

2012, a turning point for Europe in space

Christophe Venet

February 2012

2012 is likely to be a serious test year for the European Space Policy (ESP), with several crucial decisions ahead, most notably at the ESA Council at Ministerial level next fall and regarding the status of space within the next Multiannual Financial Framework (MFF) of the EU (European Union). These decisions will have mid- to long-term consequencesⁱ, and will also reveal the degree of political will to pursue an ambitious ESP in times of economic and financial constraint.

2011 has been a prolific and successful year for the ESP. The past months were marked by high-profile successes: the second flawless docking of the Automated Transfer Vehicle (ATV) to the International Space Station (ISS), the first flight of the Europeanised Soyuz launcher carrying the first two operational Galileo satellites, the important discoveries and observations made by the Herschel, Cryosat, Proba-2 and Mars Express missions, the approval of the Meteosat Third Generation (MTG) programme, one of the most complex space projects ever initiated by Europe, or the launch of the first French high resolution and dual-use Earth observation (EO) satellite *Pléiades*. At the same time, governance and funding issues continued to burden the ESP – epitomised in the harsh conflict over the future of the Global Monitoring for Environment and Security (GMES) programme. Similarly, issues as important as the future launcher policy, the ISS policy or the exploration strategy are still marked by uncertainty.

This paradoxical situation is very much representative of Europe's efforts in space. Despite the absence of a state-centric and unitary political dynamicⁱⁱ, Europe is a leading space power at the global level. However, this balance between scientific and technological successes and cumbersome political bargaining is fragile. Two years after the adoption of the Lisbon Treaty, which gave both new competences and new responsibilities to the EU in spaceⁱⁱⁱ, the question remains the same: will Europe remain a major spacefaring actor, or is it going to decline in a context of economic crisis, increasing global competition and persisting internal deadlocks?

To understand what is at stake in the upcoming months, it is necessary to analyse the context in which decisions will be taken, focusing in particular on enabling and constraining factors. In this respect, we will first identify the structural trends framing the decision-making process, both at the external and internal level (1). On the basis of these elements, specific focuses will be put on the two flagship programmes (2), on the issues to be discussed at the ESA Council (3) and on space and security (4).

In 2012, several crucial decisions lie ahead, most notably at the ESA Ministerial Council next fall and regarding the status of space within the next MFF of the EU. These will reveal the degree of political will to pursue an ambitious ESP in times of economic and financial constraint.

Christophe Venet is Research Associate to the Ifri Space Policy Program.

Ifri is a research center and a forum for debate on the major international political and economic issues. Headed by Thierry de Montbrial since its founding in 1979, Ifri is a non governmental and non profit organization. As an independent think tank, Ifri sets its own agenda, publishing its findings regularly for an international audience. Using an interdisciplinary approach, Ifri brings together political and economic decision-makers, researchers, and internationally renowned experts to animate its debate and research activities. With offices in Paris and Brussels, Ifri stands out as one of the rare French think tank to have positioned itself at the very heart of the European debate.

The opinions and remaining errors are the responsibility of the authors alone.

ISBN: 978-2-869592-989-4
© All rights reserved, Ifri, 2012



Structural trends

The decisions to be taken in 2012 will be constrained or enabled by structural trends. These are of external nature (economic crisis and increasingly competitive global environment) and linked to internal factors (evolution of the European space governance, difficult quest for a European identity through space). While all these factors are linked together, it is important to distinguish between their long-term implications and their short-term effects.

