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# Report on the Activities and Findings of a UK-Africa Space Technology Knowledge Exchange Tour

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# Note of Thanks

The execution and success of this tour would not have been possible without the hosts, consultants, and team that worked together to make it a reality.

We thank the Research and Innovation Systems for Africa (RISA) Fund for their efforts in co-funding this initiative, and to the Research Institute of Innovation and Sustainability (RIIS) for facilitating the discussion and introductions.

We are appreciative to the following people for their hospitality and collaboration:

## Hosting teams who made our visits possible:

- Joanne Wheeler – Earth Space Sustainability Initiative
- Keeley Scott – The Royal Aeronautical Society
- Sam Bird – Seraphim Space
- Vinay Patel and Fiona Flanagan – Space Park Leicester
- Josh Barker – National Space Centre
- Maria Kalama, Florian Deconinck, and Aleix Megias – Open Cosmos
- Stuart Naylor and the Satellite Applications Catapult team
- Carl Savage – European Space Agency Business Incubation Centre
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- Andrew Dickson – Scottish Development International
- Frazer Lang – Scottish Africa Business Association
- Derek Harris and Rosie Hull – Skyrora
- Darran Gardner – University of Strathclyde
- Aidan Darker – FCDO Science and Innovation Network

Finally, the pioneering delegates who took part in this tour, and made it the success it was.

# Executive Summary

Global Alliance Africa, a six-year project funded by UK International Development through Innovate UK's Global Challenge Research Fund (GCRF) and the Foreign, Commonwealth and Development Office (FCDO), recently organised a knowledge exchange tour to the UK for key space sector stakeholders from Kenya, Rwanda, and South Africa. The tour aimed to foster collaboration between the UK's advanced space sector and the visiting countries, emphasising ecosystem building, partnership opportunities, and addressing common challenges.

This report outlines the design of this knowledge exchange tour, maps the learnings captured, and unpacks the value-add it provided to the stakeholders across each of the participating territories.

Events in this tour were tailor-made to cover diverse aspects across the whole space-technology value chain, from the technologies going up into space, how the data is collected and analysed, and how that data is then used for social impact and business models down on Earth. These aspects included space sustainability, investment opportunities, academic collaborations, rocket manufacturing capabilities to downstream applications, and how to enable the creation of these in Africa. The structure of the tour is shown in Figure 1 below.

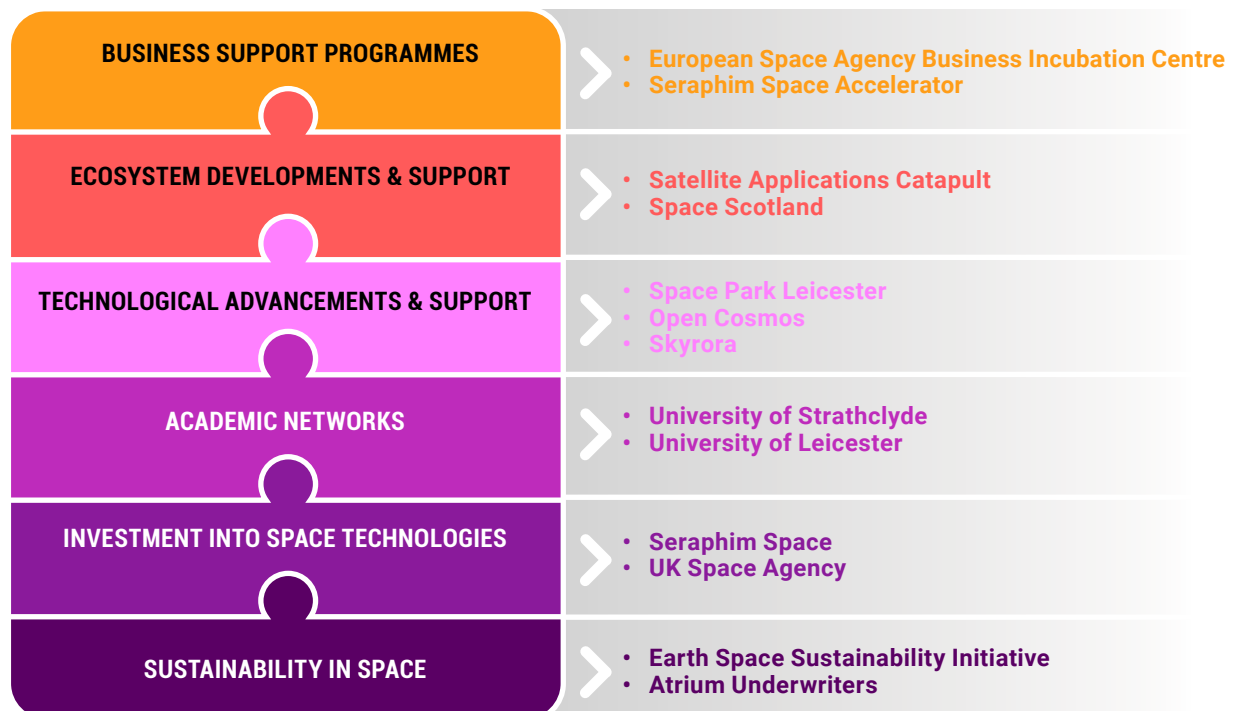


Figure 1: The structure of our tour, beginning with sustainability and building between each puzzle piece of the ecosystem.

