is now available in the DMCii image archive, providing an invaluable snapshot of more than 40 countries, including Cameroon, Congo, and Ethiopia for assessing phenomena such as deforestation, urbanisation and desertification. >>

EUMETSAT hosted the Monitoring of Environment and Security in Africa (MESA) Preparation Workshop on 9-12 May. >>

Luxembourg-based satellite connectivity provider SES is expanding its presence in Africa through an agreement signed with French company YellowSat, to provide internet connectivity to governments and other institutions in Africa. >>

The ITU deadline agreed by most African countries for the transition from analogue to digital broadcasting is only four years away. Elsewhere in the world, the transition has taken between 3 to 14

years to complete so time is running out. Knowing the difficulties of rolling out terrestrial digital (DTT) broadcast equipment, the satellite companies are putting forward DTH satellite as an alternative. >>

Fires raging in July in central Africa generated a high amount of pollution that was showing up in data from NASA's Aura Satellite, with the ominous shape of a dark red butterfly in the skies over southern part of the Democratic Republic of the Congo and northern Angola. >>

Africa discussed setting up its own space agency, with the approval of a planned feasibility study by the 53 member states of the African Union. The African Space Agency, as it would be known, would be intended to help ensure the continent becomes an important player in the global space programme. >>

Held between 26-28 September 2011, the African Leadership Conference (ALC) is forum established by the Governments of Algeria, Kenya, Nigeria and South Africa and it is held biannually. These Governments are in the fore-front of an on-going plan in the continent for development of an African Resources and Environmental Management Satellite Constellation (ARMC) Initiative. The concept is open to other African countries that wish to join the venture in the future.

The African Union (AU) Commissioner for Human Resources, Science and Technology, has called on African countries to expedite the implementation of frameworks to develop space science. >>

Using satellite images to measure night time light levels streaming from West African cities could prove to be an important new tool in fighting the spread of measles, according to a study. >>

Angola

The construction and launch of the Russian-built Angolan satellite would cost 10.6 percent of a total US$241.6 million attributed to the Ministry for telecommunications and Technology by the Public Investment Programme, according to a report in the latest edition of weekly newspaper Expansão. >>

The Angolan Government has obtained a US$ 278.4 million loan for the installation of the country's national satellite telecommunication system (ANGOSAT). This follows the signing of an agreement for the ANGOSAT project by the Finance Minister, Carlos Lopes, and the chairperson of Eximbank of Russia, Nikolai Gavrilov, on behalf of a syndicate of Russian banks. The Angolan government expressed satisfaction with the financial cooperation with Eximbank and other Russian banks and wished that the process should grow into a broad cooperation between both financial institutions and the Angolan Ministry of Finance. >>

Angola government is engaged in the improvement of schooling level of technicians in the field of telecommunications and information technologies, so that they can produce at long term, the components for Angola's satellite - Angolasat - that will start functioning within four years. >>

Japan intends to help Angola install satellites for the exploration of mineral and geologic resources. >>

Egypt

Egypt announced that it has indefinitely postponed the launch of a research satellite scheduled for 2013. The head of Egypt's National Authority for Remote Sensing and Space Sciences (NARSS), Ayman al-Desouky, did not give a new date for the launch of EgyptSat 2. >>

The first satellite with Egyptian-designed technology was due to be launched within six months,

according to the Egyptian Arabic daily al-Masry al-Youm. Egyptian designed nano-technology made it into the satellite. The EU and the Egyptian Ministry of Scientific Research and Technology funded the research. >>

Namibia

The Earth Observation and Satellite Applications Research and Training Centre (EOSA- RTC), was launched in collaboration with the African Monitoring of the Environment for Sustainable Development programme (AMESD). It is located at the Polytechnic of Namibia and comprises a satellite data receiving station and data centre, which will provide data useful for agriculture. The data, which will be provided free to farmers' associations and government departments, will include water indices, rainfall estimates, and maps of soil moisture content. >>

Nigeria

6 January 2011: The replaced Nigerian satellite, NIGCOMSAT-1R, underwent and passed a major performance test. >>

27 June 2011: Nigeria concluded plans to launch into orbit two satellites from Russia, a top government official with the country's National Space Research and Development Agency (NASRDA) said. Director General of the agency Seidu Mohammed told a news conference in Abuja that the earth observation satellites, NigeriaSat-2 and NigeriaSat-X, would provisionally be launched on July 7. >>

2 August 2011: The Nigeria communication satellite (NIGCOMSAT-1R) scheduled for re-launch in December this year would save the country over 450 million dollars being spent annually for the purchase of and importation of bandwidth to facilitate internet access, telephony and broadcasting, the Federal Government has said. >>

26 August 2011: The Nigerian Minister of Science said the ground station had made about 24 contacts with both Nigerian satellites since they were launched in Russia on August 17. >>

17 September 2011: The recently launched Nigerian earth observation satellites will significantly boost the country's capabilities for natural resource management as well aid disaster relief through the Disaster Monitoring Constellation, the Minister of Science and Technology, Prof Ita Okon Bassey Ewa, has said. >>

South Africa

26 January 2011: South Africa announced plans to launch satellites within the next 15 years in an effort to break into the global satellite launching market and lower the cost of launching its own satellites. The Department of Science and Technology (DST) also announced that workshops will be held to create a firm launch plan. >>

20 March 2011: The year 2011 marks a turning point in the history of space science and astronomy in South Africa. A new space agency on the launchpad, new scientific breakthroughs, an upcoming congress in Cape Town, and the country's bid to host the largest radio telescope in the world, the SKA. All these factors are contributing to give South Africa a new place on the map when it comes to astronomy and research.

The newly established South African National Space Agency (SANSA) will have a first chance to introduce itself to the global space community when South Africa hosts the International Astronautical Congress in Cape Town, from 3 to 7 October 2011. The IAC is the most important event for the scientific and industrial community in the field, and will be an important opportunity for South Africa to showcase its scientific, institutional and industrial capabilities to the world. As this will be the first International Astronautical Congress on the African Continent, IAC 2011 will be a historic milestone in the development of the African space arena. >>

1 April 2011: This was the first working day for the new South African National Space Agency (Sansa) - which was formally established in December - and saw the launch, by the Post Office, of a stamp series in honour of South Africa's Sumbandila Earth observation microsatellite (SumbandilaSat).

As of 1 April, SumbandilaSat had completed 8 480 orbits, having spent one year and 192 days in space. Since September 17, 2009, when the first image was received, the satellite has downloaded 1 392 images. >>

5 April 2011: South Africa is expected to formally agree to participate in the Russian-led international Radioastron space telescope programme. A draft contract between the South African National Space Agency (Sansa) and its Russian counterpart, Roscosmos, has already been agreed. >>

29 August 2011: Engineers at SunSpace worked to fix problems with South Africa's second satellite, SumbandilaSat, which was damaged during a solar storm in early June. >>

21 September 2011: The South African National Space Agency (Sansa) hopes to start a programme to build South Africa's next satellite next year. "We need a fully operational satellite," affirmed Sansa CEO Dr Sandile Malinga in Johannesburg on Wednesday. "We are looking at a three to four year development cycle. If we start in all earnest next year, it will take us to [20]14/15 to launch one." The new satellite, which will be for Earth observation, is expected to cost R400-million and will be built in South Africa. >>

26 September 2011: South Africa will soon join the Russian-led international Radioastron space telescope consortium. South Africa is expected to sign the agreement late this month or next month. >>

27 September 2011: An informal settlement upgrading programme, the first ever satellite-derived baseline information on informal settlements has increased the ability of the provincial Department of Human Settlements in South Africa's North West Province to address housing needs and improve the livelihoods of people living in such settlements. >>

6 October 2011: The South African National Space Agency (SANSA) called for a "developmental agenda" in the provision of satellite services from outside Africa. Sansa raised concerns that while the contracting and licensing terms for those services were favourable to South Africa, it was not the same case in the region. The organisation's chief executive Sandile Malinga aired those views during a panel discussion at the 62nd International Astronautical Congress in Cape Town. >>

22 November 2011: The South African Space Agency's (Sansa's) Space Operations directorate has been selected by the United States' National Aeronautics and Space Administration to provide tracking services for the launch of its latest Mars mission, the Mars Science Laboratory. >>

Sudan

The practical implementation of launching a Sudanese satellite began within the framework of a joint cooperation between Sudan and Ukraine in the sphere of the establishment of ground stations, manufacturing and launching satellites in the stable and unstable orbits of communication services and remote sensing. >>

Tunisia

A Tunisian, Mr. Mustapha Masmoudi, President of the Tunisian Communication and Spacial Sciences Association (ATUCOM), co-chaired the African Regional Group which took place during the International Astronautical Congress in Cape Town, South Africa during October. >>

