

# EUROPEAN ASTRONAUT CENTRE

**The European Astronaut Centre (EAC) of the European Space Agency (ESA) is situated in Cologne, Germany. It was established in 1990 as a result of Europe's commitment to human space programmes and is the home base of the 12 European astronauts who are members of the European Astronaut Corps.**

EAC has developed considerable expertise in the field of human spaceflight activities through participation in regular co-operative spaceflight missions with Russia and the United States.

The centre's role – under the leadership of Prof. Ernst Messerschmid – has been significantly extended for International Space Station (ISS) crew operations required for ESA contributions such as the Columbus Laboratory, the ESA payloads and the Automated Transfer Vehicle.

The role of EAC is to prepare and implement astronaut training programmes for a variety of missions, including those for the ISS. It also coordinates astronaut training between ESA and its Space Station programme partners.

EAC is responsible for the preparation, planning and scheduling of the European astronauts' tasks and flight assignments as well as coordinating astronaut activities with other countries.

EAC also handles astronaut selection for ESA and provides support ranging from public relations assistance to medical monitoring, including assistance to the families of astronauts both at home and abroad. This is especially important during extended stays by astronauts on spaceflight missions and at ESA's partner training centres.

EAC has a team of 80 people – including 12 astronauts – the ESA staff complemented by staff from DLR, CNES (the French space agency) and ASI (the Italian space agency) and the centre is hosted on the premises of the German Aerospace Establishment (DLR) through an agreement between the German government and ESA.

The activities of EAC cover three main areas – the management of the European Astronaut Corps, the training of International Space Station (ISS) astronauts and medical support.

The nature of EAC as an independent centre means it also has its own general, administrative and communication services, liaison functions with ESTEC – ESA's European Space and Technology Centre at Noordwijk, the Netherlands – as well as with NASA establishments and Star City in Russia.

After its foundation in 1990, EAC was the home base for the original three European astronauts who were selected for the first Spacelab mission on the US Space Shuttle, in which the German astronaut Ulf Merbold participated in 1983. Dutch astronaut Wubbo Ockels flew with Spacelab D1 in 1985 and at the same time Claude Nicollier, of Swiss nationality, was in training at NASA.

Since then the list of missions flown by European astronauts and supported by EAC has grown and the participation of EAC staff has resulted in the accumulation of substantial human, technical, operational

and scientific expertise in manned spaceflight activities.

EAC provides not only significant parts of training and operational assistance during missions but also medical support to the astronauts and their families at their duty stations in the USA and Russia.

Today, some 38 space missions have been performed by 31 astronauts from ESA and its member states, providing EAC with a wealth of accumulated experience on human space activities.

For more than a decade, Europe has participated in at least one spaceflight per year, a rate which is likely to continue until at least 2006.

Such flight opportunities have given European astronauts invaluable all-round experience – from performing 'spacewalks' or acting as Flight Engineer on Soyuz, to participating in long-term space missions.

Staff of the European Astronaut Centre in Cologne, Germany, pictured during the summer of 2004.



The medical control room at EAC which is used for monitoring the health of astronauts during space missions.



Hardware mock-ups and other training facilities are part of the large astronaut training hall at EAC.



A special deep water pool – known as a neutral buoyancy facility – is used at EAC to train astronauts for working in space outside the Space Station.



Numbers and figures in this newspaper were correct for the end of 2004.

# European Astronaut Corps

**ESA member states participating in the International Space Station (ISS) programme decided to unite their respective astronaut teams with the existing ESA core team to form a single European Astronaut Corps.**

This integration process was completed in 2002 and the astronaut corps consists currently of 12 members from Germany, France, Italy, Belgium, the Netherlands, Spain, Sweden and Switzerland.

EAC's astronaut division, under the leadership of former astronaut Michel Tognini, assumes responsibility for all individual astronauts.

During the summer of 2004, eight ESA astronauts were stationed at different establishments in Europe, plus six at the NASA Johnson Space Centre in Houston – where the qualification as mission specialist entitles them to be eligible for spaceflights on the Space Shuttle.

The experience gained by ESA astronauts in spaceflight operations is not only valued by their involvement in mission support, taking charge of the communications with the space crews or the preparation and coordination of on board operations, but also when not assigned to a mission.

Recent assignments have provided feedback to hardware and procedural developments, operations and the participation in strategic development such as the preparation for the European Union White Paper on Space, ESA's Aurora future exploration programme and the preparation for Soyuz at CSG.

