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EUROPEAN APPROACH TO HUMAN SPACE MISSIONS

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Cooperation in the frame of the ISS Programme will remain the mainstay of human spaceflight activities until the end of 2020. The bulk of the funding for human spaceflight goes to the development and operation of equipment, systems and facilities. For ESA, the Columbus Laboratory, docking equipment for the Automated Transfer Vehicle (ATV), and payloads required for conducting experiments onboard the ISS are examples of the technology being developed. Since the human exploration of Mars is generally viewed as the long term goal for human spaceflight, ESA has started in 2005 the ExoMars programme with a view to, through the execution of a series of robotic missions, acquiring a better knowledge of Mars' environment.

Regrouping 14 space agencies, the International Space Exploration Coordination Group (ISECG) established in 2007 a voluntary, non-binding international coordination mechanism. For Europe to shape its position on space exploration in the global arena, there is a need to define a joint European vision and strategy. This matter will be addressed in details during a Conference at ministerial level of the European Union, with ESA participation, to be held in Brussels on 23 October 2010.

¹ This article reflects the views of the author and shall not be construed as being the position of the European Space Agency on any of the issues being considered.

I. HUMAN SPACEFLIGHT ACTIVITIES

Europe's effort in the field of human spaceflight is concentrated, for a large part, within the European Space Agency (ESA). The Agency dedicates close to 17% of its annual budget of 3 billion euros in that field of space activity, through the implementation of a number of ESA programmes.

Some costs are generated by activities performed directly by the ESA astronauts themselves, such as those costs entailed by their multi-year training at the European Astronaut Centre in Cologne, at the NASA Johnson Space Centre in Houston or at the Russian astronaut training facilities at Star City, north of Moscow. However, this category of costs represents a fairly low percentage of the total costs. The bulk of the funding for human spaceflight goes to the development and operation of equipment, systems and facilities enabling ESA and the industry of its Member States to extend the scope of their technical knowledge and expertise through the development of new or improved space technology in a very exclusive domain, in which – for obvious reasons - security requirements are the most demanding of all.

Being able to master such a complex technology results in ESA delivering, for example, an infrastructure module like the Columbus Laboratory, docking and berthing equipment for modules destined to the International Space Station (ISS) like the Automated Transfer Vehicle (ATV), and payloads required for conducting experiments onboard the ISS. Thus, being involved in human spaceflight enables a space agency to have access to a very specific category of space technology, which supplements the technology effort that materializes through activities in other fields of space activity.

II. CONTINUATION OF ISS COOPERATION UNTIL END 2020

II.1 Decision to be made by the ISS Partners

Currently, the ISS Partners are working, consistent with their respective decision-making processes, at government and Cooperating Agency levels, to confirm – preferably before the

end of 2010 - that ISS Cooperation will continue until the end of 2020, and possibly beyond. At their meeting in Tokyo held early March 2010, the heads of the five ISS Cooperating Agencies noted that there are no identified technical constraints to continuing ISS operations beyond the current planning horizon of 2015 to at least 2020. They also expressed their strong interest in continuing operations and utilization for as long as the benefits of ISS exploitation are demonstrated.

Therefore, cooperation in the frame of the ISS Programme is bound to remain the mainstay of human spaceflight activities for all of the ISS Partners until the end of 2020, and possibly beyond.

It is recalled that ISS Cooperation is governed by the 1998 Intergovernmental Agreement (IGA) and the four related Memorandums of Understanding between NASA and each of the Russian Space Agency (Roscosmos), the European Space Agency, the Government of Japan on behalf of a series of Japanese Agencies, and the Canadian Space Agencies. The ISS Agreements do not provide for a termination date and therefore the current effort to extend the duration of the cooperation can be construed as having, essentially, a technical and operational character.

The United States Partner has made continuation of ISS Cooperation until 2020 part of its new space policy announced by President Obama on 28 June 2010. Obviously, for NASA to secure the required funding entails a number of decisions to be taken by the US Congress, consistent with the applicable authorization and appropriation process.

II.2 ESA programmes for human spaceflight

ESA, through a dedicated ISS exploitation programme started on 1 January 2000, conducts activities required for the cooperation on behalf of the 10 ESA Member States signatories of the IGA. The Programme is based on successive 5-year funding commitment (referred to as "Programme Periods"), confirmed and renewed every 3 years. According to applicable rules, a new Period starting on 1 January 2011 shall be decided and subscribed in 2010. However, such decision may be delayed since it is usually made as part of the subscription to a series of ESA

programmes at the occasion of an ESA Council meeting to be held at ministerial level approximately every three years, the next one being planned for 2012.

A significant part of the ISS Exploitation programme costs are related to the payment of ESA's share of ISS common systems operations costs (CSOCs), which is an obligation of the European Partner under ISS Agreements. It is expected that ESA's CSOCs obligations will be subject to an offset, based on an agreement to be concluded with NASA, through ESA's provision of transportation services using Ariane-5 launchers coupled with Automated Transfer Vehicles.

