



A CALL FOR EVIDENCE IN SUPPORT OF A NATIONAL SPACE INNOVATION PATHFINDER

The Space Growth Partnership response to
evidence tendered.

Abstract

Expressions of Interest were sought from a cross section of the UK Space industry to evidence priorities for a National Space Innovation Pathfinder. This is a summary of those expressions and the Space Growth Partnership response to the analysis of the data captured.

This summary of responses to the call for evidence can be found on the Space Growth Partnership website [<https://www.spacepartnership.org.uk>] and found from links on the UK Space Agency and UKspace trade association websites.

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Space Growth Partnership and Space Sector Council

1. The Space Growth Partnership ('SGP') was established in 2017 to create the structure and working environment for the UK's space industry, academia and government to come together to plan for and deliver high levels of sector growth and social benefits to the UK. The intent was to agree and implement a jointly owned space industrial growth plan for the sector focussed on driving the UK towards its '10% of the global space economy' target. The current membership of the SGP comprises the UKSpace Trade Association, the Space Academic Network, the Satellite Applications Catapult, UK Space Agency, UK Research and Innovation, Department for International Development and the Ministry of Defence.
2. The sector also created the Space Sector Council (SSC) in 2017 to provide a CEO-level governance board for the Space Growth Partnership and the forum through which industry and universities could provide consolidated sector advice to Government on major issues facing the sector and priorities for investment and other activities. The SSC replaced the previous Space Leadership Council that was set up following the publication of the Space Innovation and Growth report in 2010.





Introduction to the consultation

3. In January 2017, Government published its consultation paper on its modern Industrial Strategy. This consultation provided a focus for SGP activities in that year, driving an initiative to establish the evidence base and action plan for a potential Space Sector Deal. The SGP commissioned its first request to the sector for proposed National programmes in April 2017. This response produced some 40 expressions of interest in innovation programmes potentially worth around £1bn in investment. The priority investment areas identified by the sector from this evidence collecting exercise were:
 1. Geospatial data
 2. Ubiquitous, resilient and secure connectivity
 3. Resilient positioning, navigation and timing and security
 4. In-space assembly, servicing and debris removal
 5. Food security (including farm demonstrators)
4. In March 2017, the Satellite Applications Catapult concluded a review of future space-enabled markets that was based on extensive analysis and individual market [reports](#) by a range of space and non-space market experts. This review highlighted some £70bn in emerging market opportunities for space companies by 2030.
5. In December 2017, Government published its modern [Industrial Strategy](#), which was based on a vision for a transformed economy based on five foundations to improve productivity and wealth creation (figure overleaf). The SGP judged that an emerging industrial action plan for space would be a good fit with the Government's Industrial Strategy with specific opportunities for enhanced space sector growth.

Our five foundations align to our vision for a transformed economy







6. In May 2018, the Space Growth Partnership published [Prosperity from Space](#), its blueprint for growing the sector and increasing the economic and social benefits the sector provides in the UK. This was the Sector’s first strategy following the 2016 referendum decision to leave the European Union. The Prosperity from Space strategy was aligned with the 2017 Industrial Strategy’s ambitions and designed around four clearly defined, mutually supporting pillars.

The Prosperity from Space Strategy			
			
Creating a National Space Programme to unlock increased private investment	Creating the right environment for success by building existing strengths	Investing in people and places	Continuing to drive growth from our investment in ESA, Eumetsat and EU Programmes
This will be achieved by: <ul style="list-style-type: none"> • Building new partnerships and exports • Maintaining world-leading excellence in the ‘stand out’ UK industrial and academic strengths • Combining capabilities in space data and AI to drive productivity in sectors across the UK economy 	This will be achieved by: <ul style="list-style-type: none"> • Improving the entrepreneurial pathway and access to finance • Setting up a cross-Government working group to secure high value inward investment • Demonstrating how smart Government procurement can stimulate commercial investment and infrastructure • Delivering a globally competitive and progressive regulatory regime 	This will be achieved by: <ul style="list-style-type: none"> • Attracting and training up to 30,000 additional skilled people by 2030 • Actively encouraging diversity and inclusion in our workforce • Showcasing exciting scientific achievements in space and undertaking 1,000,000 interactions per annum with young people to inspire the take up of STEM careers • Spreading the benefits around the UK by developing locally led regional technology hubs 	This will be achieved by: <ul style="list-style-type: none"> • Enhancing the UK’s relationship with ESA and maintaining at least the current level of investment • Enhancing the UK’s relationship with Eumetsat and continuing our currently planned levels of investment • Fully supporting on-going Government negotiations to ensure future UK/EU partnerships cover current and planned EU space programmes, or identifies commercial and industrial opportunities to address shortfalls in activity

7. The priority areas for new national investment in emerging market, from the Prosperity from Space report, are summarised in the following table. In deciding on these four priorities, the publication team drew on both the market and ‘expressions of interests’ programme analysis conducted in 2017.

