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The French Presidency of the EU and the Dynamics of European Space

Report of the conference held on July 2, 2008



Space Policy Program



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Ifri

27 rue de la Procession
75740 Paris Cedex 15 - France
Tél. : 33 (0)1 40 61 60 00
Fax : 33 (0)1 40 61 60 60
Courriel: ifri@ifri.org

Ifri-Bruxelles

Rue Marie-Thérèse, 21
1000 - Bruxelles, Belgique
Tél. : 00 + (32) 2 238 51 10
Fax. : 00 + (32) 2 238 51 15
Mail: info.bruxelles@ifri.org

Website: www.ifri.org

INTRODUCTION

The introduction to the conference was made by **Laurence Nardon**, Head of Ifri's Space Policy Programme. The main objective of the conference of July 2, 2008, was to assess the possible and expected impact of the French Presidency of the European Union Council (PFUE) on the future of the European space policy.

Since the 1950's, France has been the leader of the European space effort. But can it continue to do so? Several factors indicate that it may become difficult for France to play that role in the future. First of all, there may be a certain fatigue in the French dedication to space. Budgets and programmes remain stable. Also, France's traditional partners in Europe (Germany, Italy, Spain) have become bigger space actors and are resentful of France's leading posture – complaints about France's "arrogance" in the conduct of space programmes are often heard. There is also the arrival of new European space-faring countries (Poland, Hungary, the Czech Republic, etc.) to contend with.

The day was organised in three panels. The first session dealt with the reality of French leadership in space policy, the second one with the relevance of the European level for the conduct of space programmes and the last one with the role of the private sector for innovation.

This report has been written by Laurence Nardon, Head of Ifri's Space Policy Programme.

PANEL 1 - THE FRENCH SPACE PROGRAMME IN 2008

The first session set out to assess the challenges met by the French space policy today. It looked at the space-related goals of the French Presidency of the European Union (PFUE). The project of a “Code of Conduct in Space” was presented as a specific goal of the PFUE. Although not explicit in the current French agenda, Space for Africa is also given a voice.

Panellists:

Serge Plattard, Cnes representative at CLORA (Club des Organismes de Recherche Associés) in Bruxelles, on the space goals of the French presidency of the EU;

Rodolphe Paris, European Defense Agency, on current military space programmes – *due to a family emergency, Mr Paris could not be with us;*

Rosine Couchoud, Ministry of Foreign Affairs, on the Code of conduct project;

Declan Kirrane, ISC Intelligence for Science, on space for Africa;

Serge Plattard was the first speaker and presented the space-related goals of the PFUE. France is indeed the first contributor to the European Space Agency (ESA). Space has also been defined as one of the three top priorities by the Ministry of Research during the PFUE. It is therefore a major issue for the French government, whose EU Presidency comes at a very particular moment, i.e. when the EU needs to define clearly the goals and aims of a space policy. Priorities, objectives, means and an effective roadmap to achieve the goals have to be determined.

Serge Plattard also reminded us of the four major general goals of the PFUE: energy and climate; immigration; agriculture; and security and defence. He underlined that each of these issues is impacted in a way or another by space. For instance the White Book on Defence and National Security recently published by the French government stresses the urgent and immense need for an EU-level space policy.

Plattard then exposed what could be achieved during the PFUE. A major event will take place in Kourou on July, 21st and 22nd, with an informal meeting of ministers responsible for space activities. Four initiatives will be discussed: the role of space for fighting climate change; the Lisbon goals – for instance, how space can help to achieve integrated services application?–; security, with the maintenance and surveillance of space infrastructures or early warning systems; and exploration. This meeting should also be a preparation for the 5th European Space Council that will take place in Brussels on the 26th of September and a place where a consensus could be reached.

A GMES Forum will also be held in Lille on 16th and 17th September, prior to a communication expected in October. And a general public event will be organised in Strasbourg in October dealing with Planet Earth, Space and Europe, and GMES demonstrators.

