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AGENDA 2007

- A Document by

the ESA Director General

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Foreword

1. ESA, a research and development agency, must continuously adapt to an environment which its very successes transform: the emergence of new user communities, the introduction of new public and commercial services, the advent of new operators, citizens' dependence on services using new space systems, etc.

As a consequence, ESA has become part of a political, economic and social frame which is itself evolving, creating new needs and opportunities but giving rise also to constraints and shifting responsibilities.

ESA must therefore change if it is to adapt. Despite having to maintain momentum on a solid ongoing programme in science and having investments (such as Envisat and ISS) that are only now entering full exploitation, the Agency must be open to change, not in response to shortcomings or failures, but so as to remain an instrument optimised for an environment that increasingly needs its services, skills and know-how.

2. ESA has already come a long way and, by boosting its internal capabilities and building new relations with the European Union and industry, the previous ESA DG established the broad lines of, and basis for, a process of change that must now be taken further and accelerated. Failing that, ESA will not develop into the instrument that Europe needs and Europe, for its part, will not be able to rely, in good time, on an instrument which its development and its aspirations so clearly need.

3. This is the right time to be stepping up the process of change at ESA:

- the European Union is on the way to enlargement and is acquiring a new Constitution, which will open up additional competences and generate new needs, including in the defence field;
- the space industry (including manufacturers, operators and

- service providers) is pressing ahead with substantial restructuring, in Europe and around the world;
- the major space powers, and the United States in particular, are reassessing their space policies;
- Europe can once again, thanks to the ESA Council decisions last May, rely on guaranteed access to space on a stable, long-term footing, regardless of the situation prevailing in the commercial market;
- Galileo, the first joint ESA/EU Programme, is now under development.

4. ESA is one of the only space agencies in the world to combine responsibility for:

- the 'basic' activities required to develop and maintain the fundamental elements on which a space policy depends for its implementation: access to space, the technology base, industrial capabilities, ground facilities;
- 'inspirational' activities: sciences (Earth-, space-, life- and physical sciences), and human and automatic exploration;
- 'utilitarian' activities: developing space systems to support public services (meteorology, environment, disaster management, education, energy, agriculture, etc.) and commercial offerings (telecoms, navigation and imagery), for the benefit of citizens.

This feature is a source of strength for both ESA and Europe, providing a basis for the technical and industrial synergies that have been the key to European efficiency.

Space powers, which are still only part way to exploiting these synergies, are taking substantial action to improve their practices:

- ever-closer coordination in the USA between NASA, which is mainly responsible for 'inspirational' activities, and the DoD, which handles 'basic' and 'utilitarian' activities;

- gradual evolution of the Russian space agency, Rosaviaspace, towards an increasing involvement across the range of space activities, including defence (the transfer of responsibilities for the Glonass satellites is a case in point);
- merging of the three Japanese agencies, NASDA, ISAS and NAL to form a single agency, JAXA, charged with developing all Japanese launchers and satellites, including security (IGS) satellites.

ESA must look to evolve in such a way as to reinforce these technical and industrial synergies, including those for space developments required for future defence systems.

5. To carry through the process of change at ESA, it is necessary to define:

- ambitious objectives, supported at the highest political level,
- organisational arrangements consistent with those objectives.

The objectives proposed in the present document are for attainment within four years, i.e. by mid-2007. This corresponds to:

- the envisaged duration of the ESA/European Union Framework Agreement, a key factor in the evolution of ESA,
- the start of the subsequent European Commission budget, bringing new funding resources at European level,
- the duration of the ESA DG's mandate.

The objectives have not yet been assigned individual due dates. A detailed timetable will be provided in due course along with a detailed action plan to be developed once the four-year objectives have been shared between the Executive and the Member States.

While some of the objectives fall solely to the Executive, many others depend on the will of the Member States and will call for

decisions by them. It will be necessary therefore to secure from the Executive and the Member States a common understanding of those objectives, so that all players at ESA are pulling together, heading in the same direction, in pursuit of shared objectives.

The objectives, which are proposed therein, have been given concrete and, if possible, quantified or measurable definitions. They are not meant as criteria against which to measure the success of the DG's mandate, for while their attainment depends on him, it does not depend on him alone. Quantification does however make for focused effort and enables progress to be measured over time.

This Agenda 2007 will stay an informal document. It is an overall coherent roadmap for all players at ESA:

- the DG, to prepare formal proposals to Council on each item requesting a decision by Member States;
- the ESA staff, to adapt its actions and culture for supporting the DG in his tasks;
- the delegations of Member States, to assess individually the DG's proposals in the frame of an overall road map.

It is also a signal to existing and future partners of ESA that the Agency is willing to move and adapt its programmes, relationships and operations in order to provide the best solutions to Europe's ambitions and European citizens' expectations.

Progress towards achieving individual objectives will be analysed every year and the objectives themselves may then be adjusted in the light of that progress or of changes in the environment. As a result, Agenda 2007 will be regularly updated.

Where We Are Today

1. Space: space elements are increasingly becoming an integral part of major regional and global, institutional and commercial infrastructures. Governments and citizens are therefore dependent on the use of space systems, or are becoming increasingly aware of their enormous potential to:

- achieve greater *security* for all: prevention and management of conflicts and natural disasters; meteorology; environmental security; rescue at sea; etc.
- develop *the economy*: navigation, communications, natural resources management, meteorology, etc.
- contribute to *social progress*: equal access to information, distance learning, telemedicine, etc.
- push back the frontiers of *knowledge* and inspire future generations.

Space activities today form an integral part of a political, social and economic environment which is exerting an increasingly powerful influence over the development of those activities.

2. Global scene: characterised today by:

- an immense effort to recover from a recent major economic slowdown resulting in restrictions on public investment and a crisis in the global market;
- powerful demands for security, within national frontiers and beyond, and growing awareness at the world level of stakes relevant to our planet's management, resulting in the increasing role of information control (guaranteed access, verification, etc.).

On the global space scene, the most striking development is the ongoing revision of US space policy. Fundamental questions on the future of space access systems and human spaceflight are

being addressed and are planned to be answered by the end of 2003, but the policy overhaul is already:

- augmenting state, and particularly military, support in key applications areas (telecommunications, navigation, observation), offsetting the sharp dip in the commercial markets and preparing for tomorrow's markets;
- increasing investment in science programmes by over 10% per annum in relation to 2003, with special emphasis on new technologies (nuclear propulsion, nuclear power generators, optical links);
- leading to increasingly political use of international cooperation (cf. the recent Earth Observation summit in Washington);
- treating education as a priority, viewing it as an essential tool for ensuring continued availability of the technical skills that are critical to the continuation and development of space activity. Space must become again, as it used to be in the 1960s in the USA, able to attract the best young engineers, scientists and technicians.

3. European scene: in addition to the trends observed on the global scene, the European scene is characterised by the continued drive to build a political Europe, and more particularly:

- enlargement of the European Union to 25 Member States, creating new prospects and new needs;
- expansion of EU competences, especially in the space and defence fields;
- institutional review encompassing the roles of the Council, the European Parliament and the European Commission.

