UK SPACE AGENCY

Investment Principles

November 2015

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Introduction

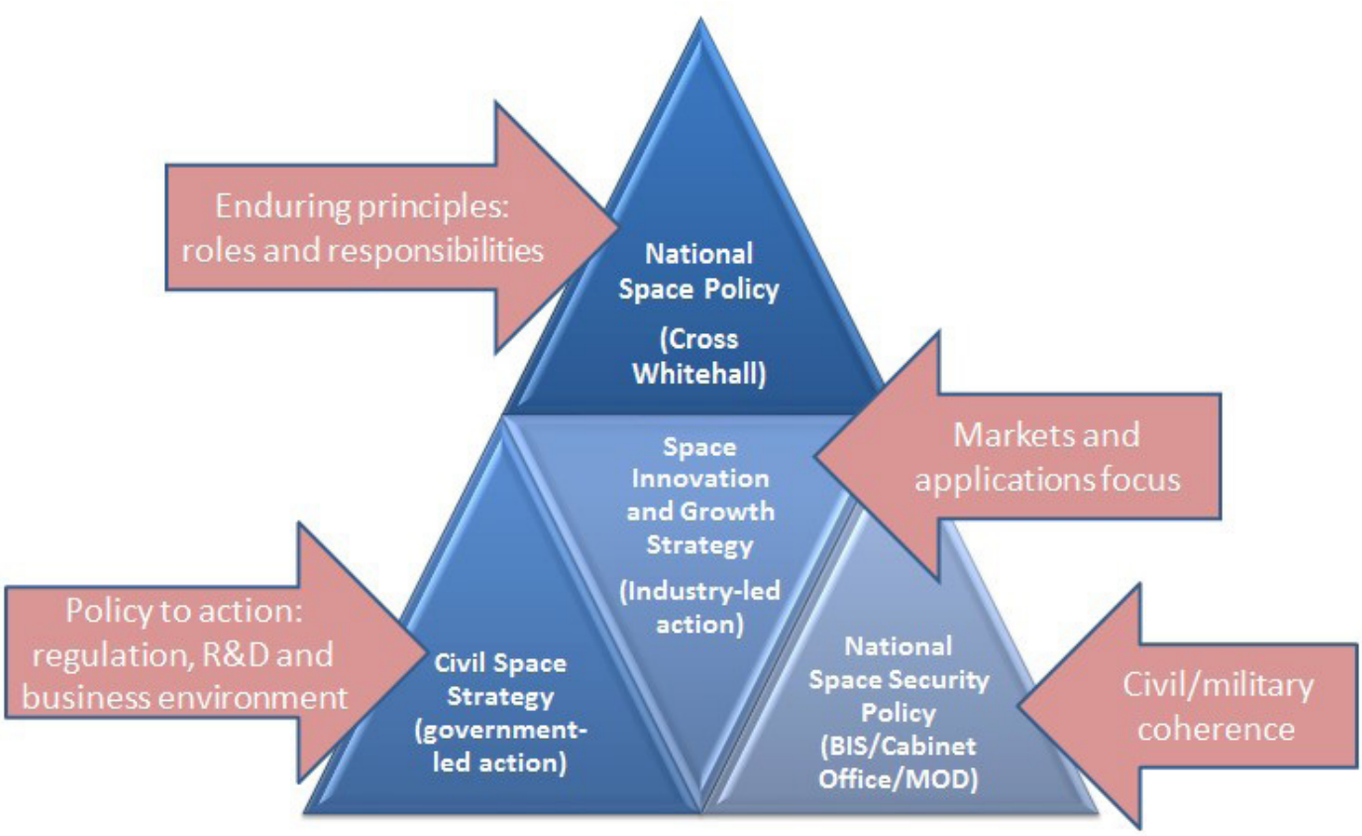
There are a number of UK space-related strategies and policy documents, which set the framework for UK Space Agency policy action and overarching targets, and describe how the UK Space Agency will work with other departments and industry to achieve our objectives. However, what these documents do not currently set out is how the Agency decides on priorities for funding and policy action. The principles set out in this document aim to address this gap.

The principles set out here are particularly closely related to the Civil Space Strategy (CSS). The next CSS, which will be developed in 2016, will set out how we plan to reach our growth targets and to support space infrastructure for the public good, including where we should allocate funding to achieve this.

Decisions on priorities are ultimately made based on the skills and judgement of Agency staff, though to decide on these priorities we need to be clear on how we will use the wide range of evidence and information available. This document sets out the key principles that the Agency will follow to achieve this, enabling us to take a blended approach to determine how best we can achieve our objectives.