The year will end with several high-level events related to space. The ESA ministerial Council will take place on November 25-26 in The Hague. Two EU councils will follow: the Competitiveness Council of December 1st and 2nd, and the European Summit of December 11 and 12. It is anticipated that a specific paragraph on space will be included in one of the two European Summits declaration.

The speaker underlined the strong willingness of France to do more for space, without arrogance, but setting up priorities fully in line with the resolution of the last European Space Council (22 May 2007).

(Rodolphe Paris)

Rosine Couchoud, from the French Ministry of Foreign and European Affairs, presented the innovative project of a Code of Conduct in Space.

Several factors have highlighted the issue of space security. Human activities are depending more and more on space activities (communication, weather forecast, navigation or climate survey); Space-faring nations rely more and more on space for their security (military operations, surveillance); Some specific activities have had harmful consequences on the space environment: the recent Chinese anti-satellite test has generated considerable amounts of long-life debris.

The need to strengthen the security of space activities is therefore recognised internationally and several declarations have been noticed:

- UNGA resolutions 61/75 of December 2006 and 62/43 of January 2008 call for international transparency and confidence building measures (TCBM);
- the speech of UN-COPUOS President (Gérard Brachet) in 2007: “a safe environment for space activities is no longer a given, if one takes a long term view”;
- Russia and China proposed a treaty for the prevention of the placement of weapons in outer space, February 2008;
- US Administration: “new Transparency and Confidence Building Measures in Space (TCBMS), implemented on a voluntary basis, have the potential to enhance satellite safety and reduce uncertainty in an evolving space security environment”;

- President Sarkozy speech in Kourou, in February 2008: “It is time we found international pragmatic solutions to this concrete problem. To promote security of space activities, we must put in place transparency and confidence-building measures on a voluntary basis, that would be acceptable by the most possible States”.

The EU has indeed developed its own approach to space security. The European space policy adopted with the EU Council resolution of 27 May 2007 recognises the strategic value of space for the security, environment, peace and prosperity of Europe and the need for an autonomous and reliable access to space. It favours a multilateral framework to discuss security in outer space. It recognises that a treaty for the prevention of an arms race in outer space could have some merit, but that it would be too difficult to converge on clear definitions and on a precise scope and to elaborate a verification system. Europe favours a pragmatic and incremental approach that would create an atmosphere of confidence and transparency.

The EU has therefore looked at TCBM in outer space since 2007. The EU joint reply to UNGA/61/75 resolution of September 2007 listed the basic principles that must apply to space activities: freedom for all to use outer space for peaceful purposes; preservation of the safety, security and integrity of space objects in orbit and due consideration for the legitimate defence interest of all nations.

In 2008, the EU drafted a Code of conduct for outer space activities. The main principles and objectives that such a Code should follow are the progress towards adherence and implementation of the relevant existing treaties or guidelines regarding space activities, the development of best practices guidelines for a safer space traffic management and the development of measures strengthening confidence and mutual understanding. The EU recommends the voluntary nature of such a code.

The aim of such a code is to elaborate best practices guidelines on a voluntary basis. They will integrate rules of behaviour on acting in concert, the prevention of potential harmful actions in space and a consultation mechanism for resolving incidents. The expected results should be the reduction of the risk of accidents and collisions between space objects, the mitigation of space debris generation and the enhancement of mutual understanding and confidence between space-faring nations and actors.

This EU project is the result of a common effort by Member States. It was launched by Italy, then actively supported by the successive presidencies of the EU with the full cooperation of other Member States. The PFUE will actively sustain the way forward to propose this EU contribution to the international space community in close cooperation and coordination with other Member States.

As soon as it is ready, the EU draft Code of conduct will be submitted for consultation and review to space-faring nations and other nations involved in space activities. It will be presented to the relevant international fora, where EU outreach activities appear to show a consensus on a text for an international Code of conduct. Such project could be endorsed by the UNGA and possibly launched for subscription by all countries.

In conclusion, Rosine Couchoud said that an international code of conduct or set of best practices guidelines will strengthen the security of space activities and allow their development for the sake of human activities.