The paradoxical effect of the economic crisis

Looking only at budgets and revenues, the crisis had a limited impact on both the institutional and commercial space sectors since 2008. Commercial space revenues continued to increase in the downstream and upstream sectors – yet at a moderate pace for the latter^{iv}. As for the institutional space budgets, they remained flat at worst (ESA in 2012^v) or slightly increased at best (ESA between 2011 and 2011, CNES between 2007 and 2012^{vi}). Budget decreases were exceptional, and only concerned minor ESA contributors^{vii}. All in all, the European space sector benefited from strong governmental support during the crisis. European institutional actors continued to lead the demand for satellite procurement (among other with the Galileo and GMES procurement contracts), the use of national export-credit agencies (such as the French *Coface* or the *British Export Credit Guarantee Department*) for space projects expanded, and some countries (most notably France^{viii}) launched economic stimulus packages to fight the crisis and channelled some of these funds to the space sector. As a whole, these trends seem to indicate that governments understood the strategic nature of space activities, as they backed the space sector in the crisis, both politically and financially.

At the same time however, the European space sector starts to feel the effect of the crisis, even if the impact is still moderate. In late 2011 for example, ESA adopted a plan to reduce its internal operating costs by 25% until 2015^{ix}. More significantly, budget constraints are increasingly put forward by decision-makers in the discussions on the ESP's future. The GMES crisis for example, originated in a conflict between EU Member States and the European Commission (EC) over the MFF budget. Similarly, France is evoking the economic and financial situation to justify its conservative position on the future European launcher^x.

All in all, the effect of the global economic and financial crisis on the European space sector is paradoxical. The space sector has been relatively spared by the crisis until now, but the crisis will likely overshadow all the decisions to be taken in 2012, in particular at the ESA Council and regarding the future MFF. At the end of the day, the crisis is a real test-case for the strategic nature of space in Europe. It could even be considered as an opportunity to fully implement the paradigm change that emerged gradually two decades ago: that is to move from a technology-push approach towards a demand-driven perspective in order to fully exploit the long-term benefits of space applications^{xi}.

A challenging international environment

It is not possible to consider Europe isolated from the broader trends on the global space scene. Indeed, the space policies of all the other international actors have an influence on Europe's relative position in the hierarchy of space powers. The stakes are high for Europe, as it needs to remain a significant space power both to maintain its strategic autonomy and to continue being perceived as a credible partner for international cooperation. As a matter of fact, the international environment in space is increasingly competitive, on the political front as well as from an economic perspective.

Politically first, the geopolitics of space is evolving rapidly. In the medium term, China and India are emerging rapidly as important spacefaring nations, Russia and Japan, two historical space powers, are in the course of reorienting and reinvigorating their space policies, and several

emerging countries start to get involved in space activities in Asia (South Korea, Vietnam, Thailand, Singapore), in South America (Brazil, Venezuela, Chile, Bolivia), in Africa (South Africa, Nigeria, Algeria) or in the Middle East. To adapt to these changes, Europe will have to come up with a coherent and credible strategy for international cooperation, backed by efficient space diplomacy.

On the short run however, the most pressing issue for Europe will be the developments within the U.S. space policy. The current U.S. budgetary crisis, coupled with the difficulties in implementing the new direction given by President Obama to the U.S. space policy are particularly worrying for Europe, as the U.S. has always been its most important cooperation partner in space. The first concrete consequences of this situation have been the withdrawal of the U.S. National Oceanic and Atmospheric Administration (NOAA) from Eumetsat's second-generation European Polar System (EPS-SG)^{xii} and most importantly, NASA's likely withdrawal from ExoMars, as Barack Obama's budget proposal for 2013 cuts into NASA's science budget^{xiii}. Europe will have to find solutions for these two programmes within the next months^{xiv}, but this also raises the question of a credible international cooperation strategy on the long term.

On the economic front then, competition is also increasing. Europe will have to find adequate responses in all the commercial space markets, as new entrants appeared in the satcom business, on the commercial launch market, and on the EO data market. In addition, U.S. firms might increase their presence on the international market for satellite manufacturing, given the decreasing prospects on the U.S. domestic market and the increasing pressures to reform the ITAR (International Traffic in Arms Regulation) rules. As Europe's economic model in space has always relied heavily on exports – given the small size of the European institutional market – increased commercial competition could seriously endanger the ESP. On the background of the economic crisis, the equation becomes a complicate one: European governments want to cut costs and thus reduce their spending, but they are conscious at the same time that the European space industrial basis needs a strong governmental backing to survive.