These ongoing changes in the European scene are fundamental to the development of space activities in Europe and to the way in which ESA itself evolves. Various scenarios are possible

depending on the priority given by the Member States to the European Union's new needs and competences, ranging from:

- a worst-case scenario in which the existing intergovernmental provision of funding by the Member States through ESA would simply be replaced by communitarian funding, with a view to, at the most, pursuing the same type of space activities at the same level, under the leadership of the European Union. Because of the current imbalance between the various ESA Member States in terms of motivation, this scenario would in practice lead to a rapid decline in European industrial capacities and would not therefore enable Europe to acquire the space infrastructures that are vital to a political power, as demonstrated by the US policy;
- the preferred outcome, namely to make best use of the existing funding by the ESA Member States, which reflects the industrial 'supply-side' offering, and of potential additional funding by the European Union, which reflects the demand emanating from citizens, in developing the space systems that are a vital component of a politically and economically powerful Europe and a key to improving the daily lives of the citizens of Europe and their partners.

On the European space scene, the most striking developments are the current difficulties and restructuring of the European space industry, which put at risk the future development of space activities in Europe. The launcher industry has been subject to recent decisions of the ESA Council, restoring stability and opening perspectives for the future. The satellite industry is still to be stabilised, being today characterised by:

- three independent large system integrators having an overcapacity for system tasks (compared to the present and foreseeable demand) and in addition characterised by a high degree of vertical integration,
- a rather fragmented equipment and subsystem supplier

industry with a high degree of duplication of competences between the equipment suppliers and between the equipment suppliers and the system integrators,

- a weak and dispersed added-value industry with ambiguous links with system integrators, in spite of European satellite telecommunication operators being active and successful on the world market.

The present crisis in the commercial space sector has a huge impact on the system integrators, amplified by their vertical integration. The equipment suppliers and service companies are also affected by the market crisis, again amplified by the high integration of the primes who tend to keep work in-house.

4. ESA:

- has the well-proven ability to mobilise Member States to come together to fund, develop and exploit publicly funded space systems that they could not develop on their own;
- has developed the internal capabilities and the relations with industry needed to supply reliable, high-performance space systems;
- has in recent years started to reinforce its role in Europe, consolidating its in-house capabilities, building relations and a joint programme with the European Commission and adapting its relations with European space industry as the latter continues to restructure;
- has reinforced its presence on the global scene, demonstrating its steady relations with the United States, a long-standing partner, developing cooperation with Russia and initiating cooperative links with Japan and China;

but ESA

- depends almost exclusively on its Member States' research

budgets to address a range of activities extending very substantially beyond science and research;

- is not yet fully geared to providing external customers with the solution they require, the scientific communities and Eumetsat excepted;
- has difficulty in playing an active role in the political process of European integration, even though the model it offers can be viewed as a precursor for the forms of strengthened cooperation increasingly demanded by that process;
- remains as yet an onlooker where defence activities are concerned;
- is having in the short term to contend with wider governmental budgetary constraints, at a time when the question of the programmatic follow-on of large initiatives and developments begun more than ten years ago (Ariane, ISS, Envisat, Artemis) is at stake, raising the question of the preservation of certain European industrial capabilities.



Looking Ahead Four Years

II 1. The European Union

- Enlargement to 25 Member States with new frontiers, new responsibilities and new needs (narrowing the digital divide, increasing security, sustaining development, etc.) requiring a redistribution of resources that will have increased significantly less than the needs.
- A new European Union Treaty:
 - shared competence in space matters, not preventing the Member States from exercising their own competences,
 - European Security and Defence Policy,
 - revised decision-making process.
- New European institutions:
 - a revamped Commission, with (or without) a Commissioner for space affairs and with (or without) a dedicated space budget,
 - a European Armaments Research and Military Capabilities Agency,
 - a Parliament with extended decision power.
- A first step in the implementation of a security and defence policy: national security, civil protection and reconstruction, humanitarian action and sustainable development.
- Additional sources of funding for the development of space systems associated with specific policies' demands and complementing the traditional sources of funding for ESA activities: enlargement budget, European networks (TEN) budget, defence research budget, space budget (?), etc.
- Increasingly close ties with Russia, which will border the Union, and with the Mediterranean rim.

II 2. European industry

- Institutional programmes will rely upon large and small system integrators; however, the restructuring process of the European Large System Integrators adapting their structure to the evolution of the commercial market will have come to an end, likely resulting in one (or, at maximum, two) large telecommunication satellite manufacturers in Europe and one large launcher prime.
- It can be expected that the equipment supplier industry will be transformed due to conditions placed by the European Commission when approving the restructuring of the Large System Integrators and to the restructuring of the presently existing equipment suppliers both in the satellite and launcher fields. These specialised suppliers will serve European and non-European primes.
- The Galileo operating company will be established and operational.
- Alliances with non-European partners, essentially in the USA and Russia, whose interests extend beyond the space domain, will be in place.

II 3. The commercial market

Whether on the launcher or satellite side, the commercial market will be slow to pick up. It will take time for the market to digest the restructuring of industry and operators and the price war resulting from the current crisis.

Despite some revival of fortunes expected in the next few years, there is no prospect of the commercial market getting back by 2007 to the levels of activity of the late 1990s. It is estimated that the level of activity generated by the commercial market in European industry will correspond to a workload below 50% of the capabilities of industrial production currently available in

Europe. This constitutes a challenge to all who are responsible for maintaining a balanced European industrial capability, considering that the public space sector will be of increasing importance over the years to come.

II 4. Space agencies around the world

- The US Air Force, the executive agent of the American DoD, will continuously increase its role in space and will, if the present focus in defence is maintained, be the world's premier space agency, and will be implementing all programmes relating to US homeland and foreign security, calling for a full range of observation, surveillance, positioning and telecommunications systems, along with an absolute guarantee of access to space.
- NASA's role will have evolved due to the increasing links with the US Air Force and given the very immediate uncertainties attaching to the future of human spaceflight beyond ISS exploitation, and given the immediate uncertainties attached to human space exploration and their involvement in the development of new space transportation systems.
- The Russian Space Agency will have become a major partner for the European space sector, through cooperation particularly in launchers and human spaceflight, but is likely still to be dependent on remunerative international cooperation.
- China will by that time have emerged as a major space player not only because it will be mastering the full range of space technologies (this includes human spaceflight) but even more because China will generate the world's largest demand for space infrastructures. It is likely too that China will have developed closer ties with the European space sector, in the framework of the Galileo Programme and of new science programmes.

II 5. Technology breakthroughs

As indicated above and given current investment in the United States, the technology breakthroughs that can be expected in a four-year timeframe concern:

- new propulsion systems, which could revolutionise space transportation systems and space exploration;
- nuclear power generators, which could revolutionise exploration methods;
- further integration of space segments into overall systems (Systems of Systems) mainly driven by defence strategies.

Considering the situation of the commercial market described above, it is obvious that the potential technological breakthroughs are driven by the breakthrough that they can open up for defence applications. Taking into account the magnitude of budgets required for their development, their emergence in the medium term strongly depends on decisions related to defence strategies. However, they would in turn revolutionise space science, space applications and commercial services, underlining the dual aspects of advanced space technologies.

II 6. Conclusion

Despite the uncertainties associated with this four-year scenario, ESA has to anticipate these possible developments if it is to be the optimised instrument that Europe needs.

So ESA must change, rather than wait for its environment to force change upon it or, worse, disregard it on the grounds that it is not the instrument that is needed.