Declan Kirrane, from ISC Intelligence for Science, ended the session by talking about space for Africa. He first mentioned that the EU may indeed need a little French “arrogance” to make its space policy go forward, meaning that France is one of the most committed and active countries on space policy and that such activity is not useless.

Declan Kirrane underlined the importance of the July Competitive Informal Ministers meeting in Versailles. There is a major problem with the European policy on Research & Development as there is no evaluation mechanism. There are no instruments to measure the evolution of space technology research in Europe. This informal Council could be a step towards the implementation of such a mechanism. The speaker also noticed that the current spending for R&D in space technology in the EU is about 300/400 billions of Euros, which would represent 20/30% of what is spent in the USA. A mechanism of policy process evaluation, according to the speaker, has to be implemented by the EU.

Concerning the issue of space and Africa, the speaker suggested that during the PFUE, an ambitious and concrete agenda should be created and promoted for space cooperation with Africa. Beyond this point he thinks that science and technology cooperation has to be consolidated because it is a strong and efficient vector of development in Africa.

To conclude, the speaker has claimed how important and urgent it is to include Africa in our field of thought much more than we currently do.

Questions and Answers

- **Question** (*Laurence Nardon*): What space-based technologies could concretely help Africa’s development?
- **Answer** (*Declan Kirrane*): Tele-medicine and monitoring mosquito-infested areas.
- **Question** (*Rebecca Johnson, Acronym*): On the European Code of conduct in space: what particular problems have been met during the negotiations? Has the European draft Code been discussed at all with the USA?; How is it perceived by Russia and China?; Could France support a particular forum for negotiation if the CD does not work out?
- **Answer** (*Rosine Couchoud*): The EU is favouring a concrete approach that can be worked out and accepted by a great number of countries in a near future. The European draft Code of Conduct has so far not been discussed outside EU member states. The way forward of the project is to be agreed first within EU.
- **Comment** (person from Hungary?): On the capacities and successes of European space industry: Europeans are already in a strong position. They

should be proud of it instead of blaming themselves for a supposed “arrogance.”

▪ **Question** (*Christine Leurquin*, SES): What is the telecommunication agenda of the EU and its interactions with the space agenda?

▪ **Answer** (*Serge Plattard*): The telecom package is currently discussed and has to be taken into account by the PFUE regarding space policy, in particular vis-à-vis the guarantee for full access to the frequency spectrum and protection of dedicated spectral bands for satcom operators. The French Presidency expects to reach a strong political accord on the “Telecom Package” at the TTE Council on 27 November 2008.

▪ **Question** (*Julien Hale*, Defense News): What are the security aspects of space policy and how can it contribute to the implementation of European defence capacities?

▪ **Answer** (in the absence of Rodolphe Paris, answered by *Patrick Chatard-Moulin*)

▪ **Question** (*Stephanie Schulze*): Do Nicolas Sarkozy’s declarations of last February mean that Kourou is to become a European space-port?

▪ **Answer** (*Serge Plattard*): Sarkozy’s proposal was a political declaration, nothing more, nothing less. It should be understood to mean that the Kourou space-port, the European space-port, is at the disposal of all European countries if they so wish. There is already a division of labour: the land belongs to France, the facilities belong to ESA and the operations are managed by Arianespace.

▪ **Comment** (*Daan du Toit*, Embassy of South Africa): Africa should not be always presented as a backward continent. In south Africa, for instance, there are many space realisations. Also, debates on Africa include too rarely African representatives.

PANEL 2 - THE MANAGEMENT OF EUROPEAN SPACE

How do major space programmes shape the evolution of space policy management in Europe? The second session reviewed the examples of Galileo, GMES and Space exploration. How is it possible to organise a space programme with ESA, the EU, industry and member states as stakeholders? What lessons have we learned from the past difficulties of the Galileo programme? How is the management of GMES being set up? How should Europe set about exploring space? How should we organise our cooperation with Nasa?