We set out the five principles which we will use to inform funding decisions, and explain how we gather the evidence to enable informed assessments against these priorities to be made. The five principles are as follows:

1. Strategic significance
2. Rationale for Intervention
3. Impact
4. Risk
5. Resource requirements



Collecting evidence

In choosing our funding priorities, we seek to bring together a range of evidence from diverse sources to ensure that our decisions are evidence-based. This evidence comes from a number of different streams.

Consultation and collaborative working

Consultation helps us to garner views and preferences, to understand possible unintended consequences of our policies, and to get views on their implementation. In line with the cross-government principle of open policy making, within the Agency we actively seek to consult with the public, industry, academia, research organisations, other departments and international partners to ensure that our decisions are evidence-based. We seek to engage early on in policy development when the policy is still under consideration to ensure views can genuinely be taken into account.

The nature of this consultation will depend on the questions at hand, and we will make appropriate judgements on when, with whom and how to consult on a case by case basis. In some instances this may be a full, formal consultation, such as the 2015 consultations on Spaceport locations and criteria and on the draft National Space Environments and Human Spaceflight Strategy. In others, relevant evidence can be acquired on a more informal basis, for example through workshops and regular discussions with affected parties. In all cases we follow the governing principle of proportionality of the type and scale of consultation, and recognise that consultation is only one part of a wider scheme of engagement.

One important way in which we collect information is through our advisory bodies that reflect the broad role of the Agency across policy, regulation, the growth agenda and programme delivery. These panels provide independent advice on priorities for space science, exploration, education and skills, space technology, earth observation, and spectrum issues. They also provide advice on the feasibility of implementing projects, looking in detail at the technical and programmatic issues underpinning successful delivery. They draw together member from across government, academia and industry to allow different perspectives to be taken into account.

Much of our work in the Agency concerns supporting the UK space industry, and working towards meeting the Innovation and Growth Strategy target of having a £40bn UK space sector by 2030. We work closely with industry to ensure that we have a full understanding of their needs and challenges. To this end, we have regular information-sharing meetings with UK space companies and industry groups, from large companies such as Airbus through to small suppliers working in diverse areas across the sector.

Learning from experience

Within the Agency we are committed to ensuring that our funding is spent on activities that provide the greatest possible economic and social return. We recognise that good evaluation evidence is essential for this, to ensure that our policy decisions are based on reliable and robust evidence.

The UK Space Agency Evaluation Strategy, published in August 2015, sets out the processes we follow when evaluating our activities and programmes. We also use good evaluation evidence from other countries, and work closely with the European Space Agency to ensure that we collect robust information on the impact of their programmes.

Whether from lessons learned reviews, process evaluations, or full, detailed impact evaluations, the evidence generated here is essential for understanding how and where to direct our funding. It can help identify gaps, produce better evidence on what works, and improve evidence on the value-added of the Agency's activities.

Appraisal evidence

We consistently work to strengthen our evidence base on the impact of space funding. As with learning from experience, having a better understanding of this impact can help ensure that decisions on funding allocation and policy design are both well-informed and evidence-based.

To this end, we regularly conduct research to generate new evidence. This includes:

- The Size and Health of the UK Space Industry – this biennial report (latest version published October 2014) helps establish the UK space industry's general size and health, provides an input into the formulation of UK space policy, and tracks progress towards policy objectives
- Case for Space – published in July 2015, this report draws together existing evidence and conducts new analysis to assess the impact of space on the UK economy, and assesses the role of government support within the industry
- **Returns to public space investments (forthcoming)** – this project combines a literature review, consultations and case studies to examine the evidence on returns from public space investments. Looking at different 'types' of investment, it provides evidence on their respective returns and as such can help inform policy design

More widely, our economics team works closely with analysts and colleagues in the Department for Business, Innovation and Skills and more widely to develop our understanding of the impact of science and innovation funding. We also have subscription agreements in place to gain access to new space-related research reports, and work closely with academia and industry through working groups and more informal routes to ensure that we gather together all the available evidence.

Future expectations

When deciding on priorities for funding, it is important that we have the best possible evidence on market trends and on the UK's future strategic opportunities and challenges. To this end we work with international partners such as the OECD and European Space Agency through workshops, events and day-to-day working to identify where policy action is needed, and where it is likely to be needed in the future. We also keep up to date with the latest research reports, and have regular discussions with industry and others to identify strategic priorities.

Using evidence: principles for prioritisation

The UK Space Agency is responsible for all strategic decisions on the UK civil space programme and provides a clear, single voice for UK space ambitions. With limited funding, we clearly cannot carry out all the activities for which a need has been identified. We must therefore focus our efforts and resources at the areas which offer the highest societal return.