For the European space industry, in the throes of crisis, the only growth potential lies in implementation of the EU's policies,

including the defence policies, with their need for the development of new space infrastructures. Building on its special relations with industry, ESA must adapt in order to:

- identify the best answers in the space domain to the needs and demands expressed by the European Union and its institutions, including those dealing with defence;
- be prepared to take on system development work in these areas, where appropriate, thereby expanding its own volume of activities on behalf of third parties;
- further support the European space industry on global market competition;
- manage a new-style industrial structure, featuring fewer and fewer primes and increasingly specialised equipment suppliers and incorporating an international component that offers scope for greater competitiveness, with the attendant risk of strategic dependence, contrary to European interests.

ESA must at the same time grasp every opportunity to cooperate with non-European partners, thereby broadening its activity base and contributing to European influence in the world.



Objectives in a Four-Year Timeframe

III 1. General

As stated in the Introduction, space activities divide into three types:

- ‘basic’,
- ‘inspirational’, and
- ‘utilitarian’.

‘Basic’ activities are those safeguarding Europe’s strategic independence in the space domain. ‘Inspirational’ activities are suited to cooperation par excellence. ‘Utilitarian’ activities can be geared to independence, cooperation or competition, the ability for Europe to choose being linked to its capacity for strategic independence. All these activities use the same technologies, the same infrastructures and the same industry, but their objectives are different, calling for specific decision mechanisms and funding sources.

The primary role of a space agency is to maintain a competitive ‘basic’ space capability enabling the implementation of a policy of ‘inspiration’ and of a policy of ‘utilitarian’ exploitation of space systems. A space capability means, in the widest sense, a guarantee of access to, and utilisation of space, including the capacity to design, develop, produce, launch and exploit space infrastructures. Such capability relies upon industrial capabilities, which take a long time to build up and are sensitive to workload variations. ESA’s primary objective must therefore be to maintain competitive industrial basic capabilities, without which no space policy can be implemented. For pursuing this objective, Member States are clearly the customers.

Based on this primary objective, ESA can develop:

- ‘inspirational’ activities, for which scientific communities and the general public are the customers, and the Member States are the funding sources;

- ‘utilitarian’ activities, for which the citizens are the end users and the funding sources depend on the type of associated services (public or commercial).

The general objectives for ESA are therefore to:

- consolidate Europe’s strategic capabilities, by reinforcing and expanding the science and technology base, as well as maintaining and generating key industrial technical capabilities needed for the future; this is ESA’s basic mission, accomplished through traditional ESA programmes mainly funded by the Member States;
- develop space-based solutions opening up new services, through ESA programmes responding to demand and funded partly by the Member States according to their interest in the supply side and partly by those demanding such services. The decisions and management of such programmes must be shaped accordingly;
- place European space industry on an equal footing with the competition in commercial markets. Relevant programmes, focused on commercial competitiveness, require specific funding and mechanisms, including those for evaluation of their results.

Over a four-year timeframe, the targeting of these general objectives must in concrete terms address three sets of objectives, which are detailed in the following sections:

- meet the new needs of an enlarged Europe, including the area of defence, requiring a growing volume of space activity in Europe. Such growth requires increased public spending on the development of space systems, which will come from ESA’s capacity to attract, over and above Member States’ contributions, funding from third parties expressing demands for new services;
- integrate ESA within its political, industrial, technical and

international environment to develop further its role as Europe's Space Agency, capable of responding at the same time to the needs of its Member States, those of the European Union and those of user communities, including the defence sector, while being an influential partner on the international scene;

- reorganise the internal operations of ESA to gear its culture, skills and management to satisfy customers concerned about its efficiency, transparency and flexibility.

III 2. Programmes and budgets

1. Achievements on projects

Many programmes will reach fruition in the next four years and rolling programmes such as those in the space sciences and Earth Observation will see major milestones achieved:

- Ariane-5 ECA and Vega operational.
- Operational capacity to exploit an in-orbit crewed infrastructure including Columbus exploitation and three ATV launches; utilisation of this infrastructure for life and physical sciences, space science, Earth science and technology.
- Six meteorological satellites: MSG 2-3-4 and MetOp 1-2-3.
- First Galileo satellites in orbit and in-orbit validation nearing completion.
- In Space Science:
 - launch and operation of Smart-1, Rosetta, Venus Express, and support to the launch and operation of Double Star (CNSA), Corot and Microscope (CNES),
 - Beagle-2 landing on Mars and Huygens on Titan,
 - completion of operations/data archiving of Cluster-II,

Huygens, Mars Express and Infrared Space Observatory,

- continue operations, or support operations, of major solar and astronomical observatories, Integral, Newton, SOHO, Ulysses and Hubble Space Telescope.

- In Earth Science: Launch and operation of Cryosat, GOCE, Aeolus, SMOS, Explorer-5 and Explorer-6.

In addition, decisions expected soon, or currently being prepared, should enable us to achieve the following objectives:

- Demonstration of enabling technologies for a major exploration programme to the Moon and Mars;
- Soyuz operational at CSG, including for human spaceflight.

2. Increase of the volume of total ESA activities by 30% in 2007, compared with 2003 (representing an average of 7% per year), not including the possible Europeanisation of national programmes, which does not correspond to an increase in overall space activity.

This increase of activities is made necessary by the increasing demand for new services associated with the enlargement of the European Union, with the expectations of its citizens about their security, their environment, their quality of life, etc., and with the new competences of the European Union in particular for Defence and Security.

The new activities required by this increasing demand cannot be alleviated by a corresponding decrease of current space activities:

- activities relevant to launchers ensuring guaranteed access to space were recently stabilised by the Council at Ministerial Level up to 2007 and beyond,
- activities relevant to science (space science, Earth science,

life sciences, etc.) need to be reinforced in order to pursue the quest for knowledge, prepare the ground for new applications, and inspire new generations,

- activities relevant to advanced technologies can certainly be streamlined, but certainly not be reduced because they are the key for the European industry's competitiveness on the market, the key for space systems competitiveness compared to non-space solutions, and the key for opening new services,
- activities relevant to the In Orbit Infrastructure will decrease because of the coming transition from development to exploitation, but this reduction is significantly less than the increase required for new applications and services.

Therefore, the 30% increase in activities must be ensured by:

- at minimum, maintaining the contribution of Member States at their current level up to 2007, i.e. around 2700 M€,
- increasing the efficiency of implementing ESA programmes, thus better managing ESA budgets and decreasing the cost not directly dedicated to core space activities ('non-programmatic costs'),
- increasing significantly the contribution of the European Union to space activities.

The increase in activities would therefore mainly come from the European Commission budget and be supported by a redeployment of ESA Member State funding. The EC funding would be distributed as follows:

- *new application programmes addressing EU sectorial policies*: contribution to the Galileo deployment, imagery and chemistry satellites concretely starting the monitoring for Environment and Security, broadband satellite aiming at narrowing the digital divide in the frame of the Union's enlargement, space infrastructure responding to the first step of a European defence policy, etc.

- *funding by the European Commission for basic activities of Community interest and low technological interest*, e.g. CSG fixed costs. This would replace the current Member State funding, serving to clear funding capacity necessary to increase ‘inspirational’ activities (see third objective, below);
- *funding for non-space technologies* having significant synergy with space technologies (aeronautics for materials, defence for solid propulsion, high-speed networks for data distribution and service provision, etc.).

This increase is consistent with and vital to meeting the objective stated by Commissioner Busquin of doubling the space budget by 2010, given the need to gradually consolidate the corresponding industrial capacity.

