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Foreword

The European Science Foundation welcomes the initiative of the European Commission to develop and set in place a coherent European Space Policy. This endeavour will have to include as a central element a future space science policy, covering basic and applied science research on space, in space and from space, to be pursued at the national and European levels.

When debating and setting out a European space science policy, a crucial question is "who shall be responsible at the European level for space research in the forefront of knowledge?".

Answering this question, which can be extended to all fields of science, is essential to the development of the European Research Area (ERA). Therefore, the forthcoming White Paper needs to address this matter in concrete terms.

Within this context, ESF is pleased to be able to endorse the 'synergistic approach' for a European policy for space research, outlined in this document by the European Space Science Committee of the ESF. ESF believes that a careful choice of priorities will allow a more effective use of scarce resources.

In addition, ESF believes that an issue to be taken up in the forthcoming White Paper on a European Space Policy relates to ESA which, in its current mission, fulfils a complex and onerous role in the domains of basic and applied space research and the provision of facilities at the European level. That is, it acts and operates at the same time as a funding agency for research, a funding agency for large research facilities, a facility operator, and a coordinator and manager of research with responsibilities including peer review and evaluation. There is an ongoing debate about the new structures for the support of high-quality research in Europe. This must include the need for an external, independent European science body which, *inter alia*, can provide systematic scientific reviews, evaluation and advice on the research projects and research facilities of ESA.

Enric Banda
ESF Secretary General

Background

The European Space Science Committee of the ESF (ESSC) formulated recommendations regarding the definition of an EC-ESA Joint Strategy for Space at an early stage (Refs. [1]-[5]).

In summary, the ESSC recommended that:

- a global strategy and synergistic approach be implemented, that takes into account a defined role for each partner (ESA, EC, EUMETSAT, national space agencies)
- ESA's scientific "roadmaps" serve as elements in underpinning such a strategy
- the EC should fund an operational GMES programme
- the ISS should be recognised and funded as a Large Research Infrastructure through the EC's Framework Programme

These recommendations were acknowledged in a European Commission communication to the European Parliament "Towards a European Space Policy" ⁽⁶⁾, which indicated that "*synergies should be assessed with the ESSC-ESF*".

To develop further this European strategy for space, the European Commission, together with ESA, then prepared a "*Green Paper on Space*" ⁽⁷⁾. This paper looked into Europe's assets and weaknesses in this sector. As a basis for a broad consultation, the report tackled key issues such as the European Union's independent access to space, scientific excellence in this field, the industrial and technological base, relevant markets, human resources, the legal and institutional framework, international cooperation, and environmental and security aspects. It aimed to launch a debate with all players – national and international organisations, the EU space industry and users, scientific community and citizens. This consultation, which ended on 24 June 2003, aimed at helping to shape a European Union response to competitiveness and security challenges related to space, to be detailed in a "White Paper" to be published at the end of 2003.

The European Science Foundation acts as a catalyst for the development of science by bringing together leading scientists and funding agencies to debate, plan and implement pan-European initiatives.

The process of consultation on this “Green Paper” officially started on 6 March 2003, during a conference held in Brussels, and to which the ESSC was invited. This process was structured in a series of workshops, which took the debate to the Member States and to actors in the space domain. Each workshop offered an opportunity to provide an overall discussion on the questions raised by the Green Paper. The science related workshop took place in Berlin on 8 April 2003, where the ESF and ESSC were invited and presented informally elements of this contribution. The consultation period stopped at the end of May 2003 and a final meeting took place in Paris on 23-24 June. The ESSC was invited to submit an appropriate response and recommendations concerning this document. This assessment process by the ESSC had started during the 25th plenary meeting, held in Copenhagen, Denmark, on 12-13 March 2003.

The recommendations of the ESSC, which are detailed in this ESF Policy Briefing, were approved by the ESF Executive Board at its June 2003 meeting.

ESF’s ESSC position on the Green Paper “European space policy”

Some of the questions asked in the Green Paper are not relevant to space research, while other, important questions are not addressed at all. Hence the ESSC’s response is two-fold. First, general considerations on the Green Paper and the future European space policy are presented, also stressing elements that the ESSC would like to see incorporated in the final White Paper. Secondly, replies to the twelve questions posed in the text are offered, along with the corresponding recommendations.

