In Brief

Astronaut Applications from all ESA Member States

ESA began its search for new astronauts on 19 May this year, calling for applications from talented individuals who wish to join the European Astronaut Corps.

Out of almost 10 000 individuals who registered to begin the application process, 8413 aspiring astronauts provided the required medical certificate and finalised their online application forms. This qualified them for the next step in the selection process.

The Astronaut Selection Team, based at the European Astronaut Centre (EAC) in Cologne, Germany, now has the challenging task of selecting the best applicants. Those who make it through this first selection receive a letter inviting them to participate in the next stage – the psychological testing.

"We now have a large number of highly qualified applicants. I am confident that we will find the outstanding individuals we are looking for. This will be ensured by the next selection steps, starting with a first round of psychological testing," said Michel Tognini, Head of EAC.

These tests aim to identify the psychological and technical skills of the applicants, who will be tested in different fields including visual memory and psychomotor aptitude.

"I am very pleased that we have received so many applications stemming from all our 17 ESA Member States," said Simonetta Di Pippo, ESA's Director of Human Spaceflight. *"This shows that the strong commitment for Human Spaceflight and Exploration, which ESA and its Member States demonstrated in holding the first astronaut selection after more than 15 years, is met by an equally strong interest from European citizens."*

Most of the applications were received from France (22.1%) and Germany (21.4%) followed by Italy (11.0%), the United Kingdom (9.8%) and Spain (9.4%). 18% of the total of applications were submitted by women. esa

ESA astronaut recruitment campaign 2008

Country	No. of applicants	% of total	Men	Women
Austria	210	2.5%		
Belgium	253	3.0%		
Denmark	35	0.4%		
Finland	336	4.0%		
France	1860	22.1%		
Germany	1798	21.4%		
Greece	159	1.9%		
Ireland	128	1.5%		
Italy	927	11.0%		
Luxembourg	14	0.2%		
Netherlands	203	2.4%		
Norway	74	0.9%		
Portugal	210	2.5%		
Spain	789	9.4%		
Sweden	172	2.0%		
Switzerland	351	4.2%		
United Kingdom	822	9.8%		
Other	72	0.9%		
Total	**8413**	**100.0%**	**7111**	**1302**

ESA Astronaut Selections

The first ESA astronauts selected: Nicollier, Merbold, Ockels and Malerba

DLR's first astronauts were chosen for the German-sponsored Spacelab D-1 mission on board the Shuttle. Left, Reinhard Furrer, and right, Ernst Messerschmid. ESA's Wubbo Ockels (centre) completed the European part of the crew

Five more candidates were chosen by DLR in 1987. The group is seen here with original German astronaut Ulf Merbold: from left, Ulrich Walter, Gerhard Thiele, Merbold, Renate Brümmer, Hans Schlegel and Heike Walpot

ESA started its first astronaut selection in 1977, finding four European Payload Specialist candidates for the first Spacelab mission. This stemmed from the agreement in 1973 between ESA and NASA to supply the Spacelab, a reusable science laboratory that would be carried in the Space Shuttle's cargo bay, in exchange for flight opportunities for European astronauts.

From this selection campaign, ESA chose its first astronauts: Claude Nicollier (CH), Wubbo Ockels (NL) and Ulf Merbold (D). Franco Malerba (I) was also chosen in this group, but later resigned for medical reasons (Malerba then joined ESA's Space Science Department at ESTEC, working on an ionospheric plasma physics experiment to be flown on Spacelab in 1983. Malerba eventually flew as the first Italian citizen in space on STS-46 in 1992, sponsored by the Italian space agency ASI.).

Merbold became the first ESA astronaut to fly on a Space Shuttle mission, the 10-day STS-9/Spacelab-1 flight in 1983. Not only was this the first flight of an ESA astronaut, it was the first flight of the European-built Spacelab and the first flight of a non-US citizen on the Shuttle.

In the 1980s, while ESA astronauts were taking part in Shuttle/Spacelab missions, several other European countries and Member States of ESA, began recruiting their own astronauts in national campaigns. Many of these nationally selected astronauts flew on Russian Soyuz missions to the Mir space station or on Space Shuttle missions as Payload Specialists.

The European Astronaut Centre (EAC) was founded in 1990 in response to ESA's many ongoing projects and studies that would eventually be realigned into Europe's contribution to the ISS including the Columbus orbital laboratory. EAC

In May 1991, Belgium selected its five candidates for the 1992 ESA selection. Left to right, Werner Stessens, Frank De Winne, Marianne Merchez, Vladimir Pletser, Lucien Halleux

The second ESA astronaut group: clockwise from left, Christer Fuglesang, Thomas Reiter, Pedro Duque, Jean-Francois Clervoy, Marianne Merchez, Maurizio Cheli

In 1992, Clervoy and Cheli joined the NASA Group 14, to train as mission Specialists alongside Claude Nicollier

The newly formed European Astronaut Corps in 1998, with members joining from national space agencies, Umberto Guidoni (I), Jean-Pierre Haignere (F), Leopold Eyharts (F), Claudie Haignere (F), Paolo Nespoli (I), Reinhold Ewald (D) and Roberto Vittori (I)

would increase the size of the European astronaut group and establish a centre of excellence in Europe for astronaut selection, training and medical support. By 1991, there were 19 European astronauts in total; however they were mostly members of the various national astronaut groups with only three belonging to ESA (Ockels, Merbold and Nicollier).

ESA organised a second astronaut selection in 1992 for the Hermes manned 'space plane' programme – since cancelled – and Columbus. First there was a national selection under the responsibility of each ESA Member State, and then each country had the opportunity to present up to five candidates to ESA for a final selection.

Some of the Member States, such as Germany, France, Austria and the United Kingdom, had proposed candidates from their previous national selections in the 1980s, but others decided to hold new national pre-selection campaigns applying the newly established ESA criteria.

More than 22 000 candidates applied, reflecting growing interest in Europe in human spaceflight. Out of these, around 5500 met the criteria to be taken into consideration. After a national psychological, medical and professional screening process, 59 candidates were identified for the final ESA selection.

Six candidates were selected, including only one previously selected national astronaut: Jean-Francois Clervoy, the first French member of the Corps. Also selected were Thomas Reiter (D), Maurizio Cheli (I), Maria Merchez (B), Christer Fuglesang (S) and Pedro Duque (E). M e rchez later resigned for personal reasons.