D. Asia

Iran said that it intends to design and build a remote sensing satellite jointly with Asia-Pacific Space Cooperation Organisation (APSCO) member states. "Iranian scientists have always taken part in APSCO meetings," the Head of Iranian Space Agency (ISA) Hamid Fazeli told ISNA adding that, "designing and building a remote-sensing satellite is one of the fields for cooperation." >>

The director of the China Meteorological Administration (CMA) Zheng Guoguang presented representatives from 16 Asian countries with integrated satellite broadcasting and receiving stations and the CMA's meteorological information comprehensive analysis and processing system on behalf of the Chinese government. The recipients of the equipment are Bangladesh, Indonesia, Kyrgyzstan, Laos, Malaysia, Maldives, Mongolia, Burma, Nepal, Pakistan, Philippines, Sri Lanka, Tadzhikistan, Thailand, Uzbekistan and Vietnam. >>

Burma (Myanmar)

Myanmar (Burma) was reported as setting up a central committee and a working committee for launching satellite in a bid to promote the capacity of the country's telecommunication and information sectors. >>

China

During 2011, China took part in activities organised by the International Astronautical Federation, International Committee on Space Research, International Academy of Astronautics, and other non-governmental international space organisations and academic institutes.

China has established a long-term cooperation plan with Russia through the mechanism of the Space Cooperation Sub-committee under the Prime Ministers' Meeting between Russia and China. The two nations signed a number of cooperation agreements on space science, deep-space exploration and other areas, and their national space administrations have opened representative offices.

China has undertaken extensive cooperation with Ukraine under the Space Cooperation Subcommittee mechanism of the Sino-Ukrainian Cooperation Commission, and the two sides have signed the 'Sino-Ukrainian Space Cooperation Programme'.

China and the European Space Agency signed the "Status Quo of China-Europe Space Cooperation and the Cooperation Plan Protocol" under the mechanism of the China-Europe Joint Commission on Space Cooperation. The two sides cooperated closely during the lunar exploration missions of Chang'e-1 and Chang'e-2, and signed the "Agreement on Mutual Support for the TT&C Network and Operation" in September 2011.

China and Brazil, through the mechanism of the Space Cooperation Sub-committee of the Sino-Brazilian High-level Coordination Commission, have worked out a comprehensive bilateral space cooperation plan, actively promoted the research and development of the China-Brazil Earth resources satellites, continued to maintain data consistency of their Earth resources satellites and expanded the application of their data into regional and global application.

China signed a cooperation framework agreement on space and marine science and technology with France under the mechanism of the Sino-French Joint Commission on Space Cooperation, aiming at developing bilateral cooperation on astronomic satellite, ocean satellite and other satellite programmes.

China and Britain established a joint laboratory on space science and technology, jointly organised a seminar on space science and technology, and conducted exchanges on lunar exploration, Earth observation, space science research and experiment, personnel training and other areas.

China signed a framework agreement with Germany on bilateral cooperation in the field of human spaceflight. Under the framework, the two countries have carried out a cooperative experiment project on the Shenzhou-8 concerning space life science.

The director of the U.S. National Aeronautical and Space Administration (NASA) visited China and the two sides will continue to make dialogue regarding the space field.

China signed further memorandum of understandings and agreements with Venezuela, the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) and other countries and organisations.

China actively promoted the extensive applications of Earth observation satellite data with various countries. China gave to many countries free receiving stations for meteorological satellite broadcasting systems and comprehensive systems for meteorological information analysis and processing. With China's help, a data receiving station of the Sino-Brazilian Earth Resources Satellite Programme was established in South Africa, and another station for receiving environmental and disaster data from Chinese satellites was set up in Thailand.

China took part in activities organised by the United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS) and its Scientific and Technical Sub-committee and Legal Subcommittee. China signed relevant agreements with the United Nations on disaster management and emergency response based on the space-based information platform. A Beijing office of the programme has been established.

China assisted the Asia-Pacific Space Cooperation Organisation (APSCO) in the formulation and release of its policy on small satellite data in Asia-Pacific multilateral cooperation.

10 January 2011: China’s space scientists and engineers said that they would have a deep space monitoring network in 2016, and launch its first Mars probe later in the year to pave the way for further space explorations. >>

11 March 2011: China is ready to carry out a multiphase construction program that leads to a large space station around 2020. >>

14 April 2011: A top Chinese government space official appealed to the U.S. government to lift its decade-long ban on most forms of U.S.-Chinese space cooperation, saying both nations would benefit from closer government and commercial space interaction. He specifically called for cooperation on manned space flight, in which China has made massive investment in recent years.

Lei Fanpei, vice president of China Aerospace Science and Technology Corp. (CASC), which oversees much of China's launch vehicle and satellite manufacturing industry, said China purchased more than $1 billion in U.S.-built satellites in the 1990s before the de facto ban went into effect in 1999. >>

5 December 2011: China's post office is hoping to boost business by allowing customers to send letters postmarked from space. Emails will be sent to a computer aboard Tiangong-1, a spacecraft currently orbiting the earth, and rerouted to a special China Space Post Office branch on the ground in Beijing, the country's space programme said on its website. >>

31 December 2011: China's Information Office of the State Council published a white paper on China's space activities in 2011. >>

India

25 February 2011: Boeing has offered to partner with India on manned space missions, including on the very significant 'composite cryogenic tanks' for the launch and propulsion control of rockets. >>

2 March 2011: After 16 successful launches of its workhorse rocket Polar Satellite Launch Vehicle (PSLV) in the last 17 years, the Indian space agency is now testing a key component to re-qualify its on-flight performance parameters to avoid any unpleasant surprises. >>

20 April 2011: It was reported that the ISRO Inertial Systems Unit will step up production of systems for satellites and launch vehicles because of ISRO's plan to increase the frequency of satellite launches to meet the rising demand. >>

1 May 2011: The US has said it will ''encourage'' India to change its policies which give exclusive rights to the Indian Space Research Organisation (ISRO) for selling the satellite capacity to the lucrative direct-to-home television market.

In a report, the US Trade Representative (USTR) raised concerns over India not allowing foreign operators to participate in direct selling of satellite capacity. >>

23 May 2011: ISRO has resumed monthly launches of sounding rockets from the Thumba Equatorial Rocket Launching Station (TERLS) under Vikram Sarabhai Space Centre (VSSC) to conduct studies of upper atmosphere. The TERLS used to launch RH 200 sounding rockets regularly on the third Wednesday of every month. However, over the years, the launches were regulated based on needs. >>

9 July 2011: The government of India made two major data sharing policy decisions regarding remote sensing. They have opened up the possibility for more government agencies to own and operate remote sensing satellites other than the Indian Space Research Organisation (ISRO), and they have freed up all remote sensing imagery up to one meter resolution, where the previous restriction required data up to 5.8 meter resolution to be protected. >>

12 July 2011: For the second time in 14 years, the Indian Space Research Organisation scouted to hire an entire communications satellite to overcome the capacity crunch. A foreign satellite may be hired for a year or two. >>

21 July 2011: India and the US may soon collaborate on experiments to be conducted on the orbital observatory. "Recognising the research opportunities available on the International Space Station, both sides agreed to explore the possibilities of joint experiments," said a joint statement signed after the 2nd India-US Strategic Dialogue co-chaired by US Secretary of State Hillary Clinton and External Affairs Minister S M Krishna. Top officials of NASA and ISRO also reviewed potential areas for future cooperation in earth observation and space exploration. >>

4 August 2011: India's space agency has plans to launch a manned space mission in the future, but a lot of work needs to be done before that to ensure such missions are failure-proof. K. Radhakrishnan, chairman of ISRO, said that the space agency will have to first master the rocket technology to launch heavy communications satellites before it can progress to a manned mission. >>

7 August 2011: The Indian Space Research Organisation (ISRO) has so far launched 64 satellites and of these seven failed. Minister of state in the ministry of personnel, public grievances and pensions V. Narayanasamy informed the Lok Sabha that using Indian launch vehicles, ISRO has so far launched 64 satellites - 38 national satellites and 26 international. >>

7 September 2011: Thales Alenia Space has delivered to ISRO the flight model of the Radio Occultation Sounder for the Atmosphere (ROSA), which will be integrated into the Indian-French Megha-Tropiques mission designed to study our planet's atmosphere. >>

15 October 2011: Planning its next GSLV launch in 2012, ISRO also plans to have two more Polar Satellite Launch Vehicle missions ready before launching it. >>