Preamble

The ESSC acknowledges with interest the existence of such a document. It allows the various European space actors to initiate on a firm basis a much needed discussion aimed at laying the foundations for a truly European space policy, complete with the foreseen necessary institutional agreements. The European Commission and the European Space Agency are to be congratulated for making this document available.

Overall the ESSC believes that there has to be a synergistic approach taken by the European Commission and other involved European institutions, to ensure that coordination and existing interfaces are improved, rather than one in which they would seek to completely redefine institutional responsibilities in space.

In order to afford expensive space programmes, more than one country and more than one objective must contribute to a single programme. This concept, which could be summarised with the statement “*space projects, because of their costs, require a global approach*”, is similar to the assumption stated at the beginning of the Green Paper (“*space must, by nature, be considered at the global level*”). However the real meaning of the latter statement is not clear, bordering on the fringe of philosophy, and should perhaps be advantageously completed by the former.

Thus the development of a strategy for an efficient action of Europe in the space field must start from the identifications of the objectives and of the resources. Space scientists are regularly challenged about the high implementation costs of their disciplines. This situation is caused by the high cost of access to, and operation from, space, and also by the increasingly complex background in which science evolves. The will of scientists and space agencies alike was therefore strengthened to engage and reinforce collaborative programmes, to minimise duplication and maximize the return on public investment. Coordination between European and national programmes could become the norm with a strong ESA programme, while it is presently often the exception. This complex background is a consequence of (i) the maturity of the field, which has grown from a science- and curiosity-driven approach, to a situation where a myriad of applications, industrial uses and services to the citizens have been developed; (ii) the diversity of the type of objectives (knowledge, technology and application), of their field (scientific, civil security, defense, commercial, strategical), and of their perspective (short and long term results). This diversity must be acknowledged in order to identify a strategy that is more efficient, in the sense that it will meet more effectively all the objectives. Political will and investment means are required to sustain these upstream efforts.

Progress requires a sequence of research investments aimed at acquiring knowledge, maturing technology and developing applications. The time required for the development of this sequence however can be very long, particularly in the space sector, and this delay hides the links between research and progress, and weakens the consensus on the recognition of the need, both for research and for a long-term planning, that is consistent among its components (knowledge, technology and applications). In addition, applications do not usually stem straightforwardly from well-identified research perspectives. Rather they are often the result of an essentially unpredictable process, although adequate accompanying funding mechanisms, carefully identified steps and due involvement of the users, can help to ease this uncertainty. An important requisite for the construction of an efficient European space strategy is thus to create the conditions for the development of a balanced and long-term planning of the activities.

General considerations

Concerning the structure of the Green Paper, the ESSC regrets that none of the twelve questions posed in the document specifically address and recognise the role of fundamental research (science) in underpinning any policy for space. Currently the statement concerning scientific excellence is relegated to one of the sub-chapters, while it should sit in a prominent fashion within the document.

Furthermore, the ESSC would like to stress that science conducted in, on and from space, which is at the root of a future European space policy, is not limited to space science, meant in the traditional sense, and to Earth observation from space, as stated in § 1.1.2 of the Green Paper, but also encompasses life and physical sciences in space. Although many of these aspects are present in the current document, they are scattered in various places, thereby considerably weakening its science base).

Recommendation G1:

The subsequent White Paper should stress clearly, and in a prominent fashion, that the involvement in first-class science is absolutely essential for the promotion of European interests and leadership, as it imparts a strong strategic drive to its technological and industrial system, as successfully demonstrated in the case of the USA.

Recommendation G2:

The success of ESA's science programme is its dependence on scientific excellence as a criterion for its projects, regardless of the diversity of alleged priorities, as well as the merits of its current mandatory, GNP-related, funding scheme. If the science programmes are to be perceived as being internationally competitive, scientific excellence must remain the criterion.

Recommendation G3:

The White Paper should state that, in the space area, this involvement in first-class science encompasses research in space, research of space, and research from space. In order to ensure the long-term planning and stability advocated in the Green Paper, these other scientific programmes of ESA should also acquire a mandatory status.

Question 1

"Should Europe maintain, until 2020 and beyond, its independent access to space, based on the development of a family of European launchers and their preferential use by institutional users?"

The ESSC recognises that there is a political and strategic need for Europe to maintain and develop its own access means to space; it is also important to expand the European windows of scientific leadership concerning human and non-human access to space. This need should not however be detrimental to scientific payloads, for which the search for the most competitive bids in terms of launchers is a vital element. This is particularly true in the case of Earth science and observation missions, for which no affordable European offer for launch services is currently available.

