

From ESA Astronaut to Government Minister

Astronaut Claudie Haigneré has been nominated as Minister for Research and New Technologies in the French government.

After completing her PhD in neurosciences and a career at the French space agency, CNES, Claudie Haigneré joined the European Astronaut Corps in 1999.

She has taken part in two space missions with the Russians, 'Cassiopée' in August 1996 and 'Andromède' in October 2001. She was the first woman to qualify as a Soyuz Return Commander (July 1999), responsible for the three-person Soyuz capsule during a re-entry from space, and was the first European woman to visit the International Space Station (October 2001).



Claudie Haigneré

ESA's Director General, Antonio Rodotà, expressed delight at her appointment, commenting that:

"This appointment is an honour for the European Space Agency and puts Mrs Haigneré in a key position to shape the future of Europe's science and technology."

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In Brief

MSG installed in the ISS

On the morning of 6 June, ESA's Microgravity Science Glovebox (MSG) was successfully launched from Cape Canaveral inside the logistics module MPLM-Leonardo, aboard a US Space Shuttle mission to the International Space Station (STS-111UF2). The in-orbit commissioning phase was completed successfully, and the ISS crew has performed a first material-sciences experiment.

The MSG is the first European-provided research facility to have been launched to the ISS and the first to have completed the verification programme for this class of payloads, becoming the reference for the future development of ISS payloads. Astronauts will use it to perform a wide variety of materials, combustion, fluids and biotechnology experiments, as well as other investigations in the unique microgravity environment of the ISS.

It can also accommodate minor repairs and servicing of hardware requiring a controlled working environment. The facility offers users a wide range of innovative utilisation alternatives, from manual control by astronauts via laptop computers to fully automated and remote control from Earth (telescience). A permanent data exchange link with ground stations is also available.

The MSG will be used in the US Destiny Laboratory for a projected operational period of ten years.

ESA is planning to use the facility for European experiments. The first time MSG will be used by a European astronaut to perform European experiments will be during a Soyuz "taxi flight" mission in October 2002. ESA's Belgian astronaut Frank De Winne will perform four different experiments in the MSG, addressing the fields of protein crystallisation, zeolites crystallisation, combustion and fluid science.

The prime contractor for the development of the MSG is Astrium GmbH (D), with Bradford Engineering (NL), Verhaert Design and Development (B), ATOS (NL) and Laben (I) as subcontractors.

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Astronaut Philippe Perrin, STS-111 mission specialist, floats near the MSG in the Destiny laboratory on the ISS. (photo NASA)



Swedish chair for ESA Council

Per Tegnér, currently Director General of the Swedish National Space Board, is the new Chairman of the ESA Council for the next two years (as from 1 July 2002).

Mr Tegnér was unanimously elected at the 159th meeting of the ESA Council, held at the Canadian Space Agency in Montreal on 12 and 13 June. He takes

over from Mr Alain Bensoussan of France, whose term of office ended on 30 June 2002.

Per Tegnér, born on 22 April 1944, holds a Masters in Economics and worked for more than 25 years for the Swedish Ministry of Industry. In 1998 he was appointed Director General of the Swedish National Space Board and has been the Head of the Swedish Delegation to ESA since then.



ESA selects new Earth-Observation missions

For its second cycle of the Earth Explorer Opportunity Missions, ESA has recently selected three proposals to enter feasibility study: ACE+ , an Atmosphere and Climate-Explorer; EGPM, the European contribution to Global Precipitation Mission; and SWARM, a constellation of small satellites to study the dynamics of the Earth's magnetic field and its interactions with the Earth system.

The first Earth Explorer Opportunity Mission selection took place in 1999 and resulted in the selection of Cryosat and SMOS. Unlike the larger Earth Explorer Core Missions, which are ESA-led research missions, Opportunity Missions are smaller, have a greater degree of industrial involvement and are not necessarily ESA-led.

The three candidate Opportunity Missions recently selected will complement areas of research currently under development in the Earth Explorer programme. Once the feasibility studies are complete, two of the three missions will be retained for implementation, with the launch of the first envisaged for 2008.

ACE+

The principal goal of ACE+ is to measure variations and changes in global atmospheric temperature and water vapour distribution and so provide valuable data for monitoring climate change. ACE+ will also be used to improve weather forecasting. The mission will use four satellites in orbits between 650 and 850 km altitude. Each will carry an L band receiver for GPS/Galileo sounding and a multi-frequency X-K band transmitter or receiver for satellite-to-satellite cross-link measurements.