Enduring governance issues

At a very generic level, European space governance can be understood as “the combination of legal norms that emanate from international, European and national legal frameworks which, together, organize a coherent European decision-making process in both space policy and programmatic activities”^{xv}. This definition highlights the complexity of the issue, as European space governance is at the crossroads of policy (it is linked to the substance of space programs), politics (it has to set institutional “rules of the road”) and polity (it has to accommodate several tiers of actors).

The entry into force of the Lisbon Treaty was to bring about some important changes. Most importantly, it gave the EU a shared competence in space matters. Having a legal personality, the EU can now directly negotiate international space agreements. Similarly, the primacy of EU law over ESA law is now institutionalised. At the same time, the two other actors within the “governance triangle” still play major roles: ESA has been formally recognised by the Treaty, and the EU shares its space competence with its Member States and should coordinate its actions with them^{xvi}.

Despite these institutional developments, few tangible results emerged in the past months. Some institutions – such as the European External Action Service (EEAS) – are still searching for their precise role in the European space governance architecture, a coherent and formalised European space programme is still missing, space budget allocation is still complicated and not aligned with the long lead-times of space projects and the crucial question of EU/ESA relations is not solved yet.

Whatever option is chosen, a central feature of the European space governance which is likely to remain is the central role played by Member States. In particular, the evolution of the Franco-German tandem in space will have a crucial importance for the near future of the ESP. France and Germany are the two leading actors in the European space landscape, in terms of budgets, programmes, scientific and industrial capabilities. Despite successful cooperation in certain areas (SSA, military EO, Merlin mission), France and Germany are industrial competitors, and they increasingly voiced their divergences in the past months (on the European space governance, on launcher policy, on the ISS). A successful year 2012 for the ESP will thus partly depend on a convergence between German and French positions. The latest French-German Council of Ministers sent encouraging signals, as a common declaration on space policy was adopted, outlining their common objectives for the ESP and setting up a bilateral CNES/DLR working group to harmonise their positions on launchers and the ISS^{xvii}. However, it would be a mistake to focus exclusively on France and Germany, as other countries having significant space capabilities (Italy, Spain, UK, Belgium) could sometimes be irritated by the preeminence of France and Germany^{xviii}. Similarly, new EU Member States are showing increasing interest for space matters, as testified by the Space Councils organised by the Czech (in 2009) and Polish (in 2011) EU Presidencies.

In search of a European identity in space

There is a political convergence between the general development of a European identity and the growing ambitions of the ESP. Both developments are work in progress – there is no clearly defined and perceived European identity yet, and the ESP is still in construction despite evident successes – but in both cases there is also a strong political will to move forward. Given the potential contribution of space to the building of a European identity and the evident importance of identity factors within the ESP, both dynamics are mutually reinforcing each other. The issue can be tackled from two perspectives: how space can contribute to the development of a specific European identity, and how the elements of a European identity do shape the ESP.

On the positive side, space can be a strong identification element for European citizens as well as European decision-makers. The best example for this is the Galileo programme. After years of delays and cost overruns which at some point endangered its very existence, the programme has been saved thanks to the existence of a strong political will at the European level. It now seems to be on track for the operational phase.

On the negative side, the quest for a common European identity in space is complicated by the very nature of the European construct. Re-nationalisation tendencies seem to resurface on the background of the financial crisis. This is the case in the field of military cooperation (stagnation of the MUSIS initiative), but such trends also threaten to spread to civilian space^{xix}. This seems to indicate that the idealism of the early years is not sufficient anymore (cooperate in space for the sake of building Europe), and that national interests should be taken into account in the further development of the ESP (the ESP serves both national and the European interests).

