

The ESA Outlook Centre

– Identifying new opportunities for space-based solutions

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Introduction

Within the framework for the definition of its various programmes, particularly its application programmes, ESA already carries out 'technology-watch' activities aimed at identifying areas of possible development for space-based solutions. Those activities, although providing the information necessary to make programmatic choices, are often limited to the field of application in which they are generated and are driven primarily by industry, technologists and researchers, without a complementary vision based on an analysis of societal needs.

of society for the next five to ten years. Hence the idea of establishing an ESA Outlook Centre as an additional and complementary instrument for the Agency and its stakeholders to take a look at the outside world and to bring to it the benefits of space-based solutions, has subsequently been evaluated.

'Space Serving European Citizens'

The ESA Council, meeting at Ministerial Level in Edinburgh last November, endorsed the Director General's proposal for ESA's policy and programmes, titled 'Space Serving European Citizens'. Coherent with the European Strategy for Space developed in co-operation with the European Commission and jointly endorsed by the ESA and European Union Ministers a year earlier, the Director General's proposal identified policies and programmes to be implemented by ESA to ensure better use of space technologies and solutions to the benefit of Europeans, whilst also contributing to the achievement of Europe's ambitions.

In November 2000, Carl Bildt, Jean Peyrelevade and Lothar Späth delivered their report entitled 'Towards a Space Agency for the European Union', more commonly known as the 'Wise Men's Report', to Antonio Rodota, ESA's Director General. For that report, they had independently analysed the evolution of the space sector in Europe and elsewhere in the World, thereby providing the Director General with some guidelines for taking the Agency forward into the new millennium.

Among their guidelines, the Wise Men identified the need for continuous progress in space technologies and for assessing the capabilities of competing ground-based solutions. In order to evaluate how ground-based technologies and solutions are evolving worldwide and to identify the fields requiring public investment for the development of competing or complementary space-based solutions, the establishment of a permanent 'observation post' within the Agency was recommended.

Space technologies and systems, although not always visible to the public at large, already play very important roles in existing services and applications (telecommunications, meteorology, in-car navigation, etc.), but how can we further improve their visibility, anticipate citizens' needs, and develop the breakthroughs required to meet them?

The existing approach adopted by publicly funded organisations operating in the space sector to identify fields of intervention can be largely characterised as a bottom-up approach, with programmes being elaborated based on current technological capabilities and on political trends and wills. It is clear that such a bottom-up approach, even if very efficient in improving European industry's capabilities and competitiveness in existing niche-markets for space-based solutions, might also run the risk of losing new opportunities and new markets.

The need for such a complementary approach, and the advantages for ESA – and for the space community as a whole – of looking beyond the traditional 'space circles', suggested that we should evaluate the potential benefits that could accrue from the setting up of an 'observatory' for assessing the potential of space-based solutions compared to non-space-based ones, starting from a broad analysis of the needs and expectations

In fact, simply acting as a follower of the evolution in ground-based technologies might bring about the non-development of breakthrough solutions and the non-investment of the public funds needed for creating and mastering new markets.

A new approach

The formulation of an overall picture of mankind's expectations will help us to understand where and how space-based solutions could play a significant role in solving problems, meeting latent demands, and implementing policies. This new top-down approach will help decision makers in Europe to identify fields in which public funds could be invested in anticipation of future user needs by developing gap-filler or breakthrough solutions, as well as by exploiting existing systems or technologies differently. It will therefore complement the existing bottom-up activities already in place at ESA as well as in other publicly funded organisations financing space projects. It will allow the Agency to meet the two-fold objective of:

- identifying the potential for space-based solutions directly linked to the users' expectations and needs, sometimes driving new technology developments and opening the door to breakthrough innovation
- changing the usual space-organisation perspective, which is currently often limited to the circle of space companies, opinion makers, scientists and researchers.

To implement such a top-down approach, a new 'Outlook Centre' is being established, within the Directorate of Strategy and External Relations, which will serve as a focal point. It will involve and potentially benefit all of the ESA Directorates, relying mainly (see below) on an internal network of staff drawn from the different Directorates both for its ideas and inputs and for communicating the Centre's findings and projections back into their own Directorates and structures.

Such a top-down approach in analysing and striving to meet the future demands of society is a typical feature of large industries operating in the manufacturing field. Pharmaceutical, automotive, aeronautical, telecommunications and energy companies all use this type of approach in planning their long-term investment in research and development geared to the production of innovative solutions. Such analyses often lead to the development of breakthrough products, the Renault Espace and the Airbus A380 being good examples. Such an effort should also be beneficial for the space sector, where long-term

investments and planning are the norm. However, the market associated with space products is small and space-based solutions are still much more within the realm of governments than being driven by commercial demand. This is why those responsible for defining priorities and planning the development of future space solutions should take benefit from such a complementary approach and why ESA, as the body responsible for elaborating and implementing a long-term European space policy, has taken the initiative in implementing it within its structure.