To do this, and to use the evidence collected through the above routes, we follow five principles for prioritisation. We generally prioritise according to the impact of our activities on the UK, the rationale for intervention and according to the strategic significance of the work. We balance this against the risks and resources involved. Our vision and high-level strategy set out in the Civil Space Strategy guides our actions, and our corporate plans and annual reports describe what we intend to do / have done. The five principles used to prioritise our work are as follows:

1. Strategic significance

Key questions:

- How does the work fit with wider UK Space Agency strategy, the Agency's technology strategy and area-specific strategies and / or with other Agency objectives?
- How does it fit with BIS strategy?
- How does it fit with wider HMG strategy and objectives?
- Are there elements of strategic significance that go beyond return on investment?
- What would be the impact of the new work on the balance of the UK Space Agency's current portfolio of work?

In assessing the strategic fit, we will consider how a given funding proposal relates to the Agency's objectives and vision, as set out in figure 1. It is not necessarily the case that a proposal that relates to more pathways or outcomes will be a better use of funding, rather it will depend on the likely impact of

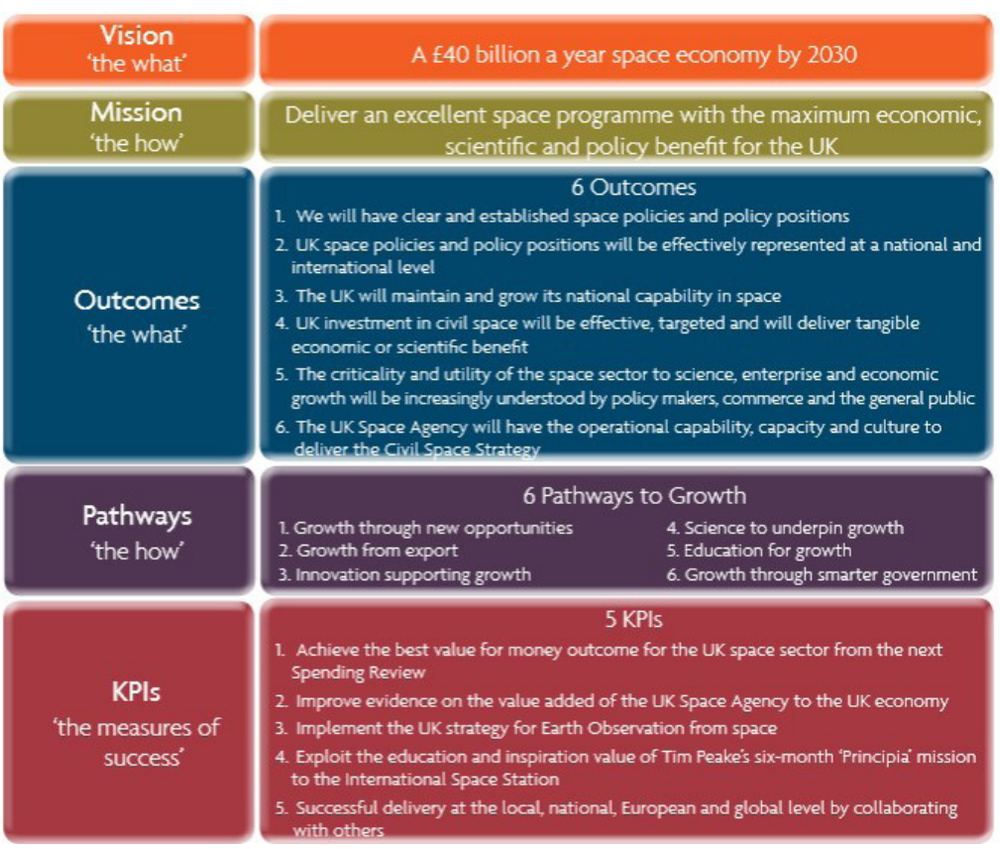
funding / policy action within a given area.

We also need to consider the wider strategic significance of our activities, in particular the fit with Department for Business, Innovation and Skills (BIS) strategy and wider HMG objectives. In this, we will also recognise the role of the Agency in delivering on behalf of other departments and organisations.