Japan

The Vietnamese government has decided to award contracts for its observation satellite project to Japanese companies, the Nikkei business daily said. NEC Corp. is expected to build the first orbiter to be launched in 2017, and oversee the production of the second one planned for 2020, the Nikkei said. >>

Kazakhstan

Kazakh President Nursultan Nazarbayev signed into law the ratification of a Russian- Kazakh space cooperation agreement. Russia and Kazakhstan will work together in Earth remote sensing, the development of spacecraft, launch vehicles and other equipment, the creation of ground-based space infrastructure and other spheres. >>

The commissioning of a key space launch facility has been postponed to 2017 due to errors in the draft design and slow progress in relevant flight tests, a Kazakh national space agency official said. The Baiterek project, co-launched in 2004 by Kazakhstan and Russia, will serve to launch new environmentally safe rockets to phase out older boosters at the Baikonur Cosmodrome. >>

Kazakhstan is ready to consider Russia's proposal of converting the Baikonur Space Centre into a joint-stock company with Russia as a major shareholder, Kazakh chief Talgat Musabayev said. Baikonur, the world's first and largest space centre which Russia currently uses for many of its space launches, is

located in Kazakhstan and leased by Russia until 2050. >>

Kazakhstan stated it was interested in joining the Belarusian-Russian orbital group of satellites. >>

Malaysia

Malaysian satellite operator, MEASAT Global (MEASAT), has chosen Arianespace to launch the MEASAT-3b satellite. The MEASAT-3b will be boosted into geostationary transfer orbit by an Ariane 5 launch vehicle from the Guiana Space Center, Europe's Spaceport in French Guiana, during the fourth quarter of 2013, Arianespace said in a statement. >>

Pakistan

17 May 2011: The Pakistani cabinet granted approval in principle to start negotiations and signing of the draft of the third Frame Agreement between Space and Upper Atmosphere Research Commission (SUPARCO) and China National Space Administration (CNSA) on cooperation in space science and technology. >>

24 May 2011: Pakistan and China announced they will jointly launch a communication satellite PAKSAT-1R on August 14 to replace the Sat-1 satellite, which is on the verge of expiry. >>

18 August 2011: After successful launch of communication satellite Paksat-IR, Pakistan Space and Upper Atmosphere Research Commission (SUPARCO) now plans to launch high resolution Remote Sensing Satellite System (RSSS), in 2014, to meet the national and international user requirements in the field of satellite imagery. RSSS will be a progressive and sustainable programme. Initially, SUPARCO plans to launch an optical satellite with payload of 2.5 meter PAN in 700 km sun-synchronous orbit by the end of year 2011, which will be followed by a series of optical and SAR satellites in future. >>

6 September 2011: The Chairman of SUPARCO was confident that the recently launched PAKSAT-IR has the capacity to bring a revolution in the national education programme especially in promoting quality education in the primary and secondary schools through distant learning which could be provided to schools all over the country. >>

Singapore

20 April 2011: Singapore's first indigenous micro-satellite, X-SAT, lifted off on board India's Polar Satellite Launch Vehicle PSLV-C16. >>

South Korea

South Korea's first communications satellite, Cheollian, started commercial operations, making it the 10th country to have its own such satellite. The satellite will provide information to eight institutes and companies, including the Korea Meteorological Administration and the National Emergency Management Agency. >>

Taiwan

Taiwan's Ministry of Economic Affairs announced the commencement of the European Satellite

Navigation Competition (ESNC) 2011 Taiwan. For 2011 the focus is on telematics applications based on the Galileo navigation satellite system. >>

Turkmenistan

China will launch a communications satellite for Turkmenistan with its Long March-3B carrier rocket in 2014, the Chinese launch contractor said. The satellite will be Turkmenistan's first communications satellite. >>

Vietnam

7 January 2011: The Japanese government decided to provide funding for developing Vietnam's space satellite projects under its official development assistance. >>

27 April 2011: Vietnam will launch its first remote sensing satellite in 2014, according to the Space Technology Institute of the Vietnam Academy of Science and Technology, via VOVNews.

The Head of the Space Technology Institute, Associate Professor Doan Minh Chung said that the satellite, called VNREDSat-1, will be designed and assembled using French technology in 2013. >>

1 August 2011: The government of Vietnam decided to go ahead with a second microsatellite for earth observations, through its VNREDSAT (Vietnam Natural Resources Environment and Disaster monitoring small Satellite) programme. >>

18 August 2011: According to Viet, by the end of 2010, Vinasat-1 satellite had reached full capacity. In the meantime, satellite leasing services are on the rise. In order to meet burgeoning demand, VNPT has decided to invest in a new satellite, Vinsat-2. However, the group is facing difficulties in raising $350 million for the project. VNPT has sought for the government's support to carry out the project. >>

17 November 2011: Vietnam will build a space centre by 2018 for which it will spend over $600 million. Under the plan, the Vietnam Space Centre, covering an area of nine hectares at Hoa Lac High-tech Park in Hanoi, will specialise in researching and producing small satellites to be used in domestic weather forecast, geodesy, exploration, radio- television broadcast and rescue, Xinhua reported. The project will be implemented by the Vietnam Academy of Science and Technology (VAST) with design and construction support from Japan, said Doan Minh Chung, director of the Space Technology Institute (STI). >>

7 December 2011: The Viet Nam Academy of Science and Technology (VAST) and the National Aeronautics and Space Administration (NASA) signed a joint statement outlining different areas of space-based research that will further co-operation between the two agencies. The two agencies will implement projects in earth science, including the use of ground-based networks, airborne missions and space-based technology to understand the earth system and the impact of human activity on the environment. >>

E. The Americas

The governments of Venezuela and Uruguay signed a series of strategic agreements in the areas of science and technology, energy and oil, agriculture, food, commerce and finance, that will further the

integral development of both nations.

Amongst the varied agreements approved in Montevideo, the capital of Uruguay, was a protocol amendment to a prior accord that will allow for the development of a satellite program "Venesat-1", using Venezuela's "Simon Bolivar" satellite, which will permit both nations a shared use of the orbit so that Uruguay can also develop spatial technology. >>

Later in the year, Brazil's National Institute for Space Research - INPE - formally became the newest member of the International Charter 'Space and Major Disasters'. >>

Argentina

16 March 2011: ARSAT has again selected Arianespace for its commercial launch services - this time to orbit the Argentina satellite operator's second satellite, Arsat-2. >>

14 May 2011: Argentina's National University of La Plata is joining hands with NASA and Dassault Systems Solutions in a project that will see the Argentine engineering and aeronautics experts collaborating in the building of a climate change monitoring satellite.

The partnership was hailed as the first collaboration of its kind, mainly because of NASA's decision to outsource some of the key work. >>

28 October 2011: President Cristina Fernández de Kirchner met with US authorities to sign a bilateral space cooperation agreement that will be developed jointly by NASA and the National Committee for Space Activities (CONAE). >>

Bolivia

28 June 2011: Bolivia has begun building its own telecommunications satellite called Túpac Katari with the technological support of China. The new satellite will be launched into orbit between 2013 and 2014 and it will cost a total of $300 million.

This investment will be assumed by the country's government and it will have a net utility of $7 million a year. The Chinese Development Bank will allocate more than $255 million to the project which uses the latest technologies. Chinese company Great Wall Industries has been hired for construction of the satellite platform.

The new Bolivian device is a DFH-4 third generation satellite with antennas oriented to the Bolivian territory and it will mainly serve TV transmissions. The satellite will be monitored by the Space Bolivian Agency (ABE). >>

12 August 2011: China and Bolivia jointly launched a communications satellite project that will be completed within three years. The construction of the Tupac Katari satellite, named after an 18th century indigenous hero who fought Bolivia's Spanish colonizers, will benefit the Bolivian people, said Bolivian President Juan Evo Morales Ayma at the launching ceremony. >>

20 November 2011: Bolivia expects huge benefits from the satellite "Tupac Katari", which is being built by a Chinese company and will be put into orbit at the end of 2013 or the beginning of 2014, a government official said. >>

Brazil

27 March 2011: ViaSat Inc. said that it has expanded the coverage of its Yonder high-speed internet service over Brazil and the surrounding region. The StarOne C1 satellite is providing the bandwidth and a ViaSat regional teleport has been installed and commissioned in Rio de Janeiro. The new region of the network is operational for maritime and aviation customers of the Yonder network. >>

29 March 2011: Specialists from Brazil and China carried out electromagnetic compatibility tests between the Cbers-3 satellite and the reception and image recording station of the National Space Research Institute (INPE/MCT), located in Cuiabá, I the Brazilian state of Mato Grosso, the Ministry of Science and technology said. In partnership with the Chinese Academy of Space Technology, INPE is carrying out the Cbers (China-Brazil Earth Resources Satellite) Programme, and Cbers-3 is the fourth satellite launched by the programme. >>

