**ANNEX B**

**SSAC REPORT – Scotland's Space Sector: Exploring potential future opportunities**

**ROUNDTABLE PROGRAMME, ATTENDEES AND BREAKOUT GROUP NOTES**

**SSAC VIRTUAL ROUNDTABLE**

**21 February 2024, 11.00-14.00**

**Programme**

| 11:00-11:05 | Welcome and objectives | Dr Graham Kerr, SSAC Project lead |
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| 11:05-11:15 | Background to SSAC | Professor Julian Jones, SSAC Chair. |
| 11:15-11:25 | Overview of Scottish Government space sector policy | Scott McClelland, Scottish Government |
| 11:25-11:35 | Emerging key questions for international space sector | Professor Colin McInnes, University of Glasgow |
| 11.35-11.45 | Scotland's space industry | Dr Hina Khan, Executive Director, Space Scotland |
| 11.45-12.25 | **Breakout Session 1 - Opportunities, risks and policies**<br><br>1. Where are the greatest economic opportunities for Scotland in the longer term (10-20 years) and what do we need to do <u>now</u> to position our sector to take advantage?<br><br>2. What are the risks and barriers to stability and growth in the Scottish space sector and how can these be overcome.<br><br>3. How can Government (UK & Scottish) best support the space sector in Scotland?<br><br>4. How is legislation likely to impact the space sector and how can Scotland help influence local and international policy and standards? | |
| 12.25-12.55 | **Lunch Break** | |
| 12.55-13.35 | **Breakout Session 2 - Technologies, people and working together**<br><br>1. In which relevant areas of research are we world-leading and how can we best enable the adoption of this for impact in the Scottish space sector? | |

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| | 2. How can Scotland's space sector support sustainability and contribute to broader national and international goals in areas such as climate change, AI, technology innovation, and education?<br><br>3. What skills are needed to support the current and future space sector and how can we ensure that the skills are available in Scotland?<br><br>4. Which collaborations nationally, and internationally, and between different disciplines and sectors, will become the most important for the Scottish space sector? How can we use these collaborations to further our involvement in larger space programmes worldwide? | |
| 13.35-13.55 | **Plenary** | Professor Julian Jones, SSAC Chair |
| 13.55-14.00 | Summing up and next steps | Dr Graham Kerr, SSAC Project lead |

## FRAMEWORK FOR BREAKOUT DISCUSSION

The project is intended to review the potential future global opportunities for the space sector. It will offer recommendations highlighting future opportunities best aligned to the existing and potential strengths of the Scottish space ecosystem, taking into consideration existing areas of industrial capability within and out-with the space sector and academic research in relevant areas. Particular consideration may be given to opportunities aligned with the other priority areas identified within the National Innovation Strategy.

The project will also seek to set out the actions that the collective ecosystem should implement to position Scotland to maximise the economic opportunities, including identifying where the respective ownership of relevant actions best sits.

**Breakout Groups**
Attendees will be split into two pre-determined breakout groups. While each group will discuss all of the questions outlined in the programme, they will do so in a different order to ensure each question gets sufficient consideration if some groups do not get round to discussing all four.

**SSAC Working Group Members**
Julian Jones – SSAC Chair
Graham Kerr – SSAC Member (Space Project Lead)
Louise Horsfall – SSAC Member
Connor Blair – SSAC associate member
Colin McInnes – University of Glasgow
Javier Martin-Torres – University of Aberdeen
Anton Dubenko – SSAC volunteer, University of Edinburgh
Shrawan Jha – CENSIS

**Roundtable Attendees:**

Alastair McInroy
Andrew Mount
Andy Campbell
Benjamin Wells
Bill Wood
Craig Clark
Daniel Smith
Ellie Ebrahimi
Hina Khan
Hugh Hunter
Julian Dines
Karen Wilson
Kristina Tamane
Malcolm Macdonald
Matteo Ceriotti
Matthew Warden
Paul Winstanley
Peter JW Anderson
Rosa Santomartino
Ross Donaldson
Scott Wilson
Sharon Lemac-Vincere
Stewart Miller