SWARM: one of the three new Earth Explorer Opportunity Missions selected for Phase-A study

EGPM

EGPM is a mission consisting of a single satellite in a Sun-synchronous, low Earth orbit and carries a precipitation microwave radiometer, which will provide global rainfall observations. It is an element of the joint NASA-NASDA GPM mission proposal, which comprises a 'core' satellite carrying a precipitation radar and a precipitation radiometer, and a number of smaller satellites with only a precipitation radiometer on each.

SWARM

The objective of the SWARM mission is to provide the best survey ever of the

geomagnetic field and its temporal evolution, and gain new insights for improving our knowledge of the Earth's interior and climate. The SWARM concept consists of a constellation of four satellites in two different polar orbits between 400 and 550 km altitude. Each satellite will provide high-precision and high-resolution measurements of the magnetic field. Together they will provide the necessary observations for the global high-precision survey of the geomagnetic field that is needed to model its various sources.



'Cosmic Vision 2020': the new ESA Science Programme

Following the outcome of the ESA Ministerial Council in Edinburgh in November 2001, the Director of Science undertook a complete reassessment of the ESA Science Programme.

This was done in close collaboration with the science community, represented by the Space Science Advisory Committee, Industry and Member State delegations. The results of this exercise were presented as a proposal to the 99th meeting of the ESA Science Programme Committee in Andenes (Norway) on 22/23 May.

After extensive consultations with all its partners, the Executive could propose a revised plan, which not only maintained the missions approved in October 2000, but added the Eddington mission also. The new plan therefore contains the following missions:

Astrophysics

Group 1: XMM-Newton, Integral;
Group 2: Herschel, Planck, Eddington;
Group 3: GAIA.

Solar System Science:

Group 1: Rosetta, Mars Express, (Venus Express would have been in this group);
Group 2: SMART-1, BepiColombo, Solar Orbiter.

Fundamental Physics:

- STEP (2005) the 'equivalence principle' test,
- SMART2, a technology demonstration mission (2006) for LISA, a joint mission with NASA, searching for gravitational waves (2011).

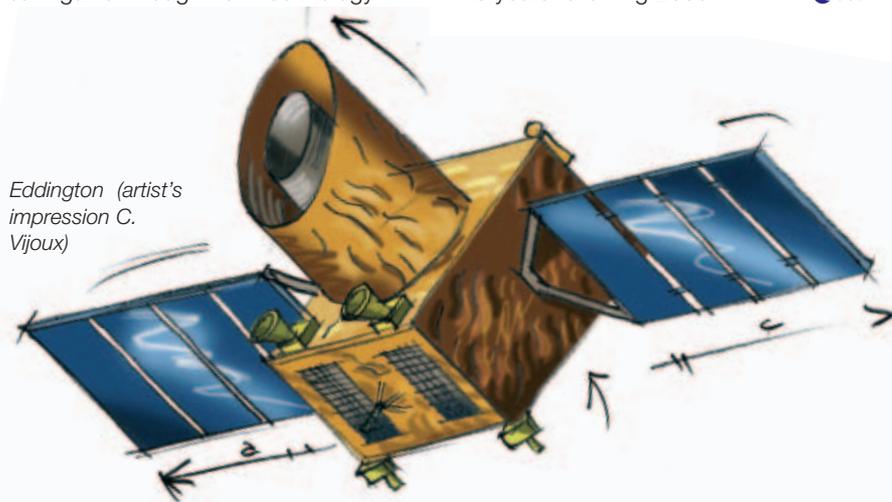
In addition, the Agency is committed to cooperation with NASA in NGST (the Next Generation Space Telescope), the successor of the Hubble Space telescope, with launch in 2010. STEP (2005), the mission to test of the nature of mass and the basis of mechanics, relies on a decision by NASA, the major partner.

The 'production groups' indicated are more than scientific groupings. Missions within each will be built synergistically using common technologies and engineering teams where possible.

Such a scenario is going to rely on specific commitment to new ways of working, e.g. the implementation of BepiColombo and Solar Orbiter with international partners. Both missions will be implemented as a single activity, leading to significant savings. Other examples are the planned implementation of Herschel/Planck and Eddington in a single project, re-using the same bus, and significant gains through new technology

in terms of the cost-effectiveness of spacecraft development and procurement.