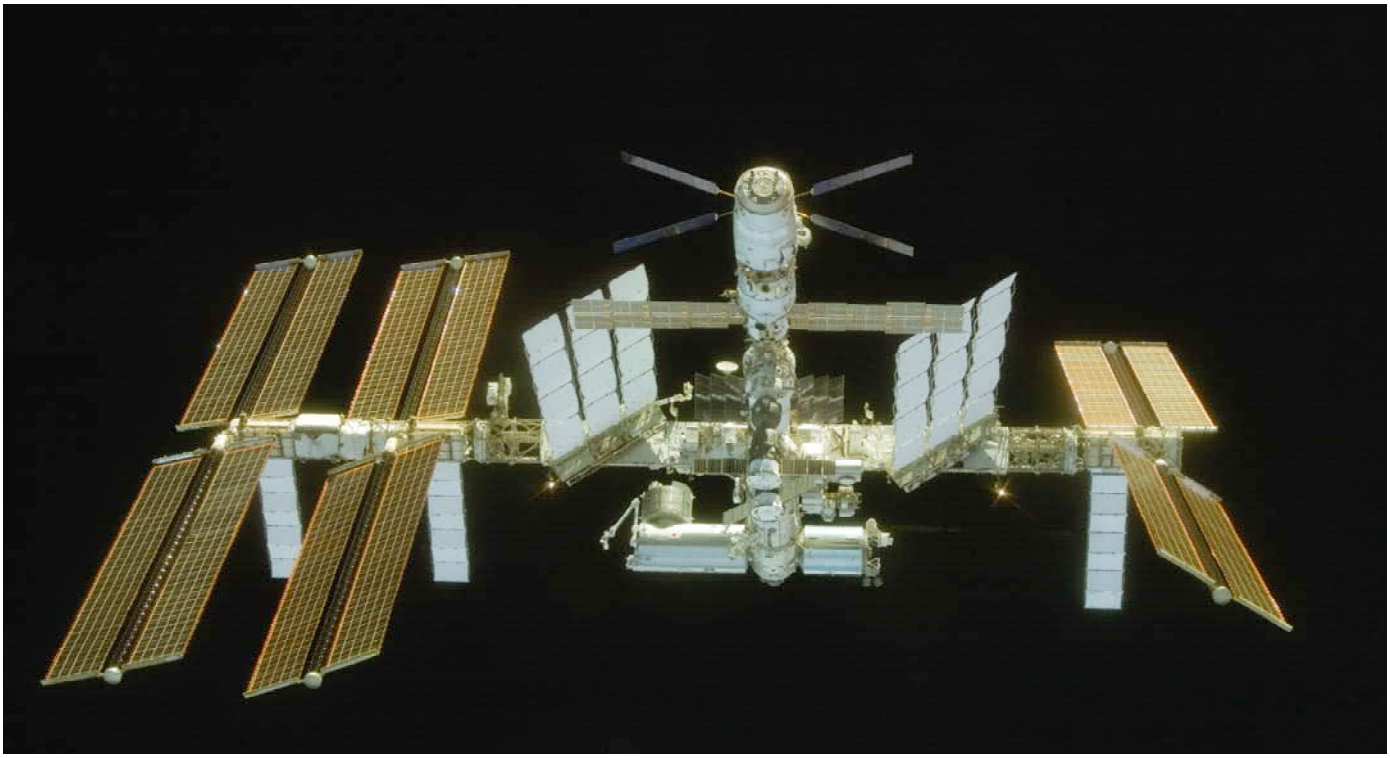
In the following six years, Europe would achieve many milestones in human spaceflight. In 1992, Merbold became the first ESA astronaut to undertake a second space mission (Spacelab IML-1, STS-42) and Claude Nicollier became the first European astronaut as a Mission Specialist on the Space Shuttle, taking over much more operational responsibilities than the Payload Specialists before.

In 1998, the European Member States decided to merge the national astronaut teams and to reinforce a European identity by forming a single 'European Astronaut Corps'. This process was concluded in 2002 when Philippe Perrin became the last member to join, bringing the Corps up to 16 astronauts (Perrin had been a CNES *spationaut* since 1996 and had flown as a Mission Specialist on STS-111 in 2002. After this flight he joined ESA to work on ATV. He left the European Astronaut Corps in 2004 before he could fly in space as an ESA astronaut.).

There are currently eight astronauts in the European Astronaut Corps. After the new selection campaign, four candidates will be chosen for training to be ready for a flight to the ISS from 2013 onwards. With the prospect of future human exploration missions to the Moon and Mars, another astronaut selection campaign could be carried out in 2014. esa

The European Astronaut Corps in 2002, with Frank De Winne (B), Michel Tognini (F), Philippe Perrin (F) and André Kuipers (NL)

Refuelling in Orbit: *Jules Verne's* Premiere for Europe:



The ISS as seen in June 2008, showing latest additions – Kibo, Columbus and ATV (NASA)

ESA's ATV *Jules Verne* became the first western spacecraft to refuel another space infrastructure in orbit. On 17 June, Jules Verne was used for the first time to transfer in one step 811 kg of propellant to the International Space Station while the two vehicles orbited Earth at 28 000 km/h.

It took less than half an hour to automatically transfer about 280 kg of the Russian UDMH (unsymmetrical dimethyl-hydrazine) propellant fuel and 530 kg of nitrogen tetroxide to the International Space Station's (ISS) own Russian-built propulsion tanks.

Because of the toxic and explosive characteristics of the hydrazine, the transfer is done through dedicated pipes located outside the pressurised hulls of ATV and the ISS. The fuel lines run from the ATV, through the docking mechanism to the ISS's own plumbing.

The ISS crew was not involved in the refuelling operation – at the time they were busy preparing for a spacewalk scheduled for early July. The ATV was prepared for the refuelling operations by the ATV Control Centre in Toulouse. After the necessary verifications to ensure no leakage was present in the complete ATV piping system, Moscow Control Centre initiated the automatic refuelling procedure sequence, with the active support of the Engineering Support Team collocated in the Moscow Control Centre.

"We are impressed by this new achievement of Jules Verne ATV, which went without a hitch. And we really have to congratulate the teams of RSC Energia, Astrium and Thales Alenia Space for their years of efforts to integrate the Russian refuelling system in the ATV from the hardware and software point of view," said Massimo Cislaghi, ESA's leader of Engineering Support Team.

"We have now successfully performed all the nominal operations of Jules Verne, such as the ISS attitude control, the ISS reboost, the gas transfer of air, the water transfer, the dry cargo and now the refuelling. Only undocking and re-entry remain, which we hope to do in September," said Hervé Côme, ESA's ATV Mission Director.

"Europe has gained a new space capability which represents a new step towards human spaceflights and advanced exploration programmes. ATV is the only western vehicle able to refuel another spacecraft in complement to the Russian Progress," said Jean-François Clervoy, ESA astronaut and ATV senior advisor.

ATV *Jules Verne* has followed up its successful automatic docking on 3 April 2008 by achieving all its scheduled objectives - and much more. Astronauts on the ISS are discovering capabilities never planned for before its mission.

One of its empty tanks has successfully stored 110 litres of condensation water from the ISS.

Water retrieval in this way was not planned in ATV's original objectives. Five 22-litre water bags had been used to store this unwanted condensation water before transferring it into the ATV's empty spherical water tanks.

Since early April, the hatch has remained open between *Jules Verne* and the rest of the ISS, at times making the European spacecraft one of the centres of daily life for the crew and the ISS logistics activities. Crewmembers are using the extra 48 m^3 of space in the European supply vessel as a new area to sleep and wash instead of using the usual Crew Hygiene Station.