19 April 2011: It was reported that launcher and pad preparations to boost the Ukraine-built Cyclone-4 from Brazil's Alcantara launch centre were entering their final phase, with the goal of completing the qualification liftoff in 2012. Discussions between Ukraine and Brazil to jointly work on a Delta II-class launcher and launch site in northern Brazil date back to the 1990s and have been officially underway since 2003. >>

10 June 2011: It was reported that Indra will provide rapid deployment satellite communications systems to Brazil's armed forces. >>

31 August 2011: During August, the Brazilian government signed an agreement with the Chinese Academy of Sciences for construction of a nanotechnology centre in Campinas, in the Brazilian state of Sao Paulo, which will be set up in the Brazilian Synchrotron Light Technology Association (ABTLuS). >>

27 October 2011: NASA signed two cooperative Earth science agreements with Agencia Espacial Brasileira (AEB). >>

10 November 2011: In the year that severe flooding and landslides claimed over 800 lives in Brazil's Rio de Janeiro state, Brazil joined the international space organisation - the International Charter - that makes timely satellite data available to rescue authorities during disasters. >>

13 December 2011: Brazil is looking to private investment to stimulate the production of satellites as it begins to put its new space policy into practice. The ministry of science, technology and innovation in partnership with the Brazilian Space Agency have developed a strategy of heavy investment in the domestic production of satellites and related technologies to boost the country's presence in space. >>

Canada

3 March 2011: MDA's Radarsat 2 radar Earth observation satellite has picked up the US government as a regular customer. >>

17 August 2011: An Ottawa company, Neptec, is building part of a new Japanese satellite that will stare into black holes and distant galaxies. As the Japanese ASTRO-H satellite stares at objects millions of light years away, Neptec Design Group's job is to prevent any wobbles in the satellite from blurring the pictures. >>

Costa Rica

8 March 2011: Costa Rica and Brazil took the first steps to reach a bilateral agreement that would allow both nations to mutual cooperation in the development of nanotechnology, the space industry and in other areas of mutual interest. >>

17 April 2011: Costa Rica is looking for cooperation and financing to develop the first Central American meteorological satellite. The Central American Association of Aeronautics and Space (ACAE) president Carlos Alvarado said that the idea is to launch a satellite weighing more than 1 kg and completely developed in Central America. >>

Ecuador

5 April 2011: The Ecuadorean Civil Space Agency (EXA) presented a small satellite for Ecuadoreans and overall, for students to be able to look at Earth from space. It is expected that the satellite NEE-01 PEGASO Project, set up by EXA, can be launched in 2012. >>

20 May 2011: The National Assembly awarded EXA with the VICENTE ROCAFUERTE National Medal to Scientific Merit for its outstanding and longstanding labour in designing and developing the Ecuadorian Civilian Space Programme. >>

16 December 2011: The Ecuadorian Air Force - FAE, EXA and the Netherlands company ISIS signed the contract and agreements needed to launch into orbit the first Ecuadorian satellite, the NEE-01 PEGASUS, on board a Russian Dnepr RS20 launch vehicle operated by KOSMOTRAS from the Yasny cosmodrome on October 2012. >>

Mexico

1 September 2011: MacDonald, Dettwiler and Associates Ltd. announced the signing of a contract valued at US$751,000 with Petroleos Mexicanos for the continued monitoring of natural oil seeps and spills in the Gulf of Mexico. >>

6 October 2011: The Mexican Communications and Transport Ministry has contracted with Europe's Arianespace consortium to launch the Mexsat 3 satellite in late 2012 as a co-passenger aboard a heavy-lift Ariane 5 rocket or as sole passenger on a Europeanized version of Russia's Soyuz vehicle, Evry, France-based Arianespace announced. >>

Peru

Defence Minister Jaime Thorne said Peru is currently evaluating proposals to purchase a satellite through a government-to-government mechanism. "Peru is considering several proposals including government-to-government deals, particularly a very interesting proposal from a friendly country," he said. >>

Ukraine and Peru signed a framework intergovernmental agreement on cooperation in the space sector. The parties intend to cooperate in the field of creating space transportation systems and launch services, creating satellite systems for research, in the sphere of space science and technology, Earth sensing and observation, and in the field of communication systems. >>

United States

7 April 2011: Marrying British small satellite expertise with Florida's space launch industry should position both parties to capture a larger share of a global aerospace industry worth $250 billion a year, said UK trade delegates meeting in Florida. >>

13 April 2011: Museums around the United States competed for retired space shuttles. >>

17 April 2011: A new U.S. federal spending bill represented a cut to NASA's funding, but a lessening of restrictions. >>

21 April 2011: As part of the NASA Open Government plan, NASA announced more than 150 milestones related to integrating Open Government into the agencies programmes and projects. >>

26 April 2011: NASA and the U.S. Agency for International Development (USAID) agreed to expand their joint efforts to overcome international development challenges such as food security, climate change, and energy and environmental management. >>

12 May 2011: Aerospace-related economic development played a significant role in the 2011 Florida Legislative Session, with more than $43 million being committed for growth of the industry in the coming year. >>

15 May 2011: U.S. lawmakers restricted bilateral collaboration between NASA and China. >>

16 May 2011: Paul G. Dembling, co-author of the legislation that founded NASA, died in Florida. He was 91 years old. >>

25 May 2011: NASA and Hawaii have agreed to collaborate on a wide range of activities to promote America's human and robotic exploration of space. >>

9 July 2011: President Obama suggested spaceflight is stuck in the Apollo-era mode and said NASA needs a technological breakthrough to allow faster, longer spaceflight with a goal of getting astronauts to Mars. >>

13 July 2011: NASA selected the Center for the Advancement of Science in Space Inc. (CASIS) to develop and manage the U.S. portion of the International Space Station that will be operated as a national laboratory. >>

29 August 2011: NASA has boosted its cost estimate of a major telescope project to 8.7 billion dollars, even as lawmakers have threatened to slash the space agency's budget, a spokesman said. The James Webb Space Telescope, which aims to replace the Hubble Space telescope with great power and accuracy, would now be ready by October 2018, according to the latest estimates. >>

19 September 2011: Twenty-five years after their top-secret, Cold War-era missions ended, two clandestine American satellite programs were declassified, with the agency unveiling three of the United States' most closely guarded assets. >>

30 November 2011: The secretive X-37B robotic space plane set its own space-endurance record on a project operated by the U.S. Air Force Rapid Capabilities Office. The craft, also known as the Orbital Test Vehicle-2, was boosted into Earth orbit atop an Atlas 5 rocket from Cape Canaveral, Fla., on 5 March. On 30 November, it marked its 270th day of flight - a lifetime in space that was heralded in the past as the vehicle's upper limit for spaceflight by project officials. >>

Uruguay

Uruguay is set to launch its first satellite by 2013, developed by experts from the University of Engineering of Uruguay and financed by the state company for telecommunications ANTEL.

The purpose of this satellite is to cover rural areas where fibre optics cannot reach and experts are learning how to manage the energy and communications protocols which will allow the satellite to transmit the necessary information.

The new satellite will transmit on a low orbit and it will be only within sight fifteen minutes a day which, making monitoring more complicated. >>

Venezuela

Venezuela's National Assembly endorsed a new satellite contract programme with China, the second such bilateral project between the two countries. The parliament published the authorization of the new project, also known as "VRSS-1," in Venezuela's official gazette, at which point the project legally takes effect. >>

F. The Middle East

15 June 2011: The World Bank partnered with NASA and USAID to bring remote sensing technology to Arab countries. The Grants from the Global Environment Facility (GEF) will finance the hardware, software and technical assistance needed for the application of various remote sensing and Earth observation decision-support tools to address water resources and agricultural management. These tools will enhance the capacity of participating countries to monitor local and regional societal issues such as fires, drought, flooding, fresh water availability, evapotranspiration and crop yields. >>

Iran

17 March 2011: Iran launched its Kavoshgar-4 rocket carrying a test capsule into space, the official IRNA news agency reported. >>

18 June 2011: Iran launched a domestically built rocket and the Rasad 1 (satellite) has been put into orbit, al-Alam reported. >>

20 June 2011: Iran said that it received the first group of photos and remote-sensing data sent by the Iranian RASAD satellite. >>

31 August 2011: Iran plans to send a monkey into orbit as part of a plan to eventually send humans into space, Iran's ISNA news agency reported, citing Hamid Fazeli, head of the country's space agency. A so-called life-capsule, carried by a Kavoshgar-5 carrier- rocket, will lift off with a rhesus monkey, Fazeli said, according to ISNA. >>

6 September 2011: The Head of Iran Space Agency (ISA) Hamid Fazeli says the country's Rasad 1 ("Observation") satellite had successfully completed its mission following its launch aboard a Safir rocket in mid-June. >>

16 November 2011: Iran plans to launch three new domestically-manufactured satellites, Defence

Minister Ahmad Vahidi has said. The satellites named Fajr (Dawn), Navid (Promise) and Tolou (Sunrise) will be launched during the current Iranian calendar year, which ends March 19, Vahidi was quoted as saying by the Mehr news agency.

