

## In Brief

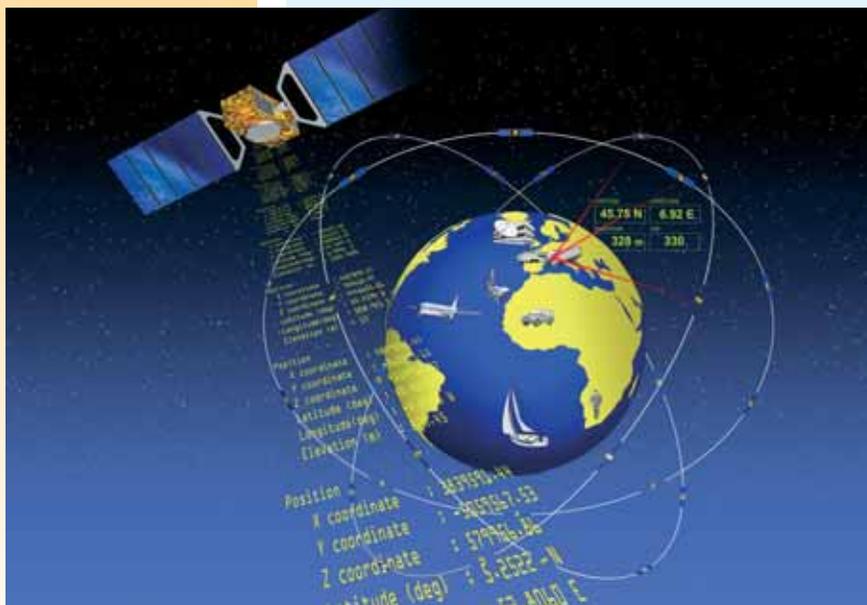
# Galileo becomes a reality for Europe

The agreement reached by the Agency's Member States in a Council Meeting at Delegate level in Paris on 26 May has cleared the way for the official launch of the legal entity that will have the task of coordinating ESA and European Union involvement in the Galileo Programme. The Agency is now able to finalise the conditions for participation in this European initiative to develop a global satellite navigation system, and to approve the Galileo Joint Undertaking founding act soon to be signed by ESA and the EU.

The Galileo Joint Undertaking, to be headquartered in Brussels, has a key part to play in implementing the various phases of the Programme. This unique organisational structure, which will pave the way for the entity that will eventually operate the Galileo system, will be responsible for Galileo's development and validation phase, and also for the preparations for system deployment and operations.

Galileo will complement the existing satellite navigation system, which presently relies entirely on the American Global Positioning System (GPS). Funded equally by ESA and the EU, Galileo is designed to provide a complete civil system, which is scheduled to be operational by 2008. It will offer the citizens of Europe and the rest of the World an accurate and secure satellite positioning capability supporting a broad range of applications: e.g. control of road, rail and sea traffic, synchronised data transmission between computers, and many others.

Projections point to very significant economic benefits from this first project to be carried out jointly by ESA and the EU, with a return on investment factor of 4.6 and the creation of over 140 000 jobs. The Galileo system will be built around 30 satellites (27 operational and 3 reserve spacecraft) occupying three circular Earth orbits, inclined at 56° to the Equator, at an altitude of 23 616 km. This configuration will provide excellent global coverage. Two Galileo Control Centres will be established in Europe to control satellite operations and manage the new navigation system, from which all of Europe's citizen's will derive benefit.



On hearing about the successful outcome of the Council Meeting at Delegate Level, Mrs Edelgard Bulmahn, the German Minister of Education and Research, in Paris to chair the ESA Council at Ministerial Level the following day, commented:

*"I am extremely delighted with this result. Galileo is now on its way. I am grateful to all ESA Member States that have striven to find a balanced solution and pleased that Europe has once again proved able to remain at the forefront of high-level technology for a programme useful to all of us in our everyday lives".*

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## ISS Node 2 ready to go

The first European node for the International Space Station has passed its acceptance review and is now about to be shipped to Kennedy Space Centre.