Recommendation 1.1:

The answer is yes; however the existing science budgets should not support the possible additional costs borne out of the political and strategic necessity to subsidise European launchers.

Question 2

“In which fields – including those concerned with space systems used for security and defense – does Europe have critical technology and industrial short-comings, and how to redress the balance?”

The remit of ESSC is limited to research. However, looking at the broader context of technology, for which science is the main driving force, it appears clearly that our present competencies and capabilities cannot be maintained with the current level of R&D in Europe.

In this sense, the ESSC considers that, in order for Europe to stop lagging behind, a substantial effort of investment in R&D is required. This is also linked to our committee’s answer to the question n° 5 (see corresponding recommendations). In comparing the European situation to, e.g. that of the USA, it appears clearly that (i) the lack of a European defense policy, and (ii) the lack of military R&D effort in Europe (e.g. in the development of infrared detectors), are highly detrimental. The latter constitutes one of these shortcomings of European industry.

Question 3

“What is the outlook for growth in the European institutional market? In parallel, is it necessary to seek agreement with key international partners (United States, Russia) to establish more balanced market conditions?”

In the various areas of space research the European “market” is almost entirely institutional, and could only be enhanced through legislation. In the document, use is made of institutional orders/demand/programmes as well as of public expenditure/customers. If “institutional” and “public” have in this context the same meaning, a single word should perhaps be used; otherwise the different meaning of the two words should be stated.

Recommendation 3.1:

Agreements with key international partners (e.g. CEOS in the field of Earth observation)

should indeed be pursued. A data policy, harmonised at the European – and possibly global – level, would benefit public use. This policy should address unresolved issues such as the identification of the resources in Europe for long-term archiving and scientific exploitation of the data.

Question 4

“From a European point of view, do the results eventually expected from the experimental programme on board the ISS correspond to the level of investment and the running costs? How should Europe develop its participation and its objectives?”

The issue of the use of the International Space Station (ISS) for scientific research has been at the heart of a heated debate for many years. If it is clear that the scientific community did not ask for the ISS, it is also clear that it now represents the only viable option in the foreseeable future for whole fields of research, such as life and physical sciences in space ⁽⁸⁾. Furthermore in areas such as biology, physiology and medical research, exo/astrobiology, fluid and material sciences, and fundamental physics, the European scientific community has attained a leadership position at the world level ⁽⁹⁾. The ESSC wishes to stress at this point that all the researches planned in the ISS have been thoroughly peer-reviewed, as is the case with any large, ground-based, infrastructure. In some of the areas listed above, “research in microgravity” has become an instrument leading to first-order scientific results, and also to identified and potential applications.

This is not the case for other fields though, and the area of, e.g., Earth observation, can expect little benefit, if any, from the use of ISS for science. Hence the answer to this question very much depends on the scientific area being considered.

Recommendation 4.1:

Access to, and use of, the ISS, should be facilitated for European researchers in the fields of life and physical sciences in space. Corresponding ground-based research work should find funding sources at the European level since this aspect is not covered by ESA’s support, contrary to the case of, e.g. NASA. For these areas

of research, it appears justified that Europe optimises its participation and expected return on investment by securing an independent access to space, as well as a permanent European astronaut on board the ISS for conducting scientific experiments.

Recommendation 4.2:

In other fields, the use of the ISS has not demonstrated its interest. This is for instance the case in Earth observation, where the related budgets should not suffer from the important investment which Europe has agreed to provide for the ISS in 1998.

Question 5

“How may the financing of space activities at European level be organised in a more coherent manner, avoiding that an increase of resources at European level is accompanied by an equivalent reduction of investment at national level?”

This question is two-fold. It is underlined by both, the need for making the space-related funding avenues more coherent, and the need to recognise that funding for R&D in Europe should be substantially increased, if Europe is to truly become the “most dynamic knowledge-based society in the world”. Hence, redundancies between national and European programmes should be reduced, while maintaining the necessary capabilities at the national level. Without the latter, key expertise and know-how would disappear.

It is thus clear that a precise assessment of these capabilities, of the various sources and avenues of funding – not all coming from space agencies – and of the existing redundancies and incoherencies, is mandatory and should be undertaken in the near future. Financing space activities comes after a proper review of innovative proposals. A better coherence between national and ESA’s programmes could thus be achieved by harmonising these procedures at the European level.