Answering a request from the ISS crew, ESA ATV managers authorised the use of *Jules Verne's* area by the astronauts for washing with their usual wet fabric towels and treated napkins. They also wash their hair with an alcohol-free rinseless shampoo.

ISS resident crews can enjoy ATV's extra space

Some crewmembers also enjoy *Jules Verne* as their sleeping quarters, given that the sound level of the ventilator fans and air circulation is relatively low. Although the ISS has two small crew cabins, each one is big enough to accommodate only one person. The third ISS crewmember can sleep anywhere in the ISS, including inside the ATV, just as long as they attach their sleeping bag to a wall!

"The ATV's pressurised cabin offers the crew a large space, a lot of privacy and it also helps to keep the station air humidity level lower," said Hervé Côme, ESA's ATV Mission Director.

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Second Flight for ESA Astronaut Christer Fuglesang

ESA astronaut Christer Fuglesang (S) has been assigned as a Mission Specialist on board the 11-day STS-128 mission, currently scheduled for launch with Space Shuttle *Atlantis* to the International Space Station (ISS) on 30 July 2009.

This will be Fuglesang's second flight after being a Mission Specialist on the 13-day STS-116 mission to the ISS in December 2006. For the STS-128 mission, Fuglesang will undertake two spacewalks as part of his mission responsibilities.

When he arrives at the ISS, he will again be meeting up with another ESA astronaut (this time Frank De Winne (B), who will be a member of the ISS Expedition Crew). In December 2006, ESA astronaut Thomas Reiter was on the ISS as the first ESA astronaut to be a member of an ISS Expedition Crew and returned with Fuglesang on the return leg of the STS-116 flight.

The STS-128 Shuttle Atlantis will transport a Multi-Purpose Logistics Module (MPLM) in its payload bay, which will carry science and storage racks to the ISS. MPLMs are Italian-built pressurised cargo containers that travel in the Shuttle's cargo bay.

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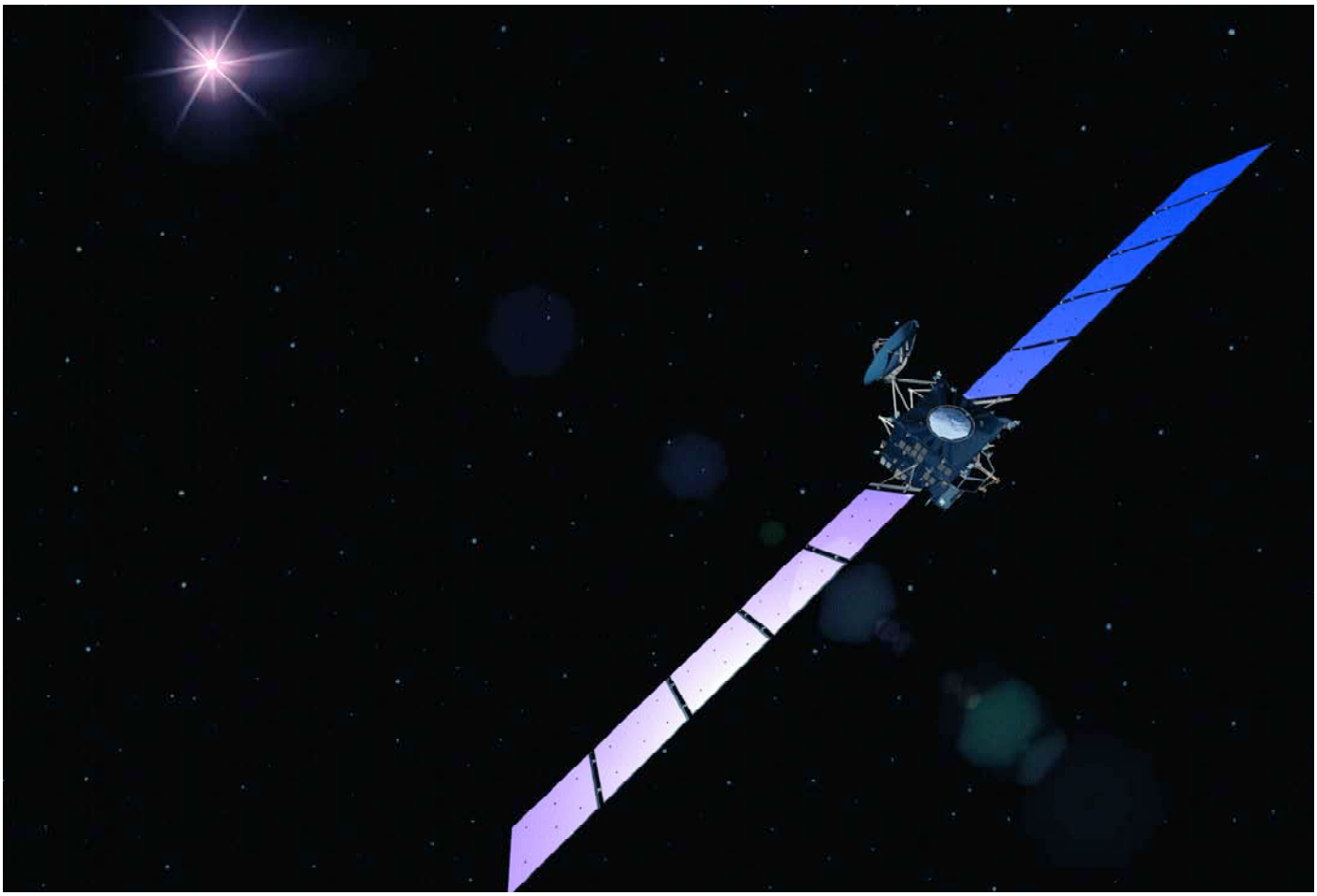
Rosetta Wakes up for Asteroid Encounter



ESA's Rosetta Spacecraft, now over 300 million km from the Sun

ESA mission controllers woke the Rosetta spacecraft out of hibernation this July to prepare for its encounter with asteroid (2867) Steins on 5 September.

Launched in March 2004, ESA's comet chaser will study the relatively rare asteroid as it flies by on its way to Comet 67/P Churyumov-Gerasimenko. Rosetta will reach its final destination only in 2014, after travelling a total of about 6500 million km.

Rosetta has already swung by Earth twice and Mars once, performing gravity-assist manoeuvres to give it the necessary boost to continue on its journey. The third and last Earth swing-by is scheduled for November 2009. The spacecraft will also fly by two asteroids and study them on the way: (2867) Steins in September, and (21) Lutetia in June 2010.

