

VRI SPACE UPDATE
N°8
July/August/September/October 2009

1.	Major events for Europe in space during the last four months: Frank De Winne in ISS, high-level involvement of the Union in space, roadmap projects for exploration and security, growing business for SES and Eutelsat, for Earth observations satellites.....	2
•	Since October 11, Frank De Winne, ESA astronaut, is the first non-American non-Russian commander of the International Space Station.....	2
•	On October 15, José Manuel Barroso, President of the European Commission, defining vision and ambitions of Europe in space	4
•	On 23 October, 1 st EU-ESA International Conference on Human Space Exploration giving the green light to define a roadmap towards a common vision and strategic planning for space exploration. Belgian Minister Sabine Laruelle is in charge of defining the roadmap for the 2 nd Conference which will take place in November 2010.....	5
•	Summer 2009: major satellite operators, especially in the business of communications and broadcasts, are facing the economic crisis.....	7
2.	Some prospective changes for space in Belgium and in Europe	9
•	January or February 2010: announcement of the first contracts for the FOC (Full Operational Capability) phase of the Galileo system.....	9
•	1 st February: retirement of Monique Wagner, who managed the section Space Research & Applications of Belspo (Belgian Science Policy)	10
•	1 st February: the new Commission Barroso taking place in Brussels	10
•	1 st April: the move of Belspo into ‘Platinum’, avenue Louise, 233-245.....	10
•	During 2010: enlargement of ESA with Hungary and Romania.....	10
3.	The growing role of missions in space with very small and highly compact nano-satellites (Cubesats)	11
•	Project of Cubesat constellation for QB50 project: Workshop at Von Karman Institute for Fluid Dynamics (VKI) on November 17-18	11
4.	Global environment and security monitored by remote sensing satellites: Europe’s strategic challenges for dual-use systems in space	12
•	12
•	Status of the European Commission about GMES missions and future	12
•	ESA and Security, with GIANUS (Global Integrated Architecture for Innovative Utilisation of space for Security)	13
5.	The establishment of national space agencies in many member States of ESA: for better management and greater efficiency	14
•	Netherlands Space Office (NSO) established on September 30 by the Dutch Minister of Economic Affairs	14

Exceptionally, this issue covers four months instead of two to report about space activities in Belgium and in Europe during the Summer period until late October. With the next issue in December, we will resume the bimonthly periodicity of this newsletter.

1. Major events for Europe in space during the last four months: Frank De Winne in ISS, high-level involvement of the Union in space, roadmap projects for exploration and security, growing business for SES and Eutelsat, for Earth observations satellites

• **Since October 11, Frank De Winne, ESA astronaut, is the first non-American non-Russian commander of the International Space Station**

Onboard the Russian Soyuz TMA-15 spaceship, with Russian cosmonaut Roman Romanenko and Canadian astronaut Bob Thirsk, Frank De Winne left the Earth on May 27 and will return on December 1st to Kazakhstan. His spaceflight, with a planned duration of more than six months, saw him very busy in the ISS around scientific and technological experiments, logistics and maintenance activities, a great number of media events through TV links, especially of ARISS (Amateur Radio on the ISS) contacts with students and youth. It was intensively marked by the first permanent 6-people crew and by operations with manned and unmanned spacecraft:

- from 17 to 28 July, Space Shuttle Endeavour, with a crew of 7 astronauts, was docked to ISS to deliver the last elements of Japan's Kibo module; during some 10 days, the station was the home for a total of 13 people.
- on July 24, Progress M-67 was launched to dock five days later with the station to bring 1,200 kg of dry cargo, 830 kg of propellant, 210 kg of water, 50 kg of oxygen; it was undocked on September 21 for atmospheric reentry on September 27.
- from 30 August to 8 September, Space Shuttle Discovery was part of the ISS, bringing again to 13 the total number of people in the station; its payload, the "made in Italy" Leonardo MPLM (Multi-Purpose Logistics Module), was loaded with supplies and equipments (3 racks for life support) and reloaded with results of experiments and with medical samples for ground analysis. During this mission, another ESA astronaut, Christer Fuglesang of Sweden, performed two EVA's (Extra Vehicular Activities) with the assistance of Frank.
- on September 10, Japan launched with H-IIB, its most powerful rocket, the automated HTV-1 (H-II Transfer Vehicle) cargo spacecraft which had rendez-vous with the station on 17 September; it was grappled and attached