Objectives and structure

The objectives that the ESA Outlook Centre will be pursuing, with a 5 to 10 year horizon, will include:

- anticipating and understanding the role of space-based solutions to meet society's expectations and needs
- evaluating the position of space-based versus non-space-based solutions vis-à-vis markets and society
- identifying space-based solutions already available to meet society's expectations and needs
- identifying specific space-based solutions to be developed and recommending investments in particular technology fields to stimulate breakthrough and innovation.

Although the Outlook Centre will be an ESA body, it will rely on a networking concept to involve different types of actors external to the Agency. This will provide a broader perspective in the analysis and improved sharing of the results with communities that are not focusing solely on space-related activities. Different parties will be involved depending on the particular process being used in implementing the Outlook Centre objectives, and they will interface with ESA's staff through a special body, namely the ESA Outlook Committee (EOC), which will be responsible of the management of the Centre itself.

The Director General, following recommendations from all ESA Directorates willing to join the process, will nominate the EOC members. The Director General will also nominate the EOC's chairperson, whose duties will include representing the Agency with third parties involved in the Outlook Centre process, convening and chairing meetings of the EOC, submitting agendas and items to be discussed, and producing analyses and reports. The chairman will be supported by a small team to assist in the organisation and management of the tasks relevant to the timely execution of the implementation process.

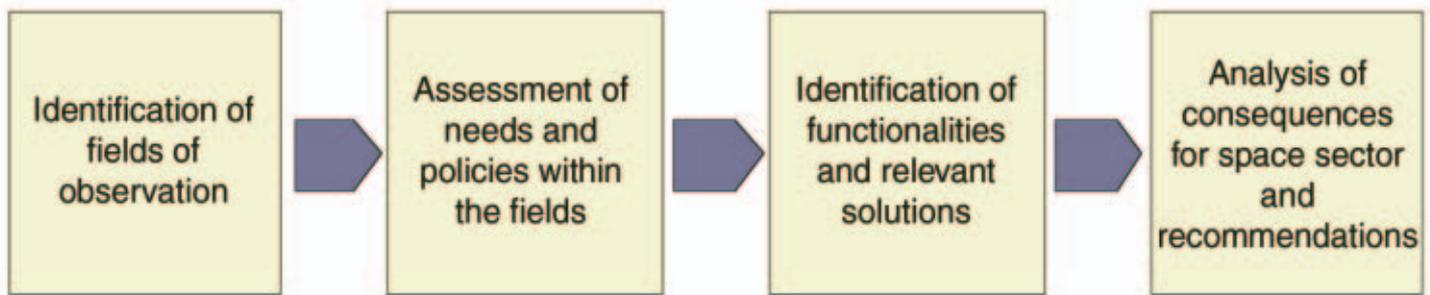


Figure 1. The process blocks

The process

The process for achieving the objectives set for the ESA Outlook Centre can be divided into four main blocks (Fig. 1):

Block 1 – Identification of field(s) of observation and associated themes

Starting the top-down approach requires an analysis of society's needs and expectations by selecting one or more general fields of investigation. Such fields might encompass several analysis themes relevant to the development of innovative solutions and will be selected on the basis of analyses performed by external bodies (research centres and institutes) typically involved in such exploratory activities. The aim is to clearly identify areas in which society and future user communities will need new technologies and innovative technical solutions.

Typical fields for investigation include the environment, health, security, Earth resources, etc., each of which might generate several themes for analysis. The identification and selection process will rely exclusively on studies already performed by external bodies in Europe. The Outlook Centre will therefore federate a network of selected institutes and research centres and co-operate with them, on

the basis of their already available results, to select appropriate analysis themes.

Block 2 – Assessment of society's needs and expectations re the selected themes

Once the domains/areas to be analysed have been selected, the Outlook Centre will proceed to assess society's needs and expectations for each of them. This part of the process will require close co-operation with selected partners, in order to map their analysis results into the Outlook Centre's logic and goals.