All these structural factors will have an impact on the crucial decisions to be taken in 2012 for the two flagship programmes, at the ESA Ministerial Council and in the field of military space.

Diverging paths for the flagship programmes

Official ESP documents throughout 2011 kept recalling that the utmost priority is the timely and efficient implementation of the two flagship programmes, Galileo and GMES^{xx}. Both programmes are on diverging paths however, as Galileo passed several milestones towards its operational phase while GMES is in the midst of a serious crisis.

Galileo finally on track

After years of struggling, Galileo finally seems to be on track. The first two satellites of the constellation have been launched from Kourou on a Soyuz rocket in October 2011, and in February 2012, contracts for the procurement of 8 additional spacecraft and for their launch aboard an Ariane 5 have been signed^{xxi}. In addition, Galileo was included in the next MFF for the period 2014-2020. The 7 billion euro allocated to the project over 7 years will be used to order and launch the 6 last satellites of the constellation and to cover the operational costs^{xxii}.

The uncertain future of GMES

All the medium term issues related to GMES (data policy, Sentinel ownership, overall governance architecture) are currently overshadowed by the funding crisis. Despite the fact that GMES was mostly within cost and schedule (unlike Galileo), the EC surprisingly announced in June 2011 that it would not be included in the next MFF, but should instead be funded through an intergovernmental agreement^{xxiii}. While this move could be explained by the economic context, by the traumatising experience of Galileo and by a certain lack of support within the EC for large-scale infrastructure projects^{xxiv}, it seemed in contradiction with several previous EC documents^{xxv}.

Several ESP stakeholders voiced their strong opposition to this decision: the European Association of Remote Sensing Companies (EARSC) issued a position paper on the threat to GMES^{xxvi}, 44 members of the European Parliament (EP) signed a petition urging the EC to bring GMES back into the MFF^{xxvii}, the Council of the EU in its 8th Space Council resolution “urged the EC to take the necessary and timely actions to secure the continuity of the programme and to reassure GMES users and stakeholders of its commitment to the GMES programme”^{xxviii}, the EP adopted a motion for a resolution in December 2011^{xxix} and ESA threatened not to launch the Sentinel spacecraft if no funding solution is found^{xxx}. As a response, the EC issued a Communication detailing the practical implementation of the intergovernmental solution in November 2011^{xxxi}, instead of the expected legislative proposal.

The pressure on the EC is likely to remain high. The Danish Presidency intends to put the question on the agenda of an upcoming Competitiveness Council^{xxxii}, and the EC will have to table an alternative proposal to the one it already issued. The EP is also likely to continue its lobbying to bring back GMES in the MFF, as it needs to assert its political role after the adoption of the Lisbon Treaty. Finally, the schedule is getting tighter, as a final text on GMES operations has to be adopted by the end of 2013 at the very latest. All in all, it seems very unlikely that GMES will be scrapped completely, given the huge sums already invested in the project (more than €3bn) and given its recognised socio-economic value. An alternative compromise to the full reintegration into the MFF is possible, but its contours are yet to be defined.

Tough decisions ahead at the ESA Council

Among the many issues to be discussed at the next ESA Council at Ministerial level, launchers and exploration (both manned and robotic) stand out. These two policy areas are indeed at the crossroads, as crucial decisions need to be taken as to the next European launcher, the future of the ISS and future exploration plans.

Which launcher after Ariane 5/ESA?

An autonomous access to space is identified in almost every important ESP document as an utmost priority. Despite this wide consensus however, capturing the precise meaning of “autonomous access to space” in the European context is more challenging. Combining elements highlighted in several official documents, an ideal definition of European autonomous

access to space could be the following: the capability to orbit European institutional payloads aboard versatile and highly reliable launch vehicles developed in Europe and launched from a spaceport on European territory, at minimum cost and with the highest possible schedule assurance. It is clear however, that this is an ideal situation, and that it will be very difficult to equally satisfy all these conditions at the same time. In addition, five key factors seem to be indispensable to maintain a guaranteed access to space for Europe in the future: strong support by institutional actors, a reduction of the costs, a sustainable commercial strategy, a complete launcher family and a Next Generation Launcher (NGL)^{xxxiii}.