Panellists:

On the general outlook for European space:

Kevin Madders, Systemics Network International;

On Galileo:

Paul Verhoef, DG Energy and Transports, EU;

Didier Faivre, Head of the Navigation Programme, ESA;

On GMES:

Mauro Facchini, DG Enterprise, EU;

Pierre Potin, GMES Space Office, ESA;

On European space exploration:

Richard Heidmann, Association Planète Mars;

Kevin Madders, made the following remarks:

“In introducing this theme, I'd like to make **three points** on the general situation and outlook for European space, before introducing the panellists and then – most importantly in particularly this session – opening the floor to discussion on how we *might* manage European space at this particular juncture of a French Presidency, a Sarkozy Presidency. I'm looking forward to a good discussion, because this Presidency offers a rare opportunity for space, and the sooner we get ideas flowing to the Presidency and the other institutions, the better.

My first point relates to the situation for European space by reference to a date and a place – Friday June 13th, Ireland, the day we learned the outcome of the Irish referendum. Where does that Irish No leave us in space? It leaves us, for the purposes of the French Presidency period, in the position just before the German Presidency, at the end of June last year, when it managed to secure agreement on what became the Lisbon Treaty. In other words, it leaves us still with the ESP adopted in April/May last year. And that Policy will still have to be our guide, not for now the prospect of the new Art. 189 that Treaty contains and which allows clear EU legislative competence on a European space programme. Everything therefore depends now on how that first, basic Policy – a consummate piece of compromise and consensus, more a collective coming together than a thing of real substance – can be used in a context in which it is just that – measures of substance from action on security to exploration – that are being put forward by the new Presidency, the nation which is historically and today the *primus inter pares* in space in Europe but which is now advocating “more Europe” here, and is able to do so against a compelling geopolitical environment with respect to the US and Russia as well as China and India, the most important among the new space powers.

This brings me to my second point. If we take the ESP as a container, of course it can be filled as a matter of logic. But what with? And what are the prospects? The answer to the first question is an easy one, given that Europe through ESA and recently the EU has already been active in launchers, telecoms and navigation including Galileo, EO including GMES aspects, ISS and science – it’s that large “rest” that we haven’t done or done much of, i.e. security/defence and exploration. And this is exactly where the incoming Presidency messages have been aimed at. As to the prospects, this depends partly on the political environment and the limitations upon any Presidency, and partly on the political force, leadership and strategy this Presidency can bring to bear, including in building a package that includes space but is not, for the first time since the 1960s, confined to space; rather, it may have in particular to include an understanding related to space, on the one hand, and security, on the other, in order to succeed. This is, perhaps, fertile ground for discussion. But what is certain is that, if the present Nice Treaty Presidency rotation continues, this is the last of the Presidencies for a long time that is well placed to make a decisive push for space. If not now, then when? And that depends in part on the space community.

My third and last point relates to “means”, and here we come to the “management” this panel’s theme talks of. In reality, at this level of policy discussion, this boils down to who does what, and this in turn revolves around the EU’s role. Not the Member States’ – they could in theory do everything, but we know in practice they never will. And not ESA either – it exists because of Member States’ respective needs to combine in this field but clearly lacks the scope and political weight of the EU. President Sarkozy here seems to be calling for the cards finally to be placed on the table in this interminable game, adopting a hard-nosed, “what are we doing and how best to do it” attitude inspired in part by the restructuring of NASA’s mission in the US. The status quo is no longer inviolate. Political ranks have broken. A new dynamic can – if this opportunity is used decisively – now enter the scene.

But, before we get carried away, let us contemplate just how things have gone when the EU has entered the field, with our first speakers, on Galileo – which saw the opening yesterday of the Commission’s big-ticket call for tenders for the €3.4 billion worth of contracts for the Galileo Full Operational Capability procurement – and then on GMES – this massive, later programme, again run by the Commission, which has recently undergone its own reforms (Munich road map, GMES Advisory Council, GMES Bureau ...) but for which the

really important management structures, particularly for operations, are to many observers by no means clear. We will end our panel's speeches with that dazzling, but especially ambitious new area for the EU led programmatically by ESA, exploration."