The assessment will be based on two different courses of action:

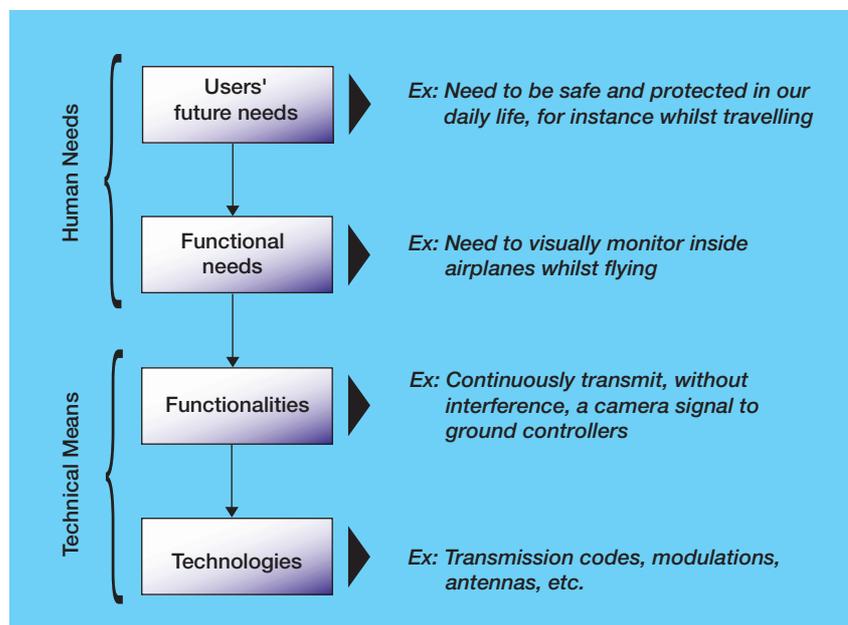
- Identification of needs and expectations coming directly from society, considering the ongoing evolution in the citizens' daily lives, their lifestyles and habits, their working methods, as well as the changes in human relationships.
- Analysis of measures already undertaken or planned by institutions and governments to take into account society's evolution, i.e. policies and regulations, international agreements, and any other actions falling within the framework of the selected theme.

The combination of the two approaches will provide the Outlook Centre with a comprehensive picture of society's needs and expectations for the next 5 to 10 years.

Block 3 – Identification of functional needs, functionalities and associated solutions (space or non-space)

A further selection is necessary in the process to identify, within the general expectations and needs, the kinds of functionalities and associated solutions that may be required by society (and therefore also by commercial markets) in the future. The Outlook Centre then needs, again in co-operation with external parties, to translate these requirements into practical functionalities according to the process logic depicted in Figure 2. Such a delicate translation will lead to the identification of very specific areas where further progress is required, independent of the type of technological solution adopted.

Figure 2. The process logic



At this point, the Outlook Centre will have at its disposal a comprehensive catalogue of areas in which space-based solutions could play a role.

Block 4 – Analysis of the consequences for the space sector

The final block of the process allows the Outlook Centre to analyse the added-value of space-based solutions in each area in which new or enhanced functionalities are required to meet society's expectations and needs. In this part of the process the Centre will co-operate with non-space-based industries and operators to identify the real opportunities for space-based solutions, as gap fillers, breakthroughs or simply complementary solutions with respect to other options. This analysis will also require the taking into account of possible market stakes associated with the development or use of space-based solutions.

Where space-based solutions are found to play a role in providing the required functionalities, the consequences for the space sector could be of two types:

- (a) Where technologies to implement the identified solution have already been developed, validation and demonstration activities should immediately be planned and initiated.
- (b) Where such technologies are not yet available, new or additional R&D activities should be planned in order to develop them and make them available to markets and/or public entities when the need is expected to materialise.

The process should run continuously, with two different duty cycles:

- Blocks 1 and 2, concerning society's requirements for the next 5 - 10 years in selected areas, could be updated every 18 to 24 months, being linked to the comparatively slow evolution in our lifestyles, habits, and working practices.
- Blocks 3 and 4, concerning the solutions to the society's requirements, may need a shorter duty cycle of 6 to 8 months, in order to take into account the rapid evolution in technologies, particularly in sectors strongly connected with market demand (i.e. telecommunications and information technologies).

The parties

As the Outlook Centre is intended to monitor society's current and future needs and fulfil them by widening the circle of application for space technologies, extensive and fruitful co-operation with external parties is an essential part of the process. The accuracy and validity of many of the

analyses to be performed will depend directly on the availability and quality of the information coming from external sources. The process is entirely founded on the perspective and foresight analysis being performed in Europe by institutes and research centres, both public and private. Special agreements and arrangements will be drawn up with such bodies based on two main principles: partnership and networking.

