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SUMMARY OF THE IMPACT ASSESSMENT

Accompanying document to the

COMMUNICATION FROM THE COMMISSION TO THE COUNCIL, THE EUROPEAN PARLIAMENT, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

TOWARDS A SPACE STRATEGY FOR THE EUROPEAN UNION THAT BENEFITS ITS CITIZENS

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1. INTRODUCTION

This IA will accompany a communication on the future involvement of the EU in space. The Communication does not amount to a formal proposal. Any such proposal would have to be accompanied by another impact assessment that would analyse the financial impact in a detailed manner.

> While Galileo and GMES remain the first priorities of the EU in space, the present IA focuses on the other priority areas identified by the 2008 Space Council Resolution[1] on taking forward the European Space Policy.

The political context of the communication is framed by article 189 of the TFEU which introduces a clear competence for the EU to act in space matters.

2. PROBLEM DEFINITION

2.1. Security of critical European space infrastructures is not ensured

The EU does not at present have full and accurate information on satellites and debris orbiting the Earth, on the space environment (e.g. radiation bursts) and possible threats coming from space (near Earth objects). This lack of information constitutes a major risk to space infrastructure.

2.2. Europe lacks a long-term strategy and critical mass for space exploration

Space exploration gives nations involved in it a high political profile in the international arena. It is also a driver for technological innovation whose spin-offs have enhanced citizens' lives to a scale that is not often realised by the general public.

Space exploration requires a political thrust, a vision and a strategy to carry it through which Europe lacks at present. Space exploration activities are also fragmented and isolated from non-space sectors. This is detrimental to Europe from an international standpoint, does not allow space exploration potential for innovation and competitiveness to materialise and could have negative effect on science and education[2].

2.3. Space policies and investments are decided at national/intergovernmental level

The space sector is largely driven by national public funding spent either directly or via a contribution to ESA[3]. As a consequence:

– Space initiatives only indirectly respond to broader European policy objectives;

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1 5th Space Council Resolution, "Taking forward the European Space Policy", 26 September 2008.

2 Conclusions of the workshops "Space exploration and innovation, industrial competitiveness and technology advance" and "Science and education within space exploration", http://ec.europa.eu/enterprise/policies/space/esp/conferences_space_en.htm.

3 The big European space powers (FR, DE, IT) contribute about half of their national space budgets to ESA, most other countries consider ESA as their space agency and contribute most or all the national space budget to ESA.

– National space policies' target is national industry, which may be detrimental to the competitive development of the European space industry;

– There is a risk of overlaps, fragmentation and discontinuity of the activities in the European space sector.

2.4. National investments for dedicated space programmes cannot sufficiently address the needs of EU policies and interventions

There is wide recognition that future space developments in areas such as security or space exploration and the exploitation of space infrastructures and space-based applications require a coordinated funding approach.

Due to the fragmentation of national decision making channels, space governance frameworks and lack of coordination of funding mechanisms, investment in essential space activities such as SSA[4] or space exploration cannot acquire the necessary critical mass.

3. ANALYSIS OF SUBSIDIARITY

The present initiative does not seek to replace but rather complement action taken by Member States individually or in the framework of ESA and reinforce coordination where it is necessary to achieve common objectives.

4. OBJECTIVES

General Objectives	Specific Objectives
(1) to promote scientific and technical progress; (2) to promote innovation and industrial competitiveness; (3) to ensure citizens' well being derived from space-based applications (4) to enhance the EU profile in space at world level.	(1) Ensure the long-term availability and security of European space infrastructures and services; (2) Ensure that the EU is in a position to fulfil the coordination role in exploration that article 189 of the Treaty calls for and to capitalise on the space exploration potential to contribute to the objectives of the EU 2020 strategy; (3) Ensure the conditions necessary to guarantee European access to space and on-orbit infrastructures; (4) Ensure convergence of national and EU policies and investment in the field of SSA and space exploration as well as convergence between action in these two areas and other EU policies; (5) Ensure a leading and strategic role for the EU

[4] Space Situational Awareness (SSA) is the comprehensive knowledge, understanding and maintained awareness of the population of space objects (spacecraft such as satellites or space debris), of the space environment, and of the existing threats/risks to space operations. SSA systems rely on ground or space based tracking and monitoring sensors.

	in space at global level and in particular in international negotiations related to SSA and space exploration.

5. POLICY OPTIONS

5.1. Option 1: Baseline

The EU would not invest in security of critical European space infrastructures nor engage in space exploration efforts. This would not affect the implementation of the other EU flagships in space, Galileo and GMES, but their long-term security and sustainability could be affected. The situation described under problem definition is likely to remain.

