Follow us on

# International Astronautical Federation News

Connecting Space People

2/2012 (June 2012)

# Message from the President

This edition of our newsletter comes out just as we are returning from one of the year's signature events: the Global Space Exploration Conference in Washington, organised in partnership with the American Institute of Aeronautics and Astronautics. We are particularly pleased with the success of this gathering, which attracted huge interest from throughout the world space community. This enthusiastic reception is encouraging us to think about a follow-up event in the future.

The IAF also showed up in force at the U.S.'s foremost space event, the National Space Symposium in Colorado Springs in April, which we hope to use as a springboard for boosting American corporate membership.

Meanwhile, preparations continue to advance for IAC 2012 in Naples, Italy, as witnessed by the busy agenda of our technical committees and the number of papers selected at this year's Spring Meeting, the details of which you will find in this issue. We also take a look at the events that will be associated with the Congress, such as the Fourth International Cluster Forum, and the results of two key initiatives aimed at promoting space among students and young professionals.

Thales Alenia Space Italia CEO Luigi Pasquali tells us what the Congress – and the upcoming European Space Agency ministerial summit that will follow – will mean to his company.

You will also find a novel format for member news intended to permit IAF members, large and small, to keep the space community abreast of their activities, and a detailed account of new developments at a fast-growing Asian member – the Vietnam Academy of Science and Technology.

**Prof. Dr Berndt Feuerbacher**
**President, International Astronautical Federation**

## IN THIS ISSUE

**MESSAGE FROM THE PRESIDENT**

**IAF NEWS**

- IAF at the National Space Symposium
- IAF at Space Propulsion, Bordeaux
- IAF Multiplying Conference Participation
- Emerging Space Leaders Grant Winners
- Young Space Leaders Recognition Programme

**MEMBERS' CORNER**

**GLOBAL SPACE EXPLORATION CONFERENCE**

**INTERNATIONAL ASTRONAUTICAL CONGRESS**

- IAC Associated Events
- 2014, 2015 IAC Bid Calls
- IAF Spring Meetings & Committee Reports
- IAC Virtual Forums
- Presidents of Space Universities' Second International Meeting

**FOCUS ON VIETNAM**

**INTERVIEW WITH LUIGI PASQUALI**

## LATEST IAF PUBLICATIONS

**Highlights in Space 2011**

**IAC 2012 Brochure**

**IGY ACHA Study**

## DEADLINE REMINDERS

IAC 2015 Deadline for submission of proposals: **29 June 2012**

IAC Virtual Forum - Call for Abstracts: **15 July 2012**

IAC Early Registration: **1 August 2012**

Luigi G. Napolitano Award applications: **29 August 2012**

IAF Call for Officers nominations: **1 September 2012**

IAC Manuscript submissions: **12 September 2012**

IAC Online Registration: **21 September 2012**

IAC Presentation submissions: **26 September 2012**

## UPCOMING EVENTS

**International Astronautical Congress 2012** (Naples, Italy, 1-5 October 2012)


**INTERNATIONAL ASTRONAUTICAL FEDERATION**
94bis, avenue de Suffren, 75015 Paris, France - Tel. +33 1 45 67 42 60 - E-mail: newsletter@iafastro.org

# IAF at the National Space Symposium

The Federation increasingly sees the National Space Symposium in Colorado Springs, USA, as a useful platform to reinforce the IAF's business focus and improve the organisation of its International Astronautical Congress.

The NSS is the premier space industry conference in the U.S., and among the most advanced in terms of organisational know-how. It is also the venue for presentation of the prestigious Space Foundation awards. This year's event, which took place 16-19 April, drew over 9,000 participants and 600 students, and attracted a record 150-plus exhibitors.

The IAF first took an interest in the symposium in 2011, when then-Executive Director Philippe Willekens attended. Based on his enthusiastic report, it was decided to send an enlarged delegation this year headed by new Executive Director Christian Feichtinger and Deputy Director Philippe Moreels.


**Credit: Space Foundation**

**Dr. Neil DeGrasse Tyson, Credit: Space Foundation**

"We see the NSS as an opportunity to learn how this major U.S. space conference is organised, and whether some of the features might be applicable to our IAC," Dr Feichtinger said. "But most importantly, we see it as a means to meet with U.S. members and find ways to improve our pitch to U.S. industry, particularly big corporations. The membership base in North America is not what it should be, compared to its role in the world space sector, and we think we can leverage the NSS, in conjunction with IAC 2014 in Toronto, to change that."

The delegation had face-to-face meetings with a number of organisations, including the Boeing Company, the United Launch Alliance, Sierra Nevada Corp and Space Adventures. It also approached dozens of others, including agencies and organisers interested in applying to host IAC 2015 and 2016. Several indicated their intention to join the IAF.

This year's NSS served as a benchmark and yielded a large number of ideas to enhance the IAC; to make it more business friendly, further improve plenary events and exhibition, and introduce new initiatives, e.g. a Space Career Day to leverage the exceptionally large number of young people attending the Congress.

# IAF at Space Propulsion, Bordeaux


**Participants of the Space Propulsion 2012, Credit: AAAF**

As part of a new policy to reinforce the Federation's role as the leading space advocacy and expert networking body, and find new ways to serve member needs, the Federation supported the Third International Conference on Space Propulsion, which took place in Bordeaux 7-10 April.

Participation in the four-day event, sponsored by the French Aeronautics and Astronautics Association (AAAF), French space agency CNES and the European Space Agency, also served to tighten IAF ties to industry and in particular to the space propulsion community.

IAF Executive Director Christian Feichtinger addressed the conference, as did ESA General Director Jean-Jacques Dordain, AAAF President M Scheller and Conference Chairs Giorgio Saccoccia and Pierre-Guy Armand.

Propulsion is one of the chief technology enablers in the space industry, a critical element for launchers, satellites, orbital modules and space transportation systems alike. Without progress in this area, growth in telecommunications, remote sensing, navigation science, exploration and other space applications would be stifled and the potential promise of commercial space could not be realised.
The central role played by propulsion systems makes them a decisive element in national space development plans, and thus a crucial factor in competition between space faring nations. But propulsion is also a critical factor in plans to heighten cooperation in space. Talks to forge an international alliance to explore the Solar System or expand the life of the International Space Station are a case in point.

Space propulsion is also critical to resolving a number of issues of special concern to the space community. Propulsion systems greatly impact launch cost, for instance, and contribute to atmospheric pollution and orbital debris. Major enhancements in engine and rocket design, as well as propellant make-up can therefore serve to considerably augment the safety and flexibility of space operations. At the same time it improves the economics of the space industry overall, and way the public views this.

The importance of propulsion system engineering and design, in turn, has made engine and rocket makers among the most dynamic in the high tech sector. Their extensive and fast-growing research, development and production capabilities are a major driver of economic growth and contribute greatly to income and employment in the nations, regions and localities in where they operate.

It therefore comes as no surprise that space propulsion occupies a key position within the IAF. It figures prominently in the technical programme presented at each annual International Astronautical Congress, and many of the programmatic and technical issues raised in Bordeaux will also be on the agenda of the upcoming IAC in Naples, Italy. A high number of papers was received for the propulsion symposium in Naples, and a new session on more advanced concepts and new design philosophies is scheduled.

The IAF's dedicated Space Propulsion Technical Committee tracks new trends in the propulsion sector and assesses their future impact. The committee makes it a priority to ensure that the IAC's technical programme reflects upcoming trends in the field. A new idea being explored is to introduce presentations with a more systemic focus – for example, reviewing progress in mixed propulsion technologies. Another is to provide opportunities to atexplore the interactions between propulsion, on the one hand, and spacecraft and mission design, on the other.

## IAF Multiplying Conference Participation

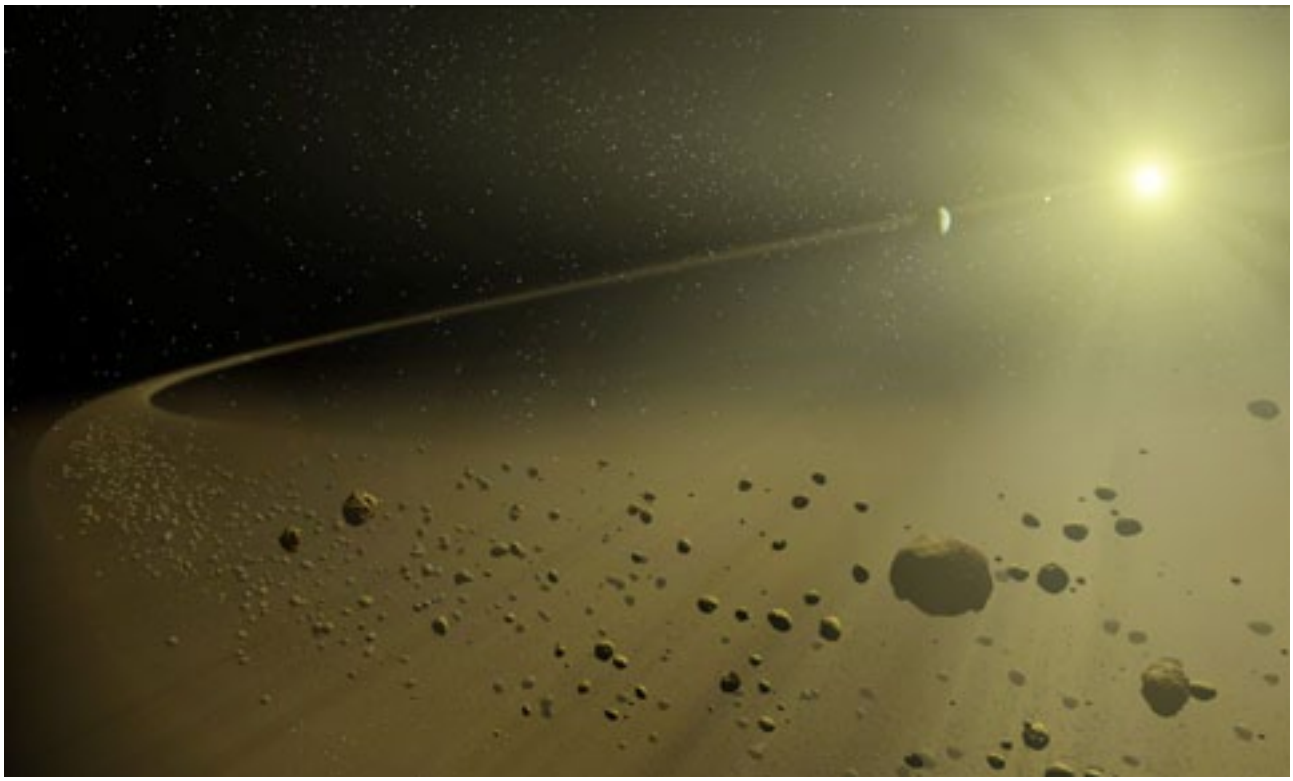
In addition to expanding its presence at major events like the NSS and the Space Propulsion Conference in Bordeaux, the new IAF management team is committed to showing the flag at as many smaller forums as possible to broaden the Federation's footprint, particularly in industry, and boost membership rolls.

After NordicBaltSat in February, top officials attended the 1st Industry Conference on UN Security Council Resolution 1540 in Wiesbaden, Germany and this year's Canadian Space Commerce Association National Conference.

The Resolution 1540 event, organised on 23-25 April by the UN Office for Disarmament Affairs, in cooperation with the German government and with funding from Norway, the U.S. and the European Union, addressed ways industry could cooperate with government to establish domestic controls to prevent the proliferation of these weapons of mass destruction and their means of delivery.

The Canadian Space Commerce Association (CSCA) conference, held in Ottawa on 28 March, focused on the impact of budget austerity on the country's critical space infrastructure, and on how to address impending budget shortfalls.

"In addition to reinforcing our Canadian presence, the CSCA event was an ideal place to make initial contacts for IAC 2014," noted IAF Executive Director Christian Feichtinger. The 2014 congress was awarded to Toronto on 2 April this year.



# IAF ANNOUNCED WINNERS OF THE EMERGING SPACE LEADERS PROGRAMME

## On 30 April, the IAF revealed the recipients of the 2012 Emerging Space Leaders Grants, which allow them to participate in the 2012 International Astronautical Congress in Naples, Italy.

These grants, formerly known as the Youth Grants, provide an opportunity for outstanding students or young professionals, particularly from developing space nations, to participate in the IAC, the UN/IAF workshop and the Space Generation Congress, taking place during the week preceding the Congress. Applicants must be 21-35 years of age and are expected to present a paper at the IAC or to participate in the Next Generations plenary.

A total of 95 applications from 30 countries were received for the Emerging Space Leaders Grants, 13 more than last year. The twelve recipients are:

**Dmitry Arakcheev**, Russia. Arakcheev, who graduated from the D. Mendeleev University of Chemical Technology of Russia in 2008, works at the Research and Design Institute of Chemical Engineering in Moscow.

**Olavo De Oliveira Bittencourt Neto**, Brazil. De Oliveira Bittencourt Neto works as a post-doctorate researcher at the University of Sao Paolo, Brazil. He is a member of the Brazilian association for aeronautics and space law and the International Institute of Space Law (IISL).

**Aafaque Khan**, India. Khan is completing a Bachelor's degree in mechanical engineering at Maulana Azad National Institute of Technology, India.

**Elizabeth Blaber**, Australia. Blaber graduated with a Bachelor of Medical Science from the University of New South Wales, Australia. In 2010, she started a PhD programme in biochemistry and molecular genetics.

**Conny Hansson**, Sweden. Since completing his PhD at the University of Manchester, UK in 2010, Hansson has been working as a research fellow at the European Space Agency's ESTEC engineering centre in the Netherlands.

**Dusan Marceta**, Serbia. Marceta is an associate professor in the Astronomy Department of the Faculty of Mathematics at the University of Belgrade, Serbia.

**Magaly Sandoval**, Costa Rica. Sandoval is studying mechatronic engineering at the Costa Rica Institute of Technology. She is a board member of the Central American Association of Aeronautics and Space.

**Rogel Mari Sese**, Philippines. Sese heads the Astrophysics Laboratory of the University of the Philippines Los Banos. He is chairman of the South East Asian Young Astronomers Collaboration.

**Nathan Silvernail**, USA. Silvernail is studying mechanical engineering at the Embry Riddle Aeronautical University, USA.

**Balbir Singh**, India. Singh is an assistant professor at the Manipal Institute of Technology at Manipal University, India.

**Vladeta Zmijanovic**, Serbia. A graduate of the Faculty of Mechanical Engineering at the University of Belgrade, Serbia, Zmijanovic is completing a PhD at the Ecole Doctorale des Sciences et Technologies at the University of Orleans, France.

**Medinah Zubairu**, Nigeria. Zubairu has a Master of Science from Nigeria's Hmadu Bello University. She is an intern at the National Space Research and Development Agency in Nigeria.

# IAF INTRODUCES YOUNG SPACE LEADERS RECOGNITION PROGRAMME

## With this new programme, IAF honors young space enthusiasts

Early in the spring, the IAF announced the winners of the 2012 Young Space Leaders Recognition Programme. These awards are issued to students and young professionals who in the course of their academic or professional activities have helped promote astronautics by enhancing outreach opportunities, expanding knowledge of space among the general public or fostering deeper engagement within the international space community. This new programme generated considerable interest among IAF member organisations, which translated into a large number of highly-qualified nominations. A total of 57 applications were received for the awards.

The five winners will be presented during the Closing Ceremony of the 63rd International Astronautical Congress in Naples, Italy on 5 October. They will also

**Applications for the 2013 Emerging Space Leaders Programme and the 2013 Young Space Leaders Recognition Programme will open in late 2012. Please visit the IAF website for more information.**

be invited to the event's gala dinner as guests of honor of the IAF President, Prof. Dr Berndt Feuerbacher. The five winners are:

**Ariane Cornell**, Executive Director of the Space Generation Advisory Council, where she is responsible for operational activities and representing the Council at the United Nations and other international organisations. Cornell has helped organise IAF/IAC activities concerning the IAF Emerging Space Leaders programme and assisted in the organisation of various IAF Regional Groups. In addition, she participates in the IAF Workforce Development/Young Professional Programme and Space Education and Outreach Committees.

**Agnieszka Lukaszczyk**, Brussels Office Director for the Secure World Foundation, where she spearheads and actively facilitates international dialogue on space policy. A former Chair of the Space Generation Advisory Council known throughout the space industry as a thoughtful leader and collaborative facilitator, Lukaszczyk works closely with the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) and the UN Office of Outer Space Affairs (OOSA). She has been closely involved in the IAF's Emerging Space Leader activities and has helped organise IAC Young Professionals' events. Lukaszczyk also actively participates in several IAF technical committees and has served as a rapporteur during a number of IAF technical sessions at the IAC.

**Nicolas Peter**, Exploration Strategy Officer in the Director General's Cabinet at the European Space Agency (ESA) and Secretary of ESA's Human Spaceflight, Microgravity and Exploration Programme Board. A graduate of George Washington University (GWU), the International Space University and the Université Louis Pasteur in Strasbourg, Peter has worked as a Research Fellow at the European Space Policy Institute and the X Prize Foundation, and as a Research Assistant at the Center for International Science and Technology Policy - Space Policy Institute at GWU. Peter serves as Secretary of the IAF Space Security Committee and has acted as both co-chair and rapporteur in a number of IAF technical sessions organised over the last several years.

**Kevin Stube**, Program/Project Manager and Project Analyst at the NASA Ames Research Center, where he provides technical integration and programme and project support to the Exploration Technology Directorate. Stube serves as Vice Chair of the Workforce Development/Young Professional Programme Committee and is a member of and participates in the Entrepreneurship and Investment and ITACCUS Committees. He helped the IAF organise its first Young Professionals Programme during the 2006 IAC in Valencia and has managed and actively contributed to subsequent IAF Young Professional Programmes in each of the ensuing years.

**Danielle Wood** recently completed her PhD at the Massachusetts Institute of Technology, USA, and is now working as a post-doctoral researcher at the Applied Physics Laboratory at John Hopkins University. Wood is researching how developing countries are building their first satellites through partnerships with more established firms in other parts of the world and, in the process, grow an internal domestic capability for engineering a satellite system. She proposed, organised and continues to manage a networking platform helping past and newly-selected IAF Emerging Space Leaders keep in contact with each other and with the IAF. She also actively assists with the organisation and conduct of the IAF Space Educator Professional Development Programme, initiated in 2010.

IAF members from around the globe announce recent news, noteworthy accomplishments, forthcoming events or programmes and other items of interest affecting their organisation

## AIAA ANNOUNCES 2012 HONORARY FELLOWS

Each year, the **American Institute of Aeronautics and Astronautics (AIAA)** confers the title "Honorary Fellow" on three leading luminaries from the world of aerospace. The AIAA Honorary Fellow award recognises those who have had long and highly-contributory careers in aerospace and who embody the highest possible standards in aeronautics and astronautics.

This year, AIAA has conferred the distinction of Honorary Fellow on: Arnold D. Aldrich, Aldrich & Associates; Dr Paul D. Nielsen, Software Engineering Institute; and Robert J. Stevens, Lockheed Martin Corporation. They received their awards on 9 May at the AIAA's annual Aerospace Spotlight Awards Gala, a celebration that also recognises AIAA Fellows and other AIAA awards.

AIAA has designated 203 Honorary Fellows since naming Orville Wright its first on 26 January 1933. Others earning the accolade include: Joseph S. Ames, Neil Armstrong, Hugh L. Dryden, Sam F. Iacobellis, Wernher von Braun, and Theodore von Kármán.

**Arnold D. Aldrich**

**Dr Paul D. Nielsen**

## ARIANESPACE TO THE POWER OF 3!

The **Arianespace** family is now complete, following two successful inaugural launches of the Soyuz medium-lift rocket at the Guiana Space Center in 2011 and the successful qualification flight of the Vega light launcher in February 2012.

The new vehicles join the heavy-lift Ariane 5, which has been operating from Europe's Spaceport since December 1999. These three launchers allow Arianespace to launch any payload to any orbit, such as communications, scientific and Earth observation satellites, as well as constellations and supply vehicles for the International Space Station.

Arianespace also provides guaranteed access to space for all their customers, including space agencies, governments and private companies. This was recently demonstrated by a launch agreement with the European Space Agency and the European Commission to orbit the second batch of Galileo satellite navigation satellites on the Ariane 5.

**Ariane 5 - ATV 3 lift-off**

The Ariane 5 completed its second mission of the year on May 12, orbiting the JCSAT-13 and VINASAT-2 communications satellite. The first, on March 23, saw the launch of the third Automated Transfer Vehicle (ATV3) to the International Space Station. The next Ariane 5 launch, carrying the MSG-3 weather satellite and Echostar XVII broadband spacecraft, is set for liftoff in the beginning of July.

A total of 10 launches are scheduled at the Guiana Space Center in 2012. Arianespace currently has a backlog of 22 missions for the Ariane 5, 15 for the Soyuz and 2 for Vega, representing more than 3 years' worth of business.

## AZERBAIJAN PREPARES FIRST SATELLITE LAUNCH

The **National Aerospace Agency of Azerbaijan** is in the final phase of preparations for the launch of the country's first satellite. The unit, a 36 transponder communications satellite supplied by Orbital Sciences Corp. using its STAR-2 bus, will be launched by Arianespace towards the end of 2012 to an orbital slot at 46 E. Long., owned by the government of Malaysia.

Known as Azerspace/ Africasat 1A, the spacecraft will provide C-/Ku band communications services to Azerbaijan, Central Asia, Europe, the Middle East

and Africa under an agreement by the Azerbaijan and Malaysian governments to jointly develop the 46 deg. orbital slot. A large portion of capacity will be preleased to Malaysian satellite operator Measat.

The space segment of the $200 million project is being financed by the U.S. Export-Import Bank. GMV of Spain is supplying the ground segment, including satellite control facilities in Azerbaijan and Malaysia.

Azerspace/Africasat-1A is the first element of a comprehensive national space plan, "Creation of Space industry in the Republic of Azerbaijan and a Lunching Telecommunication Satellites into Orbit", approved by the President of the Republic. The plan also includes two other satellites - a second telecommunications spacecraft and a remote sensing satellite—and development of space applications. Current space activity mainly concerns scientific research and the development of systems for receiving, processing and utilising remote sensing data. The country also develops measurement systems and spectrophotometric devices for satellite ground testing.

Remote sensing requirements are mainly geared to natural resource and land use management, environmental monitoring and the monitoring and forecasting of natural disasters. The current primary focus is on issues related to forest resource inventory and the creation of a monitoring system for the Caspian Sea. The rapid development of the oil and gas industry, however, is creating other requirements, in particular for mapping, leak monitoring/detection and monitoring of offshore oil spills.

The communications satellite programme is driven by a strong demand for digital television and radio, internet access, information exchange and international telephony, as well as by the government and energy sectors.

## BOEING COMPLETES NEW CCDEV DROP TEST

On 2 May, the **Boeing Company** successfully completed the second of two drop tests for its reusable CST-100 spacecraft, proposed for NASA's Commercial Crew Development (CCDev) program. The CST-100 is designed to transport up to seven people, or a combination of people and cargo, to Low Earth Orbit (LEO).

**Final drop test for Boeing's CST-100 spacecraft at an altitude of 4.3 km**
**Credit: Elizabeth Morrell/Boeing**

The test article, dropped from a helicopter at 14,000 feet over the Nevada desert, demonstrated the entire landing system, including drogue parachute and main parachute deployments, and soft-ground landing cushioned by six inflated air bags. Other aspects of the system had been tested or demonstrated previously over the course of similar capsule operations and demonstrations. Leveraging its unmatched legacy in human spaceflight and commercial airplanes, Boeing is one of four companies participating in Phase 2 of the CCDev initiative, which seeks to shift responsibility for ensuring U.S. access to the International Space Station to the commercial sector. Using commercial vehicles to replace its now-retired space shuttle fleet will enable NASA to focus its own resources on human exploration beyond Earth orbit, and ultimately to Mars.

Boeing has completed 40 milestones to date, including a Preliminary Design Review in February. This summer, NASA is expected to award the third phase of CCDev Space Act Agreements – Commercial Crew Integrated Capability – the next step in the process toward regular ISS operations. The operational phase is expected to begin by 2016-17.

## NEW AWARD FOR CZECH SPACE ALLIANCE

Frentech, a member of the **Czech Space Alliance (CSA)**, has landed a contract with Thales Alenia Space to develop solar panel deployment mechanisms for the Iridium Next satellite constellation. Development and supply of the mechanisms for the 84 Iridium Next satellites is worth about 1.8 billion Euros - the biggest commercial space contract in Czech history.

With this award, the CSA is now well on its way to fulfilling the six evaluation criteria set out in the Czech Republic's new National Space Plan (NSP), established in 2010 to improve space governance. One of the criteria to be implemented by 2016, is to achieve a sustainable commercial space activity.

Under the leadership of the Ministry of Transport, the management of the European Space Agency (ESA) and the European Union space activities in which Czech organisations are involved has undergone a major transformation,

leading to more transparency, open competition and consensus seeking in decision making. CSA members have now won over 40 ESA projects, corresponding to 80% of the Czech space industry's budget.

## CIDA-E BACKS URUGUAYAN SPACE AGENCY

**CIDA-E** is collaborating in an Uruguayan Air Force initiative aimed at creating a national space agency. A draft bill to this effect was circulated for comment by the Ministry of Defence in February and is hoped to be submitted for parliamentary approval before the next presidential elections in 2014. The mission of the proposed agency would be to centralise, channel and coordinate all space science and technology activities undertaken in Uruguay, and promote and support their development.

An initial student cubesat is already under construction at the Faculty of Engineering, and recently received financial backing from state communications company Antel. The spacecraft, now named AntelSat, is to be orbited from Kazakhstan in 2013.

One of the first objectives of the new space agency would be to elaborate a National Space Plan.

## CIRA PLAYS LEADING ROLE IN AEROSPACE RESEARCH

From the design of innovative and environmentally friendly aviation and space propulsion systems to research in guidance, navigation and control systems, **CIRA** is active on all fronts of advanced aerospace research. Through its unique skills and facilities, it has played a significant role in the development of new systems such as Vega, the new European light launcher. The Center also participates in key European and international research programmes, such as Clean Sky. It cooperates with the world's leading aeronautics and space players in both industry and government, from Boeing to Airbus and from NASA to ESA and JAXA.

Current near-term CIRA research will bring significant improvements to Vega and test an advanced winged reentry vehicle capable of autonomous orbital re-entry.

## IAASS PLANS NEW SAFETY CONFERENCE AND COURSES

The **International Association for the Advancement of Space Safety (IAASS)** is organising the 6th IASS International Space Safety Conference, to be held in Montreal, Canada on 21-23 May 2013. The conference will be entitled "Safety is Not an Option."

IAASS safety conferences offer an opportunity to reflect and exchange information on a number of topics, of both national and international interest, pertaining to space safety and sustainability, and serve as a forum for promoting mutual understanding, trust and the widest possible international cooperation in such matters.

The Association also has planned three professional courses this year geared to reinforcing the safety of space operations. The first, on Payload Design and Operational Safety, took place in Friedrichshafen, Germany on 11-15 June; the second, on Quality Assurance for Space Products, in Athlone, Ireland on 26-29 June; the third, concerning Safety Considerations in the Design and Manufacture of Composite Overwrapped Pressure Vessels, will take place at Kennedy Space Center, Florida on 7-12 August.

In early 2013, the Association will bring out a new university textbook, "Safety Design of Space Operations," that will be the first ever to cover all aspects of space operational safety, from ground launch preparation to launch, on-orbit operations and reentry. The book, published with Elsevier, is intended as a follow-up to "Safety Design for Space Systems," published in 2009 and currently the reference in the field. In 2011, this work was translated into Chinese.

The IAASS is a non-profit organisation dedicated to furthering international cooperation and scientific advancement in the field of space systems safety. IAASS is a member of the International Astronautical Federation and a Permanent Observer at the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS).

The Association's mission is to help shape and advance an international culture of space safety – covering technical, organisational and socio–political aspects – that can contribute to making space missions, vehicles, stations, extra-terrestrial habitats, equipment and payloads safer for ground personnel, crews, flight


**Polluce: the second flying test bed of the USV Program**

participants and the general public. The Association also pursues measures aimed at safeguarding the orbital environment to allow unimpeded access to space for future generations.

The international nature of the organisation reflects the reality of an industry whose effects goes beyond national borders. IAASS therefore promotes the establishment of an international regulatory system modeled on the one adopted more than 60 years ago for civil aviation and which has proved highly successful.

In addition to its other activities, the IAASS publishes the *Space Safety Magazine*, a print and online publication fully devoted to promoting the safe and sustainable use of space. With nearly 20,000 hits a month and a constant stream of daily updates, the Space Safety Magazine is rapidly raising public awareness of issues related to the safety and sustainability of space operations.

To know more about the IAASS, visit www.iaass.org and www.spacesafetymagazine.com.

## IISC PREPARES REPORT ON SPACE COOPERATION

The **International Institute for Space Commerce (IISC)** is preparing to bring out a new report on international cooperation in space. The report, currently at the final editing stage, is the latest of a series of studies and reports published by the Isle of Man-based institute and available at www.iisc.im. Founded in 2007, the IISC is a think-tank specialised in the "New Space Economy."

## ILOA ADDS GALAXY FORUM EVENTS

The **International Lunar Observatory Association's** Galaxy Forum programme – an emerging architecture for advancing space education – completed a break-out year in 2011, with 11 successful events in Hawaii, California, Kansas, New York, Canada, China, India, Japan and South Africa. For 2012-2014, the programme is adding events in Europe, Africa, South America, the Crescent Moon Countries and Antarctica.

The mission of ILOA, a Hawaii-based educational enterprise, is to expand human understanding of the Cosmos through observation from the Moon. ILOA is currently supporting four lunar missions: ILOA/Chang'e-3 Galaxy Imaging, in collaboration with the National Astronomical Observatories of China and the Chinese Academy of Sciences (NAOC/CAS), to be launched in 2013; the ILO-X Observation and Communication Precursor for Galaxy First Light (GFL) Imaging, together with Moon Express Canada Inc. (2014); ILO-1 Observation and Communication GFL Imaging/Exploration and Lunar Broadcasting at the Moon's South Pole, with MDA Canada/Odyssey Moon (2015); and a Human Moon Mission, in cooperation with various independent, national and international enterprises (by 2020).

## ITALY TO PROVIDE RADAR SOUNDER FOR JUICE

Italy, led by **Italian Space Agency ASI**, will have a key role in the JUpiter Icy-moons Explorer (JUICE), the first large-class mission selected for the European Space Agency's Cosmic Vision 2015-25 science programme. The primary Italian contribution to JUICE, which was approved in early May, will be a radar sounder conceived by a team of scientists led by Prof. Lorenzo Bruzzone of the University of Trento. The sounder will be tasked with studying the underlying geology and geophysics of two Jovian moons – Europa and Ganymede – that are thought to harbor sub-surface oceans. In addition to searching for the presence of water, the instrument will measure the thickness of the icy crust of Europa, where the JUICE spacecraft will fly by twice, and analyse the interior of Ganymede, where the orbiter will orbit during the latter part of its three-year mission.

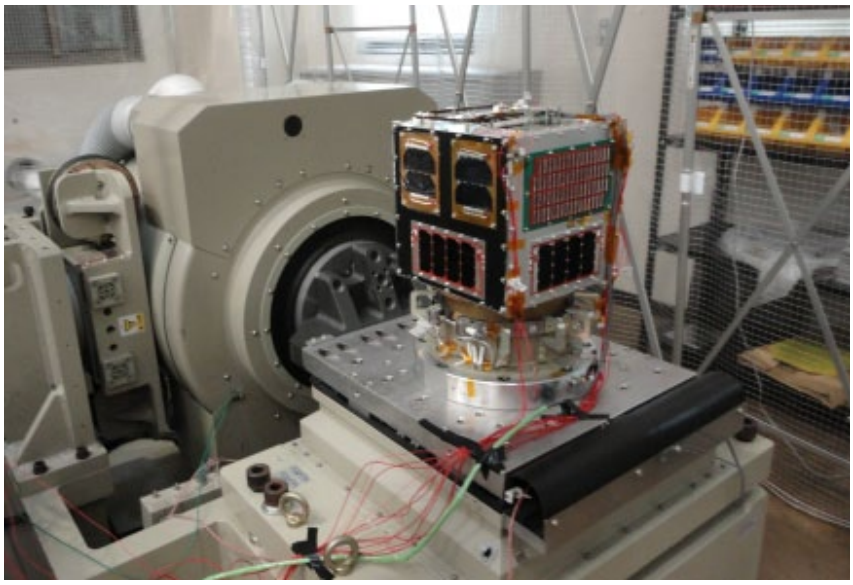
JUICE is to be launched in 2022 aboard an Ariane 5 rocket and will reach Jupiter in 2030.

## ISU : A 25-YEAR SUCCESS STORY

For its 25th anniversary, on 12 April 2012, The International Space University saw a spectacular growth in applications. As an example, for the next SSP session in Florida more than 750 applications were received and, when the risk became real that the class size would reach over 145 SSP participants, waiting lists had to be created. A similar development is taking place in the Master curriculum with an increasing number of applicants from all over the world. For potential participants from emerging space countries, however, the present financial situation is a strong barrier and several avenues are studied to sponsor them. Recent questionnaires have shown that the presence of an increasing number of hands-on facilities in ISU is both appreciated by the alumni, as well as by the sponsors, encouraging the ISU management to further develop such activities.

## KYUTECH LAUNCHES NANOSAT

Japan's **Kyushu Institute of Technology (Kyutech)** has entered the ranks of universities capable of building and launching nanosatellites. Its first nanosat, HORYU-II, was launched on 18



**Flight model of HORYU-II under virbration test at CeNT Kyutech**

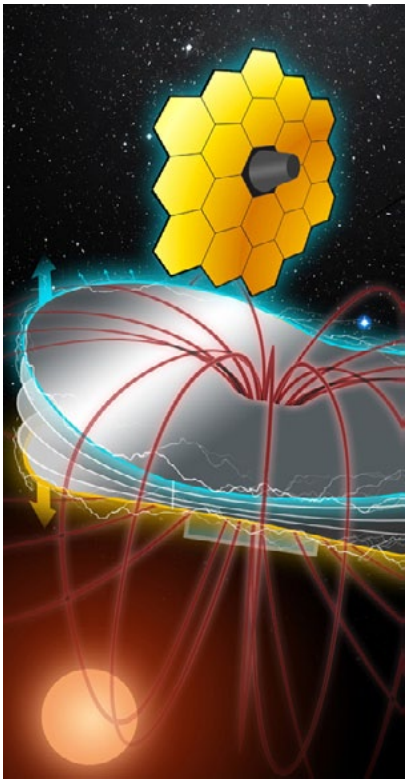
May atop a H2A rocket. The 7 kg spacecraft is the first satellite of any size to employ 300V photovoltaic power generation.

The nanosat programme utilises the facilities of Kyutech's Centre for Nanosatellite Testing (CeNT), created in 2010 within the university Laboratory of Spacecraft Environment Interaction Engineering (LaSEINE). LaSEINE is a special research centre dedicated to spacecraft charging, material degradation and hypervelocity impact established in 2004. CeNT's primary function is to support environmental testing for micro and nano satellites up to 50cmx50cmx50cm and 50kg. CeNT also runs a doctorate programme in nanosatellite development and testing that provides on-the-job training opportunities for graduate students from developing countries, in collaboration with the United Nation Office of Outer Space Affairs. In addition, the centre is leading a project to establish international standards for micro and nanosatellite testing.

## NIAC: EXCITING CONCEPTS FOR NEW AEROSPACE POSSIBILITIES

The **NASA** Innovative Advanced Concepts (NIAC) Program, managed within NASA's Office of the Chief Technologist, supports early studies of visionary aerospace architecture, mission and system concepts.

NIAC supports two phases of study, both competitively selected though competition. Phase I studies are one-year efforts to assess basic feasibility and properties. Phase II supports up to two more years of study to further develop and analyze the most promising Phase I concepts, and explore potential infusion options. In 2011, NIAC initiated 30 Phase I studies.



**High-temperature Superconductors as Electromagnetic Deployment and Support Structures in Spacecraft. Credit: NASA**

See www.nasa.gov/niac for more information, including public presentations and later reports. It expects to announce 2012 studies in August, and to present their progress in regular public meetings.

NIAC welcomes all interest in its programmes and wishes to learn about advanced concepts programmes in other space and research agencies. International participation is permitted, subject to no-exchange-of-funds conditions, and NIAC is open to discussing potential collaboration. For enquiries, please email: hq-niac@mail.nasa.gov.

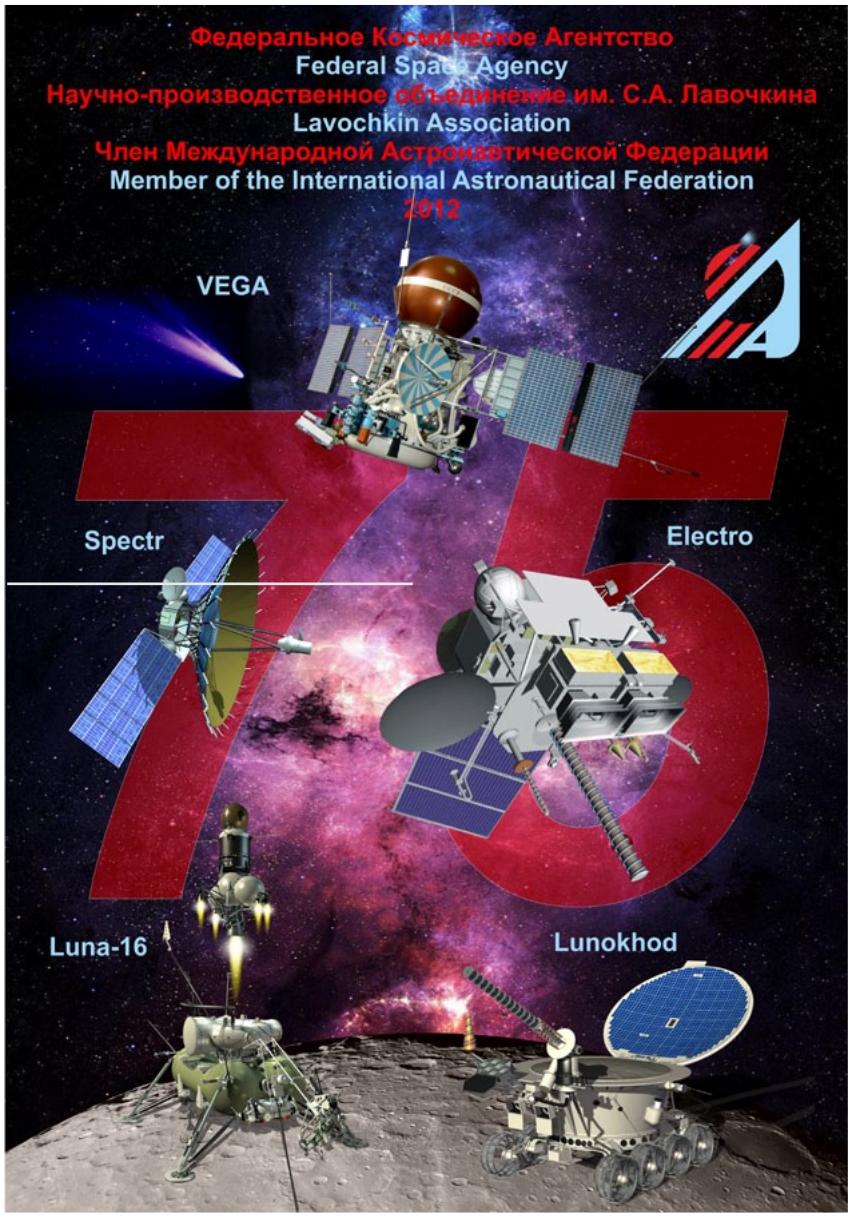
## LAVOCHKIN ACTIVE IN RUSSIAN SPACE PROGRAMME

The first landing on another planet, the first Moon rover "Lunokhod", the first return of Moon soil samples, the first balloon probe to Venus – these are among the world's first where Lavochkin has had a major role.

Today the company is involved in the development of the next generation of Russian unmanned spacecraft, in new multipurpose platforms such as "Navigator", "Flagman" and "Karat," and in small satellite bus designs.

A number of new science missions are also underway; among them "Luna-Resource", "Luna-Glob", "Mars-Net", "Spektr-RG", "Spektr-UF", "Sokol-Laplace", "Apophis" and "Venera-D."

The "Fregat" upper stage developed for the Soyuz rocket is widely used for domestic and foreign spacecraft launches, both from Russian cosmodromes and




from the European Space Centre in Kourou, French Guiana.

"Electro-L" SC was launched in 2011 and is currently operating in Earth orbit.

The "Spektr-R" astro-physical spacecraft was also orbited last year.

## PAKISTAN SPACE AND UPPER ATMOSPHERE RESEARCH COMMISSION GROWING FAST

**SUPARCO**, the national space agency of Pakistan, carries out R&D activities in space science and technology and fosters national capabilities to enable the country to reach self-reliance in space technologies for national development. Over the years, it has designed and developed two experimental satellites and established the infrastructure necessary for developing satellites and ground equipment.

SUPARCO is currently involved in the design, development, launch and operation of the PAKSAT-1R communications satellite, in collaboration with China; establishing space centres for the design, development and testing of small- and medium-size satellites for communication and remote sensing applications; upgrading TT&C and satellite ground station

**Paksat IR Launch**

infrastructure; building state-of-the-art facilities to develop user-oriented space application programmes; and supporting projects providing services to national and international organisations working in Pakistan.

Future goals include developing the capability to locally design, develop, fabricate, manufacture, launch and operate satellites and market their services and products to national and international users.

## RCAS FOCUSES ON COLLABORATION

The Research Center for Aeronautics and Space (RCAS) was established in 2001 within the **University POLITEHNICA of Bucharest**. Conceived as a bridge between the theoretical research world and the practical domain, the RCAS aims to develop close links between major companies, SMEs, research institutes and institutes of higher education through specific research projects; help industry exploit new advanced aerospace technologies; and stimulate participation in research initiatives of the European Union.

Space capabilities cover integrated aerodynamics, control systems and structural design; thermo-hydraulic systems, analysis and design; propulsion systems; and small satellites and launchers.

Projects include development of a multi-stage low orbit launch system based on unconventional fuels (VLS-DS/CN) and participation in the Microsatellite European Space Moon Orbiter (ESMO), an international university project funded by the European Space Agency.

## NVR ANNOUNCES NEW WEBSITE, SPACENED AGREEMENT

**The Netherlands Space Society (NVR)** has introduced a new user-friendly and bilingual website (www.ruimtevaart-nvr.nl) designed to help the organisation communicate more efficiently with its members. The technological upgrade has also boosted the NVR's outreach on social media – a particularly effective medium for connecting with a nation historically passionate about space activities. The outreach effort is especially important now that Dutchman (and NVR Honorary Member) André Kuipers is on his second tour aboard the International Space Station.

The NVR also recently signed a Memorandum of Understanding with SpaceNed, the association of Netherlands-based space companies. The agreement will ensure that future lecture programmes, symposia, movie nights and other events can be synched and have a greater impact and reach.

The NVR is one of IAF's oldest members and celebrated its 60th anniversary last December. It serves as a vibrant networking platform for all those involved in the space sector in The Netherlands, whether they are students, young or more experienced professionals, retirees or 'space fanatics', and organises special events to enable them to benefit from each other's experience and know-how. The NVR now counts more than 700 members, including around 25 companies.

## SIRIUSXM SHOWING STRONG SUBSCRIBER GROWTH

Satellite radio services in North America continues to add subscribers, expand programming and evolve services. **SiriusXM** Radio added 405,000 subscribers in the first quarter of 2012, raising the total to a record 22.3 million subscribers in the United States. SiriusXM Canada, a separate company, counts more than 2 million subscribers in Canada.

With auto sales in the U.S. exceeding expectations, SiriusXM now anticipates a net gain of 1.5 million subscribers for 2012, instead of the 1.3 million previously forecast. The company expects to end the year with revenues of $3.3 billion.

Launch of a new satellite, Sirius FM-6, is planned in the second quarter of 2013, atop an International Launch Services Proton rocket, to help ensure continuous and reliable delivery of SiriusXM's critically-acclaimed audio entertainment and data service. However, it may be sent aloft earlier if a launch slot opens up.

SiriusXM gives subscribers access to commercial-free music, and premier sports, news, talk, comedy and entertainment content. It has now added several new channels, including the most comprehensive Latin programming line-up available on radio. Satellite radio subscribers can also get premium data services and information, including traffic speed and incident information, fuel pricing and station information, regional and national weather forecasts, ski resort conditions, stock information, sports score updates, movie listings, synopsis and theater locations. Each data feature is geo-coded to the vehicle's current location.

## SGAC COMPLETES FIRST FUSION FORUM

The **Space Generation Advisory Council (SGAC)** has successfully completed its newest international event for university students and young professionals, the inaugural Space Generation Fusion Forum. Held 15 and 16 April in conjunction with the 28th Annual National Space Symposium in Colorado Springs, USA, the two-day event included keynote speeches from the Deputy NASA Administrator, Lori Garver, and the Senior Vice-President, General Counsel & Secretary of The Aerospace Corporation, Malissia Clinton, as well as numerous addresses from space industry and agency executives from five


**Delegates at Space Generation Fusion Forum**

different countries.

The Fusion Forum, which was attended by 50 delegates from 20 countries, also included three intense interactive panel discussions focusing on the topics of "International Collaboration: From Space Situational Awareness to Exploration," "Developing Regions and Space Applications" and "The New Role of Commercial Space Flight."

The event was hosted by the Space Foundation and received participatory support from NASA, the Federal Aviation Administration's Center of Excellence for Commercial Space Transportation and the American Institute of Aeronautics & Astronautics. With the First Fusion Forum now history, SGAC is continuing to pursue its tradition of holding high-standard international events by hosting the 11th Annual Space Generation Congress, to be held in conjunction with the 63rd International Astronautical Congress in Naples, Italy.

## SWF ANNOUNCES SCHOLARSHIPS FOR YOUNG PROFESSIONALS TO COME TO IAC

**Secure World Foundation (SWF)** is pleased to announce that it will accept applications from young professionals to support travelling to present papers at the International Astronautical Congress 2012. The goal of these scholarships is to provide young space professionals an opportunity to participate in one of the most prestigeous international space conferences to further their professional development and inject new ideas into the community.

For more information, please visit the SWF website at www.swfound.org.

## UND STARTING AEROSPACE PHD PROGRAMME

The **Department of Space Studies at the University of North Dakota's** John D. Odegard School of Aerospace Sciences, USA, is introducing a Doctor of Philosophy in its Aerospace Sciences programme aimed at providing future space scholars and leaders with the skills necessary to mix technology and science with an understanding of aerospace politics and economics.

The interdisciplinary programme, jointly managed with the School's Department of Aviation, will accept its first class in the fall of 2012. It will be open to students with a Masters or other graduate degree from an accredited institution and a grade point average of at least 3.25/4.0. The application deadline for this year's class was 31 May.

The Space Studies Department offers premier online and campus-based graduate-level courses in the field of space studies. Its Master of Science degree, offered since 1987, is one of the leading inter-disciplinary programmes in the world, combining space physical science, space life science, space engineering, space policy and law, space business and economics and space history. The popular programme is ideally suited for early and mid-level space professionals who wish to enhance their career opportunities in the space arena.

The Department of Space Studies is also the home of the NASA Space Grant and the NASA-EPSCoR programmes for the state of North Dakota. This has allowed it to become the nexus of NASA-related education and training infrastructure in the state. For further information, consult www.space.edu or contact Dr Santhosh Seelan at seelan@space.edu.

**Students in Space Studies Department at UND have an opportunity to work on NASA funded projects like the space unit development**

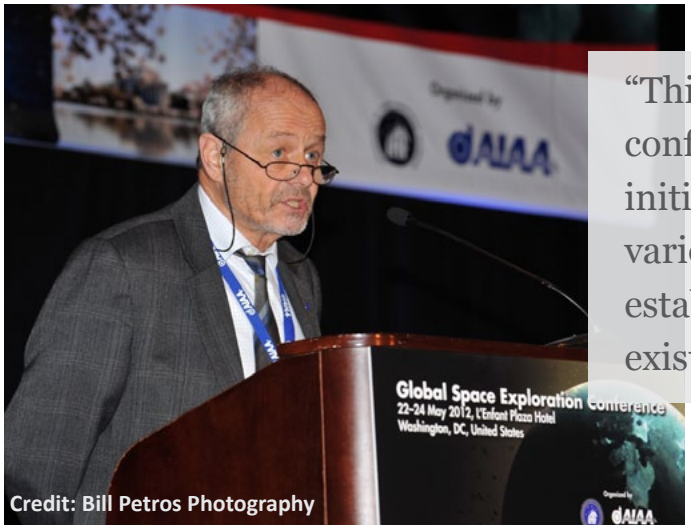
**Dear IAF Member,**

**If your organisation is also interested in sharing news and developments with the worldwide space community through the IAF Members' Corner, please send proposed entries to Juliane McCarty at juliane.mccarty@iafastro.org.**

**The deadline for submission for the next newsletter is 1 August 2012.**

# GLEX SURPASSES ALL EXPECTATIONS

The Global Space Exploration Conference, organised in Washington on 22-24 May by the IAF and the American Institute of Aeronautics and Astronautics, proved an even more outstanding success than anticipated.



Credit: Bill Petros Photography

> "This was a very successful conference. It succeeded in initiating dialogue between the various stakeholder communities, establishing links previously not existing."

The Global Space Exploration Conference (GLEX) was the first forum to bring together stakeholders from space agencies, industry, academia and the R&D community from every corner of the world, interested in putting together a sustainable international exploration effort. By fostering dialogue among these communities, GLEX became the perfect complement to the Third International Conference on Exploration, held in Lucca, Italy, in November 2011, and to the work of the International Space Exploration Coordination Group (ISECG).

The Conference drew over 630 attendants from academia, government and industry – far exceeding initial expectations. The heads of the Canadian, European and Russian space agencies were among the many participants. High level representatives from the Indian Space Research Organisation (ISRO), the Japan Aerospace Exploration Agency (JAXA) and National Aeronautics and Space Administration (NASA) also attended.

"I am extremely pleased with the results of our first AIAA/IAF Global Space Exploration Conference," said AIAA President Mike Griffin. "This event offered everything we could have desired – a highly diverse international group of scientists, engineers, managers, astronauts and operations professionals gathered together to discuss the future of space exploration. The atmosphere of energy and engagement was palpable, demonstrating the value that professional societies offer by hosting interdisciplinary events oriented around a common theme."

IAF President Berndt Feuerbacher also labelled the conference a huge success, noting that it managed "to initiate a dialogue between the various stakeholder communities" and "established links previously not existing."

Feuerbacher suggested that the immense enthusiasm generated by the conference will likely lead to a follow-on event in the not-too-distant future. "This was the first Global Space Exploration Conference, and it will not be the last. Depending

**Plenary 1: Heads of Space Agencies - Global Space Exploration Dialog**
**Credit: Bill Petros Photography**

IAF President Feuerbacher: "This was the first Global Space Exploration Conference, and it will not be the last. Depending on demand and timelines, IAF will consider continuing this dialogue."

**Junichiro Kawaguchi (JAXA) and Chris McKay (NASA) at "Human and Robotic Exploration: A scientific Perpective" Plenary. Credit: Bill Petros Photography**

on demand and timelines, IAF will consider continuing this dialogue."

GLEX included five plenary sessions, 35 technical sessions and six panel discussions and considered every aspect of exploration architecture, including possible exploration destinations for future missions, the technology needed to ensure mission success and the crucial need for continued international cooperation throughout the exploration enterprise. In particular, the conference gave the ISECG an opportunity to update the Global Exploration Roadmap and discuss possible mission scenarios.

Although the leading space powers agreed that any future exploration effort will require global collaboration and is likely to involve use of the International Space Station, there was some disagreement about what the objectives should be, and how they should be realised.

Roscosmos head Vladimir Popovkin suggested the next objective should be a permanent lunar base, building on the likely presence of water at the poles and 40 years of continuous scientific study. Other rising space powers, including India and Japan, agreed that the Moon should occupy a place of choice in the future exploration roadmap.

This position — roughly the same as the vision expressed by former US President George W. Bush — is at odds with new policy being pursued by the Obama Administration, which wants to shift the focus of exploration to Near Earth Objects.

Russia and the European Space Agency told participants that they intend to go ahead with a pair of joint missions in 2016 and 2018 to explore trace gases and the Martian subsurface as a possible prelude to a later sample return flight. The missions, which will be submitted for approval at ESA's next ministerial summit in November, had initially been planned with NASA.

The ISS partners have not yet reached a common opinion on whether and how to include other space-faring nations, notably China, in a global exploration initiative. A policy change mandated by Congress prohibits NASA from funding any project involving Chinese participation. Popovkin, ESA Director General Jean-Jacques Dordain and Canadian Space Agency President Steve MacLean announced that they intend to pursue efforts to consider Beijing for the global exploration roadmap.

The first successful manned docking at China's Tiangong-1 orbital laboratory, only weeks after GLEX, underscored just how valuable a Chinese contribution could be.

Speakers at GLEX did agree, nevertheless, that one new NASA policy—relying on the private sector for low Earth orbit transportation needs—is likely to have a positive impact on space exploration efforts. Dr Feuerbacher said the successful docking of SpaceX's Dragon spaceship at the ISS bare hours after the conference opened will be a "breakthrough" in getting astronauts and hardware into space.

Several participants noted that at a time when economists are increasingly calling for economic stimulus, a strong economic argument can be made for investing in space, current budget constraints notwithstanding.

# IAC Associated Events

Preparations are in full swing for one of the most prominent events of the year, the 63rd International Astronautical Congress, which will be held in the beautiful and historic city of Naples, Italy, from 1-5 October. You will find registration details, exhibition and sponsorship opportunities and further information on our website www.iac2012.org. The site is being regularly updated throughout the year.

Meanwhile, Congress organisers are busy putting together a diverse range of associated events for the upcoming congress. Among the main events:

**29th UN/IAF Workshop, 28-30 September**

Under the topic of "Space Technologies Applied to the Needs of Humanity: Experience from Cases in the Mediterranean Area", the workshop, jointly organised by IAF and UNOOSA and co-sponsored by ESA and ASI, will enable an exchange of views in space science and technology applications and help increase cooperation among developing countries as well as between developed and developing nations.

**IAC Cities Summit, 30 September**

This one-day meeting, in the context of IAC 2012, will bring together mayors of cities that have previously hosted an IAC or will host one in the future. The event will address the impact of an IAC on the development of host cities and their surrounding regions.

**4th International Meeting of Members of Parliament, 30 September**

After three successful gatherings (IAC 2009, 2010 and 2011), the IAF is looking forward to continuing the series with a fourth meeting in Naples.

This event offers selected Members of Parliaments from all over the world a well-defined and organised platform for dialogue with representatives from agencies, industry, engineers, scientists and other members of the global space community. It provides an opportunity to inform parliamentarians of the potential of current and future space technologies, whilst helping them deal with key space topics of major and global interest.

The fourth meeting will be on the topic of "Satellite-based Applications – Ways of Utilisation for Policy Implementation and Verification".

Over the course of the day, three distinguished speakers will have a chance to:

- address the importance of satellite applications in shaping opinion and underpinning national sovereignty;
- provide an overview of how satellites can be used by the government;
- and illustrate the utilisation of applications with practical examples.


**3rd International Meeting of Members of Parliament, Cape Town, South Africa, 2011**

### International Cluster Forum, 1-5 October

The fourth edition of the International Cluster Forum will foster cooperation between space agencies, industry, R&D institutions and universities. Hosted in the 160 m² IAF Booth, the Cluster Forum Programme will unfold in a visible area within the Congress exhibition area.

Monday, 1 October

- **IAF Booth Opening**
- **Heads of Space Agencies Press Conference**

Tuesday, 2 October

The events scheduled for the day are part of the Industry Day programme coordinated by the IAF Industry Relations Committee. The programme will include a number of panel discussions, lectures and social breaks to provide networking opportunities.

- Panel discussions on "**Satellite Navigation Systems – Economic Impacts**", "**Earth Observation Challenges**" and on **challenges and opportunities in the Mediterranean region**
- Keynote Speech from **Antonio Tajani, Vice-President of the European Commission** (*invitation only*)
- Lecture on "**Vega Launch Systems and Launch Services**"
- Networking Breaks

Wednesday, 3 October

"**Improving the Quality of Life on Earth – Societal impacts of Human Space Flight**": Wednesday's events are co-sponsored by Wyle, the NASA Johnson Space Center Space Life Sciences Directorate, and the German Aerospace Center.

- Panel discussion on "**Innovation with Earth and Space Benefits**" and on "**Benefits to Earth from Space Agencies Around the World**"
- Interactive discussions with the audience

Thursday, 4 October

"**Building the future space workforce**": The events are coordinated by the main space agencies, industries and the IAF Space Education and Outreach Committee. They will highlight HR and Young Professional/Students panel discussions and provide a platform to exchange ideas on the ways to build a successful space career.

Friday, 5 October

The last day will be open to the general public and bring together astronauts from all over the world.

## IAC 2014 TO BE HELD IN TORONTO

Early spring was a busy season for the IAC bid selection, with the IAF choosing the winner for IAC 2014 and opening the call for hosting the 2015 Congress.

On 2 April, Toronto was chosen to host the 2014 event. The Canadian city came before Adelaide, Australia; Istanbul, Turkey; and Jerusalem, Israel in the bid competition, which was the most successful and tightly contested in IAF history. Toronto will be the first North American city to accommodate the IAC since Vancouver in 2004 and Houston in 2002.

**Toronto, Canada**

**Niagra Falls**

## 2015 IAC BID CALLS

Barely two weeks after the IAC 2014 bid announcement, the call for hosting for IAC 2015 opened. The call welcomed notices of intent by 15 May and formal proposals by 29 June. So far, the IAF has received letters of intent from the following organisations:

- Geo-Informatics and Space Technology Development Agency (GISTDA) – Thailand
- Israel Space Agency - Jerusalem, Israel
- Istanbul Technical University – Istanbul, Turkey
- Mexican Space Agency – Mexico

Finalist downselect will follow on 18 July. After site inspections between 25-31 July, finalists will have until 13 September to tender their updated proposals which they can present at IAC 2012 in Naples, 1-5 October. Winners will be selected by the General Assembly on 5 October.

# IAF SPRING MEETING

The IAF's annual Spring Meeting took place on 12 – 14 March at UNESCO headquarters in Paris. As usual, the main focus of the meeting, attended by more than 400 space experts, was on preparations for the upcoming IAC. Paper selection for the Congress was particularly difficult because of a record 3,180 abstracts received. More than 1,750 papers were selected for oral presentation at IAC 2012 and an additional 400 for poster sessions.

This year's meeting also once more included one of its most outstanding parts – the Space Update lectures, which were not on the 2011 agenda due to the IAF's 60th anniversary celebration.

There was also the usual full range of technical committee meetings, detailed below.

### ADMINISTRATIVE COMMITTEES

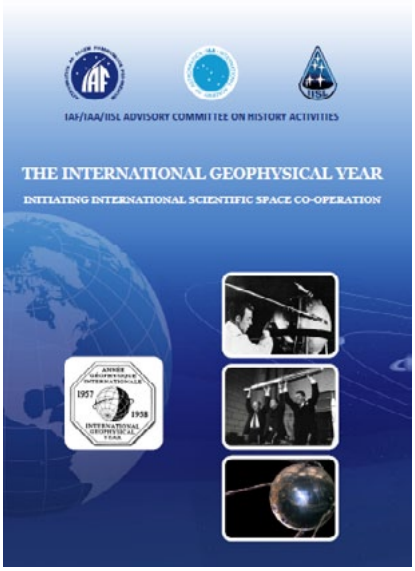
#### IAF/AA/IISL ADVISORY COMMITTEE ON HISTORY (ACHA)

The first ACHA study has now been published by the IAF on the topic of "The International Geophysical Year, Initiating International Scientific Space Co-operation". The study report was drafted under the supervision of Dr Stephen Doyle. Copies are available from the IAF Secretariat in Paris.

This report is an example of how future collaborative studies, done by representatives of the IAF, IAA, IISL and their respective committees, could be undertaken.

ACHA's next meeting in Naples during the 63rd IAC will discuss possible future study projects. All readers are invited to submit recommendations of topics of international scientific and/or technical interest to ake.ingemar.skoog@t-online.de. Please provide a title/subject head along with a short description.

*Ake Ingemar Skoog, Chair*




#### FINANCE COMMITTEE

At the Spring Meetings, the Committee reviewed the March 2012 Financial Report showing the Final Accounts for 2011, the Revised Budget for 2012 and an update of the 5-Year Plan. A report on the IAF reserves and portfolio was also presented and discussed.

The IAF is currently in healthy financial condition, with the reserves having recovered from the loss experienced in 2009 more

rapidly than had been forecast in recent updates. This is due to the positive financial result posted in 2011. The Revised Budget for 2012 currently projects a positive result. The budget will be updated and presented to the members of the General Assembly in October.

The 5-year projection for 2013-2017 has been updated to reflect the steady upward trend in terms of membership and IAC participation. It also contains provisions to adapt the manpower resources of the Secretariat to requirements over the course of the next 5 years. The Federation's reserves show a steady growth trend for the next 5 years based on a predicted moderately positive balance over these years.

Overall, the Finance Committee confirmed that the finances of the Federation are in good shape at the current time and expressed confidence that they will remain so in coming years. The committee will continue to work closely with the President and the Secretariat to ensure that forecasts are re-adjusted and necessary corrections made in timely fashion if the situation were to change.

*David Kendall, VP Finance*

## WORK FORCE DEVELOPMENT/ YOUNG PROFESSIONALS PROGRAMME COMMITTEE (WFD/ YPP)

WFD/YPP Committee plans two key projects for this year's IAC in Naples:

- **Young Professionals Virtual Forums (YPVFs)**

The committee is hosting five Young Professionals Virtual Forums (YPVFs), in collaboration with the following technical committees: Global Earth Observation System of Systems, Human Space Endeavours, Space Communications and Navigation, Space Education and Outreach, and Space Operations. The Young Professionals' Virtual Forums are technical sessions oriented towards young space professionals, which allow the sharing of information on a global scale with presenters and the audience, both online and at the IAC venue in Naples. The YPVFs allow those who cannot travel to the conference an opportunity to present their work and be a part of the IAC experience. The call for abstracts for these special sessions opened on 1 May 2012 and closes on 15 July 2012. For more information please visit www.iafastro.org/index.html?title=VF.

- **Young Professional Receptions**

The committee is also planning Young Professional Receptions, which provide useful learning & networking opportunities, during IAC 2012. Receptions will be held on Sunday, Tuesday, and Wednesday nights. All Young Professionals, please plan to join us for our "Welcome to Naples" reception on Sunday, 30 September, 2012. Contact www.iafastro.org/index.html?title=YP

*Kevin Stube, Vice-Chair*

# TECHNICAL COMMITTEES

## ASTRODYNAMICS COMMITTEE

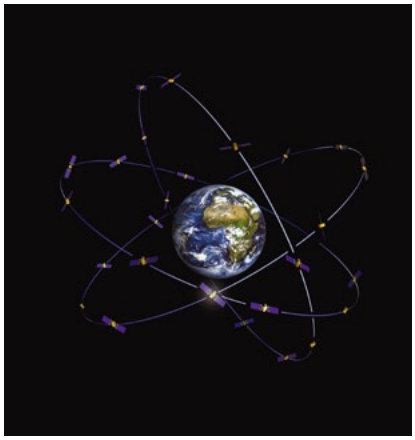
The Astrodynamics Symposium held in IAC 2011 at Cape Town was a great success, with over 90 high-quality presentations at nine different technical sessions. The John V. Breakwell Memorial Lecture, "Orbital Mechanics about Small Bodies," was presented by Prof. Daniel Scheeres from the University of Colorado.

For IAC 2012 in Naples, the Astrodynamics Committee received a record 333 abstracts. The selection process for the 116 papers accepted utilised a new methodology supported by an electronic tool developed by one of our subcommittees. The Committee members were pleased with the results and would be happy to share the experience and knowledge gained with other IAF technical committees.

At the Spring Meetings in March, the Committee welcomed five new members. An obituary was delivered for our dear colleague and friend, Uwe Feucht, who passed away accidentally in 2011.

The Committee is currently preparing the 7th International Workshop on Satellite Constellation and Formation Flying (IWSCFF), which will take place in Lisbon on 13-15 March 2013. See www.iwscff.astrodynamics.org.pt for more details.

*Dr Erick Lansard, Chair*



**Galileo constalation, Credit: ESA**

## COMMITTEE ON SPACE SECURITY

The Committee will hold a joint session in partnership with the Space Debris Symposium at the upcoming IAC 2012 in Naples. The session will deal with the Political, Economic and Institutional Aspects of Space Debris Mitigation and Removal (A.6). A full 19 abstracts were received for IAC 2012, of which nine were selected for oral presentations and three for posters. Because of the high level of interest space security is attracting, the Committee is now discussing holding another joint A.6

Symposium at IAC 2013 in Beijing. For IAC 2013, the Committee is also planning to hold a dedicated session at the Symposium on Space Policy, Regulations and Economics (E.3). This session will focus on the long-term sustainability of the space environment and provide a status report on security initiatives based on progress made by the United Nations sustainability working group, a review of the Code of Conduct discussions, and other developments in the field. Outside the IAC framework, the Committee has been supporting activities such as the Space Debris Congress held in Montreal in fall 2011.

*Kazuto Suzuki, Chair*

## ENTREPREUNERSHIP AND INVESTMENT COMMITTEE

The Committee meeting was attended by ten members and visitors, three of which participated virtually via Skype. Connecting via the computer enabled participation from North America and Japan in addition to everybody gathered in Paris.

This format reflected a recently adopted "open-door" participation policy that encourages the attendance at meetings not only of members but also of interested visitors. The aim is to recruit new members from amongst visitors in order to increase the diversity of the committee.

Three new EIC members, Mr. James Keravala (UK), Mr. Brad Cheetham (USA) and Ms. Claire Jolly (France) were selected during the meeting. Details of the upcoming IAC and possible paper session topics for IAC 2013 were also discussed.

The next meeting will be held in Naples during IAC 2012.

*Ken Davidian, Chair*

## SPACE OPERATIONS COMMITTEE

The Committee conducted a Space Operations Symposium at IAC 2011 in Cape Town featuring the following sessions: B6.1: Human Spaceflight Operations Concepts, B6.2: New Operations Concepts, B6.3: Training Relevant for Operations Including Human Spaceflight, B6.4: Flight Control Operations Virtual Forum, B6.6–B3.4: Joint Session on Sustainable ISS Operation. The Symposium was a great success with some excellent papers and good audience support at all sessions, and it was decided to maintain the Symposium in the same form for IAC 2012 in Naples.

**Credit: NASA**

The Committee will also support a joint plenary on New Concepts in Space using Social Media in partnership with the Young Professional Program and GEOSS, and provide mentoring for one of the young professionals.

A new committee member, Mr Pierre Lods from CNES, was chosen at the IAF Spring Meeting. Mr Lods replaces Mme Geneviève Campan, who had to retire from the committee due to work commitments.

The SOC also discussed setting up a subcommittee to provide a forum for discussion of the International Docking System Standard; this was agreed in principle, subject to agreement on the Subcommittee Charter. A Docking Systems Workshop sponsored by the Subcommittee was planned for 10/11 May.

*Michael McKay, Secretary*

## SPACE PROPULSION COMMITTEE

A record number of abstracts were submitted for the 63rd IAC in Naples. The selection process was made a little easier by adding a new ninth session and by agreeing to plan up to 12 oral presentations in each session. Most sessions will also have poster presentations (17 in the very popular C4.4 electric propulsion session). For the new additional session (C4.9), it was decided to present papers on more advanced concepts and new design philosophies under the heading "Propulsion Concepts and Studies". Looking ahead, the Technical Committee believes that individual propulsion technologies are now well covered and there is scope to consider more systemic issues such as optimising a mixture of propulsion technologies for various applications or missions. The possibility of having one symposium session interact more closely with spacecraft and mission design, possibly engaging novel ideas from younger members, will be considered in Naples in October.

*Richard Blott, Co-Chair*

## SUBCOMMITTEE ON 'DUAL USE'

Since IAC 2011 in Cape Town, the Subcommittee has focused its activities on two issues:

- Preparation of the joint session on Dual Use Earth Observation during IAC 2012 (session B1.6): the 15 papers proposed demonstrate a clear interest in this topic;

- A proposal to organise a workshop on the inter-operability of the various satellite navigation systems. The current baseline is to run this session in parallel with IAC 2012 in Naples.

At the Paris Spring Meeting, the Subcommittee met for the fourth time, discussing the preparations for IAC 2012 and 2013, as well as other activities dealing with dual use issues. Please contact D. Moura at denis.moura@cnes.fr or denis.moura@eda.europa.eu for more information on the Dual Use Subcommittee or to participate in its activities.

*Denis Moura du Mont, Chair*

## SUBCOMMITTEE ON THE GLOBAL EARTH OBSERVATION SYSTEM OF SYSTEMS

IAF's GEOSS Subcommittee is organising two Plenary Events for IAC Naples, as approved by the IPC: one, on Disaster Monitoring from Space, by Paul Kamoun and Giuseppe Ottavianelli; the other, "The Next Generation - Uses of Social Media", by Jacob Sutherlun in collaboration with Gunter Schreier and representatives from three other IAF Committees. The Subcommittee and the IAF Workforce Development/Young Professional Programme Committee are also organising a virtual forum pilot session in Naples on the topic of "Monitoring Natural Hazards from Space".

The GEOSS Subcommittee is a subgroup of the IAF Earth Observations Committee. It has put together Plenary Events at IACs held in Glasgow, Daejeon, Prague and Cape Town, and holds the B.1.6 technical session every other year at the Earth Observation Symposium.

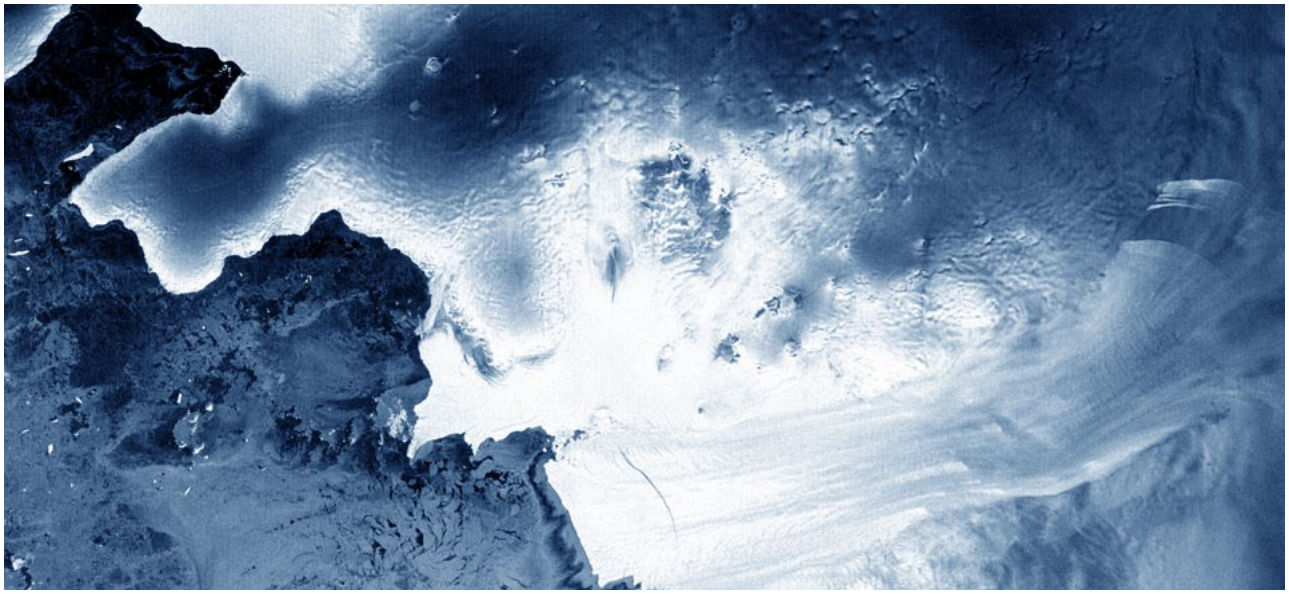
*David Brent Smith, Chair*

## SPACE ECONOMY COMMITTEE

This young Committee is gaining momentum. Its mission is to offer a forum for discussion and analysis of the space economy, foster debate on economic parameters (size of sector, impact) and organise dedicated meetings and IAC sessions. The first IAC sessions were quite successful in terms of attendance: "The space economy in figures" session (IAC 2010) attracted significant attention from major data providers (industry associations, consulting firms), while "The space economy in emerging space-faring countries" session (IAC 2011) presented new economic data from a number of up-and-coming actors in the space community. At the Spring Meetings in Paris, the Committee discussed organisation of the IAC 2012 session in Naples on "The space economy: Valuing the uses". This promises to be an exciting session, particularly in view of the many important milestones the international space sector will pass in 2012. The Committee also selected the topic for the IAC 2013 session in Beijing: "Industrial practices and government policies as drivers of the space economy." Inputs and views from nations in the Asian and Pacific regions will be particularly welcome.

The IAF Spring Meeting provides economic practitioners an opportunity to discuss specific themes and make special presentations on various indicators and statistics concerning the space economy. For example, in March the newly published OECD Handbook on Measuring the Space Economy was presented. The IAF Space Economy Committee continues to welcome new members and looks forward to organising other stimulating events within the space community.

*Pierre-Alain Schieb, Chair*



**Credit: ESA**

# IAC Virtual Forums

Are you one of the many professionals, students or space enthusiasts who would like to present a paper at IAC 2012 but cannot attend in person? Then the IAC Virtual Forums might be just for you.

Even if you can attend the IAC, you might want to think about presenting your paper through a Virtual Forum session, organised at the Congress and broadcasted around the world in real time.To make your presentation, all you need is a computer and an Internet connection.

If you cannot attend the IAC, you don't need to register for the Congress and participation in the Virtual Forums is free of charge.

The IAF Workforce Development/Young Professional Programme Committee plans to organise several virtual IAC technical sessions this year. The sessions will be co-hosted by four IAF Technical Committees:

- **Space Operations (SOC)**
- **Human Space Endeavours (HSE)**
- **Space Communications and Navigation (SCAN)**
- **Global Earth Observation System of Systems (GEOSS)**

Abstracts are due 15 July and selections will be announced on 1 August. All presentations must be uploaded by 12 September.

While mainly targeting young professionals under 35, the sessions are also open to anyone interested in participating. For more information, please contact YPVF@iafastro.org or visit the IAF website (www.iafastro.org/index.html?title=VF).

**SOC YP VF presentation by Guillaume Girard, DLR Columbus ISS Ground Controller at the 61st IAC - Prague**

**HSE YP VF keynote by NASA Associate Administrator for Human Exploration and Operations William H. Gerstenmaier at the 62nd IAC - Cape Town**

## Presidents of Space Universities Organise Second International Meeting

Representatives of space universities around the world gathered at UNESCO headquarters in Paris on 13 March to discuss academic exchanges, partnerships and best practices in cooperation, and explore how academic cooperation could be improved and expanded.
The meeting, organised during the IAF Spring Meeting at the request of the Federation's Space Universities Administrative Committee (SUAC), was attended by 15 representatives from 12 universities in Belgium, China, Germany, Italy, Russia, Switzerland, Turkey and the U.S. It was kicked off by Prof. Lidia Brito, Director of UNESCO's Division of Science Policy and Sustainable Development, and Prof. Pierre Rochus, Chairman of IAF-SUAC.

# FOCUS ON VIETNAM

Vietnam is one of a number of emerging economies keen on developing a comprehensive domestic space capability. The IAF Newsletter presents an update of this fast-growing country's ambitious space programme.

**VINASAT-1 on the launch pad**

VNREDSat-1B is the second remote sensing satellite project to be undertaken by Vietnam under the country's national space plan. The space plan also includes an ambitious communications satellite development programme.

**Recieving antenna**

The Vietnam Academy of Science and Technology (VAST) is undertaking the development of a hyper-spectral remote sensing satellite to support the country's effort to manage its natural resources and environment, and mitigate natural disasters. The small 130 kg spacecraft, VNREDSat-1B (Vietnam small satellite for Natural Resources, Environment & Disaster Monitoring), will be built in cooperation with Belgium.

A Belgian consortium led by SpaceBel was selected in July 2011 to supply VNREDSat-1B. The construction contract was signed in March 2012 and the launch is planned in 2017.

The satellite will feature a highly autonomous Proba bus developed in cooperation with the European Space Agency. SpaceBel will also be responsible for onboard software and the ground segment. In addition, the company will provide training and technical assistance in satellite design and remote sensing applications, in cooperation with the University of Liege. Qinetic Space, AMOS, CSL, Deltatec and VITO are also participating in the undertaking.

VNREDSat-1B is the second remote sensing satellite project to be undertaken by Vietnam under the country's national space plan, known as the "Strategy for Space Technology Research and Applications until 2020" (or in short, "The Strategy"). The first, a 130 kg optical satellite named VNREDSat-1, was approved in 2009, in cooperation with France, to support natural resource, environment and disaster management applications.

VNREDSat-1 is being supplied by EADS/Astrium and, like the SSOT system developed for Chile and Alsat-2 supplied to Algeria, uses an AS100 bus. Set for launch in 2014, the spacecraft features a resolution of 2.5 meters panchromatic and 10 meters multispectral with a 17.5 km swath. As for VNREDSat-1B, the project includes supply of the ground segment, including data processing facilities, as well as technical assistance and training.

The space plan also includes an ambitious communications satellite development programme. The country's first communications satellite, a C-/Ku band unit known as VINASAT-1, was built by Lockheed Martin Space Systems Corp in cooperation with the Vietnam Post and Telemetry Corp. (VNPT) and launched in April 2008. A second all Ku-band spacecraft, VINASAT-2, also supplied by Lockheed Martin Space Systems Corp. in cooperation with VNPT, was launched on 15 May, 2012. Both were orbited by Arianespace to the same 132 deg. E. Long. orbital slot.

Satellite development is only the most conspicuous of a broad range of undertakings covered by the Strategy, which was approved in 2006. The Space Technology Institute (STI), a unit of VAST, was established by the Prime Minister on 20 November 2006 to serve as Vietnam's national space science and technology agency. Among other things, the Institute is responsible for developing, controlling and operating VNREDSat-1 and VNREDSat-1B.

STI works closely with the Vietnam Commission for Space Research and Application (commonly called the Vietnam Space Committee, or VSC), which was created to manage and coordinate all of the country's national and international space technology activities.

In July 2009, a ground-receiving station and satellite image database and processing complex was inaugurated at the National Remote Sensing Center (NRSC) of the Ministry of Natural Resources and the Environment. In 2011, VAST created the Vietnam National Satellite Center (VNSC). VNSC is currently cooperating with Japan to build the Vietnam Space Center, located in Hoa Lac High Tech Park (HHTP), near Hanoi.

The Strategy also includes a comprehensive National Space Science and Technology Programme, aimed at developing and nurturing domestic capabilities in satellite technology and space applications such as remote sensing, GIS, and satellite navigation. A special management board was set up by VAST in 2008 to run this programme, which also covers fundamental research, space use legislation and other related matters.

Vietnam participates actively in international workshops intended to promote and help disseminate new space applications. In particular, it has helped organise two United Nations Workshops in collaboration with the UN Office for Outer Space Affairs (UN-OOSA), the European Space Agency (ESA) and NASA. The first, on the "Use of Space Technology for Forest Management and Environmental Protection", was held in Hanoi in 5 - 9 November, 2007. The second, concerning "Space Technology Applications for Socio-economic Benefits", took place, also in Hanoi, in 10-14 October, 2011.

For further information on the Vietnamese space programme, contact Prof. Doan Minh Chung, Director, Space Technology Institute (STI), at dmchung@sti.vast.ac.vn.

**Artist's rendering of VINASAT-1 satellite**

# INTERVIEW WITH LUIGI PASQUALI, Chairman & CEO, Thales Alenia Space Italia

Luigi Pasquali is Chairman and Chief Executive Officer of Thales Alenia Space Italia and Deputy CEO of TAS, a Thales-Finmeccanica joint venture. He talks to us about IAC 2012, the upcoming European Space Agency ministerial summit in November and future company prospects.

"Now everyone's goal must be...to ensure that European assets become a pillar of the exploration programme beyond LEO."

Q: What themes does Thales Alenia Space intend to highlight at IAC 2012?

Thales Alenia Space will be showing a broad range of space know-how and capabilities, in particular in space science and exploration. TAS provides satellite solutions for all types of science missions, including astronomy (space-based observatories in a wide range of spectral bands) and interplanetary missions.

The company is a leading prime contractor, managing both European and international consortia, and also provides specific expertise and instruments. It is one of the industry leaders in planet landing systems, which, from Titan to Mars, allow exploration probes to safely land on other planets.

Moreover, TAS plays a fundamental role in the ISS [International Space Station]. The company has been involved in its development since the beginning and has supplied more than 50 percent of the Station's pressurised volume. Involvement in the Station has allowed the company to accumulate an array of manned space design and construction capabilities that is second only to Boeing, the main NASA contractor for the Space Station. This experience will generate the know-how and skills necessary to support life in outer space and eventually to take man to Mars.

Q: Do you see the event having a positive impact on TAS's Italian activities, for example in helping rebuild and develop the L'Aquila plant or pushing ahead new spending in Cosmo-Sky-Med and other domestic space undertakings?

IAC in Naples will be a very big event for the entire space sector and will serve as a showcase not only for the Italian space industry but for actors in the space sector from around the world. TAS, as Italy's main space player, will enjoy especially high visibility. In particular, the congress will provide an excellent opportunity to touch base with the 200-plus members of the International Astronautical Federation, including all leading space agencies, space companies, societies, associations and institutes worldwide. However, the event is unlikely to have any direct impact on new national programmes such as COSMO-SkyMed second generation or on industrial development activities such as the rebuilding of the L'Aquila facility.

Q: What is the current financial and employment outlook in Italy for TAS? Do assurances of sustained

Italian national programme spending and continued success in the international commercial and government markets point to growth ahead?

With consolidated revenues of 665 million euros in 2011, Thales Alenia Space Italia has 2,270 employees – 60% of them college graduates - at 4 industrial sites in Rome, Turin, Milan and L'Aquila.

The company's strong position in Italian, European and international space activities points to solid growth ahead. Moreover, the Italian government insists that despite the current financial crisis it will maintain all of its commitments for space programme funding.

Italy has a key role in the European space programme and is the third largest contributor to the European Space Agency. It is also heavily involved at the international level. For example, Italian Space Agency ASI has a close working relationship with NASA that has led to its participation in many of the most interesting scientific missions of recent years. The country is also at the forefront of the Earth Observation area with COSMO-SkyMed, the jewel of Italian space technology, which is contributing significantly to improving our knowledge of the Earth. The system is a perfect example of the Italian commitment both at the institutional and industry level and shows how our country can obtain world-class results, particularly in the radar field, where Thales Alenia Space Italia is among the global leaders.

Q: An interface definition freeze for European-Russian cooperation in ExoMars is planned for June. Are you confident that this ambitious programme is now back on track, and in particular, does it depend on any important decisions to be taken at ESA's November ministerial conference? What does the new configuration look like for the 2016-2018 missions?

Cooperation with the Russians for the 2016 mission is right on track. This collaboration offers one remarkable advantage [compared to the previous configuration]: it will hike the duration of the science mission on the landing platform from a couple of days to one Martian year (two Earth years).

The configuration for the 2018 mission now once again includes a completely European 300 Kg class rover, which has already gone through PDR [preliminary design review]; a carrier to be supplied by ESA, with major Russian contributions; and a Russian-led Descent Module (1.6 ton class) with European support in critical areas like GNC, radar and digital electronics. These contributions will greatly benefit from the 2016 mission heritage. The 2018 mission will retain all of its original scientific objectives while enlarging its technological scope.

The MC [ministerial conference] will have to decide on the proposed schemes for financing both missions.

Q: The first mission of Orbital Science Corporation's Antares resupply system to the International Space Station under NASA's Commercial Orbital Transportation Services (COTS) programme is targeted for this summer. Can you describe the current status of the Cygnus cargo module that you are supplying for this system, and the way forward in the years to come?

Currently, the first mission of Cygnus/Antares to the International Space Station under NASA's COTS programme is planned for the end of 2012. A total of nine PCMs [pressurised cargo modules] will be provided by TAS to Orbital Sciences Corporation, four in the "standard" configuration (up to 2,000 kg of cargo up capability) and five in the "enhanced" configuration (up to 2,700 kg). The first of these units,

in “standard” configuration, will be utilised for the COTS demo mission, while the other eight units will fly under the NASA Commercial Resupply Services [CRS] contract.

The first PCM unit was delivered to Orbital in August 2011 and is now at its Wallops Flight Facility in Virginia for integration with the Cygnus Service Module. Another four units are at various stages of readiness at the TAS assembly and integration facility in Turin, Italy. Delivery of the second flight unit - the first to be flown under CRS contract - is planned for late July 2012 and the last unit delivery, for the end of 2015.

The next step in our plans is to extend the supply contract for the Cygnus PCM from 2016 to the end of the ISS’s extended lifetime so as to be able to continue to support Station logistics. Additionally, the basic Cygnus PCM fleet is currently being evaluated for potential further enhancements. The intent of the derivative concepts is to increase PCM performance, in particular the possibility of interfacing with other vehicles, and to augment the cargo carrying capability.

Among potential enhancements under study are designing the PCM for extended and even permanent stay at the ISS as a test-bed for enabling exploration technologies; developing a free-flyer module for additional testing and microgravity experimentation; and utilising the cargo carrier for deep space habitat resupply. All these ideas are under evaluation by a joint Orbital-TAS team.

Q: What kind of Automated Transfer Vehicle spinoff, if any, is likely to be proposed at the ESA ministerial summit as Europe’s in-kind contribution for extended ISS operations? Is some sort of multipurpose space tug or in-orbit servicing vehicle still the preferred choice, or are budget constraints liable to limit the scope to a simple upgrade of the existing ATV?

Europe has gained considerable experience and know-how through its contribution to building and operating the ISS over the last 15 years, and this includes ATV. Now everyone’s goal, agencies and industry alike, must be to preserve and protect those competencies in view of the upcoming space exploration programme, and to ensure that European assets become a pillar of the exploration programme beyond LEO. ATV is one of the major assets Europe can contribute with, so whatever exploration scenario is envisaged, depending on the budgetary framework, ATV will be one of its key “bricks”.

## ABOUT THALES ALENIA SPACE ITALIA

Thales Alenia Space, a joint venture of French-based Thales and Italy’s Finmeccanica, has 7,500 employees at nine industrial facilities in France , Italy , Spain , Belgium and Germany. The joint venture posted total revenues of 2.1 billion euros in 2011.

Thales Alenia Space Italia S.p.A. is the Italian component of TAS, which boasts more than 40 years of experience in the design, integration, testing, operation and commissioning of innovative space systems based on cutting-edge technologies. The compay serves the needs of commercial, government, scientific, defence and security customers from around the world.

Thales Alenia Space Italia has built over two hundred satellites for applications in telecommunications (Intelsat, Hot Bird, Olympus, Italsat, Artemis, Globalstar, Sicral), navigation (Giove B), science and exploration (Hipparcos, BeppoSAX, Cassini-Huygens, Rosetta, Integral, Mars Express, Venus Express, GOCE) and remote sensing (ERS 1 and 2, Envisat, Metop, COSMO-SkyMed).

The company is also among the biggest suppliers of orbital infrastructure, including major elements of the International Space Station and logistics modules,

and works closely with NASA, the European Space Agency, the Italian Space Agency and other major agenices on leading international space programmes.