

5. The potential for transatlantic cooperation in the International Space Station programme and space exploration

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5.1. Introduction

Europe has cooperated with the United States and other Partners in the International Space Station (ISS) programme since its inception. In the area of exploration Europe has played a key role, both at the European level through ESA and at the national level through a number of national space agencies in the development of “The Global Exploration Strategy (GES): The Framework for Coordination”⁷¹⁷ released in May 2007. ESA has also worked with NASA on a comparative assessment of lunar architecture concepts.

As the U.S. and Europe both debate the future direction of their civil space programmes, continued cooperation in the ISS and in exploration merits serious consideration. It is not the purpose of this paper to define specific co-operation options, but to examine the environment in which those options will be developed.

5.2. International cooperation in the broader space policy context

International cooperation has played a major role in the implementation of programmes by national and regional space organisations around the world.

The U.S. and Europe have had significant cooperation in space science, meteorology, Earth observation, human spaceflight and more recently planning for long term space exploration. Historically the U.S has played the lead role in much of this cooperation, but as European capabilities have matured the relationship has evolved and many areas has reached the level of partnership among equals.

Although both the U.S. and Europe look to other parts of the world when seeking cooperative partners, the relationships between their respective space agencies remain strong. It therefore seems obvious that transatlantic civil space cooperation will continue in the future.

In order to address potential cooperation relating to the ISS and space exploration it is useful to look more broadly at relevant space policies on each side of the Atlantic. While it is not the purpose of this paper to undertake a detailed analysis of these policies, their respective views on international cooperation and where ISS and exploration fit within the broader context merits consideration.

5.2.1. The Obama Administration's Civil Space Policy⁷¹⁸

The first indication of an Obama Administration's approach to civil space policy was the release by his campaign, in August 2008 of "Advancing the Frontiers of Space Exploration",⁷¹⁹ which stated that "*As President, Barack Obama will establish a robust and balanced civilian space program*" and "*will reach out to include international partners*".

Specific sections dealt with "*Space Science and Exploration*" and "*Promoting International Cooperation and Keeping Space secure*". The former, when referring to Shuttle retirement and the attendant gap in U.S. human space flight capability, proposed to "*enlist international partners to provide International Space Station (ISS) cargo re-supply and eventually alternate means of sending crews to the ISS*". With respect to enhancing ISS cooperation, "*America must take the next step and use the ISS as a strategic tool in diplomatic relations with non-traditional partners*" and "*will consider options to extend ISS operations beyond 2016*". The second section stated that "*Space exploration must be a global effort. Barack Obama will use space as a strategic tool of U.S. diplomacy to strengthen relations with allies, reduce future conflicts, and engage members of the developing world.*" Concerning "*Collaborating on Exploration*" it recognized the U.S. needs "*to fully involve international partners in future exploration plans to help reduce costs and to continue close ties with (its) ISS partners*". It also referenced GES activities noting an intention to "*continue but intensify this effort*".

In May 2009, following President Obama's January inauguration, the Administration directed NASA to establish a committee to "*conduct an independent review of ongoing U.S. human space flight plans and programs, as well as alternatives, to ensure the nation is pursuing the best trajectory for the future of human space-flight*".⁷²⁰ The Committee's final report⁷²¹ released in October 2009 endorsed extension of ISS operations, and the importance of international cooperation

in future space exploration. However, it questioned the viability and direction of NASA's exploration activities, the Constellation programme in particular, and explored various options for redirecting exploration planning.

NASA's FY2011 budget request was released 1 February, 2010. Of particular relevance were the announcements in the request^{722,723} to:

- *“Extend operations of the ISS past its previously planned retirement date of 2016.”*
An accompanying Joint Statement⁷²⁴ by the NASA Administrator and the Director of the Office of Science and Technology Policy referred to *“NASA (working together with its international partners) to extend the operation of the ISS, likely to 2020 or beyond.”*
- Cancel the Constellation Programme replacing it with an exploration programme directed, in the near term, to research and development of enabling technologies such that *“future human and robotic exploration missions (would be) both highly capable and affordable”*.
- Undertake *“a steady stream of precursor robotic exploration missions to scout locations and demonstrate technologies to increase the safety and capability of future human missions and provide scientific dividends”*.

Portions of the NASA budget request elicited a strong negative reaction from both houses of the U.S. Congress, particularly as regards plans to cancel the Constellation program and rely first on the Russians for access to the ISS for an extended period and then on an as yet to be developed U.S. commercial human transportation capability.