5.2. Option 2: Security in space dimension

This option proposes a European Space Situational Awareness System designed to protect critical European space infrastructures from the risk of collision between spacecraft or with space debris, near-earth objects[5] and space weather. The option covers the federation of existing capabilities and acquisition of components necessary to complete the system as well as the maintenance and operation of SSA ground and space systems.

International cooperation, particularly with the US, would be an important element in the implementation of this option.

First indicative estimates for a fully deployed European system as from 2014 are assessed at €130 million per year (in 2009 prices).

5.3. Option 3: Option 2 plus limited involvement in space exploration

The EU would extend the space exploration activities and coordination in Europe, jointly with the Member States and ESA. This scenario has two main components:

– Participation in the ISS[6]

This would allow enhanced EU presence in the ISS through an EU astronaut corps based upon the existing ESA corps and increased possibilities for missions, gradually placed under direct European control and ultimately leading to a European crew transportation system. This

[5] Near-Earth Objects (NEOs), comets and asteroids whose orbits bring them close to the Earth, are a rare but dramatic danger for Earth.

[6] The International Space Station (ISS) is a permanently inhabited space station orbiting the Earth at 400 km altitude for peaceful purposes. Its design, development, operation and utilisation are based on the Inter Governmental Agreement signed in 1998 between 15 International Partners. The ISS is managed by ESA (Europe), NASA (USA), Roscosmos (Russia), CSA (Canada) and JAXA (Japan).

option includes testing for sustainable human presence in space beyond LEO[7]. The cost estimate is in the order of €300 million per year.

– Launch infrastructures

The EU would contribute towards the adaptation of launch infrastructure to accommodate the evolution of the Ariane-5 launcher and towards adaptation and operational maintenance of the European Spaceport (Guyana Space Centre). The average EU contribution is estimated in the order of €100 million per year.

Both components will be implemented through ESA.

5.4. Option 4: Option 3 plus substantial investment in space exploration

This option adds to option 3 the development of human access to space and robotic exploration to Mars.

– Human access to space

Under this option the European cargo transfer vehicle (ATV) would be enhanced to be able to return payloads safely to Earth (i.e. Advanced Re-entry Vehicle, ARV) for better utilisation of the ISS and providing a bartering capacity[8]. In a second step the ARV would be improved and upgraded to transport crew to and back from LEO (ARV-Crew). The financial intervention of the EU would be around €800 million per year for 2014-2020.

– Mars sample return mission

The EU will contribute towards a first Mars sample return mission to be launched by the middle of the next decade. An annual average EU contribution of about €100 million per year would be needed in the period 2014-2020. This funding could cover the technical facility to which the samples would be returned.

The implementation of EU space exploration activities would be delegated to ESA. International cooperation would be essential for both options 3 and 4.

6. ASSESSMENT OF IMPACTS

6.1. Option 1: Baseline scenario

Under this scenario the EU would not fund neither SSA nor space exploration. The problems connected to the absence of an SSA system and the lack of EU involvement in space exploration will persist.

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7 Low Earth Orbit (LEO), generally considered to be an orbit at an altitude of 400 to 1000 km.

8 The ISS partnership is based on a non-exchange of funds; any contribution to the ISS is in-kind, providing exchange possibilities for flight opportunities, hardware and services.

6.2. Option 2

6.2.1. Economic Impact

The results from this intervention will reduce the risk of economic loss due to damage (including total destruction) of spacecraft and lead to improved space security including security for human crew in space and citizens on Earth. The intervention regarding space weather could lead to benefits in other sectors, such as the aviation and electricity sectors.

Activities in the area of SSA and securing space infrastructures from threats can also impact the competitiveness of the European space industry.

6.2.2. Environmental impact

Better information on space weather may result in better knowledge of climate change and earth weather. More accurate information on meteors will reduce the adverse affects of debris and meteors striking Earth.

6.2.3. Social impact

Protecting space assets ensures that important services will keep functioning even in case of major disruption of terrestrial systems.

6.3. Option 3

6.3.1. Economic impact

- Activities foreseen under option 3 will involve expenditure on a wide range of areas, including technology demonstration and hardware or processes development. These products and services are delivered by and benefit a wide range of public and private institutions and manufacturers in Europe.

The EU expenditure on space exploration can be expected to translate directly into turnover for the space industry by a minimum estimated factor of 2.3, implying that €100 million spent on space exploration will result in €230 million in supplying industries and new products. The most significant spill-over impact on non-space sectors is expected in the field of life support, health and wellbeing[9].

6.3.2. Environmental impact

- Space exploration will enhance the understanding of our own environment, which in turn will result in better definition of environmental policies. It will have positive effects in areas such as air quality management and regeneration, energy production, storage and distribution technologies, and water management.