Recommendations made in Prosperity from Space to focus UK national effort on four sector market priorities

	Earth Information Services	A £20bn forecast market, delivering real-time global awareness, navigation, analytics and security for the advanced data economy
	Connectivity Services	A £40bn forecast market, delivering broadband and 5G for everyone – at home and on the move, on the road, in the air or at sea, anywhere around the Globe
	In-Space Robotics	A nascent market potentially transforming the way we use and explore space, including all-new applications for science, enterprise and consumers
	Low Cost Access to Space	Maximising the value of the UK’s spaceports and launch from the UK, a £10bn forecast market, making the UK a home for low-cost launch services and developing platform technologies to promote even lower cost access to space

8. In June 2019, Government announced its intent to create a Cabinet-level National Space Council to better coordinate its use and investment in space capabilities and services. This was in part a response to the broad growth plans set out in Prosperity from Space which sought a coordinated approach to space from across Government.
9. Prosperity from Space also articulated the case for a strategic National innovation programme for the sector complimentary to the UK’s membership of the European Space Agency. In the report, the sector proposed to jointly fund a new National Space Innovation Programme (NSIP) with Government. Although Prosperity from Space did not quantify the funding requested, the sector continues work to refine options for funding proposals within the SGP.
10. The SGP had planned to request funding to kick-start the NSIP in the Autumn of 2018. However, following feedback that further evidence was needed to present a compelling case for a new National programme, and the fact that the sector was already working on a funding bid needed to make new UK commitments to ESA at the ESA Council of Ministers in November 2019, the Space Growth Partnership Board decided in June 2019 to revise its approach and seek to establish an interim National Space Innovation Pathfinder programme. This programme is proposed to be between £60m and £70m in Government funding over 3 years, broadly matched by sector funding, with the intent of using success in a Pathfinder to provide the strong evidence base to support the case for a full national innovation programme.
11. It was agreed that the sector would still need to demonstrate strong demand even for a pathfinder and that it would come forward with a set of high-quality proposals. The Space Growth Partnership Board therefore requested that the UK Space Agency run a call for expressions of interest for innovative space programmes that could be included in a Pathfinder. The evidence presented in this report summarises the results of expressions of interest submitted in support of the Pathfinder programme.
12. The Pathfinder will also enable the UK Space Agency and the sector to develop and implement governance, advisory and delivery processes for a competitive national innovation programme in a controlled way, thus providing further confidence that the full NSIP can be effectively

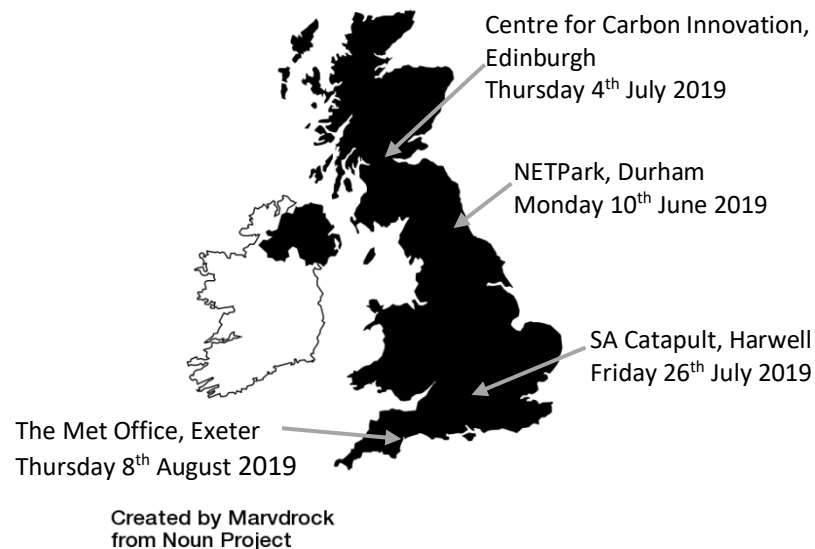
managed and deliver value-for money. It will therefore support a robust business case for the NSIP including management, financial and evaluation elements.