Currently the main question at stake is whether to go on with the development of Ariane 5ME, to start directly the development of the successor launch vehicle, or to combine both. While a consensus between France and Germany seemed to emerge initially on these issues^{xxxiv}, France's position evolved in the recent months due to the economic environment^{xxxv}. On the one hand, France claims that it would be difficult to develop both Ariane 5ME and a NGL in the current budgetary situation. On the other hand, Germany highlights the fact that Ariane 5ME could launch more capacity at the same operational costs, thus being a more profitable launch vehicle. The two major and interrelated issues at stake here are the governmental support to the European launch sector and the necessity to cut costs. While the latter is now recognised as an absolute priority by all ESA Member States, the former is less consensual. ESA Member States renewed the principle of public subventions to Arianespace only after having launched a procedure of "due diligence" in late 2010, an in-depth analysis of the revenues, pricing policies and cost structures of the European launch sector^{xxxvi}. Similarly, a binding policy of European preference to launch institutional payloads could not be formalised yet.

Europe as a key player in exploration?

Exploration is a highly visible and prestigious activity that offers not only scientific and technological gains, but also political ones. These are the reasons why the EC dubbed exploration one of the ESP's priorities in its April 2011 communication^{xxxvii}. Europe intends to profile itself as an important player in space exploration. In this perspective, it hosted the third international conference on exploration in Lucca, Italy, in November 2011. Even though few tangible results came out from the conference^{xxxviii}, it was an important political step, as it gathered almost all major spacefaring nations around one table. Europe could take advantage of its specific international identity based on multilateralism and cooperation to foster such initiatives in the future as well.

More concretely, the two most pressing issues in the field of exploration concern the future of robotic exploration and Europe's role in the ISS. After the withdrawal of NASA from ExoMars, Europe should start reflecting about a coherent strategy for international cooperation in the field of exploration, but also on the fact that robotic exploration might be difficult to label a priority in times of budgetary austerity. As for the ISS, the main question is how Europe will pay its station dues after 2017^{xxxix}. Here again, a Franco-German common position would give more weight to a European proposal. France in particular, favours a barter arrangement in which Europe provides a new multipurpose robotic vehicle that could remove space debris and be used for future robotic missions as well^{xl}.

Space and security

The link between space and security is getting higher on the ESP agenda, as testified by the last Space Council dealing almost exclusively with this issue^{xli}. However, military space issues in Europe are always overshadowed by sovereignty problems, making cooperation more difficult^{xlii}. The most pressing issues in 2012 in the field of space and security will be the Space Situational Awareness (SSA) programme, the EU Code of Conduct (CoC) and the further development of space as a Common Foreign and Security Policy (CFSP).

A preparatory programme for SSA was launched in 2008, and this year's ESA Ministerial Council will have to decide on the launch of the operational phase. Europe will mainly have to solve two questions: the cohabitation of civilian and military requirements (with an adequate governance architecture and an appropriate data policy) and the tension between European autonomy and cooperation with the U.S. These issues are complicated by the fact that two countries (France and Germany) are the clear European leaders in terms of SSA capabilities. They fostered bilateral cooperation with each other and with the U.S., and could be somewhat reluctant to share their sensitive data if no appropriate cooperation framework is found.