The nodes are elements interconnecting the laboratory and habitation modules of the ISS. When completed, the Station will have three nodes. Node 1, called Unity, has already been developed and manufactured by US industry under a NASA contract and was launched in December 1998. It connects the Russian Zarya module with the American Laboratory Destiny. Nodes 2 and 3 are being made in Europe for NASA, under a barter agreement, using European know-how and technology.

Node 2 will connect the US Laboratory Destiny, the European Columbus Laboratory, the Centrifuge Accommodation Module, and the Japanese Experiment Module Kibo. It also will be the attachment point for the Multi-Purpose Logistics Module (MPLM), and the Japanese H II Transfer Vehicle and it will carry a docking adapter for the US Space Shuttle. It will control and distribute resources throughout these Station elements and provide support to the crew and experiments, and will also provide a working base point for the Space Station Remote Manipulator System.

ESA entrusted the Italian Space Agency ASI with responsibility for the management, development and manufacture of the two nodes, which are being built under the prime contractorship of Alenia Spazio in Turin, leading a consortium of European industrial companies.

After a successful transportation readiness review, the Node 2 will be flown to the Kennedy Space Centre, Florida, USA, where it will be formally handed over from ASI to ESA and from ESA to NASA, which according to the terms of the barter agreement will then become the final owner of this ISS element.



The primary structure of the Node 2 flight unit at Alenia in Turin (I)

## ESA signs contract with DLR for Columbus Control Centre

On 31 March at Oberpfaffenhofen, near Munich, Germany, ESA Director of Human Spaceflight Jörg Feustel-Büechl signed a 37.7 MEuro contract with DLR, the German national agency for aerospace research and spaceflight, to develop the Columbus Control Centre for the European Columbus laboratory on the International Space Station (ISS).



The main functions of the Columbus Control Centre will be to command and control the Columbus laboratory systems, to provide and operate the European ground communications network for the facility, and to coordinate operations for the European payloads on board the ISS.

*"The Columbus laboratory and the Columbus Control Centre are vital elements of the European participation in the International Space Station," said Jörg Feustel-Büechl, "the signature with DLR for the Columbus Control Centre demonstrates Europe's commitment to the International Space Station programme".*

Once the Columbus Control Centre is set up in Oberpfaffenhofen, on the premises of DLR's German Space Operations Centre (GSOC) and ready for operations in 2004, DLR will take responsibility under a further ESA contract for management of the centre and coordination and support of all on-orbit operations of the Columbus laboratory on behalf of ESA.

The Columbus assembly mission, scheduled for October 2004, and the first period of Columbus operations will be managed by an Integrated Flight Control Team consisting of DLR, Astrium and ESA personnel led by an ESA Flight Director. For subsequent periods, DLR will lead the Columbus Laboratory Flight Control Team, with up to 90 operators. The team will act on ESA's behalf vis-à-vis NASA and other ISS partners for the execution of all Columbus operations.

In placing this contract, ESA is recognising the long-standing experience and competence of DLR in Oberpfaffenhofen in the management of manned spaceflight operations. DLR has been involved in spacecraft operations for 35 years and in the management of manned spaceflight missions since the first European Spacelab mission in 1983. Since 1998 DLR specialists have contributed to the design and preparation of the Columbus Control Centre.



## New Director of Launchers

Antonio Fabrizi will be ESA's new Director of Launchers from 1 July for a four-year term. Mr Fabrizi replaces Jean-Jacques Dordain, the current Director of Launchers, who takes up his new duties as ESA Director General on the same date.

Antonio Fabrizi, 55, graduated in Mechanical Engineering at "La Sapienza" University in Rome. From 1975 to 1989 he held several positions at BPD, including responsibility for feasibility studies on Ariane boosters.



Antonio Fabrizi

In 1990 he was appointed Commercial Manager at FiatAvio in charge of new initiatives development. In 1993 he became head of the Space Transportation Systems Business Unit at BPD. Between 1997 and 1999, within FiatAvio/UBS, he continued with the same responsibilities, including the Cyclone and Vega programmes.

Since 2000 Mr Fabrizi has been Vice-President, Space Business Unit, at FiatAvio and responsible for all space activities. In addition he holds several directorships (including Europropulsion, Regulus and Arianespace) and is President and Director General of Vegaspazio.