Members of ESA's astronaut corps see themselves as ambassadors for the promotion of the benefits of spaceflight.

The astronauts communicate this message in countless public relations activities, talks and scientific lectures, sharing their unique experience with the audience and thus shaping the overall attitude towards science in general and spaceflight in particular.



An artist's impression of the International Space Station in orbit round the Earth. Europe has a substantial share in the programme and among ESA's main hardware contributions are Columbus, a multi-purpose science and technology laboratory, and the Automated Transfer Vehicle, a versatile craft for ferrying supplies and helping maintain the Space Station's orbit.

## Medical support

The ESA/EAC Medical Office, led by Volker Damann, is responsible for astronaut medical selection and annual medical re-certification – as well as providing to astronauts general medical care, medical intervention for diagnosis and treatment of illness and injury, and emergency medical services.

In order to minimise ill-health, a programme of comprehensive health care in all mission phases is provided, including fitness regimes, nutritional advice and psycho-social support to the crew.

During a mission this programme is continued with specific fitness and countermeasure activities, and periodic health and fitness evaluations.

For long duration stays on board the Space Station, it will also include individual psychological support packages, family conferences, crew resource management, crew support items, habitability and multi-cultural aspects.

The ISS Medical Group (IMG), of which the Medical Office is part, considers an ISS crew as one team and will assign crew surgeons from a multi-national pool of certified flight surgeons.

This crew surgeon will follow the crew to all training and mission preparation activities and will also provide the dedicated medical training so that selected crew members function as Crew Medical Officers on board the Space Station.

The ESA Medical Office focuses on real-time, crew operations mission-support from consoles and control rooms within the European Astronaut Centre.

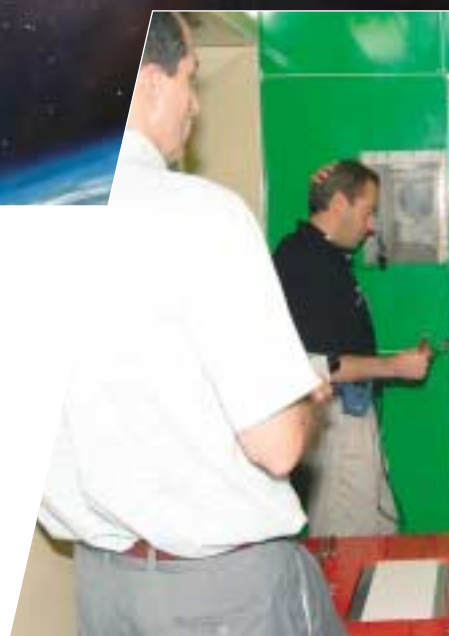
Prime medical responsibility for ISS missions will be in Mission Control Houston (MCC-H) and the increment responsible crew surgeon and his support team will work on console there.

This concept of operations is being currently tested on Soyuz missions to ISS involving ESA astronauts during which ESA Medical Operations monitors in real-time the health status of the ESA crew and of the ISS systems throughout the mission from its consoles at EAC.

During mission preparation and mission operations, a team of bio-medical engineers support the crew surgeons by providing medical engineering advice at the different sites.

The ESA-EAC Medical Office carries out joint integrated simulations with flight controllers based in ESTEC, NASA, Columbus and Moscow Control Centres, addressing close to reality medical scenarios.

Thomas Reiter training in a Soyuz capsule prior to his mission to the Mir space station in 1995.



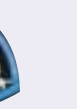
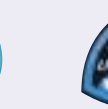
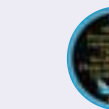
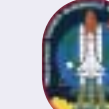
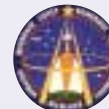
Training specialist and astronauts from ESA and NASA during an ATV Training Readiness Review at EAC.



André Kuipers back on Earth after his spring 2004 Delta mission to the International Space Station.



Astronauts learn what to expect in zero gravity by training on parabolic flights – a 'roller coaster' flight in a specially adapted aircraft that allows the passengers to experience short bursts of weightlessness.