Israel

30 January 2011: Israel signed a Cooperation Agreement with ESA. The objective of this agreement is to allow Israel and ESA to create the framework for more-intensive cooperation in ESA projects in the future. >>

27 March 2011: Russia and Israel signed an agreement on cooperation on space technology and space exploration. >>

1 June 2011: Russian University of Tomsk and two Israeli space companies signed an agreement which covers establishment of small satellite design centre. >>

8 December 2011: President Shimon Peres cut the ribbon on Space IL, a non-profit group that will compete for the international Google Lunar X Prize. The challenge is to become the first team to successfully launch, fly and land a robotic spacecraft on the moon. >>

Qatar

Qatar plans to launch its high-powered communications satellite Es'Hail in early 2013, the Supreme Council of Information & Communication Technology (ictQATAR) said in a report. In 2010, ictQATAR announced it had entered into a joint investment with Eutelstat to build, launch and operate Es'Hail. The satellite, which will operate in the orbital slot 25.5 degrees east, will vastly increase communications capabilities in Qatar and the Middle East and North African regions. >>

Qatar's first independent satellite 'Ekshail' will be launched in 2013 by the Supreme Council for Information Technology (ictQatar). Hessa Al Jaber, ictQatar secretary-general, said that the satellite would boost ictQatar's initiatives to deliver an ultra high-speed Internet links at affordable rates and a reliable network covering 95 percent of Qatar by 2015. The agency's ICT2015 strategy also calls for the expansion of investments in information technologies and services to 6 billion Qatari riyals over the coming five years, she said. >>

United Arab Emirates

18 January 2011: Officials from the United Nations and US Department of State held workshops for UAE experts in hopes that the country will spearhead a regional satellite navigation system on par with others in the world. >>

14 March 2011: Bigelow Aerospace and UAE Abu Dhabi announced the signing of a MOU for the emirate to use Bigelow Aerospace orbital stations.

23 April 2011: The United Arab Emirates (UAE) successfully launched a satellite from the European Space Center in Kourou, French Guiana, a satellite communications company of the Gulf nation said.

Yahsat, based in the UAE capital of Abu Dhabi, said in a statement that an Ariane 5 rocket carrying its first commercial telecommunications satellite, Y1A, lifted off at 1:37 a.m. Abu Dhabi time (2137 GMT Friday), the state news agency WAM reported. >>

4 May 2011: The United Arab Emirates, in launching its fifth communications satellite, became the first to provide secure and independent telecommunications for its armed forces as Persian Gulf Arab state boost their military capabilities against Iran. >>

28 May 2011: The UAE's space programme will reach greater heights with the launch of DubaiSat-2 in late 2012 as Emirati engineers working on the project unveiled the technical specifications and designs of the new satellite at a Press briefing. DubaiSat-2 will feature technical improvements marked by improved data connectivity speeds that will allow the satellite to capture and send images from a wider area to the ground station. The other improvements include better image resolution, electrical propulsion, state-of-the-art camera and sensors. >>

7 December 2011: Thales Alenia Space and Astrium Services have achieved the Initial System Acceptance (ISA) milestone on the Yahsat programme, which was approved by the Al Yah Satellite Communications Company (Yahsat) and the United Arab Emirates Armed Forces. >>

G. Indian Ocean and the Pacific

Australia

17 January 2011: In January, 2011, Australia's north-eastern state of Queensland was subjected to historic flooding along many coastal rivers. This was a result of a wet spring followed by extreme rain events over Christmas and in early January. September to November was the wettest spring since records began 111 years ago, according to the U.S. National Oceanic and Atmospheric Administration's (NOAA) National Climate Data Center. The floods have affected over 200,000 people and an area roughly the size of France and Germany, according to the Australian Bureau of Meteorology.

RADARSAT-2 images were acquired for delivery to the International Charter Space and Major Disasters on behalf of Emergency Management Australia and the State of Queensland, Australia. The RADARSAT-2 satellite data acquisition planning services were provided by the Canadian Space Agency. >>

16 March 2011: Russia and Australia are strengthening their co-operation on the exploration and use of outer space, the head of the international cooperation department at the Russian space agency Roscosmos, Alexei Korostelev, told Itar-Tass in an interview. Russia and Australia signed an intergovernmental agreement on cooperation in exploration and peaceful uses of outer space back in 2001. "We are currently working on a memorandum on support for a project to build differential corrections and monitoring stations of the global navigation space system (Glonass) near the Australian city of Brisbane," Korostelev said. >>

17 March 2011: DLR and the Australian Solar Institute signed an agreement on joint research into concentrating solar energy technology. "Australia's commitment to a climate-friendly energy supply, its excellent research infrastructure and, of course, its high levels of solar radiation are an excellent basis for us to work together on reducing the cost of solar power using technology developed by DLR," said Ulrich Wagner about the partnership. DLR has been researching concentrating solar energy technology for over 30 years, and has one of the largest research teams in the world. >>

12 December 2011: NewSat Limited, an Australian satellite company, announced that as the next stage in the Jabiru satellite project, it has entered into a contract with Lockheed Martin Commercial

Space Systems for the construction of the Jabiru-1 satellite. >>

12 December 2011: Can new types of engine make spaceflight easier and more economical? This question is being investigated by researchers at DLR using one of Europe's leading hypersonic wind tunnels, located in Gottingen. The engine is being tested for an Australian Scramjet-based Access-to-Space Systems (SCRAMSPACE) experimental spacecraft. >>

X. INDUSTRY

A. Appointments

12 January 2011: NASA announced the appointment of Michael J. Gazarik as the agency's deputy chief technologist. >>

14 January 2011: Alexander P. Lopatin was appointed Roscosmos Deputy Head by a Resolution of the Russian Government. >>

5 March 2011: Space Exploration Technologies (SpaceX) announced that NASA astronaut Garrett Reisman is joining the company as a senior engineer working on astronaut safety and mission assurance. >>

17 March 2011: Thomas Reiter, Executive Board Member responsible for Space Research and Technology at DLR, was appointed as the Director of Human Spaceflight at the ESA for the next four years. In addition, Volker Liebig will continue to be the Director of Earth Observation Programmes. The new Director of Human Resources and Infrastructure is Hans-Georg Mockel. He was the Chancellor of the University of Frankfurt (Johann Wolfgang Goethe-University Frankfurt) and the Head of Corporate Development at Fraport AG for 12 years. >>

18 March 2011: Academy Award Winner James Cameron joined the X PRIZE Foundation Board of Trustees. In addition to this appointment, Cameron serves on the X PRIZE Foundation's Exploration Advisory Committee. >>

24 March 2011: The Council of the European Space Agency appointed a team of Directors who will assist the Director General in the reorganised structure that would take effect on 1 April 2011. The motive for changing the structure of the organisation is to make ESA even more competitive and efficient to increase its added value for Member States and third parties. >>

6 April 2011: Gerd Gruppe took up his post as Director of Space Administration at the German Aerospace Center (DLR), joining DLR's Executive Board and filling a vacancy that had been open for 18 months. DLR's Supervisory Board, the Senate, unanimously appointed him on 25 November 2010. >>

10 April 2011: EADS North America announced that John Schumacher will serve as Vice President, Space line of business. >>

15 April 2011: The Commercial Spaceflight Federation announced that Rear Admiral Craig E. Steidle (U.S. Navy, Ret.) has been named as President, effective May 15. >>

27 April 2011: The Secure World Foundation announced that Dr Michael Simpson will join the staff of the Foundation, taking on the position of Senior Program Officer.