## Successful launch for Maxus 5

The European Space Agency's Maxus 5 sounding rocket mission was successfully launched on 1 April at 08:00 CEST (06:00 GMT) from Esrange, north of the Arctic Circle near Kiruna in northern Sweden.

The rocket, an 11.5 tonne solid-fuelled Castor 4B, carried a 488 kg payload of five scientific experiments with their associated telemetry and video links. The five experiments were stacked in five self-contained modules. They were designed to investigate phenomena in biology, fluid physics, material science and fundamental physics.

The launch, originally planned for later in the morning, was brought forward due to the bad weather forecast for later in the day. Maxus 5 hurtled upwards through a partially cloudy sky to reach a maximum speed of about 3600 metres per second and maximum height of just over 700 km. From booster burnout 70 km up, until atmospheric re-entry 740 seconds later, the payload was in excellent microgravity conditions.

Mission telemetry used to monitor the experiments functioned perfectly. Video images and data received at Esrange show that the experiments went well. The payload package was located soon after landing and was recovered by two helicopters about 80 km downrange. 

## Europe's antenna in Australia

The European Space Agency's first deep space ground station opened in New Norcia, 150 km north of Perth in Australia, in March. The station will play a major role in the Agency's deep space missions, including Rosetta and Mars Express. The latter was launched on 2 June.

The key component of the ground station is its massive antenna which weighs over 600 tonnes and is more than 40 metres high. It can move 540 tonnes of ballast, cantilever and 35-metre dish while maintaining precision pointing of its beam.

Construction of the 28 MEuro project began in April 2000. The last six months of 2002 were devoted to testing the electronic and communication equipment. After an initial manned period, the station will be controlled remotely from ESA's European Space Operations Centre (ESOC) in Darmstadt in Germany and the Perth International Telecommunications Centre at Gngaranga in Australia.

David Southwood, ESA's Director of Science, says New Norcia was chosen over a number of sites in the southern hemisphere. "This site has excellent weather conditions, sits at the perfect latitude for



ESA's ground station in New Norcia

deep space operations and is sufficiently distant from urban areas so that no other transmission devices disturb the satellite's transmissions," he said.

The Premier of Western Australia, the Hon Dr Geoff Gallop, officially 'switched on' the deep space ground station. 

## Mars Express spacecraft successfully launched

### **En route for the Red Planet**

ESA's Mars Express space probe has been placed successfully on a trajectory that will take it beyond our terrestrial environment and speed it on its way to the Red Planet, where it will arrive in late December. This is the Agency's first probe to head for another planet and it goes into orbit around Mars, from where it will perform detailed studies of the planet's surface, its subsurface structures and its atmosphere. It will also deploy Beagle 2, a small autonomous station which will land on the planet to study its surface and look for possible signs of life, either past or present.

Weighing in at 1120 kg, Mars Express was built for ESA by a European industrial team led by Astrium. Its Soyuz-Fregat launcher, operated by Starsem, lifted off from Baikonur in Kazakhstan on 2 June at 23.45 local time (17:45 GMT). A first firing of the Fregat upper stage put the spacecraft into an interim orbit around the Earth, and one hour and thirty-two minutes later it was injected into its interplanetary orbit.

*"Europe is on its way to Mars to stake its claim in the most detailed and complete exploration ever made of the Red Planet. We can be very proud of this, and of the speed with which have achieved this goal",* said Prof. David Southwood, ESA's Director of Science, witnessing the launch from Baikonur.

ESOC, ESA's satellite control centre in Darmstadt, Germany, quickly established contact with the spacecraft, confirming that it was pointing correctly towards the

Sun, that its solar panels had been successfully deployed, and that all onboard systems are operating faultlessly.

Mars Express is now speeding through space at more than 30 km/s on its six-month and 400 million kilometre journey through the Solar System, during most of which the spacecraft will contact Earth only once per day.

### **There in time for Christmas**

At the end of November, Mars Express will get ready to release Beagle 2. The 60 kg capsule containing the tiny lander will be released on 20 December and will enter the Martian atmosphere on Christmas Day, after five days of ballistic flight. As it descends, it will be protected in the first instance by a heat-shield, two parachutes will then open to provide further deceleration, and three airbags will

soften the final impact. This crucial phase in the mission will last just ten minutes, from entry into the Martian atmosphere to landing on the planet's surface.