In his speech, **Paul Verhoef**, from the DG-Tren at the European Commission, developed the governance aspect of the Galileo programme. The Galileo programme is undergoing an important phase, because the call for tenders for the next phase of the programme has just been issued (July 1st), for more than two billion euros.

The competence of the EU in space set up in the Lisbon treaty would have made it easier for very concrete programmes to be pursued by the EU (in its article 189). Galileo is the main example of such concrete programmes. As it is, Galileo will continue to be managed based on recent solutions. The core of Mr Verhoef presentation is to underline the many new challenges met by the EU in dealing with the Galileo programme.

The crisis met by the Galileo programme last year was mainly due to politics. Indeed, a lot of politics are clogging the programme. As a consequence, governance problems appear. The European Commission is not necessarily a good programme manager but it had to endorse this role because there were otherwise too many political disputes between member states. On the other hand, the technology was never a problem in Galileo.

According to the European Parliament, the Galileo programme needs a strong executive to go forward. As a consequence, a better regulation system has been adopted in April 2008. This regulation is characterised by a clear division of responsibilities. Galileo's governance is delivered by four political authorities within the EU: the Council of the EU (Transportation), the European Parliament, the European Commission and the new "Galileo Inter-Institutional Panel" (GIP). The latter is composed by members of the European Parliament, Commission and Council. It was created following a requirement of the European Parliament asking for better information – a legitimate concern since Galileo is funded with EU money. The GIP should be up and running in coming months.

Financing and procurement of Galileo are also a challenge for the EU. European space programmes rely on three sources of funding: the Member States, ESA and the EU. The actors involved have a quite different approach. The member states and EU approach is based on free trade and competition, whereas the ESA approach is based on maintaining the continuing competitiveness of the space industry. We need to try and get rules and culture on the same line. As regards the budget issues, EU budget tools up to now have been more adapted to distributing subsidies. As regards procurement, the EU has only ever procured limited elements, such as writing desks, pens and a few institutional buildings. In the next decade, the EU will own Galileo, and this will be much more complex. Also, Galileo actors must be very careful with the budget, as it will not be possible get extra money.

Galileo brings new realities to the EU. A lot of issues still have to be discussed: cooperation with foreign parties, the application system and the political decision on how to operate the system. It is really important that the European Commission stays involved in the system. However, ESA should come to the same level of authority and responsibilities as the EU.

Didier Faivre, from the Navigation Department at ESA, spoke next. To introduce his speech and contrary to Paul Verhoef who is annoyed by the apparent failure of the Lisbon Treaty and its famous article 189, Didier Faivre declares that article 189 does not matter. Galileo is an example where we are already working in cooperation with the European Commission in an environment where space is not a shared competence and that seems to be alright so far. Mr Faivre then listed a few important points relating to the management of European space programmes.

There is a very small number of engineers and scientists in Europe, in the area of 30 to 40 thousand persons. They are very good. Indeed, in Europe, we have enough technical and scientific knowledge to launch any programme we want, except manned flight (and this does not affect the role of Europe in the other fields). But due to this very precious and scarce resource, we cannot afford to lose a particular competence at any one time. Otherwise, Europe will not be able to develop any specific programme from scratch. As a consequence, and more than the existence of a governance framework, the existence of an efficient space sector is linked to the existence of programmes allowing to maintain these technical skills.

The second point of Mr Faivre's exposé was related to the maturity of the European space sector. The space sector in Europe, despite its long history, has never been mature in the sense that it has never been financially self-sufficient. As all space activities in the World, it needs to get public funding from institutions in order to survive. In recent years, the European space programme has found a new source of funding with the European Union. The European space community welcomes the EU as a new actor with great pleasure, since it brings new programmes and political legitimacy. For example, without the EU, Galileo would not have been created. The GMES programme would not have been launched either. These programmes are too massive to be managed at the national level.