Before 2007, funding from the European Commission can only come from existing budgets, i.e. sectorial policies (development, agriculture, environment, enlargement, information society, etc.) and the EU Framework Programme. For the period starting in 2007, new budgets could be created at EU level, but the order-of-magnitude of budgets required from the EC and the ‘raison d’être’ of such funding call for securing the access to budgets of sectorial policies.

3. Increase of ‘inspirational’ activities, science and exploration, by 30% in 2007, compared with 2003

This increase serves to maintain a balance between ‘inspirational’ and ‘utilitarian’ activities. It is made possible by Community funding replacing Member State funding of certain activities (see second objective above).

This increase would help to target a three-fold objective:

- develop new technologies, explore new ideas, encourage further inspirational activities and attract young talents;

- open up cooperation with Central and Eastern European countries;
- extend cooperation with China and India, who wish to develop their scientific activities.

4. Improve the benefits of ESA Technology Programmes

Two distinct categories of space technology programmes exist:

- activities to improve competitiveness, thus close to market, i.e. driven by demand and the short-term calendar, and
- basic technologies encompassing innovation, enabling technologies for future institutional missions, and strategic technologies ensuring European non-dependence in the long term.

In total, some 400 million Euro are invested yearly in Europe for space technology programmes, corresponding to 7% of the European investments in space. This investment is nearly equally divided between ESA and national programmes.

The European Space Technology Master Plan (ESTMP) is an important step. However, further improvements are necessary, in particular in recognising that the mechanisms driving the technology for short-term competitiveness are different from those driving the technology for strategic independence and longer term preparation.

To improve the benefits for Europe of the ESA technology programmes and to foster further the harmonisation of the European investments in technology, two lines of action must be put in place with the necessary priority: a plan to improve competitiveness of industry and a plan for innovation, strategic technology and preparation for the future.

4.1. Implementation of a plan to improve competitiveness of the European satellite industry

Access by European industry to the global market is essential to leverage the space capabilities needed for the institutional programmes and the presence of space industry in the commercial market (about 50% of the launcher and satellite sector overall, which is extremely successful compared to the relative size of the European space industry and a positive export balance for space equipment) is also a good indication of its performance and provides a strong incentive for public investments. Putting in place a European space applications policy makes sense only if the European user community can call on products whose quality and cost are comparable to the best globally available.

With the EGAS programme, a response has been provided to the issue of competitiveness in the area of launchers. Concerning satellites, the problem remains, especially in the area of telecommunications satellites, which represent the bulk of the commercial satellite market. Major efforts in terms of voluntary harmonisation have been undertaken these past years. Harmonisation between ESA programmes devoted to competitiveness (ARTES and GSTP) and national programmes is crucial since on an average basis (1998–2003) the yearly support to industry’s competitiveness is financed 55% at national level and 45% at ESA level¹. The effectiveness of the support provided by the public sector is to be improved by ensuring coherence between distribution of funding and the structure of industry, avoid scattering of efforts and profusion of skills in domains with limited market. A major objective is also to ensure that the European industry is preserved from the perverse effects of export-control regulations, allowing it to have the necessary technology at its disposal to bid freely on all interesting ventures.

¹ ESA internal assessment, September 2003

The objective of the proposed plan is to build a new Envelope Programme dedicated to the development of competitive technologies, regrouping the relevant activities of ARTES and GSTP inside a flexible programmatic framework, which also allows new requirements, stemming from technologies responding to the EU and defence needs, to be taken into account.

The funding content and management of this programme will be shaped according to the basic objective of competitiveness. In particular, the funding will be based on the principle of fair contribution consistent with the mapping of the industrial centres of excellence; the content will be driven by industry's proposals evaluated a priori on the basis of competitiveness demonstrations and commitments on future market share; the contracts will include provisions relevant to a posteriori evaluation of the results on the market.

The European Space Technology Master Plan shall guide this new technology programme of activities geared to the competitiveness of industry. The programmatic content of this programme will be the subject of a reinforced harmonisation process with the national activities in support of competitiveness. The European steering and harmonisation Committee involving ESA and national agencies or delegations will undertake this harmonisation process, with industry being represented in a consultative mode (both at prime and supplier level). The practical implementation of each individual action would be made according to the rules attached to the funding authority.

4.2 Implementation of a plan for innovation, strategic technology and preparation for the future

The programmatic frame proposed above for improvement of industry's competitiveness is distinct from activities involving the development of innovation, strategic technology and

preparation for the future, which include the province of the TRP and specific preparatory programmes. The plan could include new programmes, in particular joint programmes with the European Commission for what concerns maintenance of European sources for strategic technology.

Basic technology is a vital element for European Space, since the availability of leading-edge technology is the key to both enabling advanced missions and to maintaining independence in strategic activities, and thus to mastering competitiveness.

ESA must provide the technological bedrock on which Europe can build its future missions. To do this emphasis has to be given to:

- *potential breakthrough technologies* in areas such as detectors, nanotechnology and materials, which can revolutionise the performance of spaceborne instruments. This should draw on the capability of Europe's leading R&D laboratories and industries and will require innovative programmatic approaches from ESA such as that pioneered by the StarTiger initiative;
- *core technologies*, such as radiation-hardened microelectronic components, power generators, etc., without which the high performance and highly integrated systems needed for current and future spacecraft cannot be built. At present Europe is still dependant on external, in particular US, technologies and although the industrial capability exists in Europe the reduced and fragmented market represented by space in Europe is often impeding access at a competitive price by each individual actor to this technology. Thus a long-term strategic approach is needed involving Industry, ESA and the EU with innovative industry/ESA partnership arrangements. The elaboration of this strategy will include an in-depth analysis of the consequences of this technological dependence, both for the institutional programmes where European

autonomy may be needed, and for the access to the world market by European industry which may be hindered by export constraints;

- *prepare the medium/long-term technology needs* crucial to the future missions being undertaken by Europe and which can lead to breakthroughs in capabilities for space science, communications, Earth observation, space transportation and space exploration. In addition to the ESA funding, as recognised by the US, the investments required to achieve major advances motivate the investigation of partnerships within fields such as ground applications and defence.

The development of technology has to be taken to a level that ensures its timely availability for flight use by industry. Thus the development of technology has to be complemented by:

- a structured industrial development approach, which supports the technology development lifecycle from feasibility studies through to in-orbit use;
- increasing the opportunities for in-orbit technology demonstration in ESA and national programmes, so that the risk associated with first use of new technology can be reduced within the programmatic and financial constraints. This will require coordination at a European level.

5. Build up an education programme, in support of both national and European institutions, able to attract again the best talents to the space developments.

Two main target groups are being considered:

- young Europeans below the age of 18: 'space' makes them dream and by using 'space' ESA can enhance and encourage the motivation for science and technology in a

large number of these boys and girls. Most of the activities/projects will be specifically targeted at the teachers or organisations in charge of activities for them, in order to benefit from this multiplication factor;

- students above the age of 18: they will have already made a choice for science (or some non-science fields, but with specific emphasis on space) and look for studies of high quality. ESA has to support the national needs for scientists, engineers, space specialists and science teachers by helping the selection and training of the best talents. The specific support that ESA can bring to the education institutions is linked to the high quality of its teams and projects and includes, for example, training periods, the use of facilities such as the Concurrent Design Facility and the expertise of the scientists and engineers at ESA for the design, building and launching of student-made microsatellites.