Having deployed its solar panels and the payload adjustable workbench, a set of instruments (two cameras, a microscope and two spectrometers) mounted on the end of a robotic arm, Beagle will proceed to explore its new environment, gathering geological and mineralogical data that should allow Martian rock samples to be dated with absolute accuracy for the first time. Using a grinder and corer, and 'the mole', a wire-guided mini-robot able to burrow under rocks and dig to a depth of 2 m, it will collect samples to be examined in the GAP automated mini-laboratory, equipped with twelve furnaces and a mass spectrometer. It will be the spectrometer's job to detect possible signs of life and date the rock samples.

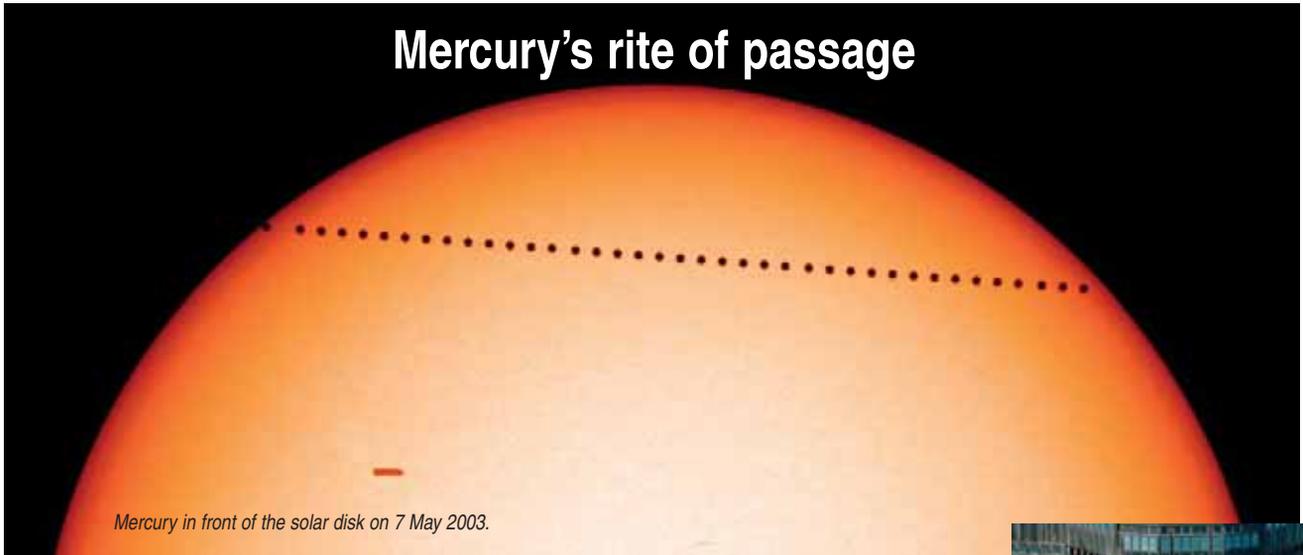
Meanwhile, the Mars Express spacecraft will have performed a series of complex manoeuvres and motor firings in order to achieve a 7.5 hour quasi-polar orbit around the planet, which will take it to within 250 km of the surface. From there it will carry out a detailed investigation of the planet, pointing its instruments at Mars for between half-an-hour and an hour per orbit and then, for the remainder of the time, at Earth to relay the information that it has collected, and the data transmitted to it by Beagle 2. 

*A full feature on the Mars Express mission will appear in the August 2003 issue of the ESA Bulletin.*



The Soyuz-Fregat launcher carrying Mars Express lifting off from Baikonur on 2 June

## Mercury's rite of passage



*Mercury in front of the solar disk on 7 May 2003.*

In Greek mythology Hermes is the swift messenger of the gods who flies across the heavens at great speed. Hermes, or Mercury in the Roman form, has given his name to the closest of the planets to the Sun since early times. Mercury is a relatively bright object in the night and early morning skies, visible to the naked eye, orbiting the Sun every 88 days. Mercury's orbital inclination is tilted at seven degrees relative to the Earth's and it is usually unnoticeable when it passes between the Earth and the Sun. A visible transit of the Sun

happens just once every 23 times Mercury passes the Earth and this has occurred only 14 times in the last century. It is thus a relatively rare occurrence despite the swiftness of Mercury's orbit.