In April, 2010 President Obama, addressing⁷²⁵ the Conference on “The American Space Program for the 21st Century” at KSC, talked of extending ISS life *“likely more than five years”*. Regarding Constellation, he indicated that rather than outright cancellation NASA was being directed to develop a “rescue vehicle” (ISS lifeboat) *“build(ing) on the good work already done on the Orion crew capsule”*, and to work towards the eventual development of a heavy lift vehicle. He also talked of the next human mission beyond low Earth orbit being to an asteroid, quoting 2025 as a target date. At no time in his speech, when addressing exploration, did he mention international cooperation. This was not seen as any change in policy, but as function of venue and audience.

The June, 2010 release of the Administration's National Space Policy⁷²⁶ superseded the Bush Administration's 2006 policy. One of its major goals is *“Expanding international cooperation on mutually beneficial space activities to: broaden and extend the benefits of space; further the peaceful use of space; and enhance collection and partnership in sharing of space-derived information”*. It calls upon U.S. Government departments and agencies to:

- “Promote appropriate cost- and risk-sharing among participating nations in international partnerships”
- “Augment U.S. capabilities by leveraging existing and planned space capabilities of allies and space partners”
- “Identify potential areas for international cooperation that may include, but are not limited to: space science; space exploration, including human spaceflight activities; space nuclear power to support space science and exploration; space transportation; . . .”

The policy reiterates the intention to “continue operation of the ISS in cooperation with . . . international partners, likely to 2020 and beyond”, and talks of a bold new approach to space exploration and the beginning of human missions to new destinations beyond the moon by 2025. Reference is also made to sending humans to orbit Mars by the mid-2030s. Overall the new policy is viewed by the majority of space policy analysts as being more favorable towards international cooperation as compared to that of the previous Administration.

In June 2010 NASA’s Deputy Administrator, while visiting Europe, stated that “NASA has a long history of international cooperation. We intend to broaden and deepen those relationships as we seek to implement the president’s new U.S. space exploration enterprise”.

At the time of drafting this article the U.S. Administration and Congress is still in discussions on the new civil space policy and its programmatic implementation. One important point of agreement has been the desire to see the operational life of the ISS extended well beyond 2016, with 2020 often mentioned. NASA and the other “cooperating agencies” are currently working on certifying ISS hardware through 2028.

On the issue of future of space exploration however, there have been marked differences of opinion on the path to be followed, both between the Administration and the Congress and between the House of Representatives and the Senate. The House favored a continuation of certain elements of the Constellation program and the development of a heavy lift vehicle on a faster timescale than that foreseen by the Administration. The Senate took a position somewhat between the Administration’s and that of the House. After much debate Congress passed the NASA Authorization Act of 2010 based on the Senate language, which was signed into law⁷²⁷ by the President on 11 October 2010.

The effect of recent elections, in which control of the House switched from the Democrats to the Republicans, on NASA in general and exploration in particular remains to be seen, particularly in the short term as concerns NASA appropriations for the current fiscal year (FY2011).

5.2.2. European Civil Space Policy

Development of a European Space Policy by the European Union and the European Space Agency began in the late '90s, both organizations recognizing the need for closer cooperation on space matters. In late 2003 the EU and ESA Councils adopted the “Framework Agreement between the European Community and the European Space Agency”.⁷²⁸ It entered into force in May 2004 calling for “*coherent and progressive development of an overall European Space Policy*”.

When the Treaty Establishing a Constitution for Europe⁷²⁹ was signed in October 2004 it contained references to “*A European space programme*”, directing the EU to “*establish any appropriate relations with the European Space Agency*”. (Note: All space related language in this treaty was included verbatim when the Treaty of Lisbon⁷³⁰ was adopted at the end of 2007).

That November, the “European Space Council” met for the first time, providing a forum for ministers of the EU and ESA member states to discuss development of an overall European space programme. Two meetings followed in 2005 and at the fourth meeting in May 2007 a Resolution⁷³¹ was adopted, as a joint European Commission/ESA document, recognizing that “*Europe is among the leading space-faring actors in the world and remains committed to maintaining its position both via strengthened intra-European and international cooperation*”. This document, together with the April 2007⁷³² Communication from the European Commission, constituted the first comprehensive policy framework covering European space activities.

The Communication recognised that “*Europe needs an effective space policy to enable it to exert global leadership in selected policy areas in accordance with European interests and values*” and that the EU, ESA and their member states needed to develop “*a joint international relations strategy in space*”. As regards the ISS and exploration the communication stated that “*Europe needs to achieve optimum utilisation of the ISS; prepare for a visible, affordable and robust exploration programme, involving the development and demonstration of innovative technologies and capabilities for the robotic exploration of Mars, to search for evidence of life and understand the planet’s habitability*”.