6. Conclusion

The above objectives will lead not only to an increase in space activities in Europe based on public funding, but also to a redistribution of resources among the different activities that ESA will implement in 2007 compared to the situation in 2003.

As described above (point 2), the above objectives first require the total contribution of Member States to stay as a minimum constant at around 2700 M€ per year and then funding from the European Union of the order of 750 M€. These additional 750 M€ could be distributed as follows:

- new application programmes: 550 M€
 - navigation technologies and infrastructure
 - observation infrastructure and services (GMES)
 - telecommunications infrastructure and services
 - space infrastructure for the defence sector: 200 M€
- } 350 M€

- funding of basic activities: 150 M€
 - CSG: 100 M€
 - ISS exploitation: 50 M€
- funding of technologies: 50 M€

Except for the developments related to the defence sector, the contribution of the European Union to new application programmes will likely require funding from Member States on a 50/50 basis, as for Galileo, in order to balance the respective interests of demand and supply. Additional contributions from Member States to new application programmes are therefore required to a level of 350 M€, justifying, as already said, Member States to maintain, as a minimum, their level of contributions to ESA programmes and requiring a decrease of current ESA activities expenses by the same amount (obtained by a reduction in some of these activities and an increase in efficiency).

The 150 M€ of Member State contributions freed by the EC funding for basic activities will be redistributed as follows:

- additional 50 M€ (half of the CSG funding, corresponding to the part based on GNP) to the mandatory Science Programme;
- additional 100 M€ to an exploration programme (Aurora).

The resulting distribution of resources among different ESA activities will be as follows in 2007, compared with 2003:

- growth of the Science Programme (10%);
- significant growth of application programmes, especially related to EU sectorial policies and defence policy;
- growth of activities supporting the competitiveness of the satellite industry active in commercial markets as well as supporting strategic technology;

- implementation of launcher activities on the basis of decisions taken at the last Ministerial Council;
- adaptation of ISS activities from development to exploitation activities, associated with the building up of a significant exploration programme.

The above trends must be supported by concrete programme proposals and be associated with:

- an increase of efficiency in implementing ESA programmes, subject of the 4th set of objectives below (see section III 4);
- an analysis of the consequences of such a redistribution of resources on the maintenance of key industrial capabilities.

In addition to the above objectives, which are focused on ESA programmes and activities, the harmonisation between ESA and national programmes must be pursued in order to improve the overall efficiency of space activities in Europe. The concept of the European Long Term Space Plan (ELTSP) must materialise in the next few years, as a tool for enhanced harmonisation. The ESA Long Term Plan, the Technology Master Plan mentioned in section III 2.4.1, as well as the concrete implementation of ESA cooperation with programmes initiated at national level, are elements from which such a European Long Term Space Plan will be developed, not increasing the volume of activities but increasing their efficiency.

III 3. ESA adapting to its environment

1. ESA and the European Union institutions

The most important aspect of the evolution of ESA is its position, together with national agencies, in Europe. That position needs to be well-defined in the framework of European Union institutions, so that ESA acquires a legitimacy it still currently

lacks in that context, having developed in parallel with their political construction. Such legitimacy is necessary so that ESA does not have to continue justifying time and again its role in the framework of the EU's sector policies, its role in the construction of a European defence policy, its role in relation to the Commissioner responsible for space, etc. This continual need to justify its role leads to inefficiency and stress, which work to the detriment of Europe and its citizens. ESA, with the national agencies, is a vital component of a Europe becoming a political and economic power. It must therefore acquire a legitimate role in the framework of Europe's institutions. It is therefore necessary to embark rapidly on a wide-ranging analysis that establishes the basis for a genuine refounding of the public space sector harnessing ESA and national agencies to meeting the needs of Europe within the framework of its institutions. However, defining, approving and implementing this process will take time, as there is still much uncertainty about the evolution of Europe's institutions, the tangibility of a defence policy, the allocation of Community budgets, etc.

Alongside this analysis, there is an urgent need to prepare for the new era:

- by establishing a relationship of trust between ESA and the European institutions, including defence, and by testing the tangibility of a common will, and
- by consolidating technological and industrial capacity in Europe, commensurate with ambitions and needs

through new programmes such as those proposed in the previous section. Such programmes will be brought into being by using the Framework Agreement between ESA and the EU currently being finalised to cover a four-year period and by establishing preliminary relations between ESA and the European defence institutions.

In four years' time, the status of ESA/EU relations should therefore be as follows:

- a series of new programmes funded jointly, along with an EU contribution to certain basic programmes currently funded by ESA Member States, giving concrete effect to the Framework Agreement between the two organisations whereby ESA provides space-based solutions for the implementation of EU sector policies;
- an agreement with the European Armaments Research and Military Capabilities Agency defining the arrangements whereby ESA may supply technologies and satellites addressing that Agency's needs;
- a decision on the future organisation of the European government space sector defining the position and functioning of ESA and national agencies in the context of the European Union institutions, which will be implemented from 2007 onwards, superseding the relationships based on the above Agreements.

In all aspects of the relations between ESA and the EU institutions, the ESA DG will take due account of the interests of Norway and Switzerland on the basis of the Resolutions adopted in 1998.

2. ESA and the Network of Technical Centres (NOC)

The future role of ESA and its relations with the European institutions will be accompanied by a consolidation of ESA and national programmes within an overall European Long Term Space Plan (ELTSP), mentioned above in section III 2, and by the further development of the Network of Technical Centres. ESA's DG was tasked in 2000 by ESA/EU Member States to offer the coordinated European technical capacities to the EU for implementation of its space-related projects and activities. This task needs to be based on the most cost-efficient services

provided by up-to-date technical competences available in a European network of technical centres. This requires on a mid-term basis a substantial restructuring of the European public technical infrastructure according to following objectives:

- effective utilisation of existing technical facilities according to agreed rules and criteria;
- central planning of technical facilities in ESA and national centres according to the needs identified from the European Long Term Space Plan as provided on a yearly basis by ESA;
- central control of future European investment (ESA and national) in technical facilities.

The three above objectives should be met within the next four years, in time for the decision on the future organisation of the European government space sector referred to above, and should allow an optimised relationship between public facilities and relevant industrial capacities.

In parallel with the above-mentioned objectives the following should be achieved within the next four years:

- capitalise on the momentum achieved to date and take advantage of the mutual understanding of the remaining challenges to be faced in organising multiple networks of technical centres in the future (to the mutual benefit of Member States and the 'customer programmes'), the existing pilot 'Flight Operations' network should become operational. This will serve as a test case for future evolution of the NOC, through which to develop the necessary guidelines for interaction with programmes, both in ESA and in national agencies;
- establishment of new pilot networks combining available national and ESA capacities for technical support to programme development (e.g. FLPP);
- build-up of cooperation schemes allowing implementation of

- ESA and national programmes through combined ESA and national teams, according to the NOC principles;
- proper mutual understanding and transparency of the budgets and costs of the ESA and national technical centres.

These measures for the evolution of the NOC initiative must be addressed, calling on the commitment of the Member States to go beyond the limitation of ‘good-will’ and ‘best efforts’ and to work with ESA in creating a coherent, state-of-the-art set of networks of technical centres fulfilling the needs of all European programmes in a cost-effective and reliable way, according to the recognised NOC principles as initiated in 1999.