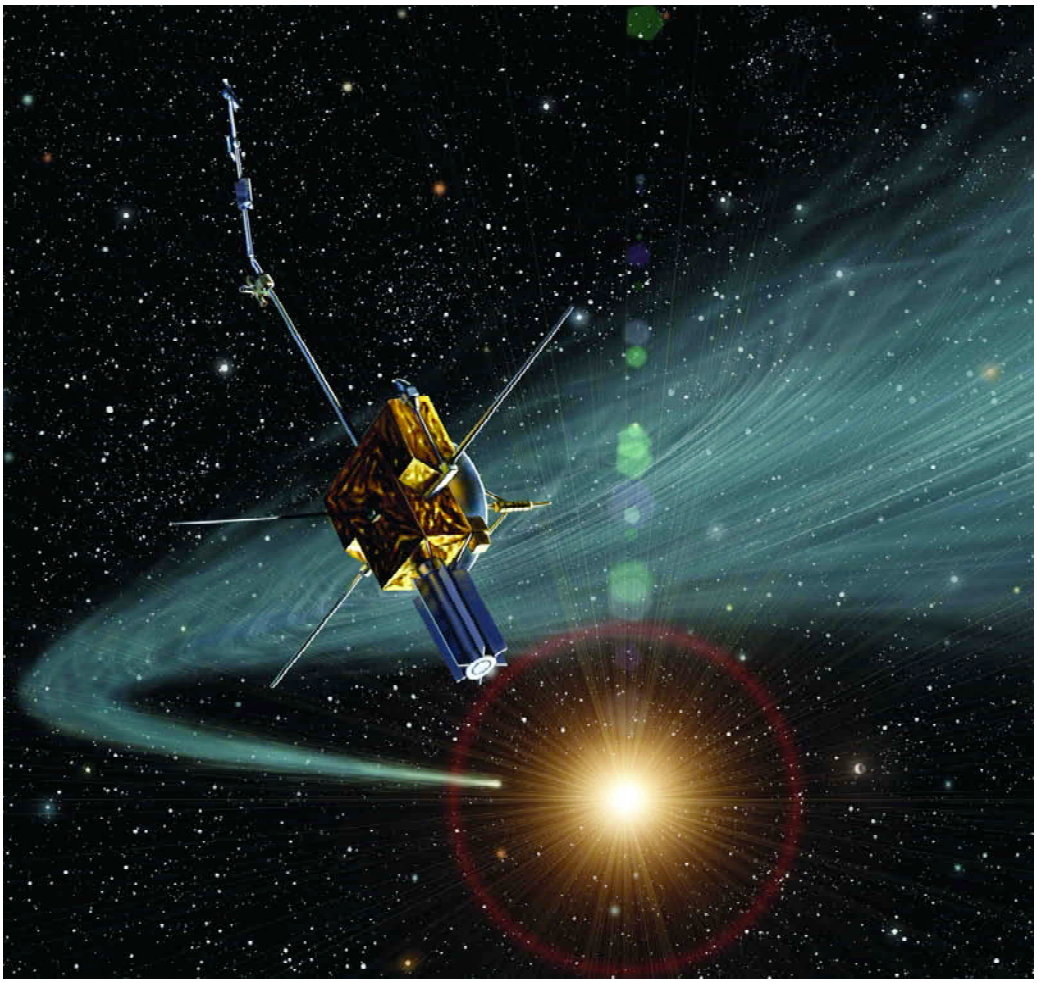
After its last planetary swing-by on 13 November last year, Rosetta headed towards the asteroid belt between the orbits of Mars and Jupiter. On 27 March 2008, the spacecraft switched to its near-Sun hibernation mode for a period of three months. During this phase, some subsystems were put into a dormant state to save power (as this is only the beginning of the mission's science phase).

Rosetta will pass within 800 km of (2867) Steins at 20:37 CEST on 5 September, at a relative speed of 8.6 km/s. This flyby is particularly exciting because it will push Rosetta to its design limits, due to the fast rotation of the spacecraft around the time of closest approach. This manoeuvre is necessary to ensure that the asteroid will stay in the field of view of the instruments. An in-flight simulation of the flyby was performed on 24 March 2008. The tests were successful, confirming the spacecraft's robustness.

In preparation for the flyby, all the instruments will be checked and tested in July. In August and early September, spacecraft operators will conduct an optical navigation campaign: Steins will be tracked by the on-board cameras and the observations will be used to refine the knowledge of its orbit which so far has only been derived from ground-based measurements.

Asteroids are samples of the Solar System's material at different stages of evolution, and studying them helps scientists understand the origin and evolution of Earth and of our planetary neighbourhood.

Ulysses Mission Ends in July



Artist's impression of Ulysses crossing the tail of Comet Hyakutake in 1996 (David A. Hardy)

After over 17 years of operation, the joint ESA/NASA mission Ulysses officially concluded on 1 July this year. The spacecraft, which studied the Sun and its effect on the surrounding space for almost four times its expected lifespan, ceased to function because of the decline in power produced by its on-board generators.

Hurtling through space at an average speed of 56 000 km/h, Ulysses has travelled over 8600 million km. The longevity of the mission is testament to a creative team of NASA and ESA engineers who have risen to every challenge. As the power supply weakened over the years, so they came up with ingenious ways of conserving energy. This year, though, the power dwindled to the point where fuel would soon freeze in the spacecraft's pipelines.

Ulysses has forever changed the way scientists view the Sun and its effect on the surrounding space. Ulysses was the first mission to survey the environment in space above and below the poles of the Sun in the four dimensions of space and time.

"Over almost two decades of science observations by Ulysses, we have learned a lot more than we expected about our star and the way it interacts with the space surrounding it," said Richard Marsden, ESA's Ulysses Project Scientist and Mission Manager.