For the foreseeable future, European participation in ISS Cooperation will still require the lion share of human spaceflight-related spending, despite efforts in costs reduction made at partnership level, and also by each Cooperating Agency individually. This leaves somewhat limited resources for ensuring meaningful ISS utilisation and R&D effort on new technology. However, additional resources are available at ESA under the European programme for life and physical sciences and applications in space (ELIPS), a user-related ESA programme, which supplements funds already earmarked for utilisation in the basic ISS exploitation programme.

II.3 Broadening the scope of ISS Utilisation

At their March 2010 meeting in Tokyo, the Heads of the ISS Cooperating Agencies envisaged to open up the possibility for investigators from non-Partner States to conduct experiments onboard ISS, so as to obtain the best utilisation opportunities. The current rules applicable to ISS cooperation are fairly restrictive in terms of access of investigators of non-Partner States, i.e. those from States not being party to the IGA. In that case, the approval of all Partners of the experiment proposed by that investigator is required, something which imposes a fairly heavy burden to the sponsoring Partner.

Recently, the Multilateral Coordination Board, the highest level cooperation body established through the Space Station MOUs, decided that investigators from all Member States of the European Union working their experiments through the ESA channels would not

require anymore a specific authorization of all the Partners. This broadening of utilization opportunities may be granted soon to the Japanese Partner for investigators who are nationals or residents of a number of Asian States.

II.4 Preparatory activities for European human space exploration

At the occasion of the ESA Council meeting at ministerial level at The Hague in November 2008, a number of ESA Member States subscribed contributions to fund different elements within a new European Transportation and Human Exploration Preparatory Activities Programme. The main objective is to prepare new ESA programmes devoted to R&D activities, enabling an evolution of existing technology in the human spaceflight sector. At this stage only preparatory activities are being carried out with relatively modest resources. They address different projects: an Automated Return Vehicle (ARV), a Lunar Lander, and different scenarios for space exploration. The aim is to develop detailed proposals for new programmes to be decided upon, and executed, when circumstances – considering the maturity of results and availability of sufficient funding – are right.

II.5 Exploration of Mars

It appears that a consensus has developed among several space agencies that the long term goal of human spaceflight activities shall be to make possible a manned mission to Mars, with the safe return of astronauts to Earth after their 6-month sojourn. The Agencies have not yet acquired necessary technology and expertise for executing such a risky mission, which is envisaged for around 2050, assuming that significant funding and R&D will be available by then.

As mentioned before, human spaceflight programmes will be primarily dedicated to ISS Cooperation for the short and medium term. However, other steps and objectives may also be identified for furthering astronaut activities over the coming years. Since the human exploration of Mars is generally viewed as the long term goal for human spaceflight, ESA has started in 2005 the ExoMars programme, as part of the European Space Exploration Programme - Aurora, with a view to, through the execution of a series of

missions, acquiring a better knowledge of Mars' environment. The Exomars programme is dedicated to the robotic exploration of Mars, in the frame of a bilateral cooperation with NASA comprising two missions, to be executed respectively in 2016 and 2018.

III. COORDINATION OF SPACE EXPLORATION EFFORT

III.1 The ISECG

In 2006, 14 government-level space agencies took the unprecedented step of elaborating a vision for peaceful robotic and human space exploration, focusing on destinations within the Solar System where humans may one day live and work, and developed a common set of key space exploration themes. When adopting its Terms of Reference in November 2007, the International Space Exploration Coordination Group (ISECG) established a voluntary, non-binding international coordination mechanism. Through that mechanism, individual agencies may exchange information regarding interests, objectives, and plans in space exploration.

III.2 Defining a European strategy for space exploration

With the entry into force of the Treaty on the Functioning of the European Union on 1 December 2009, the European Union has acquired explicit competences related to space exploration, to be exercised in parallel with those of Member States and through its relationship with the European Space Agency. The various

players in the public section involved in space activities in Europe realize that, for Europe to shape its position on space exploration in the global arena, there is a need to define a joint European vision and strategy. The first international conference on Space Exploration took place in Prague on 23 October 2009 to address that matter. Moved by the same goals and held at a ministerial level, the second event of this kind will be held in Brussels on 21 October 2010 under the current Belgian Presidency.

Obviously it is too early to have a clear understanding of what will be discussed at the Brussels Conference on Space Exploration. However, it appears that the following issues will be addressed at the Conference:

- (a) the political dimension of space exploration in Europe, assuming adequate funding of activities is made available;
- (b) the full and effective use of the ISS for exploration, including through the development a common transportation policy and a possible extension of ISS partnership;
- (c) the development of required new technologies, where Europe has world class capabilities; and
- (d) the development of an agreed global scenario, including at international level.