# ESA's astronaut team



*Pictured (front row from left): Pedro Duque (Spain), Gerhard Thiele (Germany), Jean-François Clervoy (France), Umberto Guidoni (Italy, who left in July 2004 to become a European Deputy), Léopold Eyharts (France), Reinhold Ewald (Germany), Roberto Vittori (Italy) and Claude Nicollier (Switzerland).*

*Back row from left: Paolo Nespoli (Italy), Thomas Reiter (Germany), Christer Fuglesang (Sweden), Frank De Winne (Belgium), Michel Tognini (France, head of the astronaut corps and no longer flight active), Hans Schlegel (Germany), Philippe Perrin (France, who left the corps in June 2004 to become test pilot for the new Airbus A-380) and André Kuipers (Netherlands).*



## European astronaut missions

**Sigmund Jähn (Germany)**  
Salyut 6 1978

**Jean-Loup Chrétien (France)**  
Salyut 7 1982  
Mir 1988  
STS-86 1997

**Ulf Merbold (Germany)**  
STS-9 1983  
STS-42 1992  
Euromir 94 1994

**Patrick Baudry (France)**  
STS-51G 1985

**Reinhard Furrer (Germany)**  
STS-61A 1985

**Ernst Messerschmid (Germany)**  
STS-61A 1985

**Wubbo Ockels (Netherlands)**  
STS-61A 1985

**Helen Sharman (Great Britain)**  
Mir 1991

**Franz Viehbök (Austria)**  
Mir 1991

**Klaus-Dietrich Flade (Germany)**  
Mir 1992

**Dirk Frimout (Belgium)**  
STS-45 1992

**Michel Tognini (France)**  
Antares/Mir 1992  
STS-93 1999

**Franco Malerba (Italy)**  
STS-46 1992

**Claude Nicollier (Switzerland)**  
STS-46 1992  
STS-61 1993  
STS-75 1996  
STS-103 1999

**Hans Schlegel (Germany)**  
STS-55 1993

**Ulrich Walter (Germany)**  
STS-55 1993

**Jean-Pierre Haigneré (France)**  
Altair/Mir 1993  
Perseus/Mir 1999

**Jean-François Clervoy (France)**  
STS-66 1994  
STS-84 1997  
STS-103 1999

**Thomas Reiter (Germany)**  
Euromir 95 1995/6

**Maurizio Cheli (Italy)**  
STS-75 1996

**Umberto Guidoni (Italy)**  
STS-75 1996  
STS-100/ISS 2001

**Jean-Jaques Favier (France)**  
STS-78 1996

**Claudie Haigneré (France)**  
Cassiopee/Mir 1996  
Andromède/ISS 2001

**Reinhold Ewald (Germany)**  
Mir 1997

**Léopold Eyharts (France)**  
Pégase/Mir 1998

**Pedro Duque (Spain)**  
STS-95 1998  
Cervantes/ISS 2003

**Gerhard Thiele (Germany)**  
STS-99 2000

**Roberto Vittori (Italy)**  
Marco Polo/ISS 2002

**Philippe Perrin (France)**  
STS-111/ISS 2002

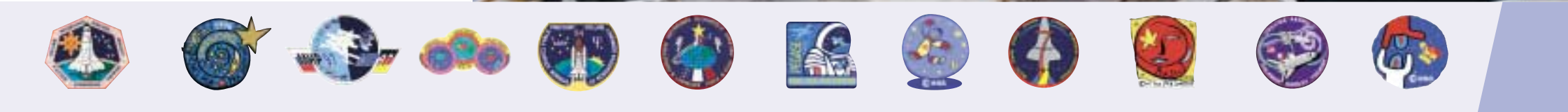
**Frank De Winne (Belgium)**  
Odisea/ISS 2002

**André Kuipers (Netherlands)**  
Delta/ISS 2004

ESA astronaut Philippe Perrin, representing the French Space Agency (CNES) was a mission specialist on Space Shuttle flight STS-111 in June 2002. He is seen here during a space walk to attach power, data and video cables on the International Space Station.



ESA uses a specially converted European Airbus for parabolic flight training and André Kuipers is pictured here during a moment of weightlessness.



# Training astronauts for life in orbit

Many long hours and years of training turn the potential astronauts of today into the spacefarers of tomorrow.

With the advent of the International Space Station (ISS), preparing men and women for work on the orbiting outpost has become a highly-complex process.

Training is coordinated between the major partners, with each being responsible for instructing astronauts in the operation of the elements it has or will supply to the Space Station.

Mission-specific training for European elements and payloads, such as the Columbus laboratory and the Automated Transfer Vehicle, takes place for all international astronauts at the European Astronaut Centre (EAC) in Cologne, Germany.