The third point developed was linked to the lessons that were developed through the Galileo programme. Three lessons can be learned from the Galileo programme:

- Be simple. A new structure of governance for Galileo has been created almost every year for the past decade, each new one replacing the one before. According to Mr Faivre, this is not serious. The concession system was too complicated and has failed. A simple relation between the public sector acting as a customer and industry acting as a supplier is still the most appropriate way of building space infrastructures.
- Be stable. Space programmes exist over a very long time. They need a long-term political and budgetary stability of at least 15 years. Space programmes are long term commitments that we have to respect.
- Be careful. There are just a few numbers of suppliers in Europe. We must take good care of them. The procurement policy should be adapted to the space sector characterised by a very small number of actors with a very specific competence.

After those two interventions referring to the Galileo programme, three others participants gave their speech supported by a **PowerPoint presentation**. Two panellists were **Mr Mauro Facchini** (EU) and **Mr Pierre Potin** (ESA), addressing the GMES programme. They were followed by **Mr Richard Heidmann** (Mars Society), presenting his views on European space exploration. Their presentations can be read on the conference page of the ifri website: www.ifri.org.

Questions & Answers

▪ **Question:** Will the call for tenders for Galileo be open to non-European companies at the prime and sub-prime level?

▪ **Answer (Paul Verhoef):** Some restrictions will exist for reasons of security. The EU decided to only select candidates with an EU origin for the prime level. For the sub-prime level, restrictions to EU-only companies will apply when they work on critical technologies.

For sub-prime contracts with non crucial technologies, competition will be open to non-EU companies and the EU will respect the rules of the WTO. Note that, at the request of the USA, launch services are not open to WTO rules (i.e. national preference may apply).

Finally, ESA will be allowed to make justified exceptions to the rule.

▪ **Question (Peter De Selding, Space News):** What will be the policy of the EU as regards the intervention of Chinese firms in the Galileo programme?

▪ **Answer (Paul Verhoef):** If a candidate has some good reasons to answer to the call for tenders, it will have to register to ESA. This organisation will decide if it is possible. If the company gets an agreement by ESA, it will freely trade.

▪ **Question:** Will you have a PPP for the next phase of procurement in 2015? Why did a PPP fail last time?

▪ **Answer (Paul Verhoef):** The PPP failed because we could not transfer enough technology to match the money put up by the private companies. Supporting the costs alone would have required too much money. We are going to stay away from PPP for a while. We need to have a better technology that we will be able to transfer. Currently, it is not really clear.

At the end of the year, we are going to study the PPP issue from the bottom up. We have to do this from an economics perspective and not from a political point of view as has been done so far. We remain very open-minded. PPP will be a political decision, made in 2010.

- **Question** (*Alain Bories, OHB Technologies*): What are the real space exploration programmes that are being developed. Are they about Mars or the moon?
- **Answer** (*Richard Heidmann*): Exploration programmes are clearly about Mars. Scientific exploration is the real objective and there is a scientific potential on Mars.
- **Question**: Concerning climate change and energy issues in Europe, how can space programmes help? Can they have an impact on these problems?
- **Answer** (*Richard Heidmann*): We cannot guarantee solutions to the climate question but we can study it better thanks to space policy. We can get a better understanding.
- **Answer** (*Pierre Potin*): GMES will provide a very valuable set of data for the monitoring of climate change, which also relies on a variety of other data outside the domain of GMES. The huge archives of Earth Observation data that ESA together with its member states have established over the last thirty years are of great interest for the study of climate change. ESA has recently proposed a specific element related to climate change as part of the Earthwatch Programme. It aims at exploiting the full potential of the long-term global EO data archives, with the objective to generate relevant Essential Climate Variables (ECVs) in support to climate change monitoring.

PANEL 3 - SPACE FOR INNOVATION

The afternoon session explored the issue of high-tech innovation through space. Are space programmes a significant driver for innovation in Europe? What is the role of European institutions such as ESA? Representatives from the industry presented their particular case, with a focus on SMEs.

Panellists:

Leopold Summerer, Advanced Concepts Team, ESA, on space innovation in Europe;

Case studies of space-related innovation:

Pascale Lardin, Director European Affairs, Altran, France;

Arnab Basu, Managing Director, Kromek, UK;

Bruno Ramos de Carvalho, CEO, Active Space Technologies, Portugal;

All four speakers used a **PowerPoint Presentation** that can be accessed on the conference page of the Ifri website. What follows are main remarks from their speech, followed by a rendition of the Q&A session.