As the events were hand-picked, so were the delegates that attended the tour. South Africa, Kenya, and Rwanda have been identified as the fastest growing space-technology markets in Africa, and delegates were selected from each country that are spearheading technology or business development in these respective countries. Seeing as space technology has high potential to add value across borders, two stakeholders who take a **Pan-African approach to their work** were also included. **The delegates selected for this tour were:**

### South Africa

- Janusha Singh – Wanscan Consulting
- Jean Pitot – Aerospace Systems Research Institute

### Kenya

- Charles Mwangi – Kenya Space Agency
- Aaron Nzau – Sayari Labs
- Kizito Odhiambo – AgriBORA

### Rwanda

- Albert Mugisha – Rwanda Space Agency
- Wilson Kagabo – Locus Dynamics
- Sarah Rukundo – Westerwelle Start-up Haus Kigali

### Pan-Africa

- Imraan Saloojee – Research Institute of Innovation and Sustainability
- Etim Offiong – African Space Leadership Institute

Feedback from delegates and hosts highlighted the success of the tour in identifying areas of focus, potential collaborations, and opportunities for innovation in both the African and UK space sectors. Additionally, the comradery amongst the group was electric and noted amongst various hosts within the UK, which shows great potential for future collaborations.

### Key takeaways from the tour

- South Africa has world-leading talent and technological capabilities within the sector. How do we showcase this?
- Kenya and Rwanda are both African leaders within this sector. How do we enable them to maximise social impact through space technology capacity development?
- Sustainability on Earth and in space are key for the sector – this needs to be implemented from the ground up to be entrenched in the development of new businesses.
- Skills, capacity building, and business support are key for the survival of the industry.
- There are various cross-industry collaboration opportunities, from water, waste, climate change mitigation, energy, medicine, tourism, and more.

The tour highlighted the immense collaborative potential across various industries, and how Africa and the UK can complement each other in terms of geographical location, current in-house skills and technologies, and different market needs.

### Key gaps identified in the global space technology industry during this tour included

- Skills development for the sustainability of the industry
- The design and implementation of regulatory frameworks
- Sustainable practices on earth and in space.

### Opportunities and next steps

- Set-up of communications for continuous interaction with and between delegates and hosts.
- Develop a space capabilities catalogue for Africa, in partnership with Satellite Applications Catapult.
- Develop a strategy or plan on business incubation support in Africa for space technology application businesses, or to build pipeline for UK investors and business support programmes to support African businesses.
- Develop international partnerships that assist Africa in using well priced space technology data for applications.
- Identify data management opportunities.
- Build out more opportunities for Africa's youth to access the space sector.
- Host more networking events that bridge the gap between the UK and African space technology companies.

The tour showcased the potential for collaboration and knowledge exchange between the UK and African space sectors, laying the foundation for future partnerships, economic growth, and sustainable space practices. Future initiatives include possible events, follow-on knowledge exchange tours, and collaborative projects to harness the full potential of space assets for societal and economic benefit.

# Tour Mission Overview



The Global Alliance Africa team - in partnership with the Research and Innovation Systems for Africa (RISA) Fund and facilitated by the Research Institute of Innovation and Sustainability (RIIS) - organised a knowledge exchange tour to the UK for key stakeholders in the space sector from Kenya, Rwanda, Nigeria, and South Africa. The UK's space sector is a world-leader in developing space technologies and innovations, particularly in key areas such as new launch capabilities, financing, legal, the entrepreneurial ecosystem, and extensive industrial networks.

The primary focus of this tour was to showcase these capabilities with an emphasis on learning about the UK's ecosystem building approach, while fostering new partnerships and opportunities for collaboration between the UK and the visiting countries.

Beyond strengthening the existing relationship between space agencies, we believe there is an opportunity to create connections within the industry and among academic stakeholders. This tour aimed to deepen participants' understanding of the common and unique challenges faced in different regions, fostering networks among various stakeholders by:

**Improving** the understanding of the value that technology and innovation ecosystems bring in building nascent industries (i.e. sharing the UK experience of its ecosystem development programmes, and the opportunities arising therein).

**Gathering** insights into policies, regulatory frameworks, and sustainability mechanisms that enable the growth of space ecosystems – covering not only space policy but also other related topics.

**Exploring** challenges related to nascent ecosystems, particularly in the space sector.

**Building** relationships between the UK and African space sectors and extending them beyond agency levels to include private and academic players.

**Assisting** in formalising partnerships and collaborations between UK and African entities.

# List of Delegates

Due to the size and exposure of the space sector, this delegation was hand-picked based on their pioneering roles in their respective space agency's strategic development, their technological capabilities within the country, and how they have harnessed space technology for positive impact in communities.

In addition to the selected industry leaders, this tour was the prize for the winner of Global Alliance Africa's inaugural NextGen Space Challenge. Run in partnership with the South African National Space Agency and Digital Earth Africa, the competition is for students in South Africa who are looking to go into a space-related profession. This programme aims to identify talent for the industry and enable new opportunities for the top candidates selected. Future iterations of the Challenge will run across additional countries as well.