3. ESA and industry

The relations between the Agency and industry are designed to ensure that the requirements of the ESA programmes are met in a cost-effective manner and to improve the worldwide competitiveness of European industry.

These two objectives are linked since the competitiveness of European industry is a condition for cost-effectiveness in ESA procurement, i.e. competitiveness of industry is to be supported as an objective in all ESA programmes.

ESA procurement policy has been permanently adapted in order to take into account the evolution of industry. The reform introduced and confirmed by Ministers in Edinburgh and applied today is based on three pillars, namely:

- a stepped approach based on parallel Definition phases followed by a competition for the Development phase organised when the system requirements and interfaces are defined. This competition for the prime contractorship (and a limited core team) is taking place at a moment when all

- potential prime contractors can compete in a fair way. When the prime is selected the suppliers are selected in a staggered way;
- a Code of Best Practices in the selection of sub-contractors has been used in all major ESA procurements, ensuring a fair competition for all suppliers with a permanent involvement of the Executive;
- an Ombudsman has been nominated to moderate in any conflicts between prime contractors and suppliers.

The ESA procurement policy has still to be further updated to take into account both the evolution of the ESA activities and the evolution of the industry structures and skills. The main new elements to be taken into account are:

- the restructuring process of the Large System Integrators that is influencing the potential for competition in the major ESA procurements. The Agency must develop the capabilities needed to master the evolving industrial scenario, in particular to enhance its technical and cost-analysis competencies to remain a knowledgeable customer able to procure in a cost-effective manner, especially in cases where no (or limited) competition is possible within European industry;
- the implementation of new application programmes addressed in section III 2.2 driven by the demands of the EU policies and funded at least partly by the European Commission and European defence institutions, requires the development of new procurement methods, harmonising the implementation of rules and procedures of each funding organisation within an overall procurement plan. Specificities relevant to defence aspects will also have to be developed and implemented in the procurement process;
- the technology harmonisation process aimed at fostering the specialisation of industry needs to be properly taken into account in the ESA procurement. Recommendations

- stemming from the harmonisation will therefore, after the approval of the IPC, be enforced in the ESA procurements. The involvement of national agencies and industry in the harmonisation process should also foster the taking into account of these recommendations in national and commercial programmes, allowing Europe to benefit from scale effects;
- the degree of attractiveness (profitability, growth potential) of the space sector as compared to other industrial sectors, is key to support the strategic decisions of industry to invest in the space sector. ESA procurements and the associated risk sharing and profit margins should ensure that this attractiveness is secured.

ESA is also playing an important role by providing all space actors with reliable and objective information about the structure, organisation and competencies of the space industry, allowing informed dialogue to take place. This role will be reinforced and placed on a permanent footing.

One of the key roles of ESA is also to protect investments made by Member States in specific technologies and specific companies when competitive. European institutions should also play a determinant role in making sure that the strategic technologies and industries will remain under European control/ownership. The restructuring of European space industry, the acquisition by non-European investors of strategic European industrial capabilities, and the merging with non-European groups could represent potential threats for the unconstrained availability of strategic technologies, competences and production facilities. European and national public authorities cannot ignore this process and their role is to ensure that Europe keeps its space future in hand. In some critical cases for Europe, ESA could play a key role in protecting Europe’s strategic interests, considering investments made and to be made by Member States. In order to be able to play such a role, the possibility of ESA becoming a shareholder in particular organisations should be studied.

In a four-year time frame ESA will have:

- updated its procurement practices in reply to the evolution of the space sector and reinforced its skills to remain the knowledgeable customer needed by Member States and the new ESA customers;
- implemented the technology harmonisation process in ESA procurements, and a harmonised industrial policy between national and ESA programmes will be a reality;
- improved the attractiveness of the space sector for industrial investments;
- reinforced its role as the European centre of excellence in the knowledge of space industry;
- initiated discussions with the relevant European and national authorities to ensure that strategic technologies and industries remain under European control/ownership. An action plan will have been defined and its implementation will be well underway.

4. ESA and the user communities

A fruitful dialogue with the user communities is key to ESA's transformation into a customer-oriented Agency.

The dialogue between the Science Programme and its users is organised through a well-established simple advisory structure coupled with open events for consultation. The scientific user communities for the exploration of the Universe are the most active and informed users of space programmes and are thus to a large extent driving the Science Programme. This is also true for Earth science and life and physical sciences, though the dialogue is more recent and the relevant user communities are more dispersed and less organised.

In the area of application services, a dialogue with users is

organised on a permanent footing for meteorology (via Eumetsat) and EGNOS. Dialogue is being built up in the areas of Galileo (via EC) and GMES. However, in the long-term, ESA should not be the direct interface to all the end users of space systems for applications; it is not within the competences of ESA and could be perceived as ESA proposing solutions and looking for problems that fit the solutions. Other organisations, such as the EC, a European Defence Agency, Eumetsat, etc. must be the federators of the demand and interface to the end users. ESA should therefore rely on these organisations' ability to federate the demand for organising the dialogue with the users. However, ESA must be proactive in order to raise awareness of the potential benefits of space systems within these organisations.

ESA will therefore set up structures able to:

- permanently monitor and analyse the situation in sectors with potential to benefit from space in order to acquire a view of activities and business practices beyond the space sector;
- collect relevant information on EU regulations and sectorial policies that may be relevant to utilisation of space systems;
- identify new services that might be associated with the above regulations and policies;
- identify users and consequently the appropriate federators;
- initiate and formalise the structure of the dialogue jointly with the federator;
- obtain demand from the federators;
- design a space solution responding to the demand, in close cooperation with the federator.

5. ESA and current EU Member States

- Greece will be a Member State in four years' time. It has officially made the request, and a detailed plan will be proposed shortly.

- Luxembourg should also be a Member State within four years, but the official request is still awaited.

6. ESA and new EU Member States

Through the EU, ESA can contribute to:

- Addressing the problems posed by enlargement (e.g. narrowing the digital divide).
- Concrete implementation of European Cooperating State agreements, by increasing scientific cooperation with Romania, Hungary, Poland and the Czech Republic.
- Extension of such status to other Central and East European countries?

7. ESA and Russia

Russia, becoming a major partner of the European Union, is a major partner of ESA. The space potential of Russia is such that increased cooperation between ESA and Russia should be used as a privileged bridge between Europe and Russia.

Further to the important programmatic cooperations that are presently starting and which will be developed in the following years, in the launcher area in particular, two objectives can become the symbol of new relations between ESA and Russia:

- the launch of European astronauts from CSG by Soyuz;
- the accession of Russia as an Associate Member State of ESA.

8. ESA and the United States

NASA is the oldest partner of ESA and cooperation between the two is exemplary in the domain of Science. Cooperation also

has the potential of becoming exemplary in the domain of Earth sciences, under the condition that Europe is able to structure its demand and the supply in order not to be trailing a dominating political will of the US in this domain, considering that Europe has the system capabilities, the technology and the industrial capabilities to be an equal partner.

ESA is a loyal partner of NASA in the ISS programme and has the potential to become an indispensable partner with the ATV, and perhaps with launches of astronauts by Soyuz from CSG. The major question concerns the activities beyond the Space Station: the future of human spaceflight is being assessed in the USA. ESA must be prepared for different cooperative scenarios while preparing the necessary technology for future exploration programmes.