[9] "Space exploration and innovation, industrial competitiveness and technology advance", Workshop conclusions and recommendations, 29-30 April 2010, Harwell (UK); http://ec.europa.eu/enterprise/policies/space/esp/conferences_space_en.htm.

6.3.3. Social impact

- An EU intervention in space exploration is expected to lead to social impacts in terms of employment, labour market structure and education, and health. The US Space Shuttle programme had an employment multiplier factor of 2.8.

- The space environment offers unique possibilities to study health problems related to various diseases, aging or immobility. Other societal benefits will be derived in the fields of energy, health, biotechnology, environment or security.

6.4. Option 4

6.4.1. Economic impact

- The rationale for economic impact described under option 3 applies to option 4 as well. The potential economic impacts will be commensurate with the increased funding.

Space exploration programmes are essential in order to maintain the competitiveness of current and next generation of European launchers.

- Due to the various technologies needed a large number of high-tech applications in the biotechnology and pharmaceutical industry are foreseen, e.g. bio-containment, tele-operations including remote micro-robotics, automated handling and storage systems and micro-analytical systems[10].

- The profile of the EU at global level will be significantly enhanced.

6.4.2. Environmental impact

By dealing with topics such as comparative planetary climatology or earth observation from the ISS, research related to space exploration would help understand climate change on Earth.

6.4.3. Social impact

Space exploration will contribute to developing global scientific leadership for Europe. Space exploration activities will foster the public interest in space science and technology, and will encourage young people to take up science, technology, engineering and maths.

- There will be a substantial positive impact on creating new, qualified jobs. ESA[11] estimates that an investment of the magnitude proposed under option 4 will lead to the creation of 3000 highly qualified direct jobs. With a possible employment factor of 2,8[12] overall employment generated by this option could accrue to more than 8000 jobs.

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10 "Space exploration and innovation, industrial competitiveness and technology advance", Workshop conclusions and recommendations, 29-30 April 2010, Harwell (UK); http://ec.europa.eu/enterprise/policies/space/esp/conferences_space_en.htm.

11 Data provided by the European Space Agency.

12 Jerome Schnee, The Economic Impact of the US Space Programme, Rutgers University,

7. COMPARISON OF THE OPTIONS

Options	Effectiveness	Efficiency	Coherence
Option 1	• Option 1 will not achieve the specific objectives of this action. The funding would be available for other initiatives.	Not applicable	This option is not consistent with the EU2020 growth strategy, which emphasises the key importance of innovation and industrial competitiveness and refers to the development of space policy as instrument to achieve the goals of such strategy.
Option 2	This option achieves specific objectives (1) regarding long term availability and security of European space infrastructures and services and partly objective (4) regarding the convergence of national and EU policies and investments on SSA and the connection of these and other EU policies.	Option 2 entails an expenditure of **€130 million per year**. An SSA system could save as a minimum over €240 million per year. This option diminishes the risk of domino effect due to spacecraft destruction. It has important social benefits resulting from avoiding the disruption of satellite based services, better prevention of electricity grid failure as well as the impacts of NEOs. Positive impact on environment notably by learning more from space weather.	This option is partly but not fully coherent with the EU2020 growth strategy. While SSA represents certain potential for innovation and growth, its main purpose is the protection of space infrastructure. The innovation potential in space exploration is not addressed in this option.
Option 3	This option achieves objectives (1), (2) and (4), but only in part objectives (3) and (5). It does not fully guarantee independent access to on-orbit infrastructures. Option 3 will give EU a higher profile in space matters but not the leading and strategic role referred to in objective 5.	Option 3 entails an additional expenditure of €400 million per year. The **total for this option is €530 million per year**. Conservative estimates put the rate of return for investment in space exploration at 2.3 and employment factor at 2.8. Other significant impacts on Europe's visibility and innovation potential, the creation of qualified high-skilled jobs and beneficial spin-off effects.	Option 3 is fully consistent with the EU2020 strategy; it will contribute to innovation and derive spill-over benefits in many areas and EU policies including health and environment.
Option 4	This option will achieve the five objectives identified.	The rationale described for option 3 applies to option 4. This option adds €900 million per year, **the total being €1.43 billion per year**. Option 4 represents an enormous technological challenge which will accelerate the pace of technological progress and multiply the spill-off and spill-over benefits for our economy and citizens.	From the coherence standpoint, this option is similar to option 3.

8. MONITORING AND EVALUATION

The present impact assessment will accompany a Communication on the future involvement of the EU in space which could pave the way for a European Space Programme proposal. Detailed provision for monitoring and evaluation will be discussed in that Impact Assessment for that proposal.

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