DELEGATE	DESCRIPTION	GOALS / FOCUS AREAS
<b>KENYA</b>		
<b>Kenya Space Agency</b> Charles Mwangi Acting Director, Space Sector & Technology Development	Design and implement space strategy for Kenya	<ul style="list-style-type: none"> <li>Next generation in industry. "How to get the youth to understand the value".</li> <li>Dis-alignment between universities and market needs.</li> </ul>
<b>AgriBORA</b> Kizito Odhiambo, Founder	Provides finance and insurance to smallholder farmers by using satellite data to inform decisions	<ul style="list-style-type: none"> <li>Investment to scale solution to access more farmers, with an aim to reach 5,000 farmers by 2025, current reach is at 2,000 farmers.</li> </ul>
<b>Sayari Labs</b> Aaron Nzau	Satellite and data management company for Kenya	<ul style="list-style-type: none"> <li>Investment to build infrastructure needed to manufacture and launch satellites locally.</li> <li>Data management solutions for optimal storage and analysis of satellite data.</li> </ul>
<b>RWANDA</b>		
<b>Rwanda Space Agency</b> Albert Mugisha, Strategic Advisor	Design and implement space strategy for Rwanda	<ul style="list-style-type: none"> <li>Build business capabilities in Rwanda using satellite data for implementation in multiple industries.</li> <li>Build technical capabilities to own the space technology value chain locally.</li> </ul>
<b>Locus Dynamics</b> Wilson Kagabo, MD	Offers cyber security, teleport services, and drone services	<ul style="list-style-type: none"> <li>Integral systems design.</li> <li>Policy design around sustainability in space.</li> </ul>
<b>Westerwelle Start-Up Haus Kigali</b> Sarah Rukundo, Country Director	Start-up support incubator	<ul style="list-style-type: none"> <li>Build portfolio of space technology companies locally to house and capacitate through their programme.</li> </ul>
<b>PAN AFRICA</b>		
<b>African Space Leadership Institute</b> Etim Offiong, CEO	Africa's first space-focused think tank whose aim is to fill the gaps in space policy and decision making in Africa. Work closely with African Union	<ul style="list-style-type: none"> <li>Executive African Outer Space strategy which they co-designed.</li> <li>Educate African companies by offering courses on space policy.</li> </ul>
<b>RIIS</b> Imraan Saloojee and Louis Sopp	Innovation consulting firm focused on strategy and solution development	<ul style="list-style-type: none"> <li>Map the African space technology ecosystem.</li> <li>Develop partnerships and pipeline for their Earth Observation challenge run yearly.</li> <li>Develop a network of business support houses for space technology companies in Africa.</li> </ul>
<b>SOUTH AFRICA</b>		
<b>Wanscan Consulting</b> Janusha Singh, Owner and Director of ZASPACE	Industry body for space technology companies in South Africa, and a geospatial consulting firm	<ul style="list-style-type: none"> <li>Collaboration opportunities between downstream and upstream for the build of solutions.</li> <li>Enable cross-sectoral efforts for space technology.</li> </ul>
<b>Aerospace Systems Research Institute</b> Jean Pitot, Chief Engineer	Building South Africa's first sovereign launch capability – by 2028	<ul style="list-style-type: none"> <li>Opportunities for technology development collaboration.</li> <li>Enable deployment of programmes to make South Africa an attractive location for space technology skills.</li> </ul>
<b>NextGen Space Challenge Winner</b> Micaela Davids	Fourth year aeronautical student	<ul style="list-style-type: none"> <li>Learn about opportunities in the industry.</li> <li>Potential post-graduate opportunities.</li> </ul>

# Tour Summary

MONDAY, 4 DECEMBER – LONDON	
Event 1	Innovation and Sustainability in Space
Host	Earth Space Sustainability Initiative



Figure 2: Group photo of the delegates and UK guests at the Space Sustainability event

Space sustainability was the beginning point of the tour, due to its importance for the survival of the sector. The Earth Space Sustainability Initiative (ESSI) is pioneering the design of the regulations around this and has a good understanding of the industry players involved in making this happen. For this event, ESSI brought these players together to paint a picture for the delegates on how this strategy is being developed, and what to keep in mind for their own strategies.

PRESENTING COMPANY	MISSION	NOTEWORTHY POINTS
Earth Space Sustainability Initiative	Works with the space agency to train countries for space sustainability – assessment appraisals and reinforcement	<ul style="list-style-type: none"> <li>Investors require Environmental, Social and Corporate Governance (ESG) goals and plans, from an insurance and finance angle.</li> <li>Aim to foster research and development for sustainability.</li> <li>Building principles with the British Standards Institute (see Figure 3 below). Have built the framework and launch principles, will build dark skies and rendezvous and proximity operations (RPO) in 2024.</li> </ul>
Atrium Underwriters	Offer space insurance	<ul style="list-style-type: none"> <li>Launcher of vehicles responsible for any liability insurance.</li> <li>Asset insurance measured at the cost to replace launch, meaning very high premiums.</li> <li>Currently \$25 billion insured in orbit, currently \$4 billion in lower earth orbit (LEO).</li> </ul>

