# Ten Years of the European Astronaut Centre (EAC)

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**The European Astronaut Centre, the home base of ESA's Astronaut Corps, celebrated its 10th anniversary on 17 May 2000 with a media event highlighting the past, present and future of the Agency's manned space programme.**

## Introduction

The roots of ESA's European Astronaut Centre (EAC) reach back to 1977 when the Agency's first four astronauts were chosen, after a pre-selection process by the Member States, to train for the Spacelab-1 mission. After that highly successful multi-disciplinary international mission landed in December 1983, US President Ronald Reagan announced the Space Station project and invited the active participation of Europe, Japan and Canada. Europe simultaneously began its own ambitious programme, encompassing the Columbus Programme with the Attached Pressurised Module for the Space Station, the Manned-Tended Free Flyer, the serviceable Polar Platform and the manned Hermes space plane.

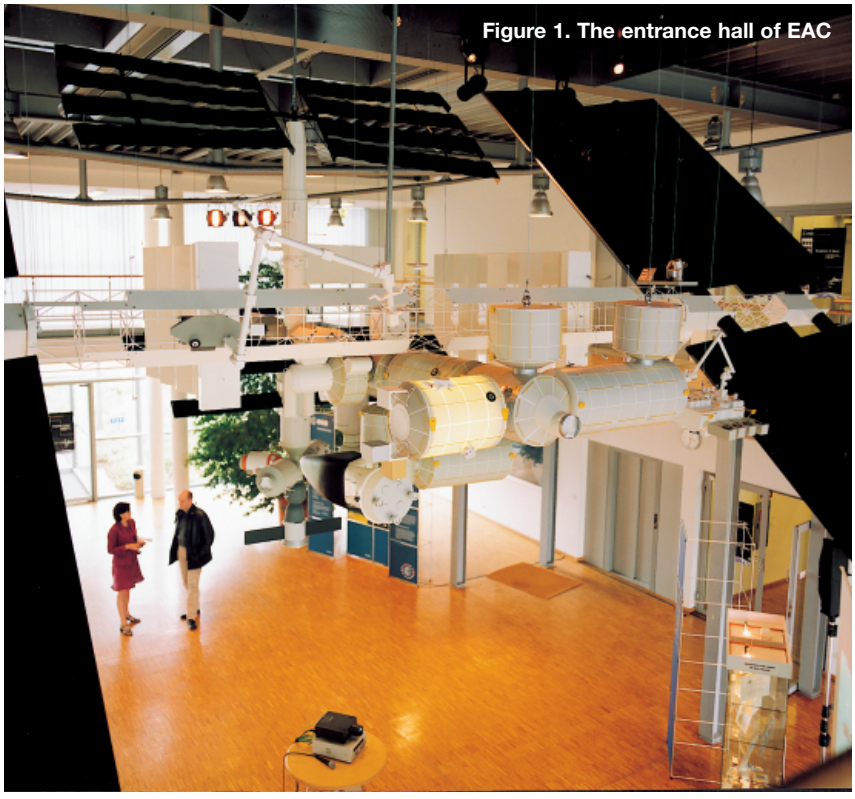


Figure 1. The entrance hall of EAC

In order to satisfy this long-term need for astronauts, ESA established EAC in Cologne (D). The Centre was formally created in May 1990, when the Host Agreement was signed between ESA and the German national authorities.