Important portfolio considerations will include an appropriate balance:

- Between difference areas such as space science & exploration, telecommunications, Earth Observation, technology development, etc.
- Between underpinning, long-term basic research and nearer market activities
- Between established approaches and more innovative work, or between risk and reward
- Between work which builds capacity (investment) and work that uses capacity (output)
- Of delivery over time

Figure 1: UK Space Agency vision



2. Rationale for Intervention

Key questions:

- Are there clear market failures or public good considerations underpinning the logic for government involvement?
- Can government action address the market failure, or is government failure a risk?
- Is the UK Space Agency best placed to act?
- Would it be best left to the private sector, other public actors, the European Space Agency or others?

The underlying rationale for public space investments is founded in market failure[1]. Particular market failures that underpin the need for public funding include:

- Spillover benefits – often sizeable benefits to other companies, unrelated markets, academia and society more widely
- Short-termism / risk aversion – leading to underinvestment in the presence of risk, uncertainty and long lead times inherent to space programmes
- System, information and coordination failures from interactions between businesses, research and educational institutions
- Barriers to investment such as high fixed costs, lack of access to finance and skills shortages

Public funding can help address these failures and boost investment closer to socially optimal levels. Space programmes also often have public good elements, and ensuring wide (often free) provision of data can ensure that scientific advances and other innovative activities proceed at the fastest possible pace.

We also do not overlook the intrinsic value of science programmes in terms of advancing the frontiers of human knowledge and our understanding of the universe.

A given investment proposal may relate to one of more of these market failures and barriers to investment. As for strategic significance, it is not the case that a proposal that relates to more of these is 'better', rather than a consideration of these in the round can give a better picture of the overarching rationale for intervention.

3. Impact

Key questions:

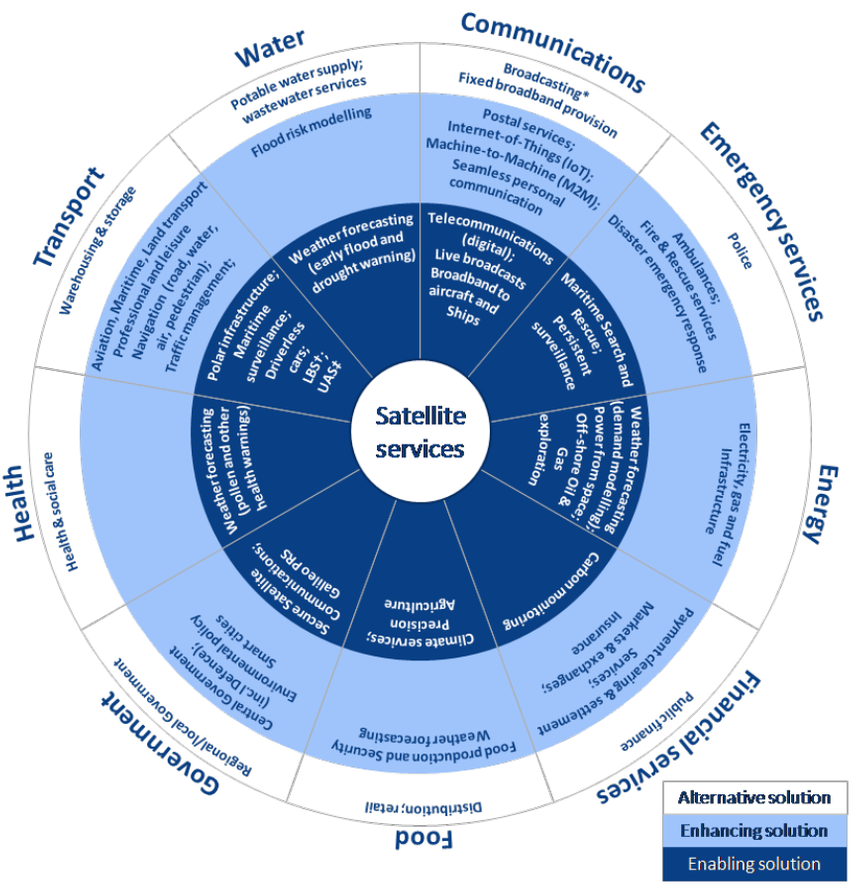
- What impact would funding have on consumers and/or industry?
- What are the likely direct, indirect, and wider effects?
- Would it result in scientific advancement?
- What value will the work have for our partner organisations , such as Research Councils?
- [Where possible] What is the likely Net Present Value of the proposal, and NPV per pound of public spend?
- Will Agency funding leverage funds from other partners and industry?

Considerations of the impact of a potential project or programme need to consider the benefits arising to consumers, industry and society more widely that would result from UK Space Agency action. All impacts should be assessed in line with HMT Green Book guidance, and impacts will be assessed relative to the counterfactual, 'without programme' scenario.