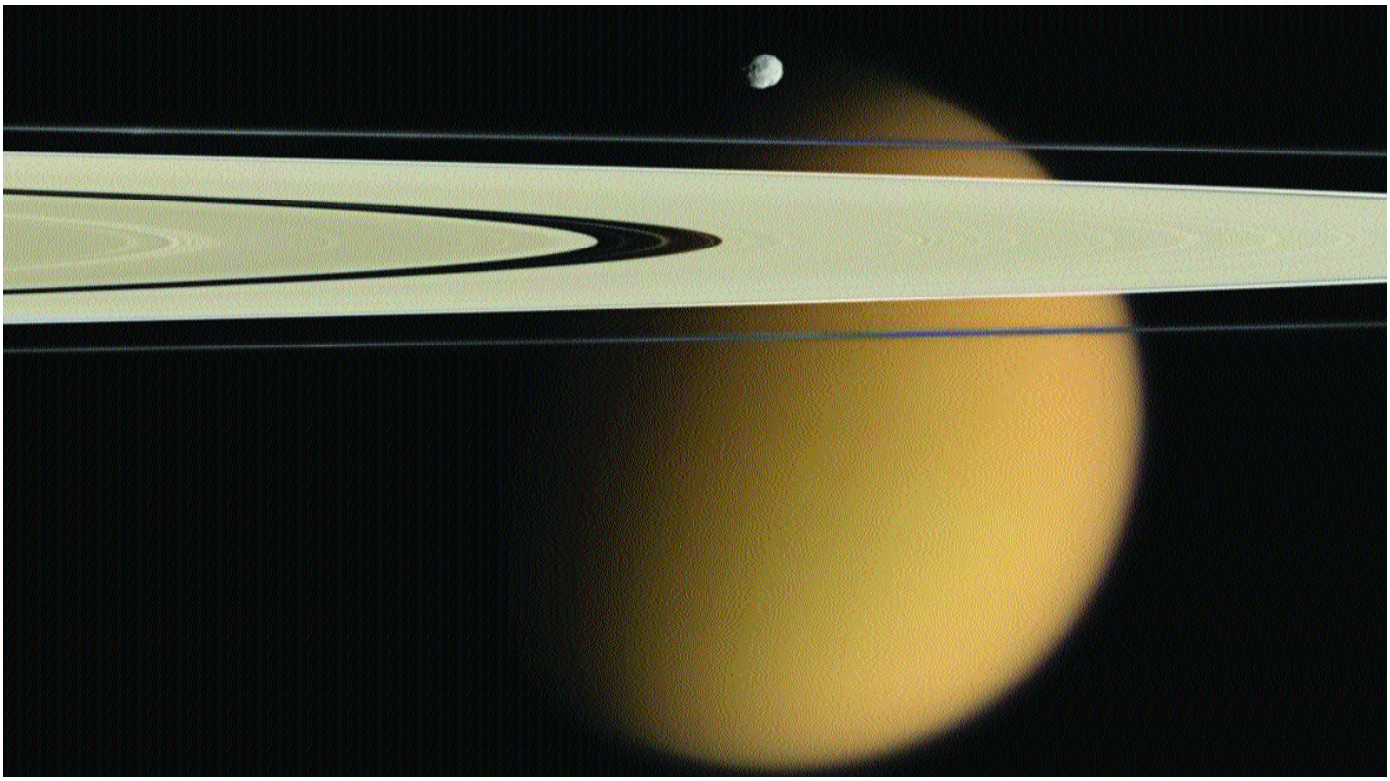
"There will never be another mission like Ulysses. Many solar missions have appeared on the space scene in recent years, but Ulysses is still unique today. Its special point of view over the Sun's poles has never been covered by any later missions, making Ulysses's pioneering character still valid. This legendary spacecraft has served us extraordinarily well and it has certainly lived up to its mythical namesake's reputation."

Ulysses showed that the Sun's magnetic field is carried into the Solar System in a more complicated manner than previously believed. Particles expelled by the Sun from low latitudes can climb up to high latitudes and vice versa, even unexpectedly finding their way down to planets. This is very important as regions of the Sun not previously considered as possible sources of hazardous particles for astronauts and satellites must now be carefully monitored.

Ulysses also detected and studied dust flowing into our Solar System from deep space and showed that it was 30 times more abundant than astronomers suspected. Perhaps most remarkably, the spacecraft detected helium atoms from deep space and confirmed that the Universe does not contain enough matter to eventually halt its expansion.

"It is with enormous affection that we bid farewell to Ulysses. It has been a story of remarkable success and collaboration," added David Southwood, ESA's Director of Science and Robotic Exploration.

Cassini Mission to Continue



Titan, the resting place of ESA's Huygens probe, forms the backdrop to the rings of Saturn and the tiny moon Epimetheus, seen by Cassini in April 2006 (NASA/JPL/Space Science Institute)

Operations of Cassini, part of the international NASA/ESA/ASI Cassini-Huygens mission, have been extended by two years. This historic mission's stunning discoveries and images have revolutionised our knowledge of Saturn and its moons.

More than 10 years after launch and almost four years after entering into orbit around Saturn, Cassini is a healthy and robust spacecraft. Three of its science instruments have minor ailments, but the impact on scientific observations is minimal. The spacecraft will have enough propellant left after the extended mission to potentially allow a third phase of operations.

Cassini's mission was originally scheduled to end in July 2008. The recently announced two-year extension will include 60 additional orbits of Saturn and more flybys of its exotic moons. Data from the extended mission could lay the groundwork for possible new missions to Titan and Enceladus.

The Huygens probe successfully completed its part of the mission on 14 January 2005 when it successfully entered Titan's upper atmosphere and descended under parachute to the surface. The descent phase lasted around 2 hours 27 minutes with a further 1 hour 10 minutes on the surface. Throughout this period data was collected from all instruments providing a detailed picture of Titan's atmosphere and surface.

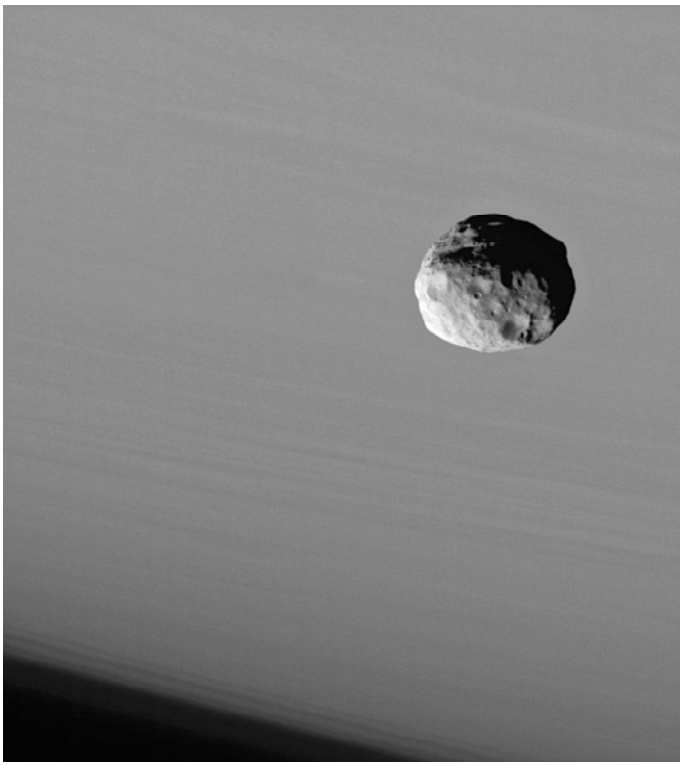
The Cassini-Huygens observations of Saturn's largest moon, Titan, have given scientists a glimpse of what Earth might have been like before life evolved. They now believe Titan possesses many parallels to Earth including lakes, rivers, channels, dunes, rain, snow, clouds, mountains and possibly volcanoes.

The Huygens landing site, which has already been observed a few times, will be further observed during the extended mission, in particular with the RADAR and VIMS instruments. Observations with these instruments, which at closest approach to Titan have a resolution of 300–500 m, will be used to look for temporal variability in this region.