## The European Astronaut Centre

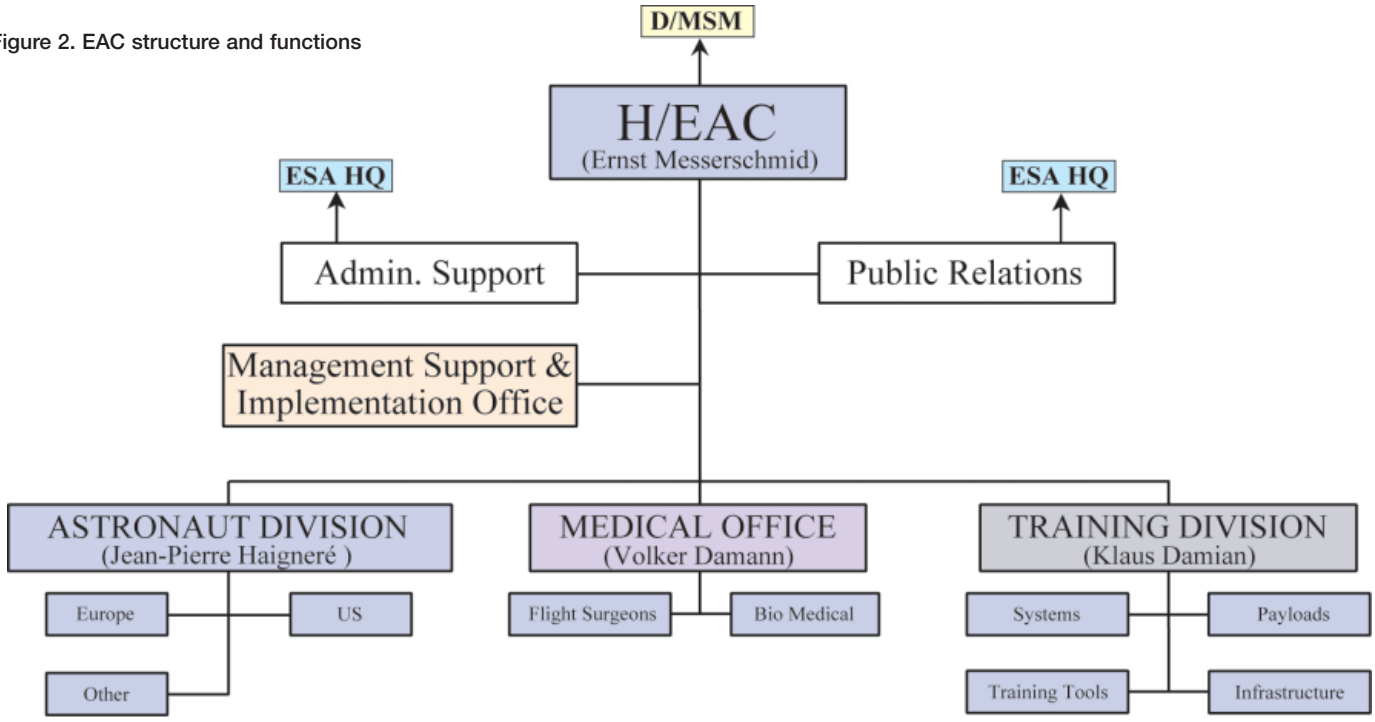
Following the selection of six astronaut candidates in 1992, EAC (Fig. 1) rapidly became the home base for all European astronauts. By then, Hermes, Free-Flyer and Polar Platform had been cancelled, and EAC focused on supporting ESA astronauts assigned to Space Station precursor missions aboard Shuttle/Spacelab and Mir. The training programme was developed in close cooperation with NASA and Russia's Gagarin Cosmonaut Training Centre and initially applied to the payload training for the Euromir-94/95 missions.

A key milestone was the Council Decision in March 1998 to integrate all European astronauts into a single European Astronaut Corps, started in 1998. This integration is now complete with the roster of 11 flown astronauts and five astronaut candidates and rookies. EAC's staff total will be almost 60 by the end of 2000 when the integration of national agency staff that began in March 2000 is completed. The German, French and Italian space agencies are contributing up to 30 seconded staff. The current organigram is shown in Fig. 2.

### *Astronaut Training Division*

The Astronaut Training Division has contributed to a number of Columbus precursor missions and is now focusing on preparing Basic Training, Advanced Training and Increment-Specific Training for the International Space Station (ISS). Basic Training for ESA astronaut candidates is performed at EAC. Advanced Training and Increment Specific Training on ESA space elements (Columbus and the Automated Transfer Vehicle) and payloads will

Figure 2. EAC structure and functions




be provided at EAC to all ISS astronauts. Following training readiness at EAC, 2 years before the Columbus launch, about 70 ISS astronauts will be trained at EAC on average each year.

EAC's training facilities include a training hall, a Neutral Buoyancy Facility, physical fitness rooms, classrooms, communication and data handling facilities, computer-based training systems, trainer control rooms, workshops and refreshment areas. This infrastructure will be progressively outfitted with a Columbus Trainer, incorporating high-fidelity man-machine interfaces with simulated functionality, standalone training models for Biolab, Fluid Science Laboratory, European Physiology Modules, European Drawer Rack and European Stowage Rack, and a high-fidelity mechanical Columbus Mockup with Orbital Replacement Units for realistic maintenance training. ESA's Automated Transfer Vehicle (ATV) training facilities will also be hosted at EAC for crews to learn how to handle the pressurised cargo as well as ATV rendezvous and docking.