PRESENTING COMPANY	MISSION	NOTEWORTHY POINTS
UK Space Agency	Mission – improve lives with space	<ul style="list-style-type: none"> <li>Regulation a key enabler for industry.</li> <li>Working with New Zealand Space Agency on consensual debris removal.</li> <li>R&amp;D into space-based solar power.</li> <li>Priority areas:                             <ul style="list-style-type: none"> <li>Launch</li> <li>Capacity building for next generation</li> <li>Earth observation</li> <li>Space safety</li> </ul> </li> </ul>
Clear Space (Innovative Start-Up)	Sustainable use of space – active debris removal	<ul style="list-style-type: none"> <li>Research and development of mechanisms to remove space debris from orbit.</li> <li>Maximise use of satellites in orbit</li> <li>There are 8,000 satellites currently in space, this number is projected to reach 100,000 by 2030.</li> </ul>
Lumi Space (Innovative Start-Up)	Sensor deployment for understanding orbit landscapes	<ul style="list-style-type: none"> <li>Build satellite range measuring stations to see where satellites are in orbit.</li> <li>Change the current status quo from a warning system for collisions to manoeuvre directions to avoid impacts and damage on satellites.</li> </ul>
Other guests	<ul style="list-style-type: none"> <li>GNOSIS</li> <li>Astro</li> <li>Lloyds of London</li> <li>Avanti Space</li> <li>Price Forbes</li> <li>UK Space</li> </ul>	

### ESSI Space Sustainability Principles

Framework	Umbrella document setting out the scope of the main space sustainability principles and definitions.	Finance Insurance Law and regulation Environmental, social and governance
Spacecraft design, manufacture and propulsion	Design, procurement and supply chain; quality assurance and product assurance Automation and robotics in manufacturing and testing; testing and approval processes Orbital selection, spacecraft, size, geometry, attitude, visual brightness, retroreflectors; propulsion and fuel	
Launch	Launch environmental impact; launch safety approval processes Launch system propulsion and fuel; disposal of upper stage	
Supporting operations in space and space weather	Operations, trackability, methods for tracking satellites, collision avoidance Space Situational Awareness; space weather monitoring and effects Space traffic management, international coordination, traffic modelling Data, AI, information sharing, tracking analysis, establishing probability of risk CNI, direct and effective control, control of distributed architecture	
Rendezvous and Proximity Operations	Rendezvous and proximity operations (RPO) (in-orbit servicing, active debris removal, re-purposing and re-use) Capture technologies, power interfaces between servicer and client	
Supporting end of life and disposal	Re-entry, end of life, 'design for demise', graveyard orbit in GEO Environmental impacts of satellite and debris re-entry	
Space debris mitigation	Space debris mitigation (single satellites and constellations); satellite passivation, effectiveness of drag	
Dark skies	Cultural significance of the night skies; indigenous community engagement Minimising impacts on astronomical science, planetary defence	
Quiet skies and spectrum sustainability	Sustainable use of spectrum and RFI co-ordination Minimising impacts on astronomical science	
Earth monitoring	Monitoring Earth on all timescales and spatial resolutions; environmental regulations monitoring	
Resource management	ISRU planetary sampling; planetary protection	

Figure 3: The principal components of the Space Sustainability strategy for the UK

**EVENT 2 THE SPACE INVESTMENT OPPORTUNITY****HOST** Seraphim Space

**Figure 4: The delegation and hosts at Seraphim Space who specialise in “turning science fiction into science fact”**

As an investor and accelerator only focused on space technologies, Seraphim Space gave the delegation a good understanding on how they manage and grow their portfolio, and what the opportunities are in terms of investment.

SERAPHIM AREA OF BUSINESS	NOTEWORTHY POINTS
Business model	<ul style="list-style-type: none"> <li>• Founded in 2018 as a private fund. In 2021, became first ever public fund (£250 million first valuation).</li> <li>• Went public to remove time constraints of investment outcomes within 10-year cycles – space technologies need more time to grow.</li> <li>• Profits are derived from share price growth, and able to speak to long-term value, investments and returns. These are important for the space sector, as technologies often take longer than normal financial cycles to grow effectively.</li> <li>• African companies currently underrepresented.</li> </ul>
Why space, why now?	<ul style="list-style-type: none"> <li>• Space is the next industrial revolution.</li> <li>• High social impact opportunity.</li> <li>• Market is a \$trillion opportunity.</li> <li>• “Space tech makes the world as we know it go round”.</li> </ul>
KEY THEMES	<ul style="list-style-type: none"> <li>• Global security.</li> <li>• Climate and sustainability.</li> </ul>
All investments linked to Sustainable Development Goals (SDGs)	<ul style="list-style-type: none"> <li>• Space R&amp;D manufacturing.</li> <li>• Moon shots.</li> </ul>

SERAPHIM AREA OF BUSINESS	NOTEWORTHY POINTS
Space index investment data	<ul style="list-style-type: none"> <li>• Big increase in investment since 2020.</li> <li>• Seraphim builds a space ecosystem map yearly on players in the market.</li> <li>• Downstream applications hold 40% of total investment, mostly climate related (carbon credits, logistics, etc.).</li> <li>• Key to being supported by a VC firm:               <ul style="list-style-type: none"> <li>o Right team to execute the vision.</li> <li>o Market size must be big enough.</li> <li>o "Secret sauce" IP, something that stops duplication of idea.</li> </ul> </li> </ul>
Seraphim Accelerator programme	<ul style="list-style-type: none"> <li>• Top 2% of applicants with most potential are selected.</li> <li>• 12-week programme, assist in building pitch deck and fundraising strategy.</li> <li>• Aim – raise funds within 12 months of exit.</li> <li>• Phases: Validation, Design, Showcase.</li> <li>• Agnostic to stream.</li> </ul>