The Resolution itself “*emphasises the political and scientific importance of the ISS and of exploration . . . reaffirms the continued strong and unified European commitment regarding its ISS contributions*” and notes “*that the continuity of the ISS partnership is an asset for future exploration endeavours*”. Emphasis is also placed on “*the importance of proactive ESA participation in the preparation of future international exploration programmes, with the objective of ensuring a significant targeted and coordinated European role in this endeavour*”.

The 5th meeting of the Council in September 2008 approved a resolution on “Taking Forward the European Space Policy”.⁷³³ Solar system exploration was recognised as one of the “*priority domains for implementing international cooperation*” and as a “*political and global endeavour*”. Consequently “*Europe should undertake its action within a worldwide programme*” necessitating the development of a “*common (European) vision and long-term planning for exploration, ensuring key positions for Europe . . . based on its domains of excellence*”.

When the Council met for the 6th time in June 2009 its main focus was on the contribution of space to innovation and competitiveness in the context of the European economic recovery programme. Space exploration was noted in the Council’s resolution as having the potential to provide a major impact on innovation and referenced a forthcoming “*High level political conference on space exploration*” as “*a first step towards the elaboration in due time of a fully-fledged political vision on “Europe and Exploration” encompassing a long-term strategy/roadmap and an international cooperation scheme*”.

This 1st EU-ESA International Conference on Human Space Exploration took place in October, 2009, Ministers concluding that the EU and ESA, in cooperation, should:

- *Continue work on the development of common (exploration) objectives;*
- *Improve communications with international partners;*
- *Elaborate a roadmap, a set of robotic and human scenarios and a set of priorities for a visible and significant role of EU/ESA in an international exploration initiative;*
- *Explore an implementation mechanism (inc funding schemes);*
- *Report progress at a follow-on conference in 2010;*

The follow-on conference took place in October 2010. Concluding that “*space exploration is a driver for innovation, technological development and scientific knowledge which can bring about tangible benefits for citizens*”,⁷³⁴ delegations agreed on the need for action in four main areas, inviting the EU, ESA and their member states to take appropriate action, concerning:

- *Technologies as an enabler for space exploration*
- *Space Transportation for exploration*
- *Exploitation of the ISS as a platform for exploration* (Inc. supporting extension to at least 2020, making utilisation accessible to all ESA and EU Member States, and studying with other Partners the potential opening of ISS utilisation to additional non-European participants.)
- *International high-level cooperation*

It is therefore obvious that throughout the development and early years of the implementation of a European Space Policy, support for continued involvement in the ISS programme has remained strong, as has Europe's desire to identify an appropriate role for itself in any large scale international space exploration endeavour.

5.3. Future prospects for transatlantic cooperation

It is not intended to provide a detailed history of activities in the U.S. and Europe relating to the programmes in question. However, an appreciation of how the different programme areas have evolved is necessary in order to understand the context within which future prospects can be viewed.

5.3.1. The International Space Station

The ISS has been an international programme since its inception. President Reagan, in his State of the Union Address⁷³⁵ in January 1984, directed NASA “*to develop a permanently manned space station and to do it within a decade*” instructing the agency to “*invite other countries to participate so we can strengthen peace, build prosperity, and expand freedom for all who share our goals*”. This invitation was accepted by certain European nations, Canada and Japan. At the time the USSR, the only other entity with a human space flight capability and its own space station (MIR), was not considered a potential partner, as it did not meet the “*friends and allies*” criteria. The programme proceeded under the name “Space Station Freedom”.

Following the demise of the Soviet Union, Russia was invited, in 1993, to join the partnership. This required a renegotiation of the multilateral Intergovernmental Agreement (IGA) signed by all participating states, and the network of bilateral Memoranda of Understanding (MoU) between NASA and the cooperating agencies of the other Partners. The programme was renamed the International Space Station. In the case of Europe, ten ESA member states were involved, the Agency taking on the role of Europe's cooperating agency. Italy participates in the ISS through ESA. However, its space agency (ASI) also entered into a bilateral MoU with NASA to provide three Multi-Purpose Logistics Modules to the programme.