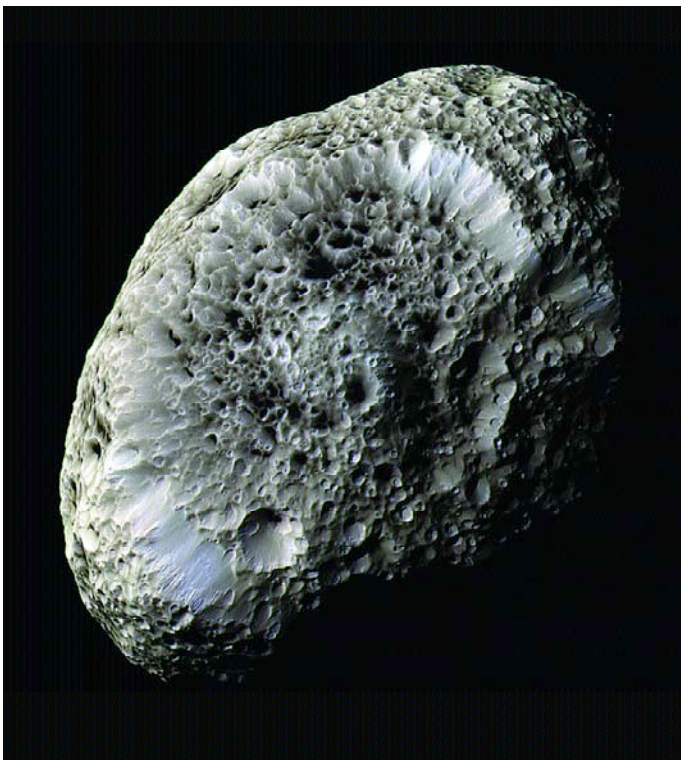
Other activities for Cassini scientists will include monitoring seasons on Titan and Saturn, observing unique ring events, such as the 2009 equinox when the Sun will be in the plane of the rings, and exploring new places within Saturn's magnetosphere.

Based on findings from Cassini, scientists think liquid water may be just beneath the surface of Saturn's moon Enceladus. Cassini discovered geysers of water-ice jetting from its surface. These geysers shoot out to a distance three times the diameter of Enceladus and feed particles into Saturn's most expansive ring. This small moon, only one-tenth the size of Titan and one-seventh the size of Earth's moon, is a high-priority target for the extended mission.

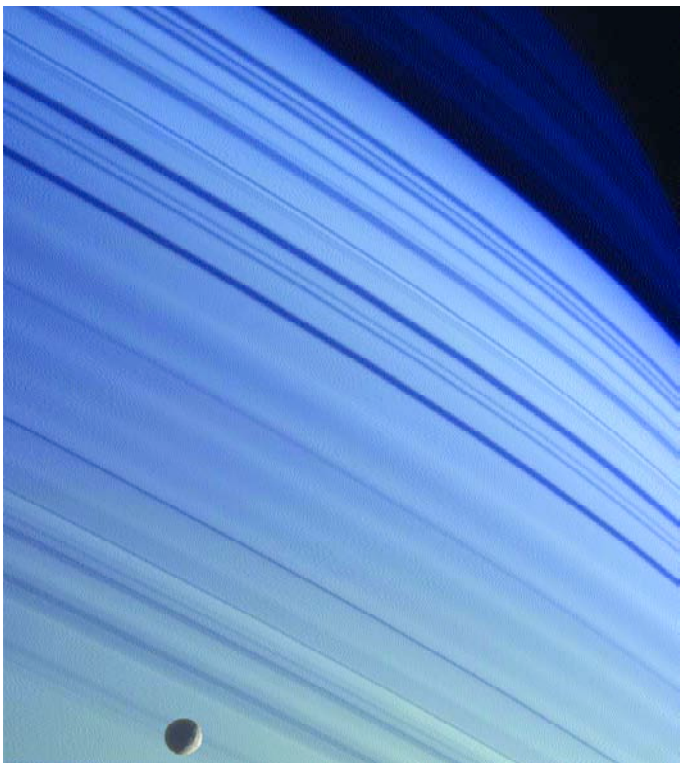
Cassini's Stunning Photo Album



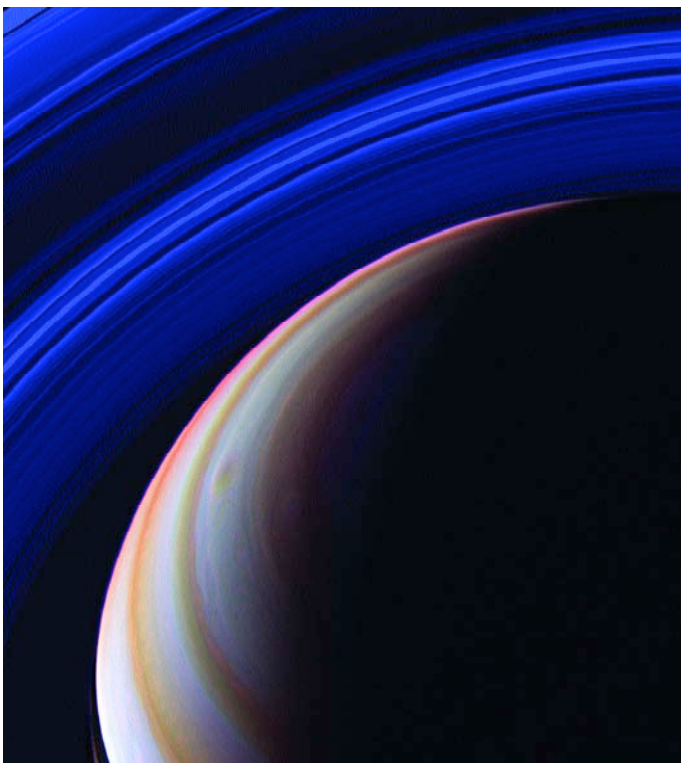
The tiny moon Janus backdropped by Saturn's cloudtops



The impact-pummeled Hyperion seen during a close approach in 2005

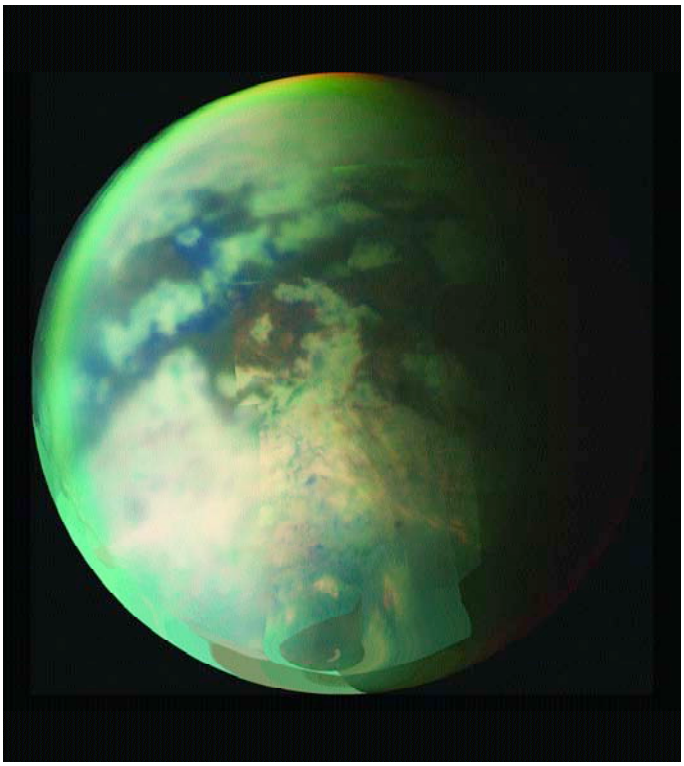


A true-colour view of Saturn's northern latitudes with the moon Mimas in the forground