A second important topic on the European space security agenda is the future of the EU CoC. After lengthy consultations with other spacefaring nations, the EU landed some successes (Japan and Canada made encouraging declarations on the importance and relevance of the CoC initiative) but also faced serious setbacks (Russia, China, India and Brazil distanced themselves from the code). The U.S. initially sent negative signals on a document deemed too restrictive for its national security^{xliii}. It rapidly became more positive however, viewing the EU CoC as "a good foundation for developing a non-legally binding International Code of Conduct focused on the use of voluntary and pragmatic TCBMs to help prevent mishaps, misperceptions and mistrust in space."^{xliv} As a consequence, the U.S. is likely to take the lead on this issue, but the EU gave a decisive initial impetus, thus enhancing its credibility as an international actor. Two other initiatives aiming at fostering space sustainability are ongoing (a Group of Government Experts meeting under the auspices of the UN and discussions on "Long Term Sustainability of Outer Space Activities" at COPUOS) and 2012 will be a crucial year to make these converge with the EU CoC initiative.

Finally, most of the intra-European cooperation endeavours in the field of military space (mostly in military EO and satcom) will continue to take place outside the EU framework on an intergovernmental basis. The most striking trend here is that states seem to move away from politically motivated cooperation towards more pragmatic approaches, based on cost/benefits analyses.

Conclusion

2012 will be a real turning point for Europe in space. In coming months, the structural constraints of a persisting economic crisis, fast emerging competitors and unsolved governance issues, combined with the necessity to make key decisions, will put the ESP under heavy stress. Europe should send strong political signals and continue its ambitious investment in the ESP. Otherwise, it will progressively fall in the second league of global space actors.

ⁱ The ESA Council will discuss programmes with very long development cycles (such as launchers, MTG or SSA), and the next MFF will cover the period 2014-2020.

ⁱⁱ Centre d'analyse stratégique. « Une ambition spatiale pour l'Europe. » Rapport n°42. Paris: la documentation française, 2011, p. 30.

ⁱⁱⁱ Centre d'analyse stratégique. op. cit., p. 35-40.

^{iv} Futron corporation. « State of the satellite industry report. » August 2011.

^v de Selding, Peter B. « European Space Agency Members Approve Flat 2012 Budget. » Space News, 11 January 2012.

^{vi} de Selding, Peter B. « Sarkozy Reaffirms Commitment to Space Spending. » Space News, 23 November 2011.

^{vii} de Selding, Peter B. « European Space Agency Members Approve Flat 2012 Budget. » Space News, 11 January 2012.

^{viii} de Selding, Peter B. « Sarkozy Reaffirms Commitment to Space Spending. » Space News, 23 November 2011.

^{ix} de Selding, Peter B. « ESA Budget-cutting Plan Targets Operating Costs. » Space News, 9 November 2011.

^x de Selding, Peter B. « France Undecided on Ariane 5 Investment Question. » Space News, 8 December 2011.

^{xi} Venet, Christophe. « Space in the Financial and Economic Crisis. » in: Schrogl, K-U./Baranes,

B./Pagkratis, S. (Eds.): Yearbook on Space Policy 2009/2010. Wien: SpringerWienNewYork (2011), p. 184-198.

^{xii} de Selding, Peter B. « Europe Defers Start on New Polar-orbit Weather Satellites. » Space News, 9 February 2012.

^{xiii} Spark, Joel. « Threat to NASA Budget Endangers ExoMars Mission. » Space Safety Magazine, 10 February 2012.

^{xiv} As for ExoMars, ESA is already in advanced negotiations with Roscosmos to transform the mission into a Euro-Russian endeavour.

^{xv} Mazurelle F, Wouters J, Thiebaut W. « The Evolution of European Space Governance: Policy, Legal and Institutional Implications. » Working Paper No. 25. Leuven: Leuven Center for Global Governance Studies; April 2009, p.8.

^{xvi} Centre d'analyse stratégique. op. cit., p. 35-40.

^{xvii} Présidence de la République. « Déclaration du ministre français de l'Enseignement supérieur et de la Recherche et du ministre allemand de l'Economie et de la Technologie. » 14^{ème} Conseil des Ministres franco-allemands, 6 February 2012.