Other cooperations are foreseen with the United States, but this time the partner is not NASA but the DoD: Galileo and the GPS constitute a theme for cooperation that is under discussion. Guaranteed access to space and future space transportation systems are surely a domain of cooperation where Europe and the US could share a common interest: mutual back-up agreements for governmental launches, development of technologies for reusable systems, etc.

9. ESA and China and India

India and especially China are becoming major space powers, thanks to the space means they have developed and also because of the needs that they have to fulfil using space means.

The two countries are candidates for cooperation in the Galileo programme and should become partners for Europe in the coming years, starting with China, with whom discussions are already well advanced.

Likewise, the two countries are also engaged in scientific programmes, and ESA should become their major partner in this domain.

10. Develop a worldwide regulatory framework for launch services

The cooperation with Russia and the foreseen cooperation with the USA in the domain of launchers, together with the mutual back-up agreement between Arianespace, Boeing and Mitsubishi concerning commercial launches, provide the basis for discussing, in close cooperation with the European Union, a worldwide regulatory framework for launch services, which will modify how guaranteed access to space can be maintained by governments.

III 4. Internal operations

Introduction

The organisation and functioning of ESA need to adapt to the growth in activity (target 30% over the four-year period), the reorientation of programmatic activities (significant increase in applications and science activities managed by the Agency), and above all the new role of the Agency vis-à-vis third parties – user communities, EU bodies, industry – called on to interact with the Agency for the purposes of these new activities, based on relationships that will necessarily differ from the Agency's traditional pattern of intervention. This adaptation and associated changes are proposed to be organised within the provisions of the current Convention of ESA. Reflections will be initiated within the coming years on the potential need to revise the ESA Convention in connection with the above-mentioned

reflections on the re-founding of the public space sector, repositioning ESA and national agencies within the framework of the EU institutions.

These changes are taking place in the context of increasingly severe budgetary constraints being encountered by our Member States, making it absolutely necessary to optimise the allocation of resources (personnel, budgets) enabling the Agency to fulfil its prime purpose and achieve the objectives set out in this document with maximum efficiency.

1. Improvement of budget management

It is necessary to set up genuine three-year budget planning providing medium-term visibility and stability for expenditure and income. This management and programming tool must provide both reliable input for dialogue with Delegations and a realistic working basis for programme Directorates.

Vis-à-vis the Member States, such planning guarantees in particular overall protection of their medium-term expenditure profiles, while heeding the commitments of each State over each of the programmes in which it is participating. It notably presents the updated forecasts for expenditure corresponding to ongoing programmes, but also the orientations proposed by the Director General for the allocation of budget resources for new activities not yet formally approved.

Vis-à-vis programme Directorates, such planning makes it possible to carry out the programmes undertaken efficiently and provide a realistic framework for the preparation of future activities.

In terms of planning that gives States a reliable forecast of their contributions, it is proposed to put in place global yearly

management of the various budgets, making it possible to adapt to the situations encountered by each programme over a given year, while heeding the States' specific commitments, the programmatic objectives, the financial envelopes and the specific rules governing each of the programmes.

The following measures to allow a more flexible system will be implemented:

- adoption of the annual budgets by Council (as foreseen in the Convention, Annex II, art. 1.5) and consolidation of the income, supported by indicative levels of the expenditures per programme, in order to reinforce the central character of the approval; such approval has to be coherent with the updated mid-term plan in order to give the programmatic and budgetary framework a mid-term perspective;
- flexibility within the overall yearly budget given to the Director General to allocate funds or secure savings according to the needs and priorities of the various individual programmes, obviously respecting: 1) full transparency to Council on the use of the yearly budget, 2) that a given country will never be requested to finance a given programme above its commitments as defined in the respective Declarations, 3) that the accounting procedures will handle specific national financial management constraints, and 4) that the geographical-return provisions associated with each programme are not impacted.

This proposal is based on the same principles as those supporting the BMS, including the exception for 'programmes open to additional contributions' like GSTP, Prodex or some of the ARTES elements, while extending the budgetary flexibility and simplifying the budget management of the Agency by restoring the balance between income and expenditure.

2. Reduce the share of expenditures not dedicated to core space activities

The objective of growth of space activities must go hand-in-hand with a reduction in the relative share of that Agency expenditure that does not directly contribute to its prime purpose and specific programmatic objectives. This concerns both direct internal costs, the costs relating to general overheads and programmes, the common expenditure recharged to the various activities and programmes, and the non-core space activities covered by programme directorates. The targeted reduction, which will be proposed end-2003, will be based on a detailed critical analysis of all activities not directly linked to core space activities (bottom-up approach), but also on the determination of representative ratios for a realistic 'best practice level'. The objective is that any reduction in charges not absolutely necessary should serve to reinforce the core space activities by expenditures in the space industry and on the Agency's technical capacity and thus contribute to the growth of the space sector together with the resources allocated by additional ESA customers.

The complete assessment of 'non-core' space expenditures will address both activities controlled and funded within the direct expenditures of the programmes and the indirect activities covered by internal recharges.

This reduction will go hand-in-hand with a proposed reform of the recharging system, which is currently complex and a disincentive for the use of the Agency's facilities.

The overall set of measures allowing the reduction of 'non-core' space-activity-related expenditure and the setting up of a well-controlled recharging system will be proposed in time for the preparation of the year 2005 budget.

3. Making the geographical return an efficient and attractive tool

The geographical-return rules, in addition to being set out in ESA's Convention, are also a natural rule governing the development of technological and industrial capabilities in the various Member States.

Their application is nevertheless proving problematic in at least three ways:

- certain actors in Europe point to it as a cause of stalled decisions, cost hikes and as an obstacle to competitiveness and creativity, in conflict with the European Union Treaty, etc. These criticisms, some of which are based on concrete examples, could constitute an argument for marginalising ESA and creating other space agencies in Europe in parallel with the Agency, despite the fact that all R&D organisations in Europe and indeed throughout the world, whether they be international or national, have established explicit or implicit equitable geographical-return arrangements;
- the rule is applied consistently to all ESA programmes, even though the programmes differ in the nature of the objectives pursued: one-off satellite development (science), development of a vehicle intended for series production (Ariane), development of technologies to enhance industrial competitiveness in upcoming markets (GSTP-ARTES), development of advanced technologies to prepare for technology breakthroughs in the longer term, funding of fixed infrastructure costs (CSG), etc.
- the rule is applied both on individual projects and at a global scale for all projects and activities, which leads to an accumulation of effects. Each project manager has some leeway when it comes to selecting industrial contractors, which is in the interests of his/her individual project. This flexibility could be beneficial at a global scale if it results in an overall balanced situation thanks to statistical

compensation between projects. However, experience shows that no such statistical compensation takes place, i.e. that all these individual return discrepancies, on the contrary, add up to significant overall imbalances. This leads to difficulties for Member States with large return surpluses or deficits. These overall imbalances have in several cases caused unnecessary pressure at Ministerial Council meetings when major programmatic decisions were at stake.

Therefore, we must collectively (Executive and Member States) maintain the conviction, and explain outside ESA, that geographical-return will remain an efficient and attractive tool provided:

- it may be adapted to each type of programme;
- measures may be taken to avoid cumulative discrepancies per programme and their adverse consequences.

4. Adaptation of ESA personnel to the new objectives

4.1 Towards reinforced technical competences

An essential factor for the success of the European space sector is linked with the high mission success rate and the reliability of its products. The Agency's strength lies in its technical competence which, in nearly all areas of space activity, covers a broad spectrum ranging from technology expertise to the capacity to define and master complex systems.