Case for a National Space Innovation Programme

13. While it is not the intent of this report to provide a detailed rationale for a strategic NSIP, it is important to contextualise the programme.
14. Work undertaken by the SGP highlights that National and European Space Agency (ESA) investments provide complementary benefits. The high-level focus for a National programme is expected to be:
 1. programmes that are building on future UK operational capabilities or are near market delivery to, for example, capitalise on first mover market advantages;
 2. bi-lateral/multi-lateral programmes outside of ESA that will grow UK capabilities and promote trade;
 3. taking forward National space priorities and leadership in strategic technology areas which do not require ESA technical expertise, mission oversight or member state partnerships.
15. Investments made with the ESA over the last 50 years have focussed on research and development (R&D) in science instruments and technology innovations in addition to ESA's cornerstone large-scale collaborative Exploration and Space Science missions. ESA is currently our single most important route to multilateral partnerships for scientific infrastructure in space with European and global partners. ESA investments provide:
 1. Access to global and European trade, supply chains and customer bases;
 2. Unique technical expertise and bespoke testing facilities;
 3. Multinational collaboration on scientific research and technology development;
 4. Accreditation based on rigorous participation requirements for those working with ESA.
16. At Space 19+ the UK made strategic investments with ESA to further the UK's national ambitions, maturing unique sector capabilities to e.g. lead on an Earth Observation (TRUTHS) and a space weather (L5) mission. These missions exemplify how the UK can build on the sectors scientific and technical heritage whilst benefitting from multinational collaboration and ESA oversight.
17. It can sometimes be challenging deciding the best delivery route for a project. A pragmatic starting point for any programme or individual project will be to understand its potential contribution to UK capabilities and value. A judgement can then be made on whether national or ESA funding is the most appropriate funding source to deliver this benefit. Indeed, in larger and more complex industrial projects, the SGP team can envisage both mechanisms being used to develop and de-risk different elements.

Conducting the call for evidence

18. In order to carefully targeted opportunities in support of the 3-year Pathfinder Programme, the Space Growth Partnership undertook a series of consultations in partnership with the UK Space Agency's ESA policy team who had scheduled workshops across the UK to get sector views on Space19+ priorities.



19. The workshops outlined the purpose and ambitions for a National Space Innovation Pathfinder and issued a call for suggestions from companies and consortiums of all sizes (SMEs and start-ups, to mature business), as well as academic institutions and research councils to provide high level details of example projects considered a priority, which would then form the basis of a well-evidenced sector proposal. Participants were encouraged to focus on priorities that showcase interesting technology and sector ambition for additional UK research & innovation, building on and complementary to, existing national funding streams (e.g. for science instruments) and opportunities through ESA.
20. The call to submit expressions of interest was distributed through these workshops and other available channels such as through the Innovate Space Knowledge Transfer Network although not explicitly to the general public. Any interested parties were encouraged to complete an expression of interest form (EOI) and send it electronically to a specified gov.uk email inbox.
21. The five highest sector priorities from the previous consultation in 2017 were used as the basis for the EOI. Projects were therefore requested under the following headings:
1. Geospatial data
 2. Ubiquitous, resilient and secure connectivity
 3. Resilient positioning, navigation and timing and security
 4. In-space assembly, servicing and debris removal
 5. Food security (including farm demonstrators)