Simpson comes to the Secure World Foundation after serving more than seven years as President of the International Space University (ISU), based in Strasbourg, France. >>

15 June 2011: Professor Johan-Dietrich Woerner was appointed Chairman of the Executive Board for the next five years by the Senate of the German Aerospace Center (DLR). >>

1 July 2011: THAICOM Public Company Limited's Board of Directors announced the appointment of

Ms. Suphajee Suthumpun as the Chief Executive Officer (CEO) of THAICOM Public Company Limited to replace Mr. Arak Chonlatanon, who will retire from this post. >>

7 July 2011: Aerojet announced that Dr James A. Drakes joined Aerojet as an executive director of Advanced Programs in the Business Development department. >>

11 July 2011: VS Hegde is the new Antrix CMD. Dr Hegde was the Scientific Secretary of ISRO. He is also Vice-President of the International Astronautical Federation. >>

13 July 2011: The X PRIZE Foundation announced that Alexandra Hall has joined the Foundation as the Senior Director of the US$ 30 million Google Lunar X PRIZE, a private race to the moon designed to enable commercial exploration of space while engaging the global public. >>

16 July 2011: Space Exploration Technologies announced that former Orbital Sciences executive and industry leader Mark Bitterman is joining the company's Washington office as Senior Vice President of Government Affairs. >>

30 July 2011: Remote sensing solutions provider DMCii has appointed Professor Jim Lynch OBE Director of Forestry to oversee the development of effective tools and partnerships for the implementation of sustainable forestry programmes. >>

30 July 2011: Virgin Galactic appointed Kenneth H. Sunshine as its first Chief Financial Officer. >>

30 July 2011: The Board of Eutelsat Communications appointed Michel Azibert to the post of Deputy CEO and corporate officer. >>

31 July 2011: Alain Ratier took over as Director-General of EUMETSAT, the European Organisation for the Exploitation of Meteorological Satellites, on 1 August 2011. >>

3 August 2011: Space Systems/Loral (SS/L), the world's leading provider of commercial satellites, announced that it has expanded its senior management team in order to accommodate increased business and prepare for further growth. >>

16 August 2011: William Gerstenmaier, NASA associate administrator for space operations, will head a new mission directorate. >>

26 August 2011: The Boeing Company announced the retirement of Brewster H. Shaw, vice president and general manager of the Space Exploration division. >>

1 September 2011: Terrence W. Wilcutt was appointed NASA's chief of safety and mission assurance. >>

8 September 2011: Virgin Galactic, the world's first commercial spaceline, owned by Sir Richard Branson's Virgin Group and Aabar Investments PJS, has appointed Steven J. Isakowitz as Executive Vice President and Chief Technology Officer. >>

14 September 2011: Ball Aerospace & Technologies Corp. announced that Steve Smith has joined the company's Washington Operations office as Director of Space Control and Special Missions. >>

26 September 2011: United Launch Alliance (ULA) announced that Mark Bitterman joined the company as the Vice President of Washington D.C. Operations. >>

1 October 2011: Satmex announced that Mr. Javier Recio joined the company as its Sales Vice

President. >>

11 October 2011: Orbital Sciences Corporation announced that it had named Kate Kronmiller Senior Vice President of Government Relations. >>

12 October 2011: Virgin Galactic announced the appointment of former NASA executive Michael P. Moses as the Vice President of Operations. >>

17 October 2011: Eutelsat Communications announced that Jean-Francois Bureau has been appointed Director of Institutional and International Affairs. >>

18 October 2011: NASA selected three new flight directors to manage International Space Station operations. >>

20 October 2011: SES announced that Niclas Friese-Greene has been appointed Senior Vice President Marketing and Corporate Communications. >>

27 October 2011: Virgin Galactic selected its first commercial astronaut pilot. >>

31 October 2011: Bobby Braun, who served as the first NASA chief technologist in a decade, left the agency to return to the faculty of the Georgia Institute of Technology in Atlanta. >>

11 November 2011: NASA Administrator Charles Bolden has named Cornell University Professor Mason Peck to be the agency's chief technologist, effective in January. >>

24 November 2011: Surrey Satellite Technology Limited has appointed Luis Gomes Business Unit Director of Earth Observation (EO) and Science. >>

25 November 2011: NASA's Chief Information Officer (CIO) announced the appointment of Valarie Burks as the deputy CIO for Information Technology Security. >>

2 December 2011: Orbital Sciences Corporation announced that it had named Mr. Patrick Rayermann Senior Director of Corporate Strategy and Development. >>

3 December 2011: SES announced the appointment of Ferenc Szelényi as its new Senior Vice President Commercial Europe. >>

16 December 2011: The Boeing Company announced that Christopher J. Ferguson, a retired U.S. Navy captain and former NASA astronaut, has been named director of Commercial Crew Interface in the company's Space Exploration division. >>

19 December 2011: NASA has named physicist and former astronaut John Grunsfeld as the new associate administrator for the Science Mission Directorate at the agency's headquarters in Washington. >>

B. Awards

7 January 2011: The American Institute for Aeronautics and Astronautics (AIAA) honoured NASA Chief Technologist Bobby Braun with the Von Karman Lectureship in Astronautics. >>

14 March 2011: Spacenet's Emergency Communications Service (ECS) was announced as a recipient of the 2010 Satellite Spotlight Product of the Year Award. >>

15 April 2011: In recognition of SpaceX's groundbreaking year in 2010, with the successful launch of two Falcon 9 rockets, and the safe return of its Dragon capsule, the National Space Society (NSS) announced that Space Exploration Technologies (SpaceX) was the recipient of the NSS's 2011 Pioneer Award for Business Entrepreneur. >>

29 April 2011: The International Astronautical Federation announced the 12 recipients of the 2011 IAF Youth Grants awards. >>

13 May 2011: Marking the occasion of the sixty years since its foundation in 1951, the International Astronautical Federation (IAF) announced that its 60th Anniversary Award would be given to the Global Positioning System (GPS), nominated by IAF member, the American Institute for Aeronautics and Astronautics (AIAA). >>

15 May 2011: In recognition of his exceptional contribution to the Canadian Space Program, Dr Henry Buijs was presented with the John H. Chapman Award of Excellence at the Canadian Space Agency's annual celebration. >>

20 May 2011: The National Space Society presented the Wernher von Braun Memorial Award to the HAYABUSA project team at the 2011 International Space Development Conference (ISDC). The award recognizes "the first round trip to and sample return from the surface of an object in solar orbit". >>

28 May 2011: The International Astronautical Federation announced that it had awarded the 2011 Allan D. Emil Memorial Award to Dr Kuniaki Shiraki of JAXA for an outstanding contribution to space transportation technology and to the success of the International Space Station. >>

25 June 2011: NASA has awarded $20 million to colleges and universities nationwide to conduct research and technology development in areas important to the agency's mission. The awards also enable faculty development and support students. >>

30 August 2011: NASA has established an astrophysics technology fellowship named for the woman many credit as one of the key contributors in the creation of the Hubble Space Telescope. >>

13 September 2011: The SGAC announced the winner of the first Ade Abiodun African Space Scholarship Award, Etim Offiong of Nigeria. >>

21 September 2011: Teachers from 14 NASA Explorer Schools (NES) have been selected for the 2011 School Recognition Award for their contributions to science, technology, engineering and mathematics (STEM) education. >>

26 September 2011: President Obama named four NASA scientists as recipients of the 2010 Presidential Early Career Award for Scientists and Engineers (PECASE). >>

30 October 2011: Elon Musk, CEO and Co-founder of Tesla and CEO and CTO of SpaceX, was recognized for Innovator of the Year in Technology by WSJ Magazine. >>

Glossary

A glossary of acronyms, abbreviations and definitions in use within the space industry.

ACE Advanced Composition Explorer
AGILE Astro-rivelatore Gamma a Immagini Leggero
AIM Aeronomy of Ice in the Mesosphere
ALTEA Anomalous Long Term Effects in Astronauts
AMIE Advanced Moon micro-Imaging Experiment
AMS Alpha Magnetic Spectrometer
ANDE-RRA Atmospheric Neutral Density Experiment Risk Reduction - Active
ANDE-RRP Atmospheric Neutral Density Experiment Risk Reduction - Passive
ANGKASA National Space Agency of Malaysia
ANITA Antarctica Impulsive Transient Antenna
APXS Alpha Particle X-Ray Spectrometer
ASI Agenzia Italiana Spaziale
ASPERA Analyser of Space Plasma and Energetic Atoms
ASTEP Astrobiology Science and Technology for Exploring Planets
ASTP Apollo-Soyuz Test Project
ASTID Astrobiology Science and Technology Instrument Development
ATIC Advanced Thin Ionization Calorimeter
AU Astronomical Unit
BATSE Burst and Transient Source Experiment
BESS Balloon-borne Experiment with a Superconducting Spectrometer
BIOS-3 Closed ecosystem at the Institute of Biophysics in Krasnoyarsk, Siberia
BLAST Balloon-borne Large Aperture Sub-millimeter Telescope
C/NOFS Communication/Navigation Outage Forecasting Satellite
CAWSES Climate and Weather in Sun-Earth System
CEEF Closed Ecology Experiment Facility
CELSS Closed Ecological Life Support Systems
CEOS Committee on Earth Observation Satellites
CHAMP Challenging Minisatellite Payload (for Geophysical Research)
CLAF Centro Latinoamericano de Fisica
CLRTAP Convention on Long-Range Transport of Air Pollutants
CME Coronal Mass Ejection
CNES Centre National d'Ètudes Spatiales (French Space Agency)
CNSA China National Space Administration
CONAE Comisión Nacional de Actividades Espaciales (Argentina)
Coronas Complex Orbital Near-Earth Observations of the Solar Activity
COROT Convection, Rotation et Transits planétaires
COSMIC Cosmic Observing System for Meterology, Ionosphere and Climate
COSPAR Committee on Space Research
COST Cooperation in the field of Scientific and Technical research
COTS Commercial Orbital Transportation Services
CREAM Cosmic Ray Energetics And Mass
CRISM Compact Reconnaissance Imaging Spectrometer for Mars