We also heard from two companies within the accelerator:

COMPANY IN ACCELERATOR	INDUSTRY AND ACTIVITIES
Aquascope	<ul style="list-style-type: none"> <li>• Water quality monitoring – B2B software as a service platform that digitises and verifies whole river basins.</li> <li>• Aim to scale and sell in Europe in 2024.</li> </ul>
Optimal Cities	<ul style="list-style-type: none"> <li>• Use satellite data to inform urban planning and smart cities.</li> <li>• Net zero focus on planning for cities, help governments and municipalities optimise design for health, safety, and logistics optimisation.</li> <li>• Have co-funding available to implement in other countries.</li> <li>• Optimal cities can collaborate with African countries in enabling better design of cities to tackle health and access to food and water issues.</li> </ul>

#### SERAPHIM'S UNDERSTANDING OF THE SPACE REVOLUTION



## TUESDAY, 5 DECEMBER - LEICESTER

Event 3 **Space Park Leicester Vision & Ambition**Host **Space Park Leicester**

**Figure 5: The delegation and hosts at Space Park Leicester**

As part of the University of Leicester, Space Park (also known as "Space City") is a collaborative community of industry, academics and students working together to drive growth in space and space-enabled sectors. This was a key visit for the delegation to understand the link between academic institutions, and how it feeds into the innovation ecosystem within the sector. The delegation toured the facilities and saw the end-to-end capabilities in technology development. Additionally, Professor Heiko Balzter, Director of Institute of Environment Futures, spoke on their transformative research.



Understanding the Space Park:

AREA OF INTEREST	KEY POINTS
The beginning of Space City	<ul style="list-style-type: none"> <li>• Opened in March 2021, was planned for 60 years before the launch. Shows the time dedication needed for such a vision to actualise.</li> <li>• Have developed over 60 satellites.</li> <li>• Have MoUs in place with Rwanda and Kenya for collaboration.</li> <li>• Projected to contribute £750 million to the UK space sector.</li> </ul>
Leicester Space Park facilities and offerings	<ul style="list-style-type: none"> <li>• Offer end-to-end capabilities and will offer launch capabilities in the next two years.</li> <li>• Aim to enable Space 4.0 (in-line with Seraphim's vision shown above).</li> <li>• Building an incubation centre – Space Park Core Hub.</li> <li>• They have a space commercialisation engine through the Satellite Applications Catapult.</li> <li>• Offer an M.Sc. in Exploration Systems.</li> </ul>
Leicester's focus areas	<ul style="list-style-type: none"> <li>• Earth observation.</li> <li>• Planetary science.</li> <li>• Space instrumentation (space research centre).</li> <li>• Nuclear power systems in space.</li> <li>• Astrophysics (had its own division since 1960).</li> </ul>

Understanding the Institute of Environmental Futures:

***"Who carries the cost of environmental damage?"***

Their offering	<ul style="list-style-type: none"> <li>• Transformative research – turning knowledge into impact.</li> <li>• Pathways to resilience.</li> </ul>
Why they are at Leicester Space Park	<ul style="list-style-type: none"> <li>• Access to diversity of applications</li> <li>• Can co-design projects with companies – take an industry-led approach and engage with them during the research.</li> <li>• Use a transdisciplinary approach.</li> </ul>
Research focus themes	<ul style="list-style-type: none"> <li>• Habitable earth.</li> <li>• Climate justice.</li> <li>• Environmental loss.</li> <li>• Climate risks.</li> <li>• Resilience (cross-cutting).</li> </ul>
Key notes of wisdom	<ul style="list-style-type: none"> <li>• Cluster development requires an 'organisational structure'.</li> <li>• Two areas to focus on for high impact environmental change is transport over long distance and energy usage – households and industry usage.</li> </ul>

## WEDNESDAY, 6 DECEMBER – HARWELL

Event 4 Harwell Science &amp; Innovation Campus

Host Innovate UK Satellite Applications Catapult

The IUK Satellite Applications Catapult has been a key player in the growth of the UK space ecosystem. The team presented their ability to build and sustain these clusters, and their role in developing the industry.

## How the Catapult works

- One of the UK's nine uniquely established catapults, to transform the UK's capability for innovation in specific areas.
- They work to energise the market, empower technology development, and enable business growth.
- Closely linked to the UK Space Agency.
- Sits at the core of ecosystem development.
- Offer connections to enable downstream applications of technology, propulsion, and launch capabilities.

## How the Catapult supports cluster development nationwide

- Match businesses with market opportunities in their area – bring people together locally.
- Focus on developing local problems that local communities will pay for.
- Engage communities with 'humans on the ground' – place a local point of contact called "space enterprise community leads" that use events, workshops, and interviews to map and understand and connect with the landscape.
- These community leads then feed the gaps to the Catapult, who assist with skills, technology, scaling, etc.

## Catapult resources

- Community platform.
- Cluster directory.
- FDI resources.
- Cluster governance workshops.
- Space capabilities catalogue – looking to build out internationally.

## Skills development to ensure future needs of the industry are met

- Space skills advisory panel, each area has a representative including HR, legal, etc.
- Space academic network in Bristol and Leicester Universities.
- Space university network – those who teach earth observation, geography, etc.