On 7 May Mercury made one of these infrequent transits. The transit, as viewed from ESTEC, began at 9:50 CET and lasted five and a half hours until 15:17 CET. During the transit Mercury was never more than a small black spot, invisible to the naked eye, against the backdrop of the glaring

Sun. This black spot was 1/160th of the diameter of the Sun and caused an almost undetectable dimming of the solar light. ESA's SOHO spacecraft was able to detect this, however, and measured it to be a diminution by one part in 30,000.

As with other solar events it was possible to view the transit in a number of ways. The safest was to use a small telescope with a screen of white paper below the eyepiece, allowing the telescope to project an image of the Sun onto it



*The safest way to see Mercury was to look at its projection on a piece of cardboard.*

*ESTEC scientists, who had set up different telescopes outside the reception, patiently explained the heavenly spectacle to the long queues of curious staff.*



complete with the shadow cast by Mercury. This was one of four ways used to view the transit at ESTEC – alongside a 15-cm refracting telescope, a filtered video camera and screen and a telescope with protection filters for the sunlight also provided a glimpse of the event. Some 500 people queued up during the day in hopes of distinguishing Mercury and some were more successful than others in seeing the tiny black dot. The next planet to make a transit of the Sun will be Venus on 8 June 2004.

## Space to make space

ESA is calling upon European design students to create products featuring new interior storage concepts by applying 'space methods' to life here on Earth.

What any spacecraft most lacks is physical space onboard. With the high cost of delivering payload, every cubic centimetre of interior volume must be exploited as efficiently as possible. So astronauts have to live at extremely close quarters, while engineers are driven to develop new methods of volume management and storage.

Now the Agency has issued a brief – 'From Outer Space To Inner Space: Implications For Innovative Storage Design' – as part of the 2nd D&AD NESTA Joint Product Design and Innovation Awards. It asks for a product featuring a new storage concept, designed for any interior, from a room of a home to the inside of a car. But it must incorporate techniques, technologies or materials developed for space or used extensively in it.

The competition is open to undergraduate and postgraduate student designers across Europe. The closing date for entries is 26 March 2004. Three winners will be selected by the Awards jury in June 2004, and each given funding and encouragement to develop their ideas.

The Awards are organised jointly by D&AD (Design & Art Direction), an organisation representing Britain's design and advertising communities and NESTA (the National Endowment for Science, Technology and the Arts), a body encouraging innovation in UK science, technology and the arts.



## Space weather comes to Berlin

The Space Weather Forum held in Berlin on 4 November last year was the opening event for the first European-wide Space Weather Week during the European Science and Technology Week 2002. The Forum was organised by the University of Greifswald's Institute for Physics/Space Weather Observatory, and 12 organisations, institutes and companies from all over Europe, including ESA and DLR.

Many newspapers and television/radio stations covered the Forum, which was attended by nearly 300 people from all over Europe – ranging from school children, students, teachers, journalists, scientists, people from industry and cultural organisations, to experts from ministries and other government bodies. Another 200 people from all over the world watched the event in real time via the Internet.

The programme of events included a direct video link with the International Space Station, which then had ESA astronaut Frank de Winne onboard. The presentations made at the Forum by acknowledged space-weather experts are still available online at <http://www.uni-greifswald.de>. Space weather promotion products like the CD-ROM included with this copy of ESA Bulletin (for European addressees) and the poster (both are in English and German) that were on display at the Forum can be ordered from Frank Jansen, the Space Weather Forum Coordinator, at [jansen@physik.uni-greifswald.de](mailto:jansen@physik.uni-greifswald.de).

ESA's participation also included the display of models of its Soho, Cluster and Ulysses satellites. Data gathered by these and other satellites about the Sun and the Earth's environment were downloaded and explained to the Forum's attendees in real time.

Further information about the causes, implications and consequences of space weather can be found in the feature article in this issue of ESA Bulletin.



*Alexi Glover (ESA) and Frank Jansen (Univ. of Greifswald) introduce the Forum participants to space weather*