Assembly of the ISS began in November 1998, the first laboratory (U.S. – Destiny) being added in February 2001. Following the loss of the Shuttle

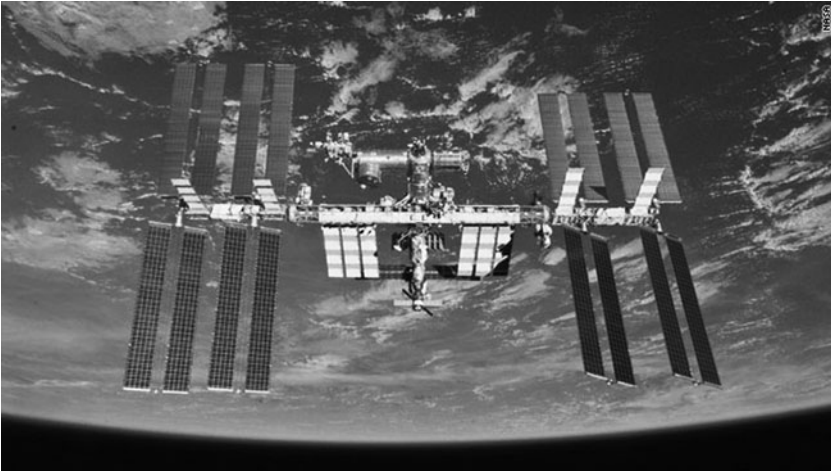


Fig. 6: *The ISS* (source: NASA).

Columbia in February 2003 there was a hiatus in assembly that lasted until July 2005. U.S. Core Complete was declared with the delivery of the U.S. Node 2 in October 2007, and six person crew capability was achieved in March 2009. Europe's Columbus Laboratory was installed in February 2008.

Current ISS operations rely on the U.S. Shuttle and the Russian Soyuz for crew transportation, and on the U.S. Shuttle, Russian Progress, European Automated Transfer Vehicle (ATV) and Japanese H-II Transfer Vehicle (HTV) for logistics resupply. The ISS partnership has now been in operation for over a decade and the Station has been permanently occupied since November 2000. When the Bush administration announced its Vision for Space Exploration⁷³⁶ in January 2004 NASA was directed to:

- *“Complete assembly of the ISS, including the U.S. components that support U.S. space exploration goals and those provided by foreign partners, planned for the end of the decade”*
- *“Conduct ISS activities in a manner consistent with U.S. obligations contained in agreements between the United States and other partners in the ISS.”*

The same document discussed the resources needed to pursue stated exploration goals; NASA funding after FY2009 projected to only keep pace with inflation. The majority of exploration funding was to be found by terminating the Shuttle program once ISS assembly was complete and ceasing ISS operations at the end of FY2016. FY2016 was therefore carried as the official termination date, although the NASA Administrator when the Vision was announced and his

successor both stated that they did not expect ISS operations to be terminated at that date, only a few years after assembly would have been completed, thus achieving full research potential.

The Obama Administration's NASA budget submit for FY2011 and the subsequently published National Space Policy talk of continuing ISS operations to 2020 and possibly beyond. This has been welcomed by Europe (and the other ISS partners). ESA's Director General, is on record, including his 17 June, 2009 address to the Augustine Committee,⁷³⁷ as supporting the idea of such an extension. While not referring to a specific year he has expressed the opinion that "*we use the ISS as a laboratory. . . as long as the benefits are worth the costs*". ESA is still working with its Member States on approving the necessary funding to meet Europe's share of ISS common operations costs beyond 2015 and on the possibility of obtaining increased funding for station utilization in coming years.

The NASA Authorization Act of 2010 includes language supporting "*full and complete utilization of the ISS through at least 2020*". Budget appropriators in both houses have also voiced their support, although they have yet to achieve consensus on NASA's FY2011 Appropriations bill. Assuming that the ISS will therefore be in operation until at least 2020 the potential for transatlantic cooperation can be addressed, from two different viewpoints.

5.3.1.1. Potential transatlantic cooperation within the context of the existing ISS Partnership

The Partnership has been successfully assembling and operating the ISS for well over a decade. In a joint statement⁷³⁸, following its February 2010 meeting, the ISS Multilateral Coordination Board (MCB)⁷³⁹ "*confirmed that there are no identified technical constraints to continuing ISS operations beyond 2015*", indicating a preparedness "*to begin implementation of such a decision when it is taken*".

These statements were reiterated at the ISS Heads of Agency meeting in March, 2010⁷⁴⁰ where a "*strong mutual interest*" was expressed "*in continuing operations and utilisation for as long as the benefits of ISS exploitation are demonstrated*". Recognizing that a NASA FY2011 budget, consistent with the Administration's request, "*would allow the United States to support the continuation of ISS operations and utilisation activities to at least 2020*" agency heads "*emphasised their common intent to undertake the necessary procedures within their respective governments to reach consensus. . . on the continuation of the ISS to the next decade*".