CSA Canadian Space Agency
CSBF Columbia Scientific Balloon Facility
CTIM Coupled Thermosphere-Ionosphere Model
CTIP Coupled Thermosphere-Ionosphere-Plasmasphere Model
CTX Context Camera
D-CIXS Demonstration of Compact X-ray Spectrometer
DIODE Détermination Immédiate d'Orbite par DORIS Embarqué
DirecTV Satellite company
DIXI Deep Impact EXtended Investigation
DLR Deutsches Zentrum für Luft-und Raumfahrt (German Space Agency)
DLR-DFD German Remote Sensing Data Center
DORIS Doppler Orbitography and Radiopositioning Integrated by Satellite
EARP European Accelerator-based space Radiation biology Programme
EC European Commission
ECOMA Existence and Charge state Of Meteoric smoke particles in the middle Atmosphere (Sounding Rocket Experiment)
EDUSAT Education Satellite
EIS EUV Imaging Spectrometer
ELGRA European Low Gravity Research Association
ENA Energetic Neutral Atoms
ENVISAT ENVIronment SATellite
EPOCh Extrasolar Planet Observations and Characterization
EPOXI Combined DIXI/EPOCh mission
ERG Energization and Radiation in Geospace
ESA European Space Agency
ESERO European Space Education Resource Office
EUMETSAT European Organisation for the Exploitation of Meteorological Satellites
EUV Extreme Ultraviolet
EVA Extra Vehicular Activity
FAO Federation of Astrobiology Organisations
FITE Far Infrared Interferometric Telescope
GALEX Galaxy Evolution Explorer
GAW Global Atmospheric Watch
GCOS Global Climate Observing System
GdR Groupement de Recherche
GEO Group on Earth Observations
GEOSS Global Earth Observation System of Systems
GEOTAIL ISTP magnetotail mission
GIOVE Galileo In-Orbit Validation Element
GITM Global Ionosphere Thermosphere Model
GLAST Gamma-ray Large Area Space Telescope
GLONASS Global Navigation Satellite System
GMD Global Muon Detector Network
GMES Global Monitoring for Environment and Security
GNM Global Numerical Model
GNSS Global Navigation Satellite System
GOCE Gravity field and Ocean Circulation Explorer
GOES Geostationary Operational Environmental Satellites
GOOS Global Ocean Observing System
GP-B Gravity Probe B
GPS Global Positioning System

GR General Relativity
GRACE GRAvity recovery and Climate Experiment
GRAIL Gravity Recovery and Interior Laboratory
GRS Gamma-Ray Spectrometer
HiRISE High Resolution Imaging Science Experiment
HMO Hermanus Magnetic Observatory
HRSC High Resolution Stereo Camera
HYLAS Highly Adaptable Satellite
HST Hubble Space Telescope
IAA International Academy of Astronautics
IAC International Astronautical Congress
IADC Inter-Agency Space Debris Coordination Committee
IAF International Astronautical Federation
IASI Infrared Atmospheric Sounding Interferometer
IAU International Astronomical Union
IBER Investigations into Biological Effects of Radiation
IBEX Interstellar Boundary Explorer
IBMP Institute of Biomedical Problems
ICESAT Ice, Cloud and land Elevation Satellite
ICME Interplanetary Coronal Mass Ejections
ICRR International Congress of Radiation Research
ICTP International Centre for Theoretical Physics
IGBP-DIS International Geosphere-Biosphere Programme-Data and Information System
IGOS-P Integrated Global Observing Strategy Partnership
IGY International Geophysical Year
IHY International Heliophysical Year
IJPS Initial Joint Polar-Orbiting Operational Satellite System
ILWS International Living With a Star
ILS International Launch Services
IMF Interplanetary Magnetic Field
INPE Instituto Nacional de Pesquisas Espaciais (Brazil)
InSAR Interferometric Synthetic Aperture Radar
Integral International Gamma Ray Astrophysics Laboratory
IPCC Intergovernmental Panel on Climate Change
IPS Inter Planetary Scintillation
IR infrared
IRAS Infrared Astronomy Satellite
ISAS Institute of Space & Astronautical Science, Japan
ISES International Space Environment Service
ISGP International Society for Gravitational Physiology
ISO International Organisation for Standardization
ISPRS International Society for Photogrammetry and Remote Sensing
ISU International Space University
ISRO Indian Space Research Organisation
ISS International Space Station
ISSOL International Astrobiology Society
ISTP International Solar Terrestrial Physics
ISTS International Symposium on Space Technology and Science
IXO International X-ray Observatory
JAXA Japan Aerospace Exploration Agency
JSBSS Japanese Society for Biological Sciences in Space

JWST James Webb Space Telescope
KAIST Korea Advanced Institute of Science and Technology
KATE/RSIS Ka-band Telemetry and telecommand Experiment/Radio Science for SMART-1
KBO Kuiper Belt Object
KIBO Japanese Experiment Module built for the ISS
KITSAT Korean Institute of Technology Satellite
LADEE Lunar Atmosphere and Dust Environment Explorer
LCROSS Lunar CRater Observation and Sensing Satellite
LCT Laser Communication Terminal
LDB Long Duration Balloon
LEO Low-Earth Orbit
LET Linear Energy Transfer
LIDAR Light Detection and Ranging
LISA Laser Interferometer Space Antenna
LOLA Lunar Orbiter Laser Altimeter
LRA Laser Retroreflector Array
LRO Lunar Reconaissance Orbiter
MARCI Mars Color Imager
MARIE Mars Radiation Environment experiment
MaRS Mars Radio Science experiment
MARSIS Mars Advanced Radar for Subsurface and Ionosphere Sounding
MASS Dust MASS Analyzer (NASA Sounding Rocket Experiment)
MAVEN Mars Atmosphere and Volatile EvolutioN
MB Mössbauer Spectrometer
MCS Mars Climate Sounder
MDIS Mercury Dual Imaging System
MEDES Institut Médicine Physiologie Spatiale
MELISSA Micro-Ecological Life Support System Alternative
MESSENGER MEcury Surface Space ENvironment, GEochemistry, and Ranging mission
MetOp Meteorological Operational satellite
MetOp-A First polar-orbiting satellite in the MetOp programme dedicated to operational meteorology
MI Microscopic Imager
MINERVA MIcro/Nano Experimental Robot Vehicle for Asteroid
Mini-TES Miniature Thermal Emission Spectrometer
MIT Massachusetts Institute of Technology
MOSTI Ministry of Science, Technology and Innovation of Malaysia
MRO Mars Reconnaissance Orbiter
MSL Mars Science Laboratory
NADIR Neutral Atmosphere Dynamics Interdisciplinary Research
NAI NASA Astrobiology Institute
NASA National Aeronautics and Space Administration
NCWT National Science and Technology Centre (Amsterdam)
NEO Near Earth Object
NExT New Exploration of Tempel-1
NICT National Institute of Information and Communications Technology
NMDB Neutron Monitor Database
NOAA National Oceanic and Atmospheric Administration
NOVA NASA Opportunities for Visionary Academics
NRF National Research Foundation (South Africa)
NRL Naval Research Lab (USA)