*Crew Medical Office*

The Medical Office provides a wide spectrum of crew support. It is responsible for medical issues during crew selections and astronauts' active careers, and provides the annual medical examinations for continuing flight certification. The infrastructure supports the astronauts and their families with, for example, nutritional advice, physical fitness regimes and human behavioural training for long-duration missions. During long-term missions aboard the ISS – lasting about 3 months – family teleconferencing and counselling will be provided.

EAC has three certified flight surgeons who represent the Agency on the various ISS medical boards. During on-orbit operations, the flight surgeons will have a valuable role in closely monitoring the astronauts' health during hazardous operations and when the crew is the subject of, for example, life sciences experiments. Based at the Mission Control Centres, they will act as ground-based ombudsmen for the crew with the scientists and payload operators. They are presently based in Cologne but when the Station is occupied they will spend extended periods in NASA's Johnson Space Center (JSC) and Russia's Star City as part of the consolidated ISS Crew Surgeon Team.

*Astronaut Division*

The Astronaut Division deals with all aspects directly related to ESA astronauts, such as:

– the definition and implementation of all processes, standards and criteria for the selection, recruitment, qualification and assignments. The division is the contact point for the Astronaut Offices of the other ISS partners and is, in particular, a member of the Multilateral Crew Operation Panel (MCOP), one of the high-level operational elements of the ISS organisation;
– the development of the ESA astronauts' operational capability, through the implementation of policies in the areas of professional and flight proficiencies as well as physical fitness;
– the career planning and the support to each astronaut during training, mission and post-flight activities;
– the organisation of the technical assignments of ESA astronauts in support of the Departments

of the Directorate of Manned Spaceflight and Microgravity;
– the safeguarding of crew safety.

The current assignment of each astronaut is shown in Table 1.

### 10th Anniversary Ceremony

During the preliminaries to the 10th Anniversary Ceremony on 17 May 2000, Antonio Rodotà, ESA's Director General, welcomed the invited guests and was particularly pleased to greet Dr. Lieb (Fig. 4), First State Secretary, representing the State of Nordrhein-Westfalen, and Minister President Clement, Mr Alain Benssoussan, the ESA Council Chairman, and Prof. Walter Kröll (Fig. 5), representing the Deutsche Forschungsanstalt für Luft- und Raumfahrt (DLR). Other guests included Heads of Delegations of the ESA Council and of related ISS agencies, resident Science Attachés of ESA Member States and ISS International Partners, delegates of the ESA Programme Board for Manned Spaceflight, representatives of Astronaut Offices, German ministries and local authorities, and special guests involved in establishing EAC in Cologne.

In his address, Dr. Lieb referred back more than 10 years to when the State of Nordrhein-Westfalen and DLR took the risky decision to build a Crew Training Complex at the DLR premises on the outskirts of Cologne. This was long before it was certain that EAC would ever be established there. In today's parlance, the 'venture capital' was well invested. An important side effect is that it has proved to be an attraction for the younger generation, illustrating the importance of and the career possibilities offered by the natural and engineering sciences.

Figure 3. The EAC 10th Anniversary Ceremony

**Table 1. ESA astronaut assignments and collateral duties**

| | |
|---|---|
| **Jean-François Clervoy (F)** | JSC: ISS display integration in Space Station Operations Branch |
| **Claudie André-Deshays (F)** | EAC: Microgravity Facilities for Columbus, supports medical operational and life science activities within D/MSM |
| **Pedro Duque (E)** | ESTEC: supporting the Module Project Division for Columbus |
| **Reinhold Ewald (D)** | EAC: supporting the training system build-up for ESA elements and payloads |
| **Léopold Eyharts (F)** | JSC: Mission Specialist training; collateral duties on Russian vehicles (Soyuz/Progress) and ISS Flight Crew Systems |
| **Christer Fuglesang (S)** | JSC: prime Support Astronaut for 2nd Station crew |
| **Umberto Guidoni (I)** | JSC: training for STS-100 Multi-Purpose Logistics Module flight (April 2001) |
| **André Kuipers (NL)** | ESTEC: Microgravity Payloads Division, coordinating scientific development inputs for MARES and ARMS |
| **Paolo Nespoli (I)** | JSC: Mission Specialist training; collateral duties in computer-based training, onboard training and system tests on ESA elements and payloads |
| **Claude Nicollier (CH)** | JSC: EVA Instructor in EVA Branch |
| **Thomas Reiter (D)** | EAC: supporting ERA and ATV projects |
| **Hans Schlegel (D)** | JSC: Mission Specialist training; collateral duties in mechanical, structural systems and crew equipment |
| **Gerhard Thiele (D)** | EAC: mission control capcom in JSC astronaut corps |
| **Michel Tognini (F)** | JSC: ISS Robotics Branch supporting MBS and ERA |
| **Roberto Vittori (I)** | JSC: Mission Specialist training; collateral duties in Shuttle system upgrades |
| **Frank De Winne (B)** | ESTEC: X-38/Crew Rescue Vehicle projects in human engineering and man-machine interfaces |