Whilst the new name 'Cosmic Vision 2020' refers to the universe, the programme is also providing vision in technological and managerial innovation here on Earth. The overall funding assumption underlying the new plan is that purchasing power will be preserved in the years following 2005.



Eddington (artist's impression C. Vijoux)

Mars — an island in Canada?

What is the best method for astronauts to take samples on a future mission to Mars? A good way to find out is to go to a place on Earth that resembles the Martian surface, put on a simulated space suit, and try. One of the most Mars-like places on Earth is the barren Devon Island in the Canadian Arctic, where the Flashline Mars Arctic Research Station (FMARS) provides a unique environment for the simulation of the human exploration of Mars. A crew of six scientists and engineers, all with different mission objectives, took part in the summer expedition to FMARS in July 2002.

One major goal of the human exploration of our Solar System in general and Mars in particular is the search for extraterrestrial life. If you want to prove the existence of past or current Martian life you have to send astronauts to the surface. Well-trained astronauts can decide on the spot whether a sample is interesting for further analysis. What is more, astronauts are more flexible in where they go on the surface and can thus adjust their science agenda to the discoveries they make during the mission.

Author Markus Landgraf was member of the crew. His objective was to take minimally contaminated samples from the surface for an exobiology experiment by the Geophysical Laboratory of the Carnegie Institute and, at the same time, to test sampling techniques under simulated planetary extra-vehicular activity (EVA) conditions. The other crew members were: Robert Zubrin (commander), Nell Beedle, Frank Eckardt, Shannon Hinsa, and Emily MacDonald. K. Mark Caviezel served as armed escort for the crew during EVAs to protect us from potential polar bear attacks.



The FMARS habitat

In order to find out whether the Apollo-approach to taking samples – using generic tools like a hammer, simple drills, and shovels, rather than specialised equipment – is the right one, my colleagues from the Carnegie Institute and I decided to try using simple tools for a sampling campaign during a number of EVAs to at least two different sampling sites close to the Haughton impact crater on Devon Island. The Haughton crater is an impact structure about 16 kilometres in diameter and 23 million years old. Due to its advanced age its rim, where the FMARS habitat is located, as well as its interior are heavily eroded. In the central part one can find breccia, a kind of rock that is created by the shattering force of the impact. Most of the rest of the geology is dominated by dolomite, the magnesium-rich, reddish flavour of limestone. The dolomite layer was created as sediment in the time before the impact when the region that is now northern Canada was the floor of an ocean.

The EVAs took us to two outcrops of indigenous rock close to the habitat. The first, called Devo Rock, is about 12 metres high and the sampling site can only be reached by a decent amount of rock climbing. Climbing the rocks, even in 1 g, turned out to be surprisingly easy in the EVA suits. Of course safety was the top priority, and thus only light tools were used. The old limestone turned out to be quite difficult to crack open. Removing the weathered superficial material and taking samples from two separate sites took about one hour and was pretty strenuous.



quite some lessons learned: Simple generic tools like a geological hammer and wedge are very efficient and can be applied in a wide variety of situations. If the sampling is carried out carefully, the only contamination can come from the tools and the packing material, because it is not necessary to touch the samples with the possibly contaminated glove. The mobility in the EVA suits is surprisingly good, provided one moves with some pre-planning, especially when climbing. Here is the rule of thumb: move slowly and think ahead!

It was amazing how much we learned during our three-week mission to FMARS. As the summer is now over in the Arctic, the Mars Desert Research Station in Utah takes over, where more experiments are to be conducted. Another

simulation habitat will be set up by the European chapters of the Mars Society in the volcanic regions of northeastern Iceland. Aply named EuroMARS this new habitat will allow European scientists and engineers to test operational procedures for planetary exploration in more detail. So step by step we are getting ready for the red planet!

During the whole sampling procedure it was obvious that taking samples at this site would have been impossible for a robot. It would be very difficult for a robot even to reach such a site.