Future on-orbit research opportunities offered by a completed ISS with a crew compliment of six were acknowledged, along with its use as a test bed which would "*allow the partnership to experiment with more integrated international operations*

and research, paving the way for enhanced collaboration on future international missions”.

At a subsequent September 2010 MCB meeting it was announced⁷⁴¹ that “*the government of Japan has approved continuing space station operations beyond 2016*”. Reference was also made to “*the approval of the government of the Russian Federation for continuation to 2020*” and to the fact that “*ESA and CSA are working with their respective governments to reach consensus about the continuation of the station*”.

It is therefore clear that any potential transatlantic cooperation must be reviewed within a broader full partnership context. Such prospects could include:

- Further utilisation, by other Partners and their respective research communities of facilities already placed aboard the station by one Partner. This could include opportunities for non-US involvement in the US National Laboratory project, e.g. education.⁷⁴²
- Bartering of a Partner’s utilisation rights in excess of that Partner’s requirements.
- Further contributions to the overall logistics resupply of the Station (inc. industry-to-industry teaming, which is already taking place).
- Development and eventual implementation of a plan for ISS end-of life.

The development of the International Docking System Standard by the ISS Partners, released in October 2010, will have implications for future cooperation (inc. possibly with non-partners) and can also be expected to have relevance to future exploration activities.

Consideration, at the government or implementing agency level, of such prospects could take place on a bilateral (e.g. U.S./European) or multilateral basis.

5.3.1.2. Potential transatlantic cooperation involving nations that are not ISS programme Partners

There have been a number of suggestions regarding bringing new Partners into the station programme, e.g the Chinese with their human spaceflight capability. Such an action would imply:

- Renegotiation of the current Partnership agreements which do not contain mechanisms for automatically adding new Partners.
- Re-computation of the apportionment of ISS resources (Power, pressurized volume, crew time, etc) each Partner receives in return for their hardware and other contributions to the station and its operation.

This should not be undertaken lightly. The negotiations that brought Russia into the programme were of comparable length and complexity to the negotiations that established the original partnership!

A much more likely scenario is involving “non-Partner participants” in station utilization. Such involvement is covered under IGA Article 9 (Utilization) Section 3:

“Each Partner may use and select users for its allocations for any purpose consistent with the object of this Agreement and provisions set forth in the MOUs and implementing arrangements, except that:

(a) any proposed use of a user element by a non-Partner or private entity under the jurisdiction of a non-Partner shall require prior notification to and timely consensus among all Partners through their Cooperating Agencies; and

(b) the Partner providing the element shall determine whether a contemplated use of that element is for peaceful purposes, . . .”

A specific European related issue that will have to be addressed is the proposal, from the Second International Conference on Space Exploration, that “ISS utilisation is made accessible to all ESA and EU Member States to optimize and broaden European scientific, technological and operational returns”.

Another potential cooperation opportunity that could be explored involves linkage between the ISS and future exploration activities. Certain European (and other non-US Partner’s) exploration contributions might be “book-kept” against Europe’s contribution to future ISS operations costs.

In the future, should the U.S. and Europe decide that it is in their mutual interest to involve non-Partner nations in the utilisation of the ISS they would still need to seek agreement from the other Partners. Considering such involvement will involve ascertaining how such candidates propose to utilize the Station, which Partner(s) would contribute the necessary resources, and what contributions the candidates would make to benefit the Partner(s) in question and to the programme as a whole.

5.3.2. Space exploration

Both the US and Europe have been working on the development of exploration plans throughout the previous decade, international cooperation playing an important role in their thinking.

5.3.2.1. Implementing an “exploration vision” in the U.S.

President Bush’s “Vision” of 2004 set four ambitious goals:

- *“Implement a sustained and affordable human and robotic program to explore the solar system and beyond”:*
- *“Extend human presence across the solar system, starting with a human return to the Moon by the year 2020, in preparation for human exploration of Mars and other destinations”:*
- *“Develop the innovative technologies, knowledge and infrastructures both to explore and to support decisions about the destinations for human exploration”:* and
- *“Promote international and commercial participation in exploration to further U.S. scientific, security and economic interests.”*

and stated that in its implementation the U.S. should *“pursue opportunities for international participation to support U.S space exploration goals”*.