## Their skills development framework includes

- Workforce foresighting – speak to educators, employers, and research foresighters.
- Apprenticeships – onboarding and upskilling.
- Early career engagement.
- In-work training.
- Formal training.

## Business visit within Harwell

Host Open Cosmos



**Figure 6:** The delegation ready to go into the clean room facility where Open Cosmos assembles their satellites.

Open Cosmos is a satellite manufacturing company housed by the Satellite Applications Catapult, using clean room facilities to manufacture and test satellites. This visit was a highlight of the tour, for the following reasons:

- Their business model is built around the concept of an 'open constellation', a mutualised satellite infrastructure, created to enable organisations to share the data generated by satellites. If a satellite is launched through them, access to the data collected from all the other satellites in their constellation is obtained, meaning more data at a fraction of the cost of launching additional satellites.
- They were very open about their design, manufacturing, and testing processes. The delegation got to tour and see the different missions currently being built, which included parts designed by a South African company in Western Cape, Simera Sense.
- They also store and analyse this data on their platform, DataCosmos, for members to access. This is a standalone product, should a user not want to launch their own satellite.
- They manage the full mission process, and are open to alternative governance models and national capacity building, based on which territory the user operates in.

There is an eagerness for Open Cosmos to work with African entities, as it gives them access to these markets, enables the enrichment of the data they provide companies, and gives Africa access to affordable, quality data. This eagerness is mutual, and conversations have already begun to establish more formal collaborations.

Examples of these are:

- The Aerospace Systems Research Institute aim to work with Open Cosmos to understand their needs from a launch perspective, to inform the design of their ports and rockets.
- Wanscan Consulting is looking to add a satellite to their constellation.
- Kenya and Rwanda's Space Agencies will explore the data platform to understand if it meets their requirements as countries, and how they can collaborate in future to enable more rich data capture in these territories.

## EVENT 5 BUSINESS SUPPORT GROWTH FOR THE SPACE INDUSTRY

HOST European Space Agency (ESA) Business Incubation Centre

### Business Incubation Centre overview

- Describes itself as the glue for all leading space companies, incl. UKSA, ESA, SAC, RAL Space, STFC, and the University of Leicester.
- Programme is 18 - 24 months.
- Alumni network membership for 10 years - their goal is to make a cluster of companies.
- Entry level - TRL 3 - 4 is the sweet spot.
- Over the last five years, have taken 15 companies a year, with a 95% survival rate and more than £210 million in private investment.
- Over 20 business incubation centres globally - meet twice a year to develop the programme based on best practice.

### How the centre supports start ups

- £52,000 to start (0 equity funding).
- £10,000 voucher for facilities access and technical consultancy.
- Commercial coaching and IP support
- Facilitate introductions to investors and start-ups.
- Provide office space, including labs – flexible leases for time, size, and in case they need to pivot ideas.
- Companies can use promotion of ESA BIC UK brand.

THURSDAY, 7 DECEMBER – EDINBURGH

Event 6 **The Scottish Opportunity**

Host Scottish Parliament, facilitated by Yvette Hopkins

The delegation had the honour of taking part in a round table discussion with Honorary Members of the Scottish Parliament, Cabinet Secretary Angus Robertson, and Members of Scottish Parliament, Michelle Thomson and Beatrice Wishart. Each country had the opportunity to explain their ecosystem, their challenges, and key goals they aim to achieve in the coming years.



*Figure 7: The delegation on the steps of the Scottish Parliament with Cabinet Secretary Angus Robertson, and MSPs Michelle Thomson and Beatrice Wishart*

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Scotland	<ul style="list-style-type: none"><li>• Sustainability is a key focus.</li><li>• Has world-leading launch capabilities that were created from existing infrastructure in the oil and gas space (SaxaVord Space port).</li><li>• Community engagement leads the decisions around how to manage environmental impact of launch.</li><li>• Parliament aims to grow the brand of Scotland.</li><li>• Focus on empowering the 'virtuous triangle' of academia, industry, and government to get risky businesses on the right path.</li><li>• Key focus areas for space sector: Data, financing, and collaboration for growth.</li><li>• Advice from Cabinet Secretary was to give government a proper understanding of the capabilities space technology has.</li></ul>
African context	<ul style="list-style-type: none"><li>• In need of infrastructure development to enable own capabilities.</li><li>• International partnerships are key for growth.</li><li>• Ecosystem has grown over the last 10 years due to the social applications of space technology – how do we empower these entrepreneurs on the ground?</li><li>• A note on the success of the Scottish clusters.</li></ul>
Kenya	<ul style="list-style-type: none"><li>• Aim for space for climate solutions.</li><li>• Wants to enable policy design through this data coming from satellites, to inform environmental, social, and economic policies.</li></ul>
Rwanda	<ul style="list-style-type: none"><li>• A new sector, and hopeful to 'start right' and learn from the mistakes other territories have made.</li><li>• A young population, want to enable entrepreneurship opportunities.</li></ul>
South Africa	<ul style="list-style-type: none"><li>• Skills shortage and pipeline development a huge barrier to the growth of the sector. Talented university students go overseas when they graduate.</li><li>• There is currently no regulatory framework for space launch.</li><li>• Midstream capabilities (data management and analysis) and component designs are world-leading, how do we get that onto the map? How do we foster and grow that talent in-country?</li></ul>