Leopold Summerer made the introductory presentation, describing ESA's programme to help technological innovation in the space field in Europe.

The conditions for innovation in general

Innovation is the combination of Invention and Implementation. It can concern products, methods or technology. Since innovation cannot be ordered, we need to create conditions that favour innovation to happen. What are these conditions? The following conditions are known to be good for innovation to happen: attractive stimuli; out of discipline thinking, intersecting and crossing disciplinary boundaries; encouraged risk taking; creativity, emphasis on research and good human resources.

But since innovation is not only about invention but also implementation, we need opportunities, markets and buyers. Some great inventions go unnoticed if there are no opportunities to development and implement them.

The specifics of innovation in space activities

How does the space field fulfil these conditions? A positive stimulus for space-related innovation is that the objectives are very challenging and that the environment is rather difficult. Space engineers and scientists in that field remain very alert. “Out of discipline” thinking is not always that common in the space sector, since researchers have a high degree of specialisation and the space field is perceived to be a rather closed field, thus inputs and stimuli across and from outside are rather the exception than the rule. In terms of “risk taking”, all space activities are risky almost by definition. Space missions and projects managers tend to be very reluctant to take additional risks by implementing new technology, where not absolutely needed. The high general risk of space activities has thus led to a risk adverse culture within the space community. Finally, the level of education is very good in Europe. It helps young people to be creative with a solid basis.

In terms of opportunities and markets to implement inventions, the space sector has relatively high entrance fees and thus only few flight opportunities. This is also related to the absence of a competitive free market in most space domains except telecom and maybe launchers: the space market can be described as a monopsony structure (only one customer) with the monopsonist lacking the resources to sustain full competition over its entire supply base. Furthermore, the « entrance fees » for a new provider on the market are very high.

Innovation Mechanisms at ESA

How does ESA address these issues and try to overcome the deficiencies of the space sector to stimulate innovation? Space missions cost in the order of 200 m€ to 1 B€ and higher. In order not to decrease the already high risks of these missions (less than 1% of ESA contracts over the last 10 years represent about 70% of the budget) Europe spends about 400 million Euros per year in R&D for space, about half of it via ESA’s Basic and Specific Technology Research Programmes.

In addition, specific programmes are in place to provide opportunities for in-orbit demonstration of new technologies.

It must however be noted that European industry has a persistent and substantial disadvantage over their US counterpart, where not only NASA represents about 5-6 times the ESA budget but also the biggest investor in space innovation programmes remains the Pentagon.

Leopold Summerer ended his presentation by presenting two specific ESA programmes dedicated to innovation: the ESA Innovation Triangle Initiative (ITI) and ESA's Advanced Concept Team (ACT) and its Ariadna programme. More information can be found at <https://iti.esa.int/> and www.esa.int/act respectively.

The next three presentations were case studies of companies dealing with space-related innovation.

Pascale Lardin, from Altran, started by presenting her company. Altran defines its mission as being a "global partner for innovation". According to Altran, an innovation strategy should follow four steps. First, there should be a marketing study, aiming to discover new needs of the market. This is followed by an R&D effort, coming up with a prototype for the new product. Then the industry builds the product. The last step is of course, sales.

Pascale Lardin then proceeded to present two examples of Altran's innovation effort for Galileo. Altran recently organised a "creativity session" in Paris, where different actors were asked to invent new types of services for Galileo. By new services, they meant services that do not exist with GPS today. The team came up with six general concepts:

- Sending people who are leaving a concert hall or a movie theatre information about restaurants and other places in the area;
- In-house services for elderly people -because the navigation signal can get through the concrete walls of a building;
- Helping people extend their social network by sending information about practical assistance and business possibilities in their area;
- Sending people very precise weather forecast, adapted to the place where they are;
- Information services for travelling people, either professional or tourists;
- Very precise information about the risks of collision on the road. This service would alert a driver about in-coming cars, bicycles or truck.