ARMS: Advanced Respiratory Monitoring System. ERA: European Robotic Arm. EVA: Extra-Vehicular Activity. JSC: NASA Johnson Space Center. MARES: Muscle Atrophy Research.and Exercise System. MBS: Mobile Base System (for ISS robot arm) NASA Johnson Space Center.


Figure 4. Dr. Lieb, First State Secretary, represented the State of Nordrhein-Westfalen

Figure 5. Mr Alain Benssoussan (left) represented the ESA Council and Prof. Walter Kröll (second from left), represented DLR. With Prof. Kröll is Mr Jörg Feustel-Büechl, ESA Director of Manned Spaceflight and Microgravity, and (right) Mrs Strömberg, Chair of the Programme Board for Manned Spaceflight

One achievement of this memorable day was the very first gathering of the entire corps of ESA's 16 active astronauts at its home base. Over the years, the astronauts have been active in Europe, the USA and Russia.

Medialink Europe provided the following broadcast reports: 37 transmissions covered by Sky News, Deutsche Welle, Canal 24 Horas, TV5, TVEI, France 3, WDR3, ZDF, 3Sat, Bayern1, RAI News 24, RAI 3, ETB 2, Canal Natura TVE1, Antena 3, La2, CNN+ and Reuters. A total of 23 interviews were given by astronauts, plus five by other ESA representatives.

Astronauts and guests discussed the themes of 'European Astronaut Experience', 'Recent European Spaceflights' (see separate box) and the 'European Astronaut Identity' (Fig. 6).

*European astronaut experience*

As of August 2000, European national space agencies (D, F, I), ESA Member States (A, UK, B), and ESA had made 31 spaceflights with 27 astronauts since Sigmund Jähn's mission aboard Soyuz-31 in 1978. European astronauts have participated in 17 US Space Shuttle missions and in 14 Russian Soyuz missions to the Salyut-6, Salyut-7 and Mir space stations. Besides the development of an impressive scientific programme (space and microgravity sciences, technology), European astronauts have been involved at the highest skill level in space operations (EVAs, robotics) and have

Figure 6. Cornelia Czymoch (right) hosted the ceremony. Here, she is talking to Pedro Duque (left), Claudie André-Deshays (centre), Umberto Guidoni (second right) and Jean-Pierre Haigneré (right)

achieved the highest qualifications, such as Mir flight engineer and Soyuz escape vehicle commander. This European legacy and EAC heritage provides the basis for being part of the ISS community. Such an impressive background, including the development and operation of Spacelab, makes Europe a bridge between the ISS partners.

*European astronaut identity*
For more than 20 years, Europe has been involved in manned space programmes with a very specific approach arising from historical, cultural and geopolitical factors. Probably because basic science is a strong feature of the European culture, it has always been prominent in European space programmes, in comparison with the infrastructure developments of the USA and Russia. It is also reflected in the composition of the European Astronaut Corps, which has almost equal proportions of scientists and pilots.

Limited financial resources have driven Europeans to be imaginative, selective and creative – achieving more with less. In the space sector, the fact that Europe was following this avenue long before the era of 'cheaper and better' arrived was the key to survival. Looking for attractive cooperative ventures, we gained a unique two-sided expertise and became a powerful 'go-between'. These cooperative efforts form the basic framework of our present programme.