Subsequently, the Report of the President’s Commission on Implementation of United States Space Exploration Policy⁷⁴³ noted that *“how our international partners will participate in the vision will depend on the specifics of the architecture that will be established by the United States and the value potential partners bring to the elements of the mission”* and recommended *“that NASA pursue international partnerships based upon an architecture that would encourage global investment in support of the vision”*.

NASA established the Exploration Systems Mission Directorate to work on defining such an architecture including a Crew Exploration Vehicle (CEV), the next generation system (post Shuttle) for U.S. human space transportation, to be brought on-line no later than 2014. The CEV was not intended to provide access to the ISS, but to be used for exploration missions beyond low Earth orbit. Various architecture options were developed, but none were deemed feasible within expected budget envelopes.

In November 2005 NASA issued the final Report of its Exploration Systems Architecture Study,⁷⁴⁴ which had been initiated in May 2005. The CEV was now seen as a means of accessing the ISS with the goal of accelerating its development and bringing it into operation in 2011. The study also examined the cost and benefits of developing a Shuttle-derived Heavy Lift Launch Vehicle for use in lunar and Mars exploration. Numerous design reference missions were studied, from ISS crew and cargo transport, to lunar (sortie and outpost) missions and Mars exploration. These efforts resulted in an overall Architecture Roadmap encompassing development of a CEV along with an appropriate launcher, robotic precursor missions to the Moon, development of a heavy lift

launch vehicle, an Earth Departure Stage and a Lunar Lander, and plans for a Lunar Outpost.

Around the same time NASA established the Constellation programme centered on an initial capability comprising an:

- Orion Crew Capsule
- ARES 1 crew launch vehicle

A lunar capability was also planned including an:

- ARES V heavy lift cargo launch vehicle
- Earth Departure Stage
- Altair Lunar Lander

NASA made it clear that they intended to develop a lunar transportation architecture alone, but would welcome other nations proposing contributions to an overall lunar return/outpost capability.

The overall plan was endorsed by the U.S. Congress with its passage of the NASA FY2005 Authorization Act⁷⁴⁵ and reaffirmed in the FY2008 Authorization Act. However, as the Constellation programme evolved it had to contend with annual budget appropriations which fell well short of initial estimates. Over time, this resulted in the curtailment of study efforts related to future human Mars exploration. Work on ARES V and the Altair lander has also been deferred.

The current situation in the U.S. as regards the future of space exploration remains unclear. The NASA Authorization Act of 2010 now provides clarification as to the direction NASA is expected to follow in its exploration activities, terminating the Constellation programme and its lunar centric orientation, while directing NASA to work on:

- A Multipurpose crew vehicle that “*shall achieve operational capability no later than December 31, 2016*”.
- A Space Launch System “*capable of accessing, at a minimum, the full range of destinations envisioned in the NASA Authorization Act of 2008, and including cis-lunar space, Lagrangian points, the Moon, near-Earth objects, and Mars and its moons, as well as being capable of providing, when used in conjunction with the multipurpose crew vehicle.. a continuing backup capability for supplying and supporting ISS cargo requirements or crew delivery requirements not otherwise met by available commercial or partner supplied vehicles*”.
- Exploration technology development and robotic precursor missions.

However, NASA's appropriations bill for FY2011 has yet to be finalised, and NASA finds itself operating on a "continuing resolution" (currently running until March 4 2011) requiring it to maintain spending on Constellation program activities.

5.3.2.2. Implementing a European exploration strategy

When the Bush Administration announced its "Vision", ESA and the European Community were already coordinating on space matters. Europe, through ESA, had been evolving its Aurora Programme since 2001, its primary objective being "*to create, and then implement, a European long-term plan for the robotic and human exploration of the solar system, with Mars, the Moon and the asteroids as the most likely targets*".⁷⁴⁶ Within Europe particular emphasis was given to Mars exploration. In agreeing to work with the U.S. and other nations on an exploration strategy built around the U.S. "Vision" Europe had to reorient its thinking to give more prominence to the Moon, while working on developing its own long-term strategy for space exploration.

While working with NASA and other non-European space agencies on GES related activities, and working internally to define its overall exploration strategy, Europe has carried out numerous studies relating to different potential components of an overall exploration architecture. These include lunar and Mars robotic missions, both orbiters and landers, a Crew Space Transportation System Study undertaken with Roskosmos on a Soyuz based spacecraft for journeys beyond LEO, and work on variations of the ATV, to provide a return capability and possibly evolve to a crew carrying capability. ESA and European industry are also working on studies of an autonomous lunar lander capability that could eventually be used for cargo and logistics delivery.