to the Harmony module of the station with the Canadarm-2 robotic arm (under the control of Frank). For unloading of materials and reloading with trashes, it remained berthed at the station until October 30; its planned reentry into the atmosphere took place on November 2.

- on September 30, Soyuz TMA-16, with cosmonaut Maksim Surayev, astronaut Jeffrey Williams and Canadian artist Guy Laliberté, was launched from Baïkonur and docked to ISS two days later. De Winne and Laliberté, who remained in the station until October 11, joined their efforts to heighten public awareness of drinking water as vital resource for mankind. With the departure of Russian Gennady Padalka, who was the commander, and of American Michael Barratt, Frank took over the command of the ISS.
- on October 15, the automated Progress M-03M spaceship was launched from Baïkonur; three days later, it docked to the ISS in order to deliver 870 kg of propellant, 790 kg of materials and 420 kg of water.

Among the last significant activities of Frank De Winne for the development and utilization of the station:

- in mid-November, the arrival of Poisk or Russian MRM-2 (Mini-Research Module), using the Progress bus, to enlarge the station for new EVA capability;
- during the second half of November, the STS-129 mission of Space Shuttle Atlantis, with 6-people crew, carrying two Express logistics carriers.

During his 6-month duration spaceflight, Frank performed many new experiments for Belgian scientists and industries:

- the PCDF (Protein Crystallization Diagnostics Facility) of ULB, VUB and ULG to understand the phenomena contributing to the formation of defections and imperfections in bio-molecular crystals;
- the YING-B (Yeast in No Gravity) experiment, jointly developed by VUB, KU Leuven, University of Ghent, in the Biolab facility to evaluate how weightlessness has an impact on the yeast cell physiology (and not, as reported by medias, how feasible is the production of beer in space!);
- the IVIDL (Influence of Vibrations on Diffusion in Liquids) and DSC (Diffusion & Soret Coefficient measurements for improvement of oil recovery) experiments of the Microgravity Research Center (ULB), using the Microgravity Science Glovebox;
- the testing of WEAR (Wearable Augmented Reality), a light and compact tool developed by Space Applications Services in Zaventem to assist astronauts during complex maintenance procedures.

- **On October 15, José Manuel Barroso, President of the European Commission, defining vision and ambitions of Europe in space**

On October 15-16, Brussels welcomed a prestigious conference on European Space Policy, dedicated to the future of the Union in space. Organized by Business Bridge Europe, this 2-day meeting of many political and industrial top-level personalities gave a general status of Europe in space, in the framework of the Lisbon Treaty officialising the efforts for space exploration and exploitation as a pan-European shared competence, as well as the role of ESA in the management of a European space programme. The opening of this Conference was marked by the first declaration of Jose Manuel Barroso, as president of the European Commission, about space policy, a powerful ambition for the European Union. His speech gave a **strong political dimension to space** which is “*invigorating European competitiveness and economic growth*” and “*essential to project the image of the EU as a world player*”. Specifying that “*the EU is devoting an average of 700 million € per year to support space projects over the period 2007-2013*”, He stated: “*Since 2007 - following a Commission Communication which, for the first time, outlined the elements of a European space policy -, the Council has put space firmly on the political agenda. Four priority areas were identified: **climate change, security, innovation and exploration**. The European Parliament has endorsed the European Space Policy and asked the Council and the Commission to make concrete proposals on these four priority areas. And the Lisbon Treaty now unambiguously enshrines space as a shared responsibility for the EU and its Member States.*”

European Commission president Barroso reviewed four long-term commitments for the EU in space. If he could not give any precise indication about their budgetary impact, he is conscious of its mandatory importance.