**Roundtable Observers:**
Anton Dubenko – SSAC working group
Connor Blair – SSAC associate member
Graham Kerr, SSAC Space Project Lead
Javier Martin-Torres – SSAC working group
Julian Jones, SSAC Chair
Scott McClelland, Scottish Government
Shrawan Jha – CENSIS

**Breakout Group Chairs**
Colin McInnes – SSAC Working Group Member
Louise Horsfall – SSAC Working Group Member

**Breakout Group Scribes**
Jennifer Gordon – Scottish Government
Rory McGregor - Scottish Government

**ROUNDTABLE BREAKOUT GROUP NOTES**

**Breakout Session 1 - Opportunities, risks and policies**

**Where are the greatest economic opportunities for Scotland in the longer term (10-20 years) and what do we need to do now to position our sector to take advantage?**

**Infrastructure**
- Concentrating on existing strengths, Scotland could put infrastructure in place to support existing companies, start-ups and incoming investors to create the right path to scale up.
- The Scottish space sector is made up of mainly SME's who need a more supportive infrastructure, shared spaces/labs for hardware development, scaling up satellite production etc.
- Scotland has strong expertise in satellite manufacturing and if companies here cannot keep up with the right infrastructure to cope with large constellations we will fall behind.
- Need to make better use of existing facilities – National Robotarium, National Manufacturing Institute Scotland (NMIS) and Universities that have facilities that could be used for collaboration and bringing together academia and industry.
- Main market seen to be in-situ resource utilisation, which spans both human and robotic exploration. Otherwise in the broadest sense - power networks and defence seen as core activity currently and continue to represent key opportunities for the foreseeable future.
- Defence in particular seen as a driving factor in the sector, eg Ukraine and the growth of military customers for launch capability - all equally applicable to climate resilience and net zero transition.
- Also lunar and martian economies - Scotland could use overarching NASA programmes associated with these to leverage opportunities for Scottish companies.

**Sustainability**
- Sustainable space is an area where Scotland is already leading following the publication of the world's first Sustainable Space Roadmap. The Environmental Taskforce are working to support the use of space data for climate mitigation and to support the space sector to be more green through innovative design. There is an opportunity here to lead the way internationally.
- Growth and sustainability need to work in tandem.
- Industry to remain mindful that while sustainability is important it should not restrict small businesses so much so that they are not commercially sustainable.

**Space data applications**
- Space data has applications in the commercial market and PwC recently published a report on applications of space.

**Collaboration**
- Better coordination between industry and academia could support spin-outs.

**Parallel technology to be harnessed**
- Scotland also has real strengths in photonics, laser communications, quantum communication and sensing, science missions, space robotics, cybersecurity and life sciences and there is an opportunity to harness these parallel technologies through better coordination and communication.
- Robotics was highlighted as a major opportunity given experience of UK Astronomy Technology Centre, NMIS and the National Robotarium as well as the existing intersections between space and robotics in simulation and emulation, in-orbit servicing, asteroid mining, constructing satellites at scale.

**Monitoring and understanding of landscape**
- Increase understanding of what exists in Scotland in design and certification.
- Opportunity to monitor what others are doing and build on this.
- Increase understanding on international research.

**Universities**
- Opportunity to showcase Scotland's flagship projects to attract international talent, for example University of Aberdeen has an instrument on Mars and are currently running a project with the Japan Aerospace Exploration Agency (JAXA).
- Opportunities in future space missions given strong history:

  - James Webb Telescope
  - European Space Agency's (ESA) Laser Interferometer Space Antenna (LISA) and PLAnetary Transits and Oscillations (PLATO) missions

- The move to small satellites will drive further opportunities in science missions.

**In-Space Missions**
- Scotland is well placed to be a gateway to developing infrastructure in space, lunar missions and in-orbit servicing etc by off-earthing workforce in construction and expertise in oil and gas sector etc. These are all opportunities that should be developed.