22. Three important factors were made very clear from the outset:
1. Proposals submitted would be protected as 'commercially sensitive' and reviewed only by staff at the UK Space Agency;
 2. Proposals used to make a wider case would not necessarily be taken forward nor guarantee funding for the authors;
 3. This consultation did not mean that any funding for a Pathfinder programme had been or would be secured.
23. Participants were asked to identify a category for their programme from the five headings and to set out the scale of the funding requirement. This included whether match funded investments would be made or alternatively, how the project would secure private sector funding.
24. Finally, respondents were asked to answer ten questions over no more than two pages as part of the application form:
- i. **What is the business opportunity that this project addresses?** Provide an executive summary of the whole pitch; to stand alone as a one-paragraph summary of the value proposition.
 - ii. **What is the size of the market opportunity that this project might open up?** Quantify the value of the market opportunity (best estimate).
 - iii. **How will the results of the project be adopted and commercialised?** Explain the route-to-market both during the project/programme and after.
 - iv. **What economic, social or environmental benefits is the project expected to deliver to those inside and outside the consortium and over what timescale?** Focus on commercial benefits such as revenues, jobs created/safeguarded, IP created, social impact and return on investment.
 - v. **What technical approach will be adopted?** Articulate what is project plan.
 - vi. **What is innovative about this project?** Explain what aspect of the proposal is new and how it compares to current marketplace offerings?
 - vii. **What are the risks (technical, commercial and environmental) to project success?** Show an awareness of key risks.
 - viii. **Does the consortium have the right skills and experience and access to facilities to deliver the identified benefits?** Outline who is or might be in the consortia and why they are the right people to achieve success?
 - ix. **What is the financial commitment required for the project?** Provide a best estimate of how much money would be needed for the whole project? How much of that would be expected to be grant, and how much would be their own (or private) investment?
 - x. **How does UK public funding add value?** Outline why they need public money, i.e. why not private investment or use existing public funding routes such as ESA?

A summary of Responses

25. The call for evidence sought views and evidence from a wide range of stakeholders. In total 84 responses to the call for evidence were received through the National Space Programme mailbox. A list of the respondents can be found in Annex A.
26. A summary of the responses is shown below. All the responses were from organisations with links to the space industry.

Number of Responses	Type of Response
4	Consultation workshops with Q&A - Edinburgh, Durham, Harwell, Exeter
180	Expression of Interest forms issued in direct response to requests from companies and organisations for a form
84	Expressions of Interest ideas received by the UK Space Agency
50	Individual companies or organisations submitted expressions of Interest

27. Of the 50 companies who responded, a summary of the size¹ of the companies is shown below

Number of Responses	Type of Company
17	Micro Companies - Less than 10 employees
7	Small Companies - 10-50 employees
5	Medium Companies - 50-250 employees
11	Large Companies - more than 250 employees
4	Government Funded Organisations
6	Universities or other Academic Organisations

¹ Source – www.endole.co.uk

A summary of the analysis from the call for evidence

28. In many cases companies were unable to categorise their projects into a single field with many identifying overlaps into other categories, as shown in the following table.

No	Category	Expressions received
1	Geospatial data	29 (10 overlapping)
2	Ubiquitous, resilient and secure connectivity	11 (3 overlapping)
3	Resilient positioning, navigation and timing and security solutions	12 (3 overlapping)
4	In-orbit assembly, servicing and debris removal	7 (1 overlapping)
5	Food Security	15 (8 overlapping)
6	Other	25 (3 overlapping)

29. Some projects were unable to conform to the 5 categories, instead labelling their projects as 'other,' while some placed their projects in every category. This made it difficult to address the overall aim of the exercise for the Space Growth Partnership, which was to generate a compelling evidence-based case for a National Space Pathfinder Programme.

30. In order to overcome this the review panel took the decision to re-examine each of the proposals and elect a single category for each. This necessitated the creation of additional categories as shown below.

No.	Revised Category	Total Projects	Total value (£m)	Average value per project (£m)
1	Earth Observation and Climate	37	£576.6	£15.6
2	Satellite Telecommunications	15	£402.3	£26.8
3	Resilient positioning, navigation and timing and GNSS	10	£49.1	£4.9
4	Robotics and Space Situational Awareness	10	£18.9	£1.9
5	Launch	5	£7.8	£2.0
6	Research or Facilities	7	£99.0	£14.1

31. After reassigning the proposals into the new categories the review panel scored each of the ten questions using a Red, Amber, Green rating. Using this method 53 projects were recommended for further consideration. These projects were then further scrutinised and 23 selected as

priorities. The breakdown of investment throughout the evaluation process is summarised in the following table.