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<b>EVENT 7</b>	<b>THE SCOTTISH ENTREPRENEURIAL ECOSYSTEM</b>
<b>HOST</b>	Space Scotland

After hearing from Parliament on how they view the Scottish space ecosystem, our delegation took part in a round table discussion with various start-ups within Space Scotland – the cluster enabled by the Satellite Applications Catapult in Edinburgh. The session was free-flow, and the companies could discuss the differences between their support structures or come up with ideas on how to collaborate. Below are some key takeaways on their view of the ecosystem:

- Scotland’s main cities each serve a general purpose to the industry. Edinburgh is where the data processing and downstream companies are, and Glasgow houses the manufacturers, or those who make physical products.
- The cluster works together to help deliver the National Space Strategy (they all work towards one goal), and they have working groups to enable this.
- Cluster funding goes to sustainable space development, workforce development, and cross-sector knowledge exchange activities.
- Challenges identified within the support system for start-ups:
  - o Slow moving support
  - o Programmes are not properly designed and key stakeholders are not included.
  - o Little continuity of projects once the programme ends.
  - o Only think in one territory but should think globally when implementing these.
  - o All funding opportunities are focused on job creation, which hinders the application success of feasibility studies – not yet at the stage where they can hire others.
  - o Cost of filling in these applications are high – on average it costs £14,000 to apply, with only a 20% success rate.

Ideas identified for potential areas of collaboration:

- Scottish companies inform design of the Westerwelle Start-Up House Kigali.
- Build Scottish-Africa constellation, which includes private sector, banks, and government, for shared access to data.
- Create joint industry partnerships in-country for the different downstream applications.
- Share knowledge on risk mitigation work already being explored in Scotland. For example, ThinkTank Maths builds casualty risk models for landings, and does precision space traffic coordination, which is a strategic capability for governments with satellites in space.

Scottish companies present at the round table:

Omanos Analytics	Trade in Space	Ecometrica
Space Intelligence	Environment Systems	Bright Ascension
ThinkTank Maths	D-Cat	EOLAS Insight
Fire Arrow	Krucial	Space Scotland

Key connections were made here between the delegates, and collaborations are being explored from these discussions.

## FRIDAY, 8 DECEMBER – GLASGOW

**Event 8** Rocket manufacturing and launch capabilities**Host** Skyrora with SaxaVord Space Port

Skyrora is a private launch vehicle manufacturer servicing the demand for launch vehicles in the burgeoning small satellite market. They offer a wide range of rockets to meet certain needs and fuse their design with sustainable technologies while giving access to space for all.

The delegation was joined by CEO of the SaxaVord Space Port, the location where these rockets are launched from British soil. Below captures a summary of the information they shared on their business offering, constraints, and future plans.



**Figure 8: The delegation in the Skyrora factory with the hosting team**

**Skyrora rockets**

- Only rocket manufacturer in the world that still use the hydrogen peroxide kerosene engines.
- Finalising study on repurposing plastic into rocket fuel.
- Use a container to launch vehicles which enables rapid capabilities – can pack up and leave a site within a week after launching into space.
- Body components of their rockets are 3D printed on site.



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<b>Shetland Space Center</b>	<ul style="list-style-type: none"><li>• Operates like an airport – “pay for what you use” model.</li><li>• Conduct 30 launches a year.</li><li>• Do orbital and sub-orbital launches – 330-030 trajectories.</li><li>• CAA licenced.</li><li>• Have cleanroom facilities for assembling of satellites.</li><li>• Have two clients – the rocket companies and the satellite companies, they need to keep both needs in mind.</li><li>• Have no populations in overflight areas (only bodies of water).</li><li>• Offers the lowest launch premium in the UK.</li><li>• Have 350km aerospace available.</li><li>• Range infrastructure:<ul style="list-style-type: none"><li>o Fixed 5,5m S band telemetry.</li><li>o Mobile 1,5m S band telemetry.</li><li>o Fixed FTS L band antenna.</li><li>o Mobile range control room.</li></ul></li></ul>
<b>Space Port requirements</b>	<ul style="list-style-type: none"><li>• Must have 500m between launch pads in accordance with safety regulations.</li><li>• There must be 1.8km radius of clear safe distance around (not near communities), and 3.2km over the launch direction. This is to ensure any failed launches don't fall back down and damage infrastructure or hurt anyone.</li><li>• Weather plays a role in launches – cumulonimbus clouds stop launches due to too much static. (There are different weather elements in Africa that would affect launch capabilities).</li></ul>
<b>Licenses required to launch</b>	<ul style="list-style-type: none"><li>• Spaceport Licence (SIA).</li><li>• Launch (SIA).</li><li>• Range (SIA).</li><li>• In-orbit (SIA / OSA).</li><li>• Rocket Operator (ANO).</li><li>• A marine licence is also required to drop into international waters.</li><li>• International law is a factor when the trajectory of the rocket enters other territories. This is dependent on direction and altitude, and the definition of 'space' in that said country.</li></ul>

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**EVENT 9 THE ACADEMIC NETWORK IN SCOTLAND****HOST** University of Strathclyde

The University of Strathclyde runs a centre for space science and applications and is one of the largest space engineering groups in the European Union. The delegation had the opportunity to hear how they assist in the development of technologies, and from some of the companies within their ecosystem.