On the second EVA our target sampling-site was an outcrop of bedrock called Marine Rock that sits isolated in the Von Braun Planitia, 2.3 kilometres northwest of the habitat. In terms of geology, Marine Rock is very similar to the first site, Devo Rock, but the bedrock there is much easier to reach. Thus, the deep sampling procedure was tested here, which involved more heavy tools like a 10 kg sledgehammer. Applying the sledgehammer to the edge of the rock turned out to be very demanding. After about 15 minutes of hitting the rock cracks appeared that we widened carefully in order to take samples from a depth of about 10 cm beneath the surface. Taking even deeper samples will require some more specialised tools like a rock drill. In total we took three samples at Marine Rock, wrapped them carefully in aluminium foil and put them in sampling bags, which were finally stored in plastic sampling containers.

In summary the expedition to the FMARS habitat was a valuable experience with

http://www.marssociety.org/arctic/index.asp
http://www.euromars.org



Sample from the Marine Rock site under examination in the laboratory.



Satellite images for humanitarian aid

ESA will assist the Reuters Foundation and its AlertNet service by providing information and imagery from ESA Earth observation missions and promoting the use of satellite remote-sensing data by the international humanitarian aid community. More specifically, ESA will provide access to information from its satellite data archives and from the current ERS-2 and Envisat missions. ESA's Director of Earth Observation Programmes, José Achache, and Reuters Foundation Director, Maureen Marlowe, signed a collaboration arrangement between the Agency and the Foundation in June.

ESA will also involve the Reuters Foundation in the user consultation processes it is conducting for the purpose of identifying the satellite data requirements of humanitarian aid organisations, as a contribution to the definition of the European GMES (Global Monitoring for Environment and Security) programme.

A dedicated "satellite image" web page will be developed on the Reuters Foundation's AlertNet site, with images provided by ESA, setting out a number of case studies and a guide to Earth observation.

Reuters Foundation Director Maureen Marlowe said: *"AlertNet's service to its member organisations will be significantly improved. The pictures and graphics from space will not only show terrain clearly, but enable our member agencies to track the movements of displaced people and monitor the*



ERS-2 image of the flooded areas of the Elbe river around Dresden, Germany, taken on 13 August 2002

impact of natural disasters such as floods and earthquakes more accurately and quickly"

The Reuters Foundation, created in 1982, is a humanitarian and educational trust, primarily funded by Reuters, the global news, information and technology group. The AlertNet service was

launched in 1997 to provide fast news and communications for international disaster relief. Membership of the service currently includes more than 175 aid agencies from 35 countries. AlertNet acts as a platform for vital communication and information sharing within the humanitarian aid community worldwide.



New round for SME funding

ESA has launched a second and expanded round of funding for innovative R&D initiatives in satellite communications from Small and Medium-sized Enterprises (SMEs).

ESA's first round of funding last year is already supporting projects in such fields as transportation management, tracking systems, integration of satellite IP

networks and interactive satellite advertising.

Claudio Mastracci, ESA's Director of Applications, commented: *"Building on our experience with the first initiative, we have fine-tuned the scheme to increase flexibility and the support we provide throughout the application process."*

Companies selected to join the scheme will be offered technical and financial support of up to 300 000 Euros to

develop their concepts to a level where commercial funding can be sought. The scheme might fund new uses for existing satellite technologies (to provide new Internet, multimedia, location-based communication or mobile applications) or support new systems and technologies with the potential to improve existing services. Two possible funding levels are available, depending on the commercial maturity of the proposal.



ESA and NIVR sign agreement for User Support and Operations Centre at ESTEC

At the end of February, J. Feustel-Büechl, ESA Director of Manned Spaceflight and Microgravity, and B. Droste, Chairman of the Board of NIVR (Netherlands Agency for Aerospace Programmes) signed an agreement on a special financial contribution by the Netherlands Ministry of Economic Affairs to the creation of the Erasmus User Support and Operation Centre (USOC).

The Erasmus USOC will be installed in the Erasmus Building at ESA's European Space Research and Technology Centre (ESTEC) and will add to the existing International Space Station User Information Centre and the European Robotic Arm Support Centre.

The Erasmus USOC will be responsible for the preparation and execution of the operation of the European Drawer Rack (EDR), which is a flexible multi-user facility located inside the Columbus Laboratory, and of the European Technology Exposure Facility



B. Droste (left) and J. Feustel-Büechl shake hands on the new agreement

located on the Columbus external platform. The agreement permits the procurement of operations test equipment and software dedicated to the EDR. It complements the participation of Belgian industry previously

agreed with the Belgian Delegation, which focuses on the first EDR payload: the Protein Crystallisation Diagnostics Facility (PCDF).