NSBRI National Space Biomedical Research Institute
NSF National Science Foundation
NSRL NASA Space Radiation Laboratory
NuSTAR Nuclear Spectroscopic Telescope Array
OMEGA Observatoire pour la Mineralogie, l'Eau, la Glace et l'Activité
ORBITALS Outer Radiation Belt Injection, Transport, Acceleration and Loss Satellite
Pancam Panoramic Camera
Pan-STARRS Panoramic Survey Telescope and Rapid Response System
PDS Planetary Data System
PFS Planetary Fourier Spectrometer
PMC Polar Mesospheric Cloud
POD Precise Orbit Determination
POLAR Polar Orbiting Satellite (NASA)
PR Public Relations
PRBEM COSPAR Panel on Radiation Belt Environmental Modelling
Proton A Russian launch system
PSD COSPAR Panel on Satellite Dynamics
PSLV Polar Satellite Launch Vehicle
RAT Rock Abrasion Tool
RF Radio Frequency
RHESSI Reuven Ramaty High Energy Solar Spectroscopic Imager
RKA Russian Space Agency
ROSA Romanian Space Agency
RSA Russian Space Agency
RWC Regional Warning Center
SARA Sub KeV Atom Reflecting Analyser
SaTReC Satellite Technology Research Centre (Korea)
SBC Sanriku Balloon Centre
SBI Solar Bolometric Imager
SCIAMACHY SCanning Imaging Absorption spectroMeter for Atmospheric CHartographY
SCOSTEP Scientific Committee On Solar-Terrestial Physics
SDO Solar Dynamic Observatory
SDSC Satish Dhawan Space Centre
Sea Launch Launch company
SECCHI Sun-Earth Connection Coronal and Heliospheric Investigation
SELENE (KAGUYA) SELenological and ENgineering Explorer
SETI Search for ExtraTerrestrial Intelligence
SGAC Space Generation Advisory Council in Support of the United Nations Programme on Space Applications
SHARAD Shallow Radar
SHINE Solar, Heliospheric, and Interplanetary Environment
SIR SMART-1 Infrared Spectrometer
SIRTF Space Infra-Red Telescope Facility
SJ-8 ShiJian-8, a Chinese seed-breeding satellite
SLR Satellite Laser Ranging
SMART Small Mission for Advanced Research in Technology
SOHO Solar and Heliospheric Observatory
SOMA Sociedad Mexicana de Astrobiología
SORCE Solar Radiation and Climate Experiment
SOT Solar Optical Telescope
SOTERIA Solar-Terrestrial Investigation and Archives

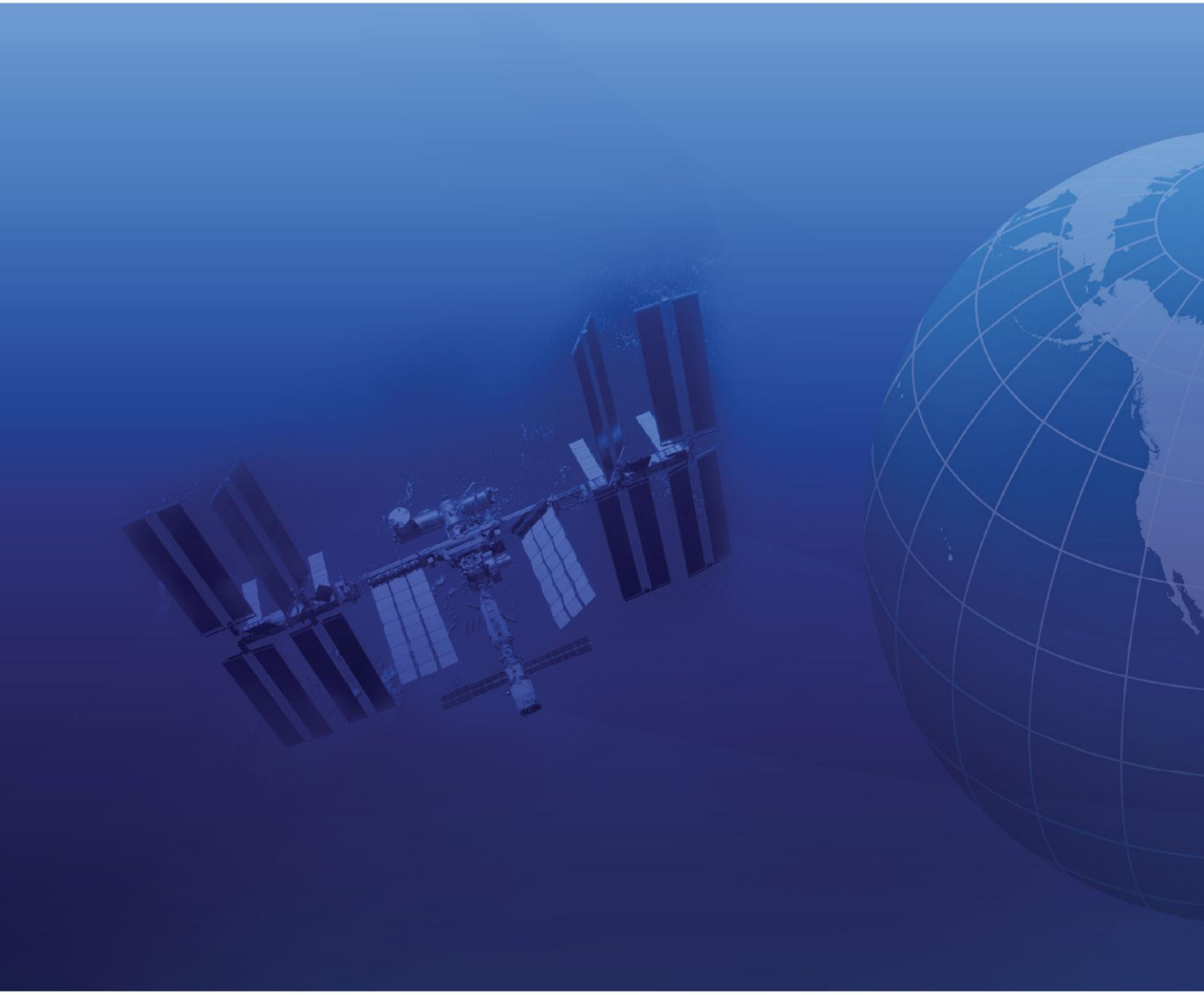
SOX Solar X-ray Spectrometer
Space 2.0 Space-product based companies
SPACEX Space Exploration Technologies
SPEDE/EPDP Spacecraft Potential Electron and Dust Experiment/Electric Propulsion Diagnostic Package
SPICAM Spectroscopy for Investigation of Characteristics of the Atmosphere of Mars
SQUID Superconducting Quantum Interference Device
SSA Space Situational Awareness
SSN Space Surveillance Network (USA)
SSOEL Society for the Study of the Origin and Evolution of Life
STARS Science Technology and Research Students program
STE Solar-Terrestrial Environment (Laboratory, Nagoya, Japan)
STEREO Solar Terrestrial Relations Observatory
STP Solar Terrestrial Probes
STP Solar Terrestrial Physics
STSC Scientific and Technical Sub-Committee (of UN-COPUOS)
SUPIM Sheffield University Plasmasphere Ionosphere Model
SVOM Space-based multi-band astronomical Variable Objects Monitor
SWEETS Space Weather and Europe - an Educational Tool with the Sun
SWENET Space Weather European Network
TARF Taiki Aerospace Research Field
TEC Total Electron Content
TEGA Thermal and Evolved Gas Analyzer
TGF Terrestrial Gamma-ray Flash
THEMIS Time History of Events and Macroscale Interactions during Substorms
THEMIS Thermal Emission Imaging System
TIEGCM Thermosphere-ionosphere-electrodynamic general circulation model
TOPEX (Ocean) TOPography EXperiment
TRACE Transition Region and Coronal Explorer
UHF Ultra High Frequency
ULDB Ultra Long Duration Balloon
ULISSE An EC programme focusing on the exploitation of scientific data including space weather data
UN United Nations
UN-OOSA United Nations Office for Outer Space Affairs
UN-COPUOS United Nations Committee on the Peaceful Uses of Outer Space
UNEP United Nations Environment Programme
URSI International Union for Radio Science
UTC Coordinated Universal Time
UV ultraviolet
VIRGO Variability of solar IRradiance and Gravity Oscillations
VLBI Very Long Baseline Interferometry
VLF Very Low Frequency
VSOP VLBI Space Observatory Programme
WACCM Whole Atmosphere Community Climate Model
WGs Wideband Global SATCOM
WIND NASA spacecraft to study solar wind and terrestrial plasma
WMAP Wilkinson Microwave Anisotropy Probe
WMO World Meteorological Organisation
WRMISS Workshop on Radiation Monitoring for the International Space Station
WSW World Space Week

Xe Xenon
XMM X-ray Multi-Mirror Mission
XRT X-ray Telescope
XTE X-ray Timing Explorer

Contributors

This publication was prepared by Scott Hatton of the International Astronautical Federation (IAF) for Tetsuo Yasaka, IAF Vice-President, Technical Activities. It was approved by Berndt Feuerbacher, President of IAF.

connecting space people



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