**What are the risks and barriers to stability and growth in the Scottish space sector and how can these be overcome.**

- Need to be careful that the commitment to sustainability doesn't hinder young and small companies to unsustainable levels.
- Competition of pace of development in the rest of the world
- Lack of infrastructure/facilities, or access to, for young and small companies that are looking to scale up.
- Lack of equality and diversity in the sector
- The encroachment of 5G on space, due to congestion in the RF spectrum with ever increasing demand for greater capacity. Need to protect the allocation of the electromagnetic spectrum.
- Finance - Creating a full end to end eco-system should mean also being able to raise the required finance wholly in Scotland. Cannot do this currently and is considered a risk that has led some SMEs locating HQs outside Scotland.

- Getting the mix of inward investment right - eg not bringing in other companies that undertake activity that's already happening in Scotland. We've got a lot of what we need already - we should just grow that.
- All individual ingredients to grow the space sector are here but they could perhaps be better integrated. The key is recognising the capabilities we have and connecting them together.

**How can Government (UK & Scottish) best support the space sector in Scotland?**

- Increased funding from the UK for infrastructure that can encourage and supplement private investment.
- More agile and a better balance of UK Space Agency investments in infrastructure across the UK.
- Investment in shared facilities (lab space particularly) for scale up.
- More support for better equality and inclusion across the sector.
- More detailed information on government needs that can be supported by space applications, to better inform research and development in the industry in creating solutions.
- Notion that concentration needs to be less on less grants tied up in unnecessary T&Cs, and move to focus on contracts for services for government.
- Government needs to be a better customer *and* a better partner with a "three pillars" approach that could build a programme of platform delivery for services undertaken with a holistic approach to the sector. That government backing would also serve as a de-risker for delivery.
- Scaling needs to be addressed and it was felt that there is a large piece missing between support provided for startups/large enterprises and those companies in the middle ready to go to next stage of growth.
- Support for space sector startups – felt to be less support at the much higher risk pre-company stage, which are more capital intensive than other sectors.
- Procurement currently a challenge around accessing to get onboard the frameworks (especially in UK level). More support felt to be needed for entering those UK level platforms.

**How is legislation likely to impact the space sector and how can Scotland help influence local and international policy and standards?**

- Current licencing processes in the UK are far behind those in the US in terms of timing and number of launches allowed.
- Improvements required licencing process to allow the sector to react and respond to the commercial opportunities created by more rapid launch.
- Acknowledgement that if Scotland wants to have influence, then it needs a presence in space - difficult to influence anything if not a player.
- However, also acknowledged that once the standards are set, they tend to favour the industries in the county that originated the standards. Key is working out the most constructive way for Scottish entities to interact regulation at the UK level.
- Broad consensus that sustainability is a key area where Scotland can have influence. Scotland has been successful in positioning that wider sustainability conversation - not just in the UK but at a global level. We have earned our right to

sit at table and global agencies coming to us. We should therefore be using that position to leverage policy in those areas.

- But also an awareness of the need to be careful on sustainability since there is a risk of being outcompeted by those actors less concerned in this area (eg China and Russia). Crucial at this point in the sector's development to ensure the sector is commercially successful and "wash its own face".

**Breakout Session 2 - Technologies, people and working together**

**In which relevant areas of research are we world-leading and how can we best enable the adoption of this for impact in the Scottish space sector?**

- The University of Edinburgh is one of Europe's largest centres for AI research.
- Scotland is leading in the gaming sector which can offer data visualisation for space data.
- Scotland has strengths in Quantum and Photonics, with Craft Prospect and University of Strathclyde leaders in the sector. Opportunity for funding from UK Spending Review 2025 – 28.
- Strengths in advanced manufacturing, additive manufacturing, robotics and in orbit manufacturing are all areas that can be built on.
- The University of Glasgow is researching space technologies and find that space is a rallying point for many cross over technologies.
- Existing strengths in space science and research in gravitational waves can drive technology into new applications. Scotland is involved in the 30-year funded ESA project LISA.
- Space science and research opportunities to link up with industry in satellite manufacturing to increase robustness to withstand space weather in Low Earth Orbit.
- There is a huge amount of existing IP in universities that has not been commercialised. There is a need for more IP protection, greater business support for researchers.
- There is an opportunity to create a mechanism for sharing information about what research IP is available with potential consumers.
- There is a gap in support available for getting research ready for commercialisation, which can normally be a costly and timely process.
- There is existing opportunity for more Knowledge Transfer Partnerships which are not currently utilised.