The main focus of ESA's astronaut training – managed by Dr Hans Bolender – is on ESA's participation in the ISS programme.

The first advanced-training class for the Space Station's international partners started in April 2001, with astronauts from Japan, Canada, Europe and NASA taking part. It lasted 18 months and was performed at the various training sites in USA, Japan, Canada, Russia and Europe in blocks of two months.

For all potential Space Station astronauts there are three phases leading to a crew member being declared ready for a flight – basic training, advanced training, and increment-specific training.



Pedro Duque demonstrates how easy it is to move around in the weightless conditions of Low-Earth orbit during his Cervantes mission to the International Space Station in 2003.

## Training facilities

Advanced training provides Station crews with knowledge and skills related to general operation of the Station elements, payloads, transport vehicles and communication with the ground.

At this stage the training is generic as the potential crew members become familiar with all systems and specialise in a subset of functions, such as resource and data operations, robotics, navigation, maintenance, intra- and extra-vehicular activities, medical aspects and payload operations for long-term, on-orbit payloads. This aspect of training is given to astronauts at all the partners' facilities to provide first-hand familiarity with specific flight elements and operations.

The final stage of training is known as increment specific (an 'increment' being the period between crew exchange aboard the Station) which gives an assigned crew (and backup crew, if applicable) the knowledge and skills required for the planned and contingency onboard tasks of their mission. For this, crews train together for about 18 months in order to foster team integration and spirit.

EAC has a variety of training tools and facilities available to support crew training, practice nominal operations or learn to detect, analyse and recover from malfunctions and replace failed onboard equipment as needed.

The Columbus Trainer Europe (COL-TRE) is a simulator supporting hands-on training for commanding and monitoring all systems of the Columbus laboratory, a research facility that will be permanently attached to the ISS in order to accommodate experiments in material sciences, medicine, biology and technology.

The Columbus Mock-up (COL-MU) hosts all system components with mechanical crew-interfaces, which the onboard crew is supposed to operate for instance for the replacement of onboard hardware.

Stand-alone training models of the four ESA Payload Racks – BioLab, Fluid-Science Lab, European Physiology Module and European Drawer Rack – are installed at EAC in special rooms to allow parallel training as required.

Each one of the ESA Payload racks is a small laboratory in itself in which the

astronauts can perform the scientific experiments on board the space station and get in touch with the scientists and instructors on the ground.

The ATV Simulator provides a simulation of ATV and Space Station characteristics, which is needed for the training on ATV approach, docking, de-docking and departure and on safety actions to command the ATV to hold or abort its approach to the Station and guide it back to a safe distance from the station. In a docked configuration, the ATV and Service Module Mock-up allow crew training for logistics or emergency activities involving the ATV cargo carrier.

The unmanned Automatic Transfer Vehicle (ATV) will serve the function of carrying supplies such as food, propellant, water and air to the station. It will remain docked to the ISS for up to six months, becoming a pressurised extension. After that period it is used to dispose of waste, which the ATV takes back on its self-destructive return flight into the Earth's atmosphere.

A team of 20 training instructors actually implements the ISS crew training provided by ESA. A total of over 400 hours of crew training is needed to prepare the first ISS crews to activate, check out, operate, monitor and maintain the European ISS modules, vehicles and experiment facilities in space.

In 2004 the EAC training division conducted about 18 weeks of training for astronaut crews, programme managers as well as for ESA and NASA flight controllers. The first increment-specific ATV training also took place in September 2004.



ESA astronaut Jean-Francois Clervoy, supervised by an EAC technician, practices docking procedures to the ISS on the ATV Rendezvous and Docking Simulator.

In the first year basic training provides teaching on space technology and science, medical skills and skills for operational work with Station systems and payloads, including special capabilities such as underwater diving as the basis for spacewalk or extra-vehicular activity (EVA) training.

ESA astronauts fly on the US Space Shuttle (insert centre) or Russian Soyuz (left) when visiting the ISS, seen here with the Earth below from a departing Space Shuttle in 2002.



Published by  
Directorate of Human Spaceflight

European Astronaut Centre  
Linder Hohe, D-51147 Cologne, Germany.  
Tel: (+49) 2203 60 01 0  
Fax: (+49) 2203 60 01 103  
E-mail: jean.coisne@esa.int  
Website: www.eac.esa.int  
Coordination: Jean Coisne, September 2004

Implementation: simcomm-media.com