Direct effects of an intervention will include, for example, impacts of funding on industry turnover, output or jobs. Indirect effects cover the wider supply chain impacts. Wider (catalytic) effects include market 'spillovers', which could include benefits to consumer end-users or other commercial users, as well as the often unpredictable benefits from scientific advances, new knowledge and know-how. Figure 2 illustrates some of these catalytic effects that may stem from space programmes (in this case, those focused on developing satellite capability).

[1] *"Market failure refers to where the market has not and cannot of itself be expected to deliver an efficient outcome; the intervention that is contemplated will seek to redress this" HM Treasury (2003a), The Green Book: Appraisal and evaluation in Central Government, Treasury Guidance, p. 11.*

Figure 2: examples of wider benefits from space-enabled applications



Given their inherent uncertainties, space programmes are often tricky to measure in quantified terms (net present value). For example, missions such as Rosetta will produce scientific outputs with currently unknown applications. To the extent possible, though, we will work in line with Green Book guidance to appraise programme proposals and – where pursued – to develop detailed economic cases as part of the business case development process.

When considering the impact of our programmes, we will also take a wide focus taking into account the value of our work for Research Councils and other partner organisations. As above, we will also not overlook the importance of the Agency's role in delivery for other departments and organisations.

4. Risk

An important consideration is the likelihood of a successful outcome from a given funding proposal. Many space programmes are inherently risky, and a good understanding of the level of risk is essential for making decisions on funding allocations that correspond to the Agency's risk appetite. We will use technical reviews to identify the level of technical and programmatic risk of proposed programmes.

As set out in the strategic significance principle above, there may be advantages in pursuing a range of programmes with different risk/reward profiles. While extra risk is undesirable, all else equal, it is often the case that the ideas with the highest risk can potentially result in the highest return. We will consider the overall balance of risk across the whole of the Agency's work portfolio.

5. Resource implications

Key questions:

- What are the resource implications (funding and staffing) of doing the work?
- Are the resource requirements proportionate to the benefits from doing the work?
- Over what period will the resources be needed?
- Will it lead to savings for the Agency by enabling us to meet our objectives more efficiently?
- What would be an appropriate level of contingency based on the risk assessment
- What resource implications will the work have for Research Councils and other agencies / organisations?

When considering the resource implications of a proposed new project or programme of work, we will take into account all resources required to undertake the work. Over the course of a project/ programme the resource allocated to it may change, depending on its requirements and the requirements of other projects, so that the Agency's resources are allocated in the most efficient way to cover all of our work.

In assessing resource implications, we will take into account the resource availability of other parties such as Research Councils, industry, European and international partners.

Summary

The list of principles set out here is not intended to be exhaustive, and is intended solely to illustrate the most important factors that we consider when making decisions on funding allocations. In many cases, we will need to take other factors into account where appropriate, for example on whether there is a legal duty to act and/or whether there are political commitments. The principles are not intended to be applied in a mechanical way: judgement and a reasoned balancing exercise are required for each case which necessitates that we consider the principles in the round and on a case-by-case basis. We will also continue to keep the principles under review.

An illustration of how the principles can be applied is shown in figure 3.

In this case, policy proposal B offers an higher expected return, and is more well-aligned with Agency strategic priorities, though is also relatively risky and resource intensive. In a scenario where these are the only policy options, the decision on which option to pursue would therefore depend on risk appetite and the level of resource available.

The principles set out here are deliberately aligned with the HMT 5-case business case model[2], which is designed around strategic, economic, commercial, financial and management cases. As and when funding for proposals is pursued, these will be developed as the business case is produced. In turn, as the business case is developed, we can develop a better understanding of the likely impact of a particular proposal and whether it is worth pursuing.

We also recognise that there will be occasions when fast-moving and unexpected proposals will arise, requiring quick decisions and potentially shifts in priorities. These principles are designed to be flexible, and apply equally to these proposals as well as to long-term, more deliberate decisions. Ultimately, it is the skills and expertise of Agency staff that will help us choose our strategic priorities, and these principles are a tool to help inform these decisions.

The ideas and principles set out here will inform decisions in the upcoming Civil Space Strategy 2016-20, which will be developed in 2016. This will set out a clear investment plan, covering issues such as the split of our funding between European Space Agency programmes and national programmes, between upstream and downstream activities, and setting out a priority list of capital projects to be pursued.

Figure 3: example policy choice

	Strategic significance	**Impact**	**Rationale for intervention**	**Risk**	**Resource requirements**
Policy proposal A	Medium	Medium	High	Low	Low
Policy proposal B	High	High	High	High	High

[2] *See: https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent*

URN: UKSA/15/6

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