Faculty Position of Microsystems Technology and Nanotechnology for Space Research

The Swiss Federal Institute of Technology Lausanne (EPFL) and the University of Neuchâtel (UNINE) have worked closely together for many years in the microsystems technology and nanotechnology for space research and want now to increase the intensity of their cooperation. We invite applications for a tenure-track Assistant Professor position.

We seek outstanding individuals in the area of microsystems technology and nanotechnology (MNT/MEMS), to exploit the strong potential in space applications.

Hired by the EPFL and based within the Institute of Microtechnology of the UNINE, the appointee will initiate independent, creative research programs and participate in undergraduate and graduate teaching, supervise PhD students, develop interdisciplinary work with other leading research teams and cooperate with industry.

We offer internationally competitive salaries and benefits. Applications with curriculum vitae, publication list, concise statement of research and teaching interests as well as the names and addresses (including e-mail) of at least five references should be by **September 30, 2002** to:

Professor Michel Declercq
Dean, School of Engineering
EPFL, CH-1015 Lausanne, Switzerland

For additional information, please contact:
Prof. Nico F. de Rooij (nico.derooij@unine.ch)
and see the following web sites:
EPFL: <http://sti.epfl.ch>, michel.declercq@epfl.ch
UNINE: http://www.unine.ch/uer/uer_microtech.htm

The EPFL and UNINE are equal opportunity employers.

Visiting and Returning from Space Safely

How best to achieve the goal of 'Flying to and Returning Safely from Space!' was the main focus of the first Joint ESA-NASA Space Flight Safety Conference held at ESA's ESTEC establishment in Noordwijk (NL) from 11 to 13 June. This three-day Conference emanated from an idea to jointly organise and expand the scope of the existing NASA Payload Safety Conference to include more general system-safety aspects.

A new era in manned space flight is gradually emerging in which effective partnership, information exchange and mutual responsibility are the overriding factors. The aim of the Noordwijk Conference was to provide a forum for the exchange of ideas and to forge closer links between space agencies as well as international industry. Hence the choice of 'Safety Through Partnership' was chosen as the Conference slogan.

This Conference was an important step for ESA in its role as a Partner in the International Space Station (ISS) Programme, which includes more responsibility and greater autonomy in the field of safety than any previous collaborative programme with NASA. This calls for enhanced cooperation between ESA and NASA specialists in all fields related to payload flight safety.

The two main Conference topics, addressed in 14 complementary sessions,

were:

- System Safety and Risk Management
- Payload Safety and Certification

both of which were extensively discussed in the context of the design, development, verification, validation and operation of space systems. Over 150 international delegates attended, including representatives from the Japanese Space Agency (NASDA), the Rocket Space Corporation, Energia, Rosaviakosmos and the Indian Space Research Organisation (ISRO).

The Conference provided a lively forum for presentations and discussions on the two main topics, as well as poster presentations and the demonstration of innovative software and training material. The plenary closing session provided an opportunity for conclusions and recommendations to be formulated and discussed.

The Risk Management sessions resulted in the conclusion that there is a need for greater international collaboration regarding the implementation of risk-management techniques and practices. The implementation should involve the definition of risk-management policy, procedures and training with a long-term view towards normalising such procedures and techniques across the international aerospace community. Information regarding successes and failures should also be more widely shared in an attempt to achieve a positive risk-management culture across the aerospace sector.

The Payload Safety sessions were mainly dedicated to the presentation of currently applied safety requirements and lessons learnt, together with proven means of compliance. Commercial activities involving safety usually require licensing and enforced adherence to government-imposed regulations. In this context, it was suggested that the ISS might well evolve over time into a hybrid government/private system, and therefore existing safety rules and processes (created primarily for multi-national government operations) would have to be standardised to properly address this metamorphosis.

It was also recommended that ISS commercialisation, and indeed the international structure of the ISS Programme itself, would benefit greatly from the establishment of a single independent safety authority. It was envisaged that each ISS Partner would participate in this single authority, exercising the roles and responsibilities assigned to them via inter-governmental agreements and memoranda of understanding.

The full Proceedings of the Conference are already available from ESA Publications Division as ESA SP-486 (Price 50 Euros: Order Form inside the back cover of this Bulletin).



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