The management by ESA of the programmes funded by its Member States must guarantee the technical quality of those programmes, and ensure that the technical, programmatic and financial risks are thoroughly assessed and controlled. ESA is a technical agency, and as such it must rely on appropriate skills and competences to elaborate the programme proposals, and

to define the preparatory activities and technology work plans. ESA must also be able to make an independent assessment of the various proposals prepared by partners or Industry, both from a technical and a financial standpoint (feasibility, technical risks and choices, cost analysis, potential market, validity of business plans, etc.). This can only be done if ESA's competences are maintained at the highest level and if sufficient resources can be allocated to the various programmes and activities.

The quality of its programmes and the efficiency of the public investment are highly dependent on the expertise available within ESA and national agencies, being the technical reference for European space. In order to reinforce this essential role, it is necessary to assess the right level of internal resources with respect to that available in national agencies, contractual in-house support and industrial external expertise. This assessment must be performed in the coming months in order to enable the corresponding adaptation of the ESA internal resources, and it is all the more critical as it is known that a very large number of experienced staff and experts will retire from the Agency in the coming years.

The management of the technical quality has to be reinforced. In particular, the lessons learnt from the systematic analysis of the failures and incidents experienced in ESA and other space programmes must be made available to future programme managers and industry and translated into actions to reduce the technical risks in future programmes. An evaluation of the consequences of the 'Faster, Better, Cheaper' approach on the quality of the relevant programmes should also be performed. ESA must reinforce its technical links with Industry and other agencies to share this knowledge on past difficulties and offer European partners its unique and independent expertise when technical problems are faced. It is only through a reinforcement of ESA's technical quality that the Agency will be able to define

and assess competently the acceptable level of technical risk, e.g. in cases of budgetary constraints in connection with a given programme.

In addition to the guarantee of technical excellence provided to our Member States, the Agency's attraction to third parties is directly dependent on the quality and availability of that unique technical competence and therefore is a key element of the strategy leading to an increase of the activities as described in this document.

Increasing the Agency's specific scientific and technical potential must therefore be a major component of:

- its training and recruitment policy, with the setting of the objective of a 10% increase in the percentage of staff assigned to technical and scientific tasks;
- the building-up of the Network of Technical Centres providing ESA with direct access to national expertise.

4.2 Towards a customer-oriented culture

The Agency has been working for many years for external customers like Eumetsat and other third parties. However, opening up to new partners will imply changes in culture, ways of working and procedures.

The compliance with security rules initiated with the commercial confidentiality for the support to competitiveness activities or the audit of rates has recently been extended and reinforced for the confidential aspects of the GalileoSat Programme, including bilateral agreements between ESA and Member States concerning clearances granted to ESA staff. The possibility of the Agency being a partner for defence entities pre-supposes a change of culture and practice in-house in the processing and

protection of sensitive or confidential information. The Agency needs therefore to establish and implement a new set of procedures and new office accommodation consistent with the requirements and practices of our new partners. A plan will be defined in consultation with, and certified by, competent authorities, and implemented by mid-2004.

The stepping-up of the quality drive will also be reinforced by the Agency becoming ISO 9001 2000 certified, based on standardisation and formalisation of the supplier customer pattern. Such certification will cover all sectors of Agency activities and not just operational or production services.

Beyond the security and quality pre-requisite, the Agency's staff concerned will be trained to gain a deep knowledge of the regulations, organisation and modus operandi of the European Union, allowing them to interface in an efficient way with the European Commission. This training programme will be initiated soon and complemented with specific training on customer/supplier relations. The exchange of staff mentioned below will also contribute to improving the customer-oriented culture of staff.

A customer-oriented culture could also imply that some of the rules and regulations of the Agency such as the Contract Regulations, the Financial Regulations or the geographical return on contracts be adapted for specific activities if absolutely necessary to comply with customer rules and regulations.

4.3 Towards greater mobility

The constantly evolving nature of space systems, of the programmatic environment and the increasing number of bases for Agency dealings with third parties all require greater adaptability on the Agency's part. In order to achieve this, it is

necessary to make provision for simpler development of the Agency's organisational set-up and personnel profile.

It would seem that the link between a staff member and the definition of the post held is a barrier to mobility in a way that is harmful both to an Agency struggling to adapt its organisation and to a staff member deprived of career development. In close consultation with staff representatives, a study will be made of an evolved regulatory staff status, focusing on the link between the Agency and the staff member rather than the link between staff and their post as defined on recruitment.

The Agency stands to benefit from this not only in terms of its activities and internal efficiency, but also in terms of the advantages to be gained from the temporary release of staff to third organisations called on to interact with the Agency. The experience gained by staff through such external mobility and the links forged with such third organisations need to be promoted by ESA and benefit the career development of the staff concerned. A procedure should be negotiated with staff representatives aimed at fostering this practice, in particular targeting European institutions, the users of space systems and notably players in the defence sector and the space industry. A target of 20 to 30 staff being seconded for a duration not exceeding three years is realistic.

4.4 Towards a reinforced corporate spirit of staff

The evolution of techniques, mobility, diversity, the recruitment of young talents, and the orientation towards external customers reinforce the need to build up an ESA-wide corporate spirit. Such an objective requires different plans of action, based on training sessions across the structure of the Directorates.

A basic training must be provided to new staff, in order to ease their integration into the Agency and allow them to be fully operational more quickly. It is thus proposed to define and hold a newcomers course, which will be given to all new staff during their first six months in post.

Training is essential to mobility. Staff wishing to evolve in their career, or whose field of activity is undergoing transformation or a technological breakthrough, must benefit from specific and detailed training in the new techniques and required competences. Such a training mechanism could take the form of an internal university and could be undertaken in association with other partners.

A basic training providing continuous information about the context in which space activities are conducted should also be available on a permanent basis to all staff. A first course on the functioning of the EU proved to be successful and this example should be widened and continued.

Finally, training has a key role to play in the transmission of know-how and skills from senior to younger staff. Maintaining basic competencies in the Agency will thus be secured by ensuring that the competence of recognised experts nearing retirement can be transferred to young staff. This function will also support the objective of a 'more technical' Agency.

4.5 Towards greater diversity

Present actions that have led to an increase in female representation at all A/L levels should be pursued, with particular emphasis on increasing the percentage of women in technical and scientific posts and promotion to management levels.

In line with the overall education action aimed at fostering scientific and engineering capabilities to face the identified shortage in 10 years, special attention will be paid to motivating young women in this field of education.

4.6 Towards a more balanced age pyramid

The average age of ESA staff is today 45.7 years. In the coming four years, 10% of ESA staff will retire. Assuming an unchanged staff complement, i.e. recruitment of 10% of ESA staff, this will not by definition decrease the average age, unless proactive actions are taken.

The objective for the average age in four years' time will be defined in six months after an analysis of the available data.

5. Towards more efficient processes

Two areas for improvement and simplification have been identified:

- shortening of the procurement cycle: the period of time between drafting a procurement proposal and signature of a contract has to be shortened substantially. A reduction to half of the present duration must be achieved;
- reform of the nature and frequency of internal and external reporting, aimed at ensuring consistency of information between programme Directorates and horizontal management and uniformity of information between activities. The consistency of briefing and reporting will be improved by setting up a common database, which will in turn allow the quantity of reports to be reduced.