These factors have strongly influenced the European approach of organising a Single European Astronaut Corps, pooling the accumulated operational expertise of ESA's Member States. The 'European' identity of ESA's astronauts is not obvious because of the diversities of their multicultural backgrounds. However, ESA astronauts can often be easily identified when looking at groups of international astronauts working together in JSC or Star City. They are skilled at overcoming their differences and using them as a strength. They play a major role in all areas of space activities despite the dominant presence of the two major space powers. Our astronauts have a great ability to use foreign languages and to adapt to various situations, cultural differences and working standards.

However, no-one could develop capabilities aimed at pushing the frontiers of space without having a long-term perspective. This is why participation in the ISS not only focuses on providing Europe with clear visibility in the greatest space programme of the new century, but also on holding high the flag of all European citizens.

**The future of EAC – the ISS and beyond**
The future of EAC and its Astronaut Corps rests on three approaches:

*Reliable service for International Partners*
International crews bound for the ISS can expect to be trained on each partner's hardware. This means that up to four crews (with up to seven members each) will come to EAC annually for training on the Columbus laboratory, ATV, the ESA-provided payload facilities and data systems. This pace will be maintained over the planned ISS lifetime of 15 years. EAC's prime objectives include a good service, reliable infrastructure and friendly atmosphere to help the crews assimilate the information quickly. EAC is striving to become an equal partner with the training centres in JSC and Star City.

*Using the ISS as a testbed for future activities*
The multi-national, multi-facetted team of experts at EAC combines the experience of many spaceflights, and continues to improve the operational flow and support for the crews. Europe has yet to have an astronaut fly as a spacecraft commander, but the Member States' industrial capacity means that it could take the lead in developing and operating a manned space vehicle. This requires future-oriented crew preparation and planning – which EAC can now begin as part of its responsibility for the Single European Astronaut Corps.

*Active promotion, preparation and participation in European manned space programmes beyond ISS*
Many thousands of people visit European space centres every year, including EAC, and many more show their interest by attending presentations given by astronauts and space experts. This proves that the public is fascinated by space exploration – and such interest deserves to be taken seriously. EAC wants to be part of the next step in exploration – be it towards the Moon or Mars – with its astronauts, its experts and its support.

*How to communicate our aims: the Space Learning Centre*
The three approaches outlined above require careful development of EAC's staff skills and infrastructure. This will be supplemented by our outreach activities: the planned Cologne Space Learning Centre where the public can be involved in parallel with Europe's astronauts and their trainers. Educational training sessions will be located next to real ones, and virtual reality and other simulators will give visitors the chance to experience what it is like to set foot in space and live there. For many, that will be a dream come true.

# Recent flights of European astronauts

7

*STS-93: exploring the X-ray Universe*

ESA astronaut Michel Tognini participated in the deployment of the Chandra X-ray observatory from the Space Shuttle's cargo bay. Chandra and ESA's XMM-Newton observatory, launched in December 1999 by Ariane-5, are exploring the violent hot surroundings of neutron stars, black holes and colliding galaxy cores. It was Tognini's second spaceflight, following his 1992 mission to Mir. The mission lasted 22-27 July 1999.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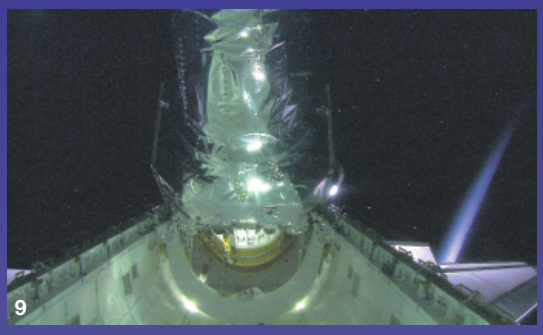
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**Figure 7. The STS-93 crew patch emphasises the deployment of Chandra. (NASA)**

**Figure 8. Michel Tognini in radio contact with Earth during STS-93. (NASA)**

**Figure 9. Chandra's deployment from the Space Shuttle payload bay into Earth orbit. (NASA)**

*Perseus: a Swan Song for Mir*

On Mir's 13th birthday, 20 February 1999, ESA astronaut Jean-Pierre Haigneré lifted off for a record 189-day stay aboard the ageing spacecraft. Commander Afanasiev and flight engineers Avdeev and Haigneré completed their science research programme before putting Mir into hibernation as they left on 28 August 1999. The mission included a spacewalk that deployed a mast-mounted lightweight antenna. For the second time since Thomas Reiter in 1995, a European astronaut gained experience with the Russian Orlan spacesuit. On 11 August they saw the Moon's shadow sweeping across a cloud-covered Europe during the total eclipse.