5.3.2.3. The US and Europe working together

Europe, along with a number of other nations, initiated discussions on space exploration with the U.S. in the months following the 2004 announcement of the "Vision". These included the development of "The Global Exploration Strategy" between 2005 and May 2007. The strategy identified five general themes in which space exploration was considered to provide benefits to society, discussed different potential location based exploration scenarios, the Moon and Mars in particular, and proposed "*the future establishment of a*

formal, though non-binding and voluntary, coordination mechanism among interested space agencies to aid in the implementation of the strategy". This mechanism has since been implemented as the "International Space Exploration Coordination Group" (ISECG). European members are ESA, ASI, CNES, DLR and BNSC/UKSA. A fundamental principle of GES activities, recognised during discussions, was that "*while general agreement exists on broad exploration themes, individual space agencies are required to pursue their unique scientific, technological and social objectives at a scale and pace dictated by national priorities. Thus successful cooperation can only occur with thorough discussion of shared interests and capabilities*".

In this spirit, in January of 2008, NASA and ESA initiated a joint activity to evaluate if their respective lunar architecture concepts could support each other's exploration plans. They issued a joint report⁷⁴⁷ in July that year addressing three scenarios concerning potential ESA contributions to a lunar exploration programme:

- *Scenario 1: ESA Provision of Stand-Alone Capabilities:*
 - Automated Lunar Cargo Landing System
 - Communication and Navigation Systems

- *Scenario 2: ESA Development of Crew Transportation Architecture Elements:*
 - Human Crew transportation to LEO via a human rated Ariane 5 and a crew transportation vehicle
 - Orbital Infrastructures

- *Scenario 3: ESA Development of Dedicated Lunar Surface Exploration Elements*
 - Surface Habitation Elements, or
 - Surface Rover

Given NASA's plans to develop an independent lunar transportation system, ESA's potential contribution of lunar surface elements which NASA, due to funding limitations, could not contemplate starting to develop before 2011, suggested a particularly interesting area of study with respect to future cooperation.

In related areas, June 2009 saw the initiation of the Mars Exploration Joint Initiative (robotic), and September 2009 saw the signing of a Memorandum of Understanding on cooperation in civil space transportation (inc. human spaceflight).

5.3.2.4. The future

The President's signature of the NASA FY 2011 Authorization Act means that a new U.S. exploration policy, markedly different from that of the Bush "Vision", is now "the law of the land". The scheduling and timing of the implementation of the new policy, however, will be dependent on funds appropriated, and the NASA Appropriations for FY 2011 bill is still being discussed in the Congress. The outcome of these deliberations, and their implications as regards the future path of U.S. space exploration, will have major ramifications on potential US-European cooperation in this area.

Given the number of space agencies currently engaged in ISECG planning, any US-European cooperation will have to take into account this broader international interest and potential involvement.

A U.S. human exploration programme, focused in the near term on a mission to an asteroid, as opposed to a lunar return with its attendant need for the development of an associated surface infrastructure, raises the question of what role potential international partners could play. As concerns the possibility of partnering in the development of the required transportation capability, this would run counter to the approach adopted for the implementation of the previous Administration's "Vision". Should the U.S. maintain this approach, international cooperation opportunities could be constrained in the near future. The Second International Conference on Space Exploration, however, saw "*international cooperation as a sound and cost effective way to ensure more resilient space architecture to and beyond LEO*" and called for "*further reflection on an international common space exploration transportation policy*".

Regarding the development of future exploration enabling technologies and robotic precursor missions, NASA is currently developing a series of Technology Roadmaps (including ones related to robotic and human exploration) which are being reviewed by the National Research Council. Meanwhile, Europe is working to establish its own long-term road maps and associated programmes for technology, which will form the bases for subsequent discussion with the U.S. and other potential partners. Technology transfer issues are likely to surface when potential cooperation is discussed. The Obama Administration is implementing plans for reforming the U.S. export control system. How this will effect bi-lateral and multi-lateral discussions on future cooperation in exploration has yet to be determined.

Despite the rhetoric on both sides of the Atlantic on the importance of international cooperation in exploration, specifics on exactly how such cooperation could take place still need to be clarified. The establishment of an international high level exploration forum to promote coordinated strategic guidance and

international cooperation, as proposed by Europe, could play an important role in this area.

5.4. Conclusion

The potential for transatlantic cooperation in the ISS program and in space exploration has to be assessed within the context of current and foreseen civil space policies and the relevant programmatic content and plans of the parties concerned.