A partnership model will be established with publicly funded European organisations, be it at European or national level, on a mutual-benefit basis, with no exchange of funds between the Outlook Centre and external participants foreseen. The contributions from external parties will consist of the provision of existing analyses and, possibly, adapting them to meet the Outlook Centre's needs. In return, the research institutes participating in the process will have access to the Centre's findings. As far as private centres are concerned, the Agency will seek to establish a suitable partnership agreement on a case-by-case basis, depending on the scale, capabilities and interests of the party concerned.

The second principle on which agreements with third parties will be based is networking. This implies that each actor permanently involved in one or more of the process blocks already described will be included in a virtual network with both the Agency and the other parties, to facilitate the maximum exchange and sharing of information.

Based on the above logic, three different kinds of partners for the ESA Outlook Centre are envisaged:

- (a) One public institute performing foresight analyses at European level, itself the co-ordinator of a network of partners used to working together and producing analyses in different fields. This party will be a 'privileged partner' of the ESA Outlook Centre, being involved from the outset in the identification and selection of study fields and their associated analysis themes. Preferably an institute belonging to the European Union, it will partner ESA in the execution of the process, possibly also being associated with the EOC.
- (b) Public or private institutes, which may or may not already be connected with the 'privileged partner', performing perspective and foresight studies on specific subjects or themes. These parties could be associated on either a mutual-benefit or a contract basis. They will share in the Outlook Centre's results according to the agreement regulating their association, and their

participation will in principle be limited to Blocks 2 and 3.

- (c) Associations of non-space-based industries and/or operators, to support the Outlook Centre with their points of view and to enhance synergies between the space and non-space worlds. Those associations will be involved on a case-by-case basis in Workshops organised during the execution of Blocks 3 and 4.

The pilot project

The ESA Outlook Centre's concept, its organisation within the Agency, the process for regulating it and the partners to be associated with it, have been studied and defined. Although many industries operating in high-technology domains requiring long-term investment, such as energy, telecommunications, transport or pharmaceuticals, commonly apply a similar top-down approach to develop future products and the technologies supporting them, the processes implemented are usually confidential, making it difficult to understand exactly how they work in practice. Hence, before launching the Outlook Centre as a permanent ESA facility, the entire process must be thoroughly evaluated. A pilot project is therefore needed to benchmark the capabilities of the centre and its benefits for the Agency and its stakeholders.

The pilot project will last up to 12 months and its scope will be limited to the analysis of a restricted number of themes derived from a single field of observation. It will, nevertheless, allow ESA to establish the EOC, to select and find an agreement with the 'privileged partner', to identify and secure the participation of third parties according to the criteria mentioned earlier, to verify the networking concept both internally and externally with third parties, and to evaluate the cost/benefit ratio of the structure vis-à-vis other new ESA initiatives and programmes.

All ESA Directorates have been invited to participate in the Outlook Centre and to join the EOC. The Directorate of Strategy and External Relations and the Directorate of Industrial Matters and Technology Programmes are expected to play very specific roles, in the strategic planning of activities and in the implementation of recommendations concerning new technology developments, respectively.

Once the EOC has been established, the pilot project will start on the basis of the following tasks:

Task 1 – Identification and association of a privileged partner, possibly in the EU framework.

Task 2 – Identification of one observation field and associated themes, and the identification and association of relevant experts from third parties.

Task 3 – Collection of data from experts and its analysis.

Task 4 – Identification of technical functions and analysis of associated solutions and market stakes.

Task 5 – Analysis of the scope for existing and future space-based solutions and the identification of future actions to be recommended.

Task 6 – Outlook Centre management.

ESA's Management Board will continuously monitor the activities of the Centre. One or more internal workshops are foreseen to stimulate technical staff working in the relevant ESA Directorates to provide inputs and suggestions to be analysed within the Outlook Centre framework (i.e. with third parties).

The results and recommendations from the pilot project will be summarised in a final report to be submitted to the Director General and to the Management Board. A final workshop involving the privileged partner as well as all parties concerned and the ESA stakeholders, is also envisaged.

Conclusions

The idea of establishing a permanent observatory as recommended in the Wise Men's report has been carefully evaluated by the Agency. That evaluation has led to the conclusion that a new instrument is necessary to complement the bottom-up approach traditionally adopted by ESA and by other public actors involved in space-related activities to identify future developments.

ESA's response in the form of the new Outlook Centre to gather, through the implementation of a networking concept, competencies and capabilities within the Agency itself and from communities external to the space sector, will provide ESA and its Member States with the means for identifying new opportunities for space-based solutions, thereby complementing the bottom-up activities already in place.

The Outlook Centre will be initiated as a pilot project lasting up to one year and focusing only on a few carefully selected themes of investigation. A hopefully successful outcome to the pilot project will ultimately establish the Outlook Centre as a permanent means of supporting Europe's decision-making in the space field.