**How can Scotland's space sector support sustainability and contribute to broader national and international goals in areas such as climate change, AI, technology innovation, and education?**

- Space can support sustainability in 3 ways:

  - Use of space data to support climate monitoring and mitigation
  - Protecting the space environment and clearing up space debris.
  - Supporting the sector to be more sustainable on earth.

- Ultimately the space sector is a way to make everyone else net zero.

- There is a need for support and incentives from government to encourage businesses to be more sustainable and innovative in creating solutions.
- There is a need to raise awareness of how Scotland is already leading the way in terms of space sustainability but that we can change the dialogue by highlighting what Scotland is already doing.
- Defence aspects are a major threat to the space environment and there is more UK funding going to defence rather than civilian use of space.
- Need to acknowledge that we are currently in a negative point at the moment in terms of sustainability.
- The narrative of space as a leader in sustainability can act as a major attractor to future generations of skills.
- Sustainable technology and innovation can cross sectors.
- Industry already felt to be contributing to the conversation and the Scottish Sustainability Roadmap stands as a testament to that existing moral commitment.
- Work should continue to promote collective messaging around sustainability policy via the Environmental Task Force roadmap and strategy.
- Need for alignment of sustainability narratives across the UK. Strong suggestion that UKSA needs to not "re-invent wheel" in this area and instead build on work already done through Space Scotland.

**What skills are needed to support the current and future space sector and how can we ensure that the skills are available in Scotland?**

- Recognition that there is a disconnect between academia and industry in terms of what skills are required and communication needs to be improved through the creation of better forums.
- There are not enough technicians or young people coming through from colleges.
- There needs to be a balance of focus between Higher and Further Education to create the right mix of skills.
- Need to consider how AI will impact and influence the skills required in the future.
- Short term solutions include programmes/courses for reskilling and upskilling to be driven in partnership between industry and education.
- Longer term solutions for 20 year's time, need to focus on primary and secondary schools and college structures which can then be built into the future. Industry needs to work more closely with schools.
- Solutions need to create pathways throughout the school structure into a career and early intervention is critical.
- Promoting and raising awareness of the opportunities out there is important.
- More work required to increase diversity in the sector at primary school level.
- Speaking to parents is important as they are the biggest influencers on children.
- Education and industry to do more to encourage apprentices.
- We don't try to teach skills that individuals require in 5 years time.
- No real problems apart from Attitude Determination and Control System (ADCS) trained folk - Italy leading here. Struggle to hold on - v. competitive landscape. Don't get a ton of support through contracts?
- Cost of VISAs - costs of folk leaving for Mangata.
- Graduate programmes/CDTs - great ideas, struggle to support because trying to close gaps. City College in Glasgow - they have supported.
- Much greater collab between this and other sectors.

**Which collaborations nationally, and internationally, and between different disciplines and sectors, will become the most important for the Scottish space sector? How can we use these collaborations to further our involvement in larger space programmes worldwide?**

- Cross-sectoral collaboration felt to be important - Technology Scotland's Photonics for Space cited as a good practice example.
- Otherwise, ESA singled out as an entity where the priority for engagement as a collaboration partner needed to change – General agreement that the whole of the Scottish and UK eco-systems are not involved enough.
- Suggestion that UKSA could be better connected to ESA, and relationship should be more like that of NASA. Anecdotal evidence that those attending ESA events highlight a perceived lack of UK engagement.
- Scotland should also be collaborating more with individual agencies globally with Italian, German, and French national agencies all given as examples.
- Acknowledgement that post-Brexit the UKG brought UK back into Horizon and Copernicus programmes, however, the sector in Scotland is yet to feel any particular benefits.
- Scotland lacks a "proper" prime and there are benefits associated with one being located within our borders as a vehicle for generating opportunities for the wider supply chain.
- Notion was presented by one manufacturer that industrial thinking perhaps being too commercial orientated and doesn't work with "big science" community, stifling potential opportunities.