^{xviii} See for example: Marta, Lucia C. « Perceptions italiennes sur la coopération spatiale militaire avec la France. » FRS, Note 16/11, 2011.

^{xix} Centre d'analyse stratégique. op. cit., p. 30.

^{xx} See for example: Council of the EU. « Towards a space strategy for the EU that benefits its citizens. » 3094th Competitiveness Council Meeting, 31 May 2011; Council of the EU. « Orientations concerning added value and benefits of space for the security of European citizens. » Doc. 17828/1/11, 2 December 2011.

^{xxi} de Selding, Peter B. « Galileo on Firmer Ground with New Satellites, launch Deals. » Space News, 2 February 2012.

^{xxii} European Commission. « A Budget for Europe 2020. » COM(2011)500 final part I, 29 June 2011.

^{xxiii} Ibid.

^{xxiv} Interview with an official in Brussels.

^{xxv} See for example: European Commission. « Towards a space strategy for the European Union that benefits its citizens. » COM(2011)152 final, April 2011; European Commission. « A Budget for Europe 2020: the current system of funding, the challenges ahead, the results of stakeholders' consultation and different options on the main horizontal and sectoral issues. » SEC(2011)868 final, 29 June 2011.

^{xxvi} EARSC. « EARSC position paper on the threat to GMES. » July 2011.

^{xxvii} de Selding, Peter B. « European Commission Urged to Put GMES Back in Budget. » Space News, 9 September 2011.

^{xxviii} Council of the EU. « Orientations concerning added value and benefits of space for the security of European citizens. » Doc. 17828/1/11, 2 December 2011.

^{xxix} European Parliament. « Draft motion for a resolution on Post-2013 GMES Regulation. » Doc. B7-0000/2011, 15 December 2011.

^{xxx} de Selding, Peter B. « ESA's Dordain Restates Sentinel Launch Cancellation Threat. » Space News, 12 January 2012.

^{xxxi} European Commission. « Communication on the European Earth monitoring programme (GMES) and its operations (from 2014 onwards). » COM(2011)831 final, 30 November 2011.

^{xxxii} Interview with an official in Brussels.

^{xxxiii} This section is based on: Venet, Christophe. « European Access to Space. Factors of Autonomy. » in: Schrogl, K-U./Thiele, G. (Eds.): European Autonomy in Space. Vienna: SpringerWienNewYork (forthcoming).

^{xxxiv} Where France would have supported the Ariane 5ME evolution, which would benefit to the German space industry, and Germany in return would have supported the development of the NGL.

^{xxxv} de Selding, Peter B. « France Undecided on Ariane 5 Investment Question. » Space News, 8 December 2011.

^{xxxvi} Ruello, Alain. « L'Agence spatiale européenne veut ausculter les comptes d'Arianespace. » Les Echos, 17 January 2011.

^{xxxvii} European Commission. « Towards a space strategy for the European Union that benefits its citizens. » COM(2011)152 final, April 2011.

^{xxxviii} See: « Third International Conference on Exploration. First Meeting of the High-level International Space Exploration Platform. Declaration. » 10 November 2011.

^{xxxix} Until there, the ATV launches constitute Europe's "barter element".

^{xl} de Selding, Peter B. « France, Germany To Establish Working Group To Resolve Ariane 5 Differences. » Space News, 9 February 2012.

^{xli} Council of the EU. « Orientations concerning added value and benefits of space for the security of European citizens. » Doc. 17828/1/11, 2 December 2011.

^{xlii} See : Pasco, Xavier and François Heisbourg. « Espace militaire. L'Europe entre souveraineté et coopération. » Paris: Choiseul, 2011.

^{xliiii} Weisgerber, Marcus. « U.S. Wants Changes to EU Space Code of Conduct. » Space News, 12 January 2012.

^{xliiv} Rose, Frank. « Remarks at the 15th Annual FAA Commercial Space Transportation Conference. », 16 February 2012.