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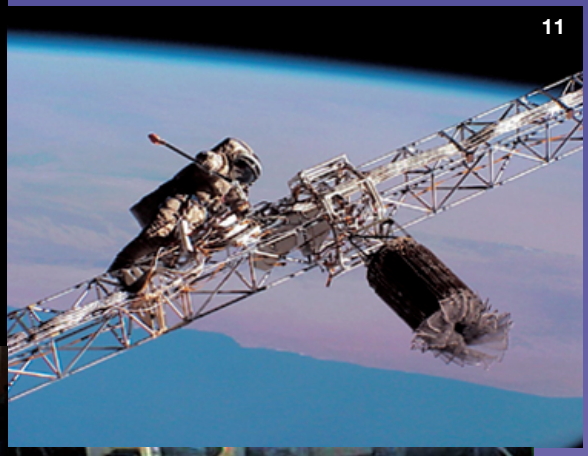
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**Figure 10. The Perseus crew was launched on 20 February 1999**

**Figure 11. Jean-Pierre Haigneré working on the antenna deployment during the 6-hour EVA in July 1999**

**Figure 12. Medical research with Cardiolab aboard Mir**

**Figure 13. Jean-Pierre Haigneré playing his saxophone during his leisure time aboard Mir**

# Recent flights of European astronauts

14

*STS-103: servicing the Hubble Space Telescope*

Claude Nicollier and Jean-Francois Clervoy, ESA's most experienced astronauts, flew 19-27 December 1999 aboard the Space Shuttle to perform the third servicing mission of the Hubble Space Telescope. Hubble's guidance sensors had failed recently, leaving the observatory in safe mode. Clervoy used the Shuttle's remote manipulator to help his EVA crewmates, including Nicollier and UK-born Michael Foale, manoeuvre telephone-booth-sized hardware.


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Figure 14. The STS-103 crew patch. (NASA)

Figure 15. A spectacular liftoff for Shuttle *Discovery* shortly before Christmas 1999. (NASA)

Figure 16. Jean-Francois Clervoy with Claude Nicollier (left). (NASA)

Figure 17. Claude Nicollier opening a container of special tools for servicing Hubble. (NASA)

*STS-99: an Earth Map in One Go*

The Shuttle Radar Topography Mission (SRTM; 11-22 February 2000) and its crew of six, including ESA astronaut Gerhard Thiele, had the unique privilege of mapping most of the Earth's surface in a single flight. After processing the hundreds of data tapes from the two radars, Earth's inhabited surface will be known in 3D at unprecedented accuracy. For this, the Shuttle flight carried a receiving antenna on a boom protruding 60 m from the payload bay. Having lived one of his own, Thiele announced 'Keep your dreams alive!'


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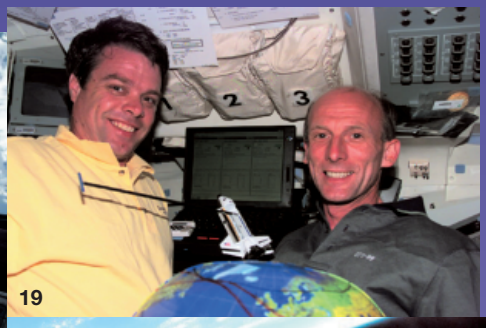
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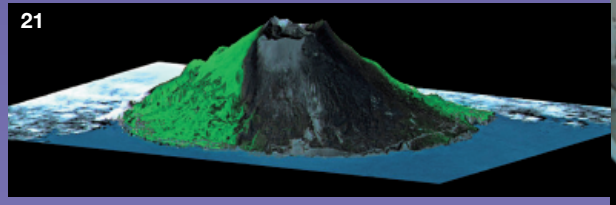
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Figure 18. Gerhard Thiele complementing the radar images with photographs. (NASA)

Figure 19. The radar measurement principle is demonstrated by Commander Kregel and Gerhard Thiele. (NASA)

Figure 20. Part of the impressive antenna mast structure extending 60 m from the Shuttle payload bay into space. (NASA)

Figure 21. SRTM image of the crater and outflow of Japan's Mount Oyama, which became active again this summer. (JPL)