<b>How Strathclyde supports the ecosystem</b>	<ul style="list-style-type: none"> <li>• Supports spaceflight collaborations internationally – for example, Mexico Space Agency and NASA.</li> <li>• Builds the most space crafts out of anywhere in Europe.</li> </ul>
<b>How Strathclyde enables innovation</b>	<ul style="list-style-type: none"> <li>• Fuses capabilities across areas: <ul style="list-style-type: none"> <li>o Earth intelligence observatory.</li> <li>o An innovation collective.</li> <li>o A hub for transdisciplinary collaborations.</li> <li>o Connects challenges with networks and capabilities to find solutions.</li> </ul> </li> <li>• Connects with the end user from the beginning of design.</li> <li>• Provide academic support to client facing companies.</li> </ul>
<b>Strathclyde OSCAR programme</b>	<ul style="list-style-type: none"> <li>• OSCAR: Offshore Servicing Coordination and Assessment with Remote Sensing.</li> <li>• Decodes climate-induced displacement of communities – where are people going due to climate change?</li> <li>• This was integrated into Kenya's strategy as a foundational data layer, which informed new partnerships to unlock Kenyan potential.</li> </ul>

Companies within the community who have received support from the University

AAC Clyde Space (also in South Africa)	Spire
Craft Prospect	Alba Orbital

# Key Takeaways

## Political

The opportunity to collaborate on growing space sectors and industries across Africa and the UK would benefit from higher profile policy exchange through diplomatic channels, to discuss and unlock solutions to particular issues. For example, how can the UK space sector offer opportunities to the space work force in African countries.

## Security

If the workflow were to increase between the UK and Africa, conversations around export, ITAR, and safe partnerships will be required.

## Information & Data

It would be beneficial to increase collaboration and connections between universities and researchers in the UK and Africa on space technology. For example, as Rwanda builds out its antenna farms, the antenna build, placement and lessons learned around it are resident in some universities who are willing partners.

Access to quality data is a huge opportunity for African companies. This can be done by investing in collaborations that enhance Africa's launch capabilities, or by enabling their access to open constellations such as Open Cosmos. These open collaborations can serve as a stepping stone for African territories to strengthen their downstream capabilities through start-ups and SMME development, while they continue to build their upstream capabilities.

## Economic

Bilateral and multilateral conferences are needed to foster collaboration between African and European entities and enable access to larger markets. The delegates in this cohort are a great example of candidates who would be exemplars to establish these. However, equal opportunities need to be given to delegates from all countries with interest, rather than conferences being dominated by one region's agenda, for example Europe's.

## Regulatory

Regulation of the space industry globally is new, with most countries not having any real frameworks around this.

Establishing regulatory frameworks that support regional and international standardisation is key to shaping the future. Soon, we won't just be talking about airports; spaceports will become integral. However, the ultimate goal extends beyond space exploration; it's about translating incredible opportunities into impactful capabilities.

Policies and frameworks need to cover the whole value chain, from upstream, midstream, to downstream applications.

## Supply Chain

Africa has a significant opportunity to participate in the supply and value chains of the global space economy. Therefore, achieving sovereign launch capabilities on the continent is a necessity. Strides are already being made in this direction, but more funding and regulatory support is required to progress these.

South Africa specifically has developed world-class design capabilities, currently housed within companies active in the country. Work must be done to ensure sustainability of these companies to continue supply components, and to build their own.

## Social Impact

The applications of space technology assist to meet most, if not all SDG goals. This indicates value in assisting with building opportunities for companies within the sector.

The trillion-dollar opportunity also boasts high potential for job creation and sustainability of the market.

## Collaboration & Knowledge Sharing

To harness the full potential of space assets in our daily lives, fostering partnerships, collaborations, and knowledge sharing is critical.

## Sustainability

With approximately 8,000 satellites currently in space, this number is projected to reach 100,000 by 2030. Space sustainability must become a priority.

Areas to consider:

- Invest in sustainable approaches, manufacturing materials, and space debris removal to ensure the responsible growth of our presence in space.
- Enable the design and implementation of sustainable practices.
- Use space technologies to improve sustainability of applicable sectors.

## Talent Pipeline & Skills Development

Skills has been identified as a gap in every region within the sector. Work must be done to showcase the potential careers available to students, to ensure sustainability of the sector.

Universities and education institutes, due to their R&D capabilities, seem to be the 'hub' that enables this development into industry.

## Research & Development

Universities in South Africa and the UK are partaking in valuable R&D activities. It is clear within the UK ecosystem that these technologies are grown and enabled in the market.

The bridge between academia and industry in South Africa can be improved. We must look to adopt the cluster models used in the UK in Africa to enable the translation from research, to business, to positive social impact.

R&D hubs in Rwanda and Kenya (or access to these) would assist them in strengthening their space technology ecosystems.

## Cross-Industry Collaboration Opportunities

Agriculture and food security – sharing data for sustainable practices.

Water management and security – monitoring and analysis through earth observation.

Waste flow patterns monitoring (enable plastics recycling, as an example).

Climate change monitoring.

Weather forecasting for disaster management.

Mines and tailings dams monitoring.

Monitor of climate-induced displacement and movement of communities.