Recommendation 5.1:

The ESSC strongly stresses the fact that the funds for European space research have

been repeatedly cut in the past years, and have become insufficient to maintain a strong foundation for space activities. This trend should be stopped, and possibly reversed.

Recommendation 5.2:

Programmes should become “all-inclusive” (i.e. include launch, platform, instruments, data processing up to level 2, science support, outreach, etc), and thus more transparent. In the field of Earth observation (for which European Ministers agreed to an envelope programme in 1999), Europe needs to secure and truly develop, both a mandatory programme (for the “Earth Explorer” component of ESA’s programmes) with a level of resources comparable to that of the so-called space science programme of ESA, and an optional, institutionally user-driven, programme (the “Earth Watch” component).

Question 6

“What action should be taken in space professions and associated fields to make them more attractive, in particular to young people?”

Here it is felt that the issue is not so much linked to the lack of attractiveness of space-related professions, but rather to the shortage of available positions in universities, laboratories and research institutions and, to a lesser level, in the private sector. Concentrating on the research area for which the ESSC holds an expertise, this fact was made very clear in the results of the study led by the ESSC for ESA’s Directorate of Science on the issue of demography of European space science ⁽¹⁰⁾. While science and technology oriented PhDs in ESA Member States represent some 60%-70% of all PhDs, almost half of the related scientific workforce holds a short-term contract.

Naturally, differences – significant in some cases – exist among European countries and disciplines. However the increasing competition for public funding tends to level out some of these differences by creating a situation where the perceived lack of political will to sustain space activities may entice individuals to choose other professional areas. In the period 1995-2000, governmental R&D budgets in the 15 Member

States of the European Union have increased by 0.61%. During the same period though, national space programmes budgets have increased by only 0.18%, and national participations to ESA's space science programme have decreased by 0.88% in real terms. The situation is somehow different in the private sector, since the R&D budgets in this area have increased by 4.9% over the same period. Although favourable in the short-term for the industrial workforce, this trend will, in the long-term, widen the gap between fundamental research and applications, making Europe more and more dependent vis-a-vis countries where R&D efforts in space are being maintained or even enhanced.

In addition, students are being discouraged from approaching space research by the uncertain perspectives and by the low salaries. Overall the long investment required in the space field to achieve the necessary insight, due to the very long lead-time of the projects, can appear quite discouraging. Another important factor also linked to this long lead-time of missions is the smaller number of peer-reviewed articles that space researchers can hope to publish with respect to other fields. While not diminishing the productivity in these areas, it does severely hamper the career development, if an adapted metrics is not taken into account for space research. This is happening despite the fact that space activity is, by its nature, very appealing for students. The few students who still chose a scientific subject do not give high priority to space projects due to these elements.

Recommendation 6.1:

In order to enhance the competitiveness of European R&D in the space sector, public research institutions must make available more job opportunities, compensating the lack of attractiveness of the salaries with respect to the private sector, by offering more permanent positions and enabling a continuous infusion of young people into these institutions. The specific nature of the space careers should be taken into account by adapting the standard academic selection criteria. These aspects cannot obviously be separated from the need to increase public R&D investment, as already recommended above.

Question 7

“What are the conditions for the emergence of economically viable and competitive applications and space services for citizens and industries? Will political actions be justified, and if this is the case, to what extent could public support be considered necessary?”

There are many examples of already identified applications and services resulting from space activities, and many other potential ones. In the area of Earth observation and environmental science, this is precisely what GMES is meant to deliver ⁽¹¹⁾.

Recommendation 7.1:

To enable the success of the GMES initiative, public support is mandatory, which goes beyond the allocation of research budgets for Earth sciences and applications. Key criteria of success are sustained funding and long-term continuity of observing systems, information availability through the end-to-end involvement of the users, and fast data delivery, all of which resulting into improved cost-effectiveness.

Question 8

“How better to define and clarify, as part of a coherent whole (including framework and time-scale): the nature and scale of the space capacities required to achieve the political objectives of the PESC? Within what context the possible new space capability may be placed at the service of the security of citizens?”

This question addresses the common security policy of the European Union and falls outside of the expertise of the ESSC.

Question 9

“What is the most efficient manner to exploit the space «acquis» in Europe for the benefit of Union policies?”