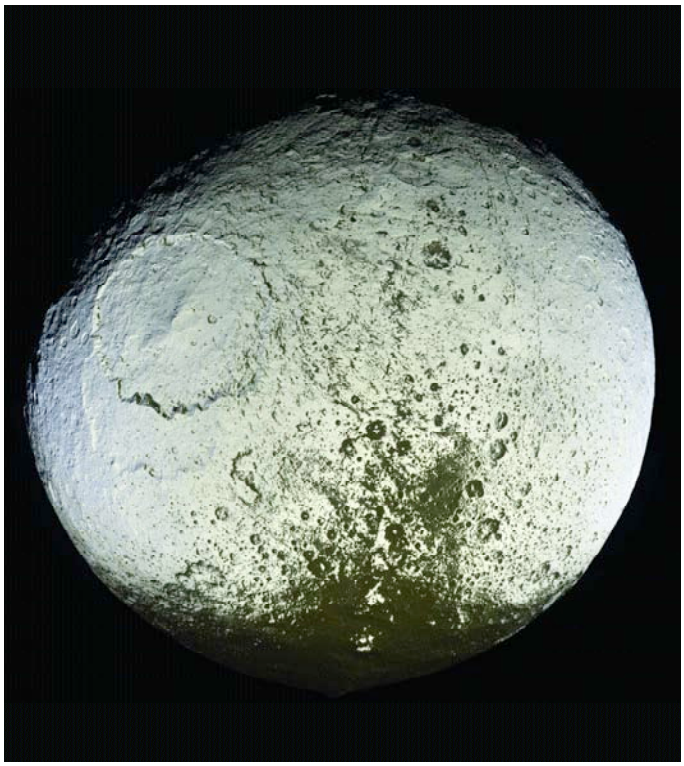


Saturn's rings and stormy cloud tops viewed with infrared filters in April 2007

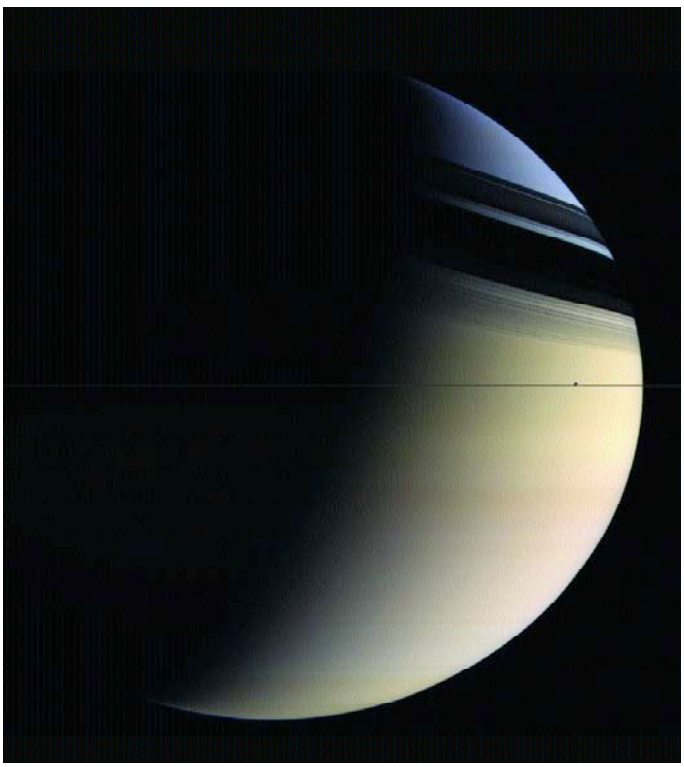
Cassini has returned data daily from Saturn's system for almost four years, taking nearly 140 000 images and gathering information during 62 revolutions around Saturn, 43 flybys of Titan and 12 close flybys of other icy moons. Here are just a few of the visual highlights from the last four years.



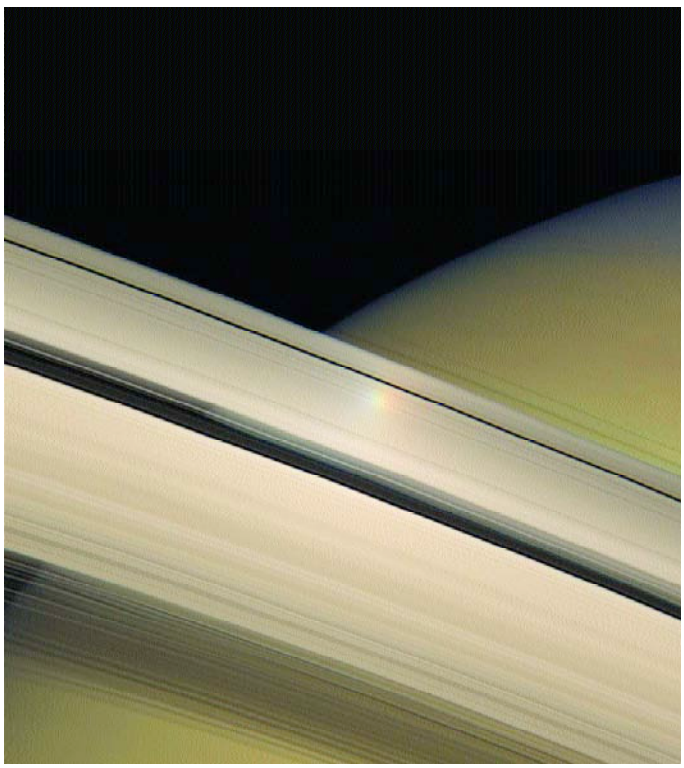
A composite of several infrared images of Titan, showing land features beneath the clouds



The bright trailing hemisphere of Saturn's moon Iapetus



Taken with filters to approximate a human eyeview, this image shows Enceladus in the ring plane