Another such session conducted with an Italian university produced the concept of monitoring the day-to-day condition of pipelines, in order to prevent gas and oil sabotage. It could also watch dangerous waste transports and construction sites.

All participants were there as voluntary contributors and not under contract. The next step will be to propose these ideas to operators.

The next speaker, **Arnab Basu**, is managing director of the British firm Kromek.

Kromek has very tight links with the University of Durham. This closeness with a student community helps them maintain an innovative approach to their work, which Dr Basu thinks is the real reason why they get so many contracts. They are producing innovative technology in the fields of medical engineering, security, industry and space.

Arnab Basu starts by mentioning the aphorism that “research is to put money into knowledge; and innovation is putting knowledge back into money”.

Kromek has devised spin-offs from space programmes. They propose the XRA system: a 3D X-ray system with automatic and fast object recognition that gives a true multi-view animation. It is a very promising tool for airport security tasked with the control of luggage. Also, Kromek invented a detection system that can analyse what type of liquid is in a bottle without opening it. The machine can see if it is an explosive (such as acetone or peroxide). This would be very useful for airport security as well. Kromek also received offers from Muslim countries who want to use the system to detect whether a bottle contains alcohol.

The last speaker of the day was **Bruno Ramos de Carvalho**, CEO of Active Space Technologies, a company established in Portugal in 2004 after being incubated at the ESA European Space Incubator. The company is new and small but has been growing above 100% every year.

Active Space Technologies develops innovative systems based on research done in the framework of space and nuclear fusion programmes, such as, for instance, the BepiColombo mission and the AlphaBus, ExoMars, JET, and ITER programmes. They have developed cryogenics hardware and have a strong R&D portfolio in thermal insulation materials. They have also been developing technology transfer products, namely garments using micro technology to keep temperature within prescription values. Active Space Technologies has a worldwide patent for this product and has received enquiries from NGOs working in the Middle-East.

Questions and Answers

- **Question** (*Laurence Nardon*): Focusing on the SME concept, what makes you different from big companies? Why would ESA choose you over a bigger company?
- **Answer** (*Arnab Basu*): Small companies innovate much faster. They have very skilled people in very specific sections. On the other hand, we have to admit that big and small companies complement each other. The big ones can spot what is missing on the market more easily. However, big companies are big machines, and are sometimes slower to react.

- **Answer** (*Bruno Ramos de Carvalho*): Innovation often boils down to a person. An individual will be the inventor and he or she may be in an SME as well as in a big company. Once again, big and small companies are really complementary in the space field.
- **Question** (*Pat Norris, Logica*): Multinational companies are the most efficient in the space field. I am British and I have seen the creation of one single new multinational company since the end of the second world war. Could ESA help Great-Britain to create such companies?
- **Answer** (*Leopold Summerer*): As we have just said, small companies are also very important and useful because of their fast reaction capacity. We might need more small companies in the future instead of big ones.
- **Question**: One main point of this Presidency will be to look at Europe's future energy policy. We might need more gas, more oil and more coal than we can afford. In this view, would it be interesting to get solar power from space? Can space improve the energy situation in Europe?
- **Answer**: We have to evaluate the difference between how much we invest in such a space project, and how much energy we get back from such an investment. Today, we do not know how much energy we could get from space. We have to consider that it already takes a lot of energy to launch a rocket. Deploying solar power in the Sahara may be a cheaper option! There is also the issue of the storage of energy. However, in 2007, the Pentagon commissioned a study that showed that it would be cheaper to beam low energy from space to distant areas of Afghanistan, rather than to use ground transportation to get fuel there.

It is true that we don't have a impressive global budget. We should aim to rise the research budget for energy in Space in coming years.

- **Question**: What about the standardisation of intellectual property rights in the EU concerning the field of space?
- **Answer** (*Kevin Madders*): We are lucky in that we are really well protected in term of patents, intellectual propriety and so on in Europe. This is the responsibility of ESA and it is doing so really well.