High-quality space research is a well-recognised asset of Europe's space programmes, and ESA's role is crucial to maintain this leadership. ESA

has an excellent track record in space research and can be regarded as a successful self-organisation of that research sector. In line with earlier recommendations of the ESSC, this excellence has been recognised by European decision-makers in the first drafts of the European space strategy, and the scientific “roadmaps” (Horizons 2000, The Living Planet, ELIPS) developed by the ESA Directorates are now considered as basic elements in underpinning any such strategy.

While the European Commission is concerned, through its Framework Programme scheme, with industrial competitiveness and policy support which impinge on aspects of space activities, ESA and the national space programmes have developed excellent operational and research activities. Consequently there has to be a synergistic approach taken by the European Commission to ensure that coordination and interfaces are improved, rather than one in which it seeks to redefine institutional responsibilities in space.

Recommendation 9.1:

It is therefore strongly recommended that this excellence is not hampered by merging diverse institutions into centralised bodies. The roles and competencies of the respective entities should be recognised, in order to preserve a healthy “biodiversity” among the existing institutions.

Question 10

“How may the political and juridical bases necessary for an efficient action by the Union and Europe in the space field, in particular with regard to the definition of the future Treaty of the Union, be reinforced?”

As already foreseen, space and the necessary corresponding research effort must be mentioned in the future Treaty of the European Union. The role, and working relationships, of the various actors, must be established on a legal basis, through a Framework Agreement. While the Treaty should only address principles and major strategic guidelines, this Framework Agreement should dwell upon ways to coordinate the activities of the various “actors”, concentrating on issues which are insufficiently – or not at all – covered by the existing schemes. This is the

case, for instance, for the exploitation of Large Research Infrastructures, for which ESA is ill equipped.

Recommendation 10.1:

Europe must establish on a regulatory and legal basis its space policy, through its inclusion in the future Treaty of the European Union, while maintaining ESA as an independent institution working in close relationship with the European Commission through a Framework Agreement.

Recommendation 10.2:

This Framework Agreement should establish guidelines in areas which are currently poorly managed, e.g. defense and security issues, or exploitation of Large Research Infrastructures.

Question 11

“Economic pressures are driving aerospace industries in Europe and elsewhere to restructure. What are the consequences of such restructuring? How may the actions of public bodies be best organised to support the competitiveness of the space industry?”

Although this aspect is essentially out of the scope of this Committee’s remit, it appears healthy for the competitiveness of European industry to preserve its diversity, but also to secure a truly institutional market in Europe, as could be the case for GMES. This can only be achieved through an adequate public policy and political will at the European scale to support its industry.

Question 12

“Are there regulatory barriers, which slow the development of new space communication services? What are the measures likely to improve regulatory environment, notably with a view to the development of the information society?”

This question addresses issues that falls outside of the expertise of the ESSC.

References

- [1] Future of space-based research in Europe: the role of the European Union, ESSC-ESF Position Paper, ESF, Strasbourg, 5 March 1999.
- [2] Towards a European space policy, ESF Policy Briefing 5, Strasbourg, November 1999.
- [3] ESSC-ESF contribution to the joint EC-ESA "European Strategy for Space". Letter from the ESF Secretary General to ESA and EC Executives, Strasbourg, 17 August 2000.
- [4] ESSC-ESF contribution on the EC-ESA joint strategy for space, REP(01)5, ESF, Strasbourg, June 2001.
- [5] Future of Europe in space research. ESSC-ESF recommendations to the ESA Council of Ministers, pp. 3-4, ESF Strasbourg, ISBN 2-912049-27-X, October 2001.
- [6] Towards a European Space Policy, EC and ESA Joint Task Force Report, COM(2001)718-EUR 20228, pages 7, 8, 20-22, 30, 32, ISBN 92-894-3271-3, 2001.
- [7] Green Paper. European Space Policy, COM(2003)17, 2003.
- [8] Position paper and recommendations concerning the International Space Station and its use for scientific research, ESSC-ESF, REP(95)4, ESF Strasbourg, June 1995.
- [9] Recommendations for ESA's future programme in life and physical sciences in space. Results of an ESF-ESSC study, REP(00)5, ESF Strasbourg, ISBN 2-912049-22-9, 2001.
- [10] Demography of European space science, ESSC-ESF study, ESF Strasbourg (in press).
- [11] Workshop on Science Issues Related to Global Environment and Security: ESF-ESSC Recommendations, Brussels, 26-27 March 2001, REP(01)2, ESF Strasbourg.

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