	Total Projects	Total value (£m)	Total grant requested (£m)	Grant as % of total investment	Average value per project (£m)
All proposals received	84	£1714.7	£984.9	57%	£20.9
Projects recommended for inclusion in Pathfinder / NSIP	52	£1297.5	£741.1	57%	£25.4
Priority projects	28	£1062.8	£576.5	56%	£37.9

Consultation Findings and Recommendations

32. The Space Growth Partnership Board have agreed that this consultation has provided a valuable and credible evidence base for the Pathfinder programme. The Board wishes to record and pass on its thanks to the companies and organisations that provided expressions of interest in this work and submitted proposals.
33. Based on the information provided at the consultation events and the outcomes of the consultation analysis, the Space Growth Partnership Board recommends that the Pathfinder Phase for the NSIP is structured to deliver:
 1. An open call for innovative proposals that use Earth observation and tackle climate change
 2. An open call for innovative proposals for ubiquitous and secure communications
 3. An open call for entrepreneurs and start-ups to develop cases for UK-based technologies and businesses
 4. A call for research organisations to develop innovative science payloads that could be deployed on small satellites
34. In agreeing to publish this response to the Call for Expressions of Interest, the Space Growth Partnership Board highlighted the following recommendations and activities in taking forward the Pathfinder:
 1. that up to 80% of the £70m Pathfinder funding over 3 years is allocated to the Earth observation and communications calls (lines 1 and 2 above) with some £3m earmarked for each of the calls for entrepreneurs and research institution calls (lines 3 and 4 above). Funding allocated to the call for entrepreneurial ideas should be for grants up to £150,000 and completed in 9 months. This will permit not only the identification of promising new projects but will also contribute to the evidence base for smaller projects not tested in this consultation.
 2. it noted the importance of the Pathfinder in establishing the case for the full National Space Innovation Programme (NSIP) that the Sector has requested to be provided with up to £300m in annual budget, funded equally between the Sector and Government. In addition to establishing the benefits of a strategic approach to national space funding in the UK and the impact that can be achieved from this, the Pathfinder provides an opportunity to define and refine the processes by which the full NSIP will be run.
 3. it noted the importance of international trade and projects to the UK and proposes that a proportion of innovation programmes would explicitly target the UK's future space trade ambitions. We would expect a proportion of Pathfinder innovation funding to be earmarked for strategic and commercial international projects.
 4. the pathfinder should be structured to be agile (entrepreneurial investors will often now wait for infrequent funding calls) and to secure commercially and nationally high value IP in the UK and take account of where UK organisations can lead innovation in strategic niche areas
 5. there should be an intent to mature future innovation opportunities to take forward new wider industrial priorities in both the Earth observation and communications themes, as well as opportunities in robotic manufacturing and servicing in space and low-cost access

to space, as and when further tranches of NSIP funding are agreed between the Sector and Government.

6. that it would expect funding to be reserved by the UK Space Agency and wider NSIP delivery partners to administer the NSIP Pathfinder to ensure smooth delivery.

Mechanisms to provide sector advice on Pathfinder Priorities and Governance

35. The Space Growth Partnership Board recommends that mechanisms are developed that enable the Space Sector Council to provide advice and recommendations to Government on the commercial and National priorities for the Pathfinder and subsequently for the National Space Innovation Programme. The SGP Board does envisage the Pathfinder being run by the UK Space Agency but would encourage that body to work with other delivery partners as needed to establish an authority and momentum to the Pathfinder programme.

Contact details

If you have any further questions about this call for evidence, or are interested in joining a working group looking at the issues covered by the call for evidence please contact Robert Waters using the details below:

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Annex A – Stakeholders who responded to the call for evidence

<p>AdeptoMines Limited Agri-EPI Centre Ltd Airbus Defence and Space Alden Arkeik Space Technologies ArQit Astroscale Athena Space Limited CEOI CGI Cobham Advanced Electronic Solutions Craft Prospect Ltd D-Orbit UK earth i Geospatial Insight Goonhilly Earth Station Ltd GRACE ICEYE iCOMAT IGTL Technology Ltd LLEO Limited Lockheed Martin UK Marshall consult MDA Corporation Methera Global National Composites Centre Northern Space & Security Ltd</p>	<p>Open Cosmos Open University Paragraf Ltd QinetiQ RALspace Reaction Engines RegenFARM Ltd Rhea Group Satellite Applications Catapult Solid State Dynamics Ltd. SSTL Swala Aerospace Ltd Teledyne e2v Telespazio VEGA UK Ltd Thales Alenia The James Hutton Institute University of Edinburgh University of Hertfordshire University of Leicester University of Nottingham University of Surrey Viasat UK</p>
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