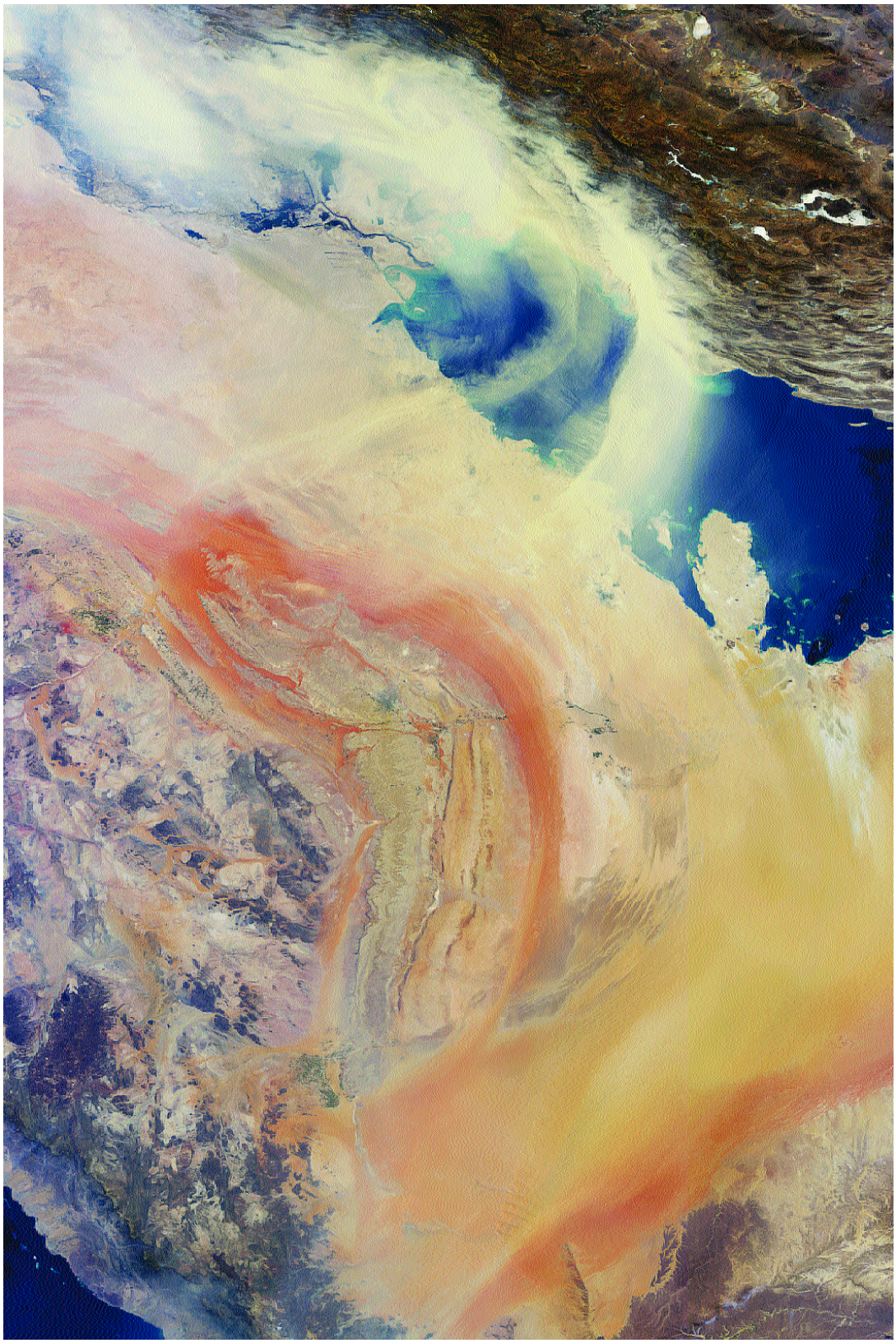


Close-up of Saturn's sunlit rings, June 2007 (All images NASA/JPL/Space Science Institute)

Ariane-5 ECA Flight V183

Ariane-5 ECA flight V183 lifted off from Europe's Spaceport in Kourou, French Guiana, at 00:05 CEST on 13 June, on its mission to place two telecommunications satellites into geostationary transfer orbit. The payload comprised Skynet 5C - which will deliver secure communication links for UK government and military users - and Turksat 3A - which will provide telecommunication services and direct TV broadcasting for Turkey, Europe, the Middle East, North Africa and Central Asia. This third launch of the year, followed by a fourth, V184 on 7 July, keeps Europe's Spaceport on target for the seven missions planned for 2008

Duststorm in Middle East



Envisat captures sand and dust blowing northeast from the Arabian Peninsula across the Persian Gulf toward Iran (visible at image top). This image was acquired on 1 July 2008 by Envisat's Medium Resolution Imaging Spectrometer (MERIS) instrument while working in full-resolution mode to provide a spatial resolution of 1.2 km

Slovenia Signs Cooperation Agreement with ESA

An agreement on closer cooperation between ESA and Slovenia was signed on 28 May, by René Oosterlinck, ESA Director of Legal Affairs and External Relations, and Mojca Kucler Dolinar, the Slovenian Minister of Higher Education, Science and Technology.

In the ceremony at the Sneznik Castle (east of Ljubljana), the Prime Minister of Slovenia, Janez Janša, welcomed the ESA delegation and confirmed the support his Government is ready to give to this new agreement.

René Oosterlinck (left), Mojca Kucler Dolinar and Prime Minister of Slovenia, Janez Janša (centre)

In May 2006, a Slovenian delegation led by Mr Peterle (former Slovenian Prime Minister and currently a Member of the European Parliament) visited ESA's European Space Research & Technology Centre (ESTEC).

As a follow up, an ESA delegation went to Ljubljana in February 2007 to exchange information with the State Secretary in the Ministry of Higher Education, Mr Lesjak, and with many potential partners in the Josef Stefan Institute and with entrepreneurs in the Chamber of Commerce and Industry.

Slovenia is the second recent EU Member State to sign a Cooperation Agreement with ESA. Estonia did so in June 2007. The adoption of the European Space Policy by both ESA and the EU confirms the importance of ESA's space activities for EU Member States. Several other EU members have approached ESA with a request to participate in ESA's activities.

This Cooperation Agreement is a first step. It is expected that Slovenia will in a few years become a European Cooperating State, with an increased financial contribution to space activities. esa

Czech Republic to Join ESA

The Agreement on the Czech Republic's accession to the ESA Convention was signed on 8 July in Prague, by Jean-Jacques Dordain, Director General of ESA, and Mirek Topolánek, Prime Minister of the Czech Republic.

The Czech Republic already has a strong tradition of space exploration. For example, Vladimir Remek of Czechoslovakia became the first European astronaut when he went into space in 1978.

Since the early 1990s, ESA has negotiated and concluded framework cooperation agreements with a number of central and eastern European countries. The Czech Republic signed such a Cooperation Agreement with ESA in 1996, requesting more specific collaboration.

In response, the ESA Council created the status of 'European Cooperating State' in March 2001. The ECS was a new status granted to European Union Member States wishing to accede to the ESA Convention. ESA concluded an ECS Agreement with the Czech Republic in November 2003; it entered into force with the signing of the PECS (Plan for European Cooperating States) Charter in November 2004.

During the first four-year period, the overall contribution to the PECS by the Czech Republic amounted to approximately €12 million. This Czech contribution goes towards projects that come under various ESA programmes: 50% on space science, 25% on space technology, 22% on Earth observation and 3% on navigation.

The Czech Republic is now embarking on the ratification procedure that will make it a formal ESA Member State by the end of the year.

With the accession of the Czech Republic, ESA and its Member States are together extending the boundaries of space even further to take in new countries and new ambitions. Such ambitions are firmly rooted in forty years of success in space, thanks in particular to the continuous investment by ESA Member States and to the increasing cooperation between the European Community and ESA. The consensus reached by 29 European countries in support of the European Space Policy adopted in May last year also demonstrates that Europe and its citizens are prepared to play a stronger role in space. esa