In the case of the ISS this can be based on the virtual certainty that the Partnership will reach agreement on an extension of operations out to at least the year 2020. However, any such future cooperation between the US and Europe, including decisions on bringing new participants into the programme, will have to be addressed within the broader framework of the Partnership as a whole.

In the case of exploration, while both parties see international cooperation playing an important role in any large scale endeavour, prospects again need to be reviewed in a broader international context, the scope of which has yet to be clearly defined. There is also the added uncertainty as to the paths the parties will eventually decide to take in implementing their own exploration planning. Clear guidance from the highest political levels on both sides of the Atlantic will be essential.

It has also to be borne in mind that President Obama's current term has passed its mid-way point. Should he not be elected for a second term the potential exists for a further radical reorientation in U.S. space exploration plans.

⁷¹⁷ The Global Exploration Strategy: The Framework for Coordination, May 2007.

⁷¹⁸ A more detailed assessment can be found starting on page X): "The New 2010 U.S. Space Policy" by Professor Michael Sheehan, University of Swansea.

⁷¹⁹ OBAMA 08: Advancing the Frontiers of Space Exploration.

⁷²⁰ Seeking a Human Spaceflight Program Worthy of a Great Nation – Report of the Review of U.S. Human. Space Flight Plans Committee, October 2009, Appendix D, Item 3.

⁷²¹ See footnote 4 above.

⁷²² NASA Fiscal Year 2011 Budget Estimates: Overview.

⁷²³ Office of Management and Budget, FY 2011 NASA Fact Sheet.

⁷²⁴ Launching a New Era of Space Exploration: Joint Statement from NASA Administrator Bolden and John. P. Holdren, Director, Office of Science and Technology Policy, February 1, 2010.

⁷²⁵ Remarks by the President on Space Exploration in the 21st Century, KSC, April 15, 2010.

⁷²⁶ National Space Policy of the United States, June 28, 2010.

⁷²⁷ NASA Authorization Act of 2010, P.L. 111–267.

⁷²⁸ Framework Agreement between the European Community and the European Space Agency; Official. Journal of the European Union, 6/8/04, L261.264.

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⁷²⁹ Treaty Establishing a Constitution for Europe, Title III, Chapter III Section 9 (Research and Technological Development and Space), Article III-248, 29 October 2004.

⁷³⁰ Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community, signed at Lisbon, 13 December 2007, Title XIX, Article 189; Official Journal of the European Union C 306 Volume 50, 17 December 2007.

⁷³¹ 4th Space Council Resolution on Space Policy, 22 May 2007.

⁷³² European Space Policy; Communication from the Commission to the Council and European Parliament, Brussels, 26.4.2007; COM(2007) 212 Final.

⁷³³ Taking Forward European Space Policy; Council of the European Union, Brussels, 29 September 2008.

⁷³⁴ Conclusions of the Second International Conference on Space Exploration by the Belgian Presidency of the EU, the European Commission, the Chair of the ESA Council at ministerial level and the European Space Agency on 21 October 2010.

⁷³⁵ President Ronald Reagan, Address Before a Joint Session of the Congress on the State of the Union. January 25, 1984.

⁷³⁶ A Renewed Spirit of Discovery: The President's Vision for U.S. Space exploration, President George W. Bush, January 14, 2004.

⁷³⁷ Augustine Committee: Review of U.S. Space Flight Plans Committee, Statement by Jean-Jaques. Dordain, Director General of the European Space Agency, 17 June 2009.

⁷³⁸ MCB Joint Statement Representing Common Views on the Future of the ISS, 3 February, 2010.

⁷³⁹ The Multilateral Coordination Board (MCB) is the highest level management body established under the ISS Agreements to ensure coordination of activities of the partners related to the operation and utilization of the station.

⁷⁴⁰ Statement: International Space Agency Heads of Agency Meeting, 11 March, 2010.

⁷⁴¹ NASA RELEASE 10-228 of 22 September, 2010.

⁷⁴² ISS National Laboratory Education Concept Development Report, December 2006, Page 4.

⁷⁴³ A Journey to Inspire, Innovate and Discover, June 2004.

⁷⁴⁴ NASA TM-2005-214062.

⁷⁴⁵ NASA FY2005 Authorization Act, P.L. 109-155, Title 1, Section 101.

⁷⁴⁶ ESA Fact Sheet: "Aurora's Origins", last updated 9 January 2006.

⁷⁴⁷ The NASA-ESA Comparative Architecture Assessment, 9 July 2008.