1. “*We must guarantee the success of our flagship projects Galileo and GMES. [...] We must ensure that long-term funding or governance issues do not get in the way of their success. At stake is not just potential economic returns that run into billions €, but also our credibility*”;
2. “*We must develop a strong, space-based capacity to deal with climate change. Such capacity will build on GMES and Galileo applications. But we must make adequate use of all space resources available*”;
3. “*We need more security **in** space and **from** space. Our space assets and infrastructure are indispensable for our economy and security and we need to protect them. The EU should develop an independent capacity to monitor satellites and debris orbiting the Earth and the space environment [...]. We should also exploit the potential of space infrastructure (already available, for example, through GMES) to protect our citizens and our ground infrastructure*

against natural and man-made hazards and to be at the service of European Security and Defence Policy goals. These capacities should be developed in partnership with Member States”;

4. *“We need to ask ourselves what role we want the EU to play in space exploration over the next two to three decades. Space exploration is essential to expand human knowledge and to stimulate innovation. By better understanding space and the evolution of other planets, we will better understand our own environment. Human space exploration of the solar system, including Mars and possibly the return of humans to the Moon, could be the backbone of such a space exploration strategy”.*

“From the Commission viewpoint, important issues will have to be addressed:

- how to assure independent access to space;*
- the issue of independent human spaceflight capability, in the context of an international partnership;*
- how to support the International Space Station”.*

He concluded: *“Space represents a fantastic political and economic challenge for the EU. The Commission and the Council have identified the priority areas for EU involvement in space. As the European Parliament has reminded us, we now need to translate those priorities into a consistent strategy”.*

Since November 1st, the existing European Commission is working on current affairs. Another Commission, under the presidency of Jose Manuel Barroso, will be in place on February 1st. It will be interesting to know which place space issues will have in the new European Commission.

- **On 23 October, 1st EU-ESA International Conference on Human Space Exploration giving the green light to define a roadmap towards a common vision and strategic planning for space exploration. Belgian Minister Sabine Laruelle is in charge of defining the roadmap for the 2nd Conference which will take place in November 2010**

An informal European Space Council, at Ministerial level, was planned to take place in Prague during the EU Presidency of the Czech Republic. Because of lack of preparatory work around the aspects of space exploration at international level, it was postponed until October 22-23. In his welcome speech addressed to Ministers and ministerial delegates from most of the 29 EU and ESA member States, to representatives of Canada, Russia, India - with Madhavan Nair, who had his last international act as Secretary General of Indian Department of Space and Director general of ISRO -, Japan, Israel, Günter Verheugen, Vice President of the European Commission, in charge of Enterprise and Industry (including space policy, without Galileo and satellite broadband) explained:

*“This conference is part of the Commission’s response to **the political mandate** which has been given to us to open a debate on the European role in the global exploration endeavour”. He stated: “Space exploration has never been driven by human curiosity alone. It is a symbol of global power and prestige [...] Never before we have seen greater willingness and better opportunities for international cooperation in the space domain. Europe should not remain sidelined in this process. We have a strong history of cooperation [...] As the EU and ESA, we are now being challenged to define our own strategic approach towards space exploration – human and robotic – in the 21st century”.*

The nice 2-day meeting in Stirin Castle did not give any real debate. It was only an open exchange of ideas on what should be the role of Europe in the global space exploration context over the next decades. It was made of some enthusiast declaration, with France calling for new efforts to reunite Europe. Only Germany expressed a very pragmatic approach. It insisted on the efficiency of the ESA system, on the right distribution of roles between ESA and EU, on the improvement of EU instruments for the industrial policy of space procurement, on the utilisation of the ISS as first priority to enable Europe’s credibility in human spaceflight.

Speaking from the ISS, Frank De Winne considers the international space station as an excellent first step for space exploration. *“We have to bring European values to global space exploration. If we look for being a strong partner, we need to have our human space transportation capability.”* He expressed this wish with a great optimism: *In the next 5 or 10 years, a European manned spaceship should be launched by a European rocket from Europe’s spaceport”*.

Belgian Minister for Science Policy Sabine Laruelle, responsible for the space activities in Belgium, reported about Europe’s role in space exploration. She insisted on the fact that Europe has to concentrate on interdependence between the international partners and that the EU has to define a common programmatic position, along with the financial resources for long-term implementation. She invited Ministers and delegates to attend the 2nd EU-ESA International Conference on Human Space Exploration which is planned to take place in Brussels during the Belgian Presidency of the Union (November 2010). This next Conference will debate on the technological and financial impact of roadmap proposal for space exploration. This roadmap has to be prepared and proposed by Belgium through an international steering group, with workshops starting in early 2010.

The main challenge of EU role in space applications and explorations will be the level of available funding resources: how much money and how to find this money? Today, the European Commission spends less than 1 billion € per year on space projects for the period 2007-2013. The space budget of EU in order to meet its needs at global scale has to grow up to more than 3 billion € for the next seven-year period of financial prospects 2014-2020.

- **Summer 2009: major satellite operators, especially in the business of communications and broadcasts, are facing the economic crisis**

Every year, the Space Business Week organized in Paris by Euroconsult (September 8-10) and the IBC 2009 exhibition in Amsterdam with some 15 satellite operators (September 11-14) are useful opportunities to appreciate the good health of the global business in space systems for communications, broadcasts and observations. There is no sign of crisis in this business of the space sector, praised as a safe harbor from the economic storm.

	In 2008	2008 growth rate	Est. 2009 growth rate
TV channels broadcast by satellite	24.100	+ 13 %	+ 6-9 %
FSS operators' capacity revenues	\$ 9,2 billions	+ 10 %	+ 7 %
Subscribers to satellite broadband access*	1,2 millions	+ 30 %	+ 25-30 %
MSS operators' revenues	\$ 1,23 billions	+ 6 %	+ 6-9 %
EO satellite operators' data sales revenue	\$ 916 millions	+ 25 %	+ 25-30 %

Source : Euroconsult

EO : Earth Observation

FSS : Fixed Satellite Services

MSS : Mobile Satellite Services

* Newtec Cy, with the Sat3Play/Astra2Connect terminal, plays a significantly promising role in the development of satellite broadband products and services.

The main drivers for the successful markets of space applications are **the digital revolution** with new developments for the images - pay-TV bouquets, HD (High Definition) channels, 3D (3 dimension) broadcasts -, with advanced compression software, as well as **the mobile connectivity** with mobile services and with compact terminals for broadband links. In the field of remote sensing from space, the earth observations are updated in a quicker mode (with the use of satellite constellations) and with a higher resolution (with optics and radar systems). Did you know that, by the end of 2008, 99 active DTH (Direct-To-Home) platforms were broadcasting over 13.800 TV channels to more than 114 million subscribers?

Space business is expanding. New markets are developed not only in Asia-Pacific, the Middle East, but also in Africa (where Malaysian Measat and Israeli Amos-Spacecom are competing with Intelsat, SES World Skies and Eutelsat) and Latin America (where Hispasat has a significant success to compete with Brazilian Star One, Mexican SatMex, Venezuelan Venesat-1). The satellite business is attracting a lot of new regional candidates to operate space systems: after Vietnam (Vinasat), Pakistan (Paksat-1R) and Laos (LaoStar) - Sri Lanka also interested – are developing their orbital assets with the support of China; Angola will get its own comsat from Russia, while Bolivia signs a preliminary agreement for the procurement of a “made in China” system; in Central Asia, Kazakhstan is developing its comsat system (with Russian technology) and is competed by Turkey (Türksat), Azerbaijan (Azersat project with a first “made in USA” satellite) and Ukraine (Libid satellite with Canadian assistance). In the field of earth observations, new players are coming: Brazil (with China), South Korea (Kompsat), Thailand (Theos), Malaysia (Razaksat), Dubai (Dubaisat), Algeria (Alsat), Nigeria (Nigeriasat), South Africa (Sumbadilasat) and - in a near future - Kazakhstan, Turkey, Singapore, Sri Lanka, Venezuela, ...

- SES (Luxembourg), which owns and operates a worldwide fleet of 41 geostationary communications and broadcasting satellites, has a growth of 5,4 % in revenues for the first nine months of 2009 (1.259 million €) with operating profits of up 7,5 % (537,5 million €). It foresees continued growth and attractive levels of profitability for 2010 and beyond. Commercially available capacity consists of 1.102 working transponders around the globe. A very successful service is Astra2Connect for pan-European broadband via satellite with terminals developed and produced by Newtec: over 50.000 subscribers throughout Europe are connected to this Ku-band direct-to-home system. Together, SES Astra, SES World Skies, SES Sirius and Quetzsat (part of SES) have 7 satellites currently in construction for launches in 2010-2011. It is negotiating with Astrium and Thales Alenia Space the contract for a package of four standardized satellites.
- Eutelsat (Paris), owner of 23 satellites and operator of supplementary capacity on further 4 satellites, targets 1 billion € for revenues during 2009-2010, with operating income of some 80 %. The net income for 2008-2009 (from July 1st to June 30) was 247,3 million € (an increase of 43,6 %). The growth is continuing for the first three months of 2009-2010, during which the barrier of 100 HDTV channels was broken. The fill rate for its 589 operational transponders is 88,8 % (523 transponders). Eutelsat is broadcasting a total of 3.329 TV channels with its satellite fleet. Its in-orbit expansion programme plans the launch of five satellites - including a full Ka-band broadband satellite, made by Astrium – until the end of 2011; the next

one will be W7 with a Russian Proton launcher on November 23 in order to cover Russia, Central Asia, Africa, the Middle East and Europe.

- Astrium Services (Paris) of the EADS Group, with a fleet of 10 satellites - further 4 in construction - can be described as the third owner and operator of satellites in Europe for military and secure telecom services, for earth observations (geo-spatial information and management) and for satellite navigation applications. It operates specific communications satellites for military authorities: in the United Kingdom, Skynet-5 (3 powerful satellites in orbit) and Skynet-4 (3 satellites) through Paradigm; in Germany, SatcomBw/ComsatBw (1 in orbit, 2nd to be launched in early 2010) through MilSat Services GmbH, a joint venture of Astrium and ND Satcom (SES Group). During the Space Business Week in September, Astrium Services received Euroconsult award for the Strategic M&A (Merger & Acquisition) Transaction of the Year, because of its purchase of SPOT Image company and its integration into the Infoterra group: its owns and operates Spot-4 and Spot-5 (optical observations), TerraSar-X (radar observations). Tandem-X (identical to TerraSar-X) is planned for launch on December 22 from Baikonur. Astrium Services invests in the construction of Spot-6 and Spot-7 remote sensing satellites for launches in 2012 and 2013 to guarantee the continuity of Spot-5 imaging data. It is candidate to operate some Sentinel remote sensing satellites of the operational GMES (Global Monitoring for Environment & Security) programme.

2. Some prospective changes for space in Belgium and in Europe

- **January or February 2010: announcement of the first contracts for the FOC (Full Operational Capability) phase of the Galileo system**

The two pre-selected consortia for the contracts to build the Galileo FOC space segment - Astrium with Thales Alenia Space, OHB-System with SSTL (part of Astrium) - have to deliver for November 13 their proposals with prices for packages of 22 satellites, of 16 satellites, of 8 satellites. The contract(s) to be announced in early 2010 could be divided between the two candidates. The first contracts for ground segment elements – System Support, Ground Mission – have also to be awarded. Galileo launch services, to be contracted with Arianespace, will be divided between Ariane 5 (with additional funds to improve its performances in MEO) and Soyuz ST launchers.

- **1st February: retirement of Monique Wagner, who managed the section Space Research & Applications of Belspo (Belgian Science Policy)**

After some 20 years at the head of Space Research & Applications – 40 % of the budget of the Belgian Science Policy -, Monique Wagner decided to go into retirement on February 1st. She is not only an important personality for Belgium in space, but also a well-known and very active team-member in ESA Councils, Committee, working groups.

Note that other significant retirements in the management of ESA are planned during 2010: Michel Courtois, Director of TEC (Technical & Quality Management) and ESTEC, then – later in the year – Jean-Jacques Dordain, Director General of ESA who will return to professor activities.

- **1st February: the new Commission Barroso taking place in Brussels**

The other 26 members of the European Commission will get to know their respective responsibilities: which Directorate will be dedicated to space exploration to serve the global policies of the Commission?

It is interesting and useful to refer to the article 189 of the Lisbon Treaty, that officialises “*a European space policy*” to be drawn by the Union, the necessary measures which may take the form of “*a European space programme*” established by the European Parliament and the Council, and the establishment by the Union of “*any appropriate relations with the European Space Agency*”.

- **1st April: the move of Belspo into ‘Platinum’, avenue Louise, 233-245**

During the last week of March, Belspo will know a very important change, with the planned move of its offices from Wetenschapsstraat to a completely new building named ‘Platinum’ : located avenue Louise, 233-245, which has a very attractive architecture.

- **During 2010: enlargement of ESA with Hungary and Romania**

By the end of 2010, ESA will have two new member States: Hungary and Romania, which already are cooperating ESA States as members of PECS (ESA’s Plan for European Cooperating States). Latvia and Estonia signed Cooperation Agreements/PECS with ESA. All these four countries of Eastern Europe are working on the development of Cubesats for educational purposes: Hungarian MaSat-1 built by students of Technical University of Budapest (to be launched during Summer 2010 by Indian PSLV); Romanian Goliat-1 Cubesat of University of Bucharest and University Politehnica of Bucharest for remote sensing observations and space environment measurements (launch with the

maiden flight of Vega in 2011); Latvia's nano-satellite Venta-1 developed by Ventspils University College, carrying a payload to collect AIS (Automatic Identification System) signals (to be launched in 2010); ESTCube of Estonia made by students of Tartu University (for launch in 2011).

3. The growing role of missions in space with very small and highly compact nano-satellites (Cubesats)

- **Project of Cubesat constellation for QB50 project: Workshop at Von Karman Institute for Fluid Dynamics (VKI) on November 17-18**

A CubeSat is simply too small to carry sophisticated sensors for significant scientific research. However, when combining a large number of CubeSats with identical sensors into a specified network, in addition to the educational value, fundamental scientific questions can be addressed which are inaccessible otherwise. Networks of CubeSats have been under discussion in the CubeSat community for several years, but so far no university, institution or space agency has taken the initiative to set up and coordinate such a powerful network.

The purpose of the QB50 initiative - with the support of Von Karman Institute (VKI) which organizes a 2-day workshop on November 17-18 - is to develop an international network of up to 50 double CubeSats (10x10x20 cm), with one half providing the usual satellite functions and the other half accommodating a set of identical sensors for lower thermosphere and re-entry research. The total mass of the 50 Cubesats, launched together on a single launch vehicle in low earth orbit, will be about 200 kg (100 kg for the CubeSats, 80 kg for the CubeSat deployment system, 20 kg margin). Due to atmospheric drag, the orbits of the CubeSats will decay: progressively the lower and lower layers of the thermosphere will be explored, perhaps down to 90 km. Following current QB50 project, 34 CubeSats are envisaged to be provided by European universities in 19 countries, 11 by universities in the US, 2 by universities in Canada and 3 by Japanese universities.

The multi-point, in-situ measurements of QB50 will be complementary to the remote-sensing observations of the much larger Earth observation satellites in higher orbits (500-800 km), to the in-situ short-duration measurements by experiments onboard sounding rockets and the remote-sensing observations from the ground with Lidars. All atmospheric models, and ultimately numerous users of these models, will greatly benefit from the measurements obtained by QB50 in the lower thermosphere.

4. Global environment and security monitored by remote sensing satellites: Europe's strategic challenges for dual-use systems in space

- **Status of the European Commission about GMES missions and future**

In a communication published on October 28, the European Commission described the challenges to be expected and the next steps forward for the space component of the GMES initiative. It raises - again - the question of financing the contributions of the EU and ESA. Additional funds have to be allocated to move into the operational phase in 2011 on schedule, in the light of ESA's long-term scenario. *"The financial effort would represent in total some 4 billion € for the period 2014-2020. This investment includes estimated annual costs of 430 million € for the operational activities and 170 million € for R & D. Finally, there is a need to continue the discussion whether the envisaged scope of GMES should be upgraded beyond 2020 or not."*

The 10-page paper of the Commission states that, in order to support the implementation of a full and open access data policy, it is necessary to develop a legal and regulatory framework of GMES. *"In this context, the ownership of the Sentinels is still an open issue which needs to be clarified. The Council mandated the Commission to do that.[...] One possible way forward is that the Commission would become owner of Sentinel infrastructure on behalf of the EU. This approach would be coherent with that being developed for EU-led space applications programmes, notably the European GNSS programmes (EGNOS and Galileo). However, further discussion with all stakeholders is needed [...]"* It specifies: *"The implementation of the GMES Space Component will depend on the successful interaction of the following main actors: the European Commission assisted by Member States, ESA as the coordinator of the GMES Space Component, and Eumetsat."* It insists on the main objective of the operations phase of the Sentinels, which is ***"to insure a continuous flow towards the users. This will include not only technical aspects, such as the control of the space infrastructure and data distribution, but also the gradual replenishment of the space infrastructure in the decades to come."***

The annex of the communication describes the six series of missions for the GMES Space Component:

- Sentinel-1 for high-resolution microwave imaging (with a SAR) – Sentinel-1A launch planned for mid-2012, while Sentinel-1B still unfunded;
 - Sentinel-2 for high-resolution multispectral imaging for land applications – Sentinel-2A launch in 2013, while Sentinel-2B still unfunded;
 - Sentinel-3 for medium-resolution multispectral imaging and altimetry to monitor global land and ocean colour – Sentinel-3A launch in 2013, while Sentinel-3B still unfunded;
 - Sentinel-4 for atmospheric composition monitoring from geostationary orbit, with instruments embarked on Eumetsat MTG (Meteosat Third Generation) satellites - first launch foreseen in 2017 (prime contractor to be announced in December by Eumetsat);
 - Sentinel-5 for atmospheric composition monitoring from low orbit, with instruments onboard Eumetsat post-Polar Orbiting System spacecraft - first launch foreseen in 2019, while a Sentinel-5 Precursor, with Tropomi, is developed with Dutch support for launch in 2014 to fill the gap between ESA Envisat and Eumetsat post-EPS missions;
 - Jason-CS (CryoSat) for high-precision altimetry, in support of ocean surface topography follow-on mission of Eumetsat.
- **ESA and Security, with GIANUS (Global Integrated Architecture for Innovative Utilisation of space for Security)**

On October 8th, ESA organized a workshop on the Dual-use European Security Infra-Red Element in Frascati, near Rome. During this workshop, Erwin Duhamel, ESA Office for Security and Partnership Development, presented the GIANUS (Global Integrated Architecture for Innovative Utilization of space for Security) concept. GIANUS is a specific model of integrated space applications, based on civilian (ESA-lead) and military (EDA/European Defense Agency-lead) user requirements, in order to link navigation, satellite communications and earth observations into one coherent and user-driven system, in view of synergy and complementary with on-going activities.

5. The establishment of national space agencies in many member States of ESA: for better management and greater efficiency

- **Netherlands Space Office (NSO) established on September 30 by the Dutch Minister of Economic Affairs**

Since September 30, the NSO (Netherlands Space Office) was launched - in presence of ESA Director General Jean-Jacques Dordain and of Dutch astronaut of ESA André Kuipers - as the Dutch agency for space affairs. It is a joint venture between the Ministry of Economic Affairs, the Ministry of Education, Culture and Science, the Ministry of Transport, Public Works and Water Management, and the Netherlands Organization for Scientific Research (NWO).

The seed from which the Netherlands Space Office has grown was planned in October 2008. At that point in time the four above-mentioned public actors signed a covenant for the creation of the NSO. It took some 11 months to establish the NSO, which is commissioned by the Dutch government to develop, in a proactive way, the Netherlands space programme and to bring that programme to real achievements in space science, exploration and applications. Further, the NSO is the face of the Dutch space community for international space organizations like ESA, NASA, JAXA (Japan), DLR (Germany), CNES (France), CNSA (China), as well as the central point of contact for the space community within the Netherlands. It also works to innovatively and openly bring the story of spaceflight science, usage and exploration to teachers, students and the general public. It cooperates closely with SpaceNed, the association of space companies in the Netherlands. It made first official presence at the international event of IAC 2009 Space Exhibition in Daejeon (October 12-16).

Space policy in the Netherlands is primarily focused on international cooperation in European contexts within the European Space Agency, the European Organisation for the Exploitation of Meteorological Satellites (Eumetsat), and the European Union. The Netherlands also have a national programme guided by the ministries of Economic Affairs, of Education, Culture and Science, and of Traffic, Public Works and Water Management. The guiding factors are: strategic importance (priorities), programmatic importance (recurring activities for the industry), practical importance (solutions for social issues). The purpose of NSO is to strengthen, through a better coordination of R&D efforts, the position of Dutch institutes, universities and industries in the European market. For further info: www.spaceoffice.nl.

The Dutch space programme plans a lot of great achievements during the next decade:

- the Misat programme on miniaturized space systems, starting with the Delfi-N3Xt nano-satellite of TU Delft, with the support of ISIS (Innovative Solutions In Space); this active 3-axis stabilized Triple Cubesat will be launched in 2011 to test a multifunctional particle spectrometer, new solar cells, micro propulsion system, radiation-tolerant flash memory.
- the FAST (Formation for Atmospheric Science & Technology) demonstration consists of an international micro-satellite formation flying mission by Delft University and the Tsinghua University of Beijing; FAST-D (Delft) of 50 kg and FAST-T (Tsinghua) of 150 kg will be put during 2014 in 650-km sun-synchronous orbit by a Chinese launcher (piggyback mode) in order to characterize atmospheric aerosols and to monitor the seasonal variation of height profiles in the cryosphere with correlation of data to visual and stereoscopic imagery.
- the TROPOMI (Tropospheric Monitoring Instrument) on the Sentinel 5 Precursor satellite for atmospheric observations from low orbit, to be launched during 2014 by ESA for the GMES programme of the European Commission.

• **Table of ESA member States with national space agencies:**

COUNTRY	National space agency (date of creation) [type of organization]
AUSTRIA	FFG/Forschungsförderungsgesellschaft (2004) [public enterprise having incorporated ASA/Austrian Space Agency established in 1987]
CZECH REPUBLIC	CSO/Czech Space Office (2003) [non-profit making organization]
DENMARK	DTU Space/Technical University of Denmark (2007) [research institute]
FRANCE	CNES/Centre National d'Etudes Spatiales (1962) [public establishment]
GERMANY	DLR/Deutsche Zentrum für Luft-und Raumfahrt - Raumfahrt-Agentur (1989) [federal public establishment]
HUNGARY	Hungarian Space Office/Magyar Űrkutatási Iroda (1992) [public establishment]
ITALY	ASI/Agenzia Spaziale Italiana (1988) [public establishment]
NETHERLANDS	NSO/Netherlands Space Office (2009) [public establishment]
NORWAY	Norsk Romsenter (1987) [public establishment]
ROMANIA	ROSA/Romanian Space Agency (1991) [public establishment]
SWEDEN	SSC/Swedish Space Corporation (1972) [public enterprise]
UNITED KINGDOM	BNSC/British National Space Centre (1985) [national office for the coordination and promotion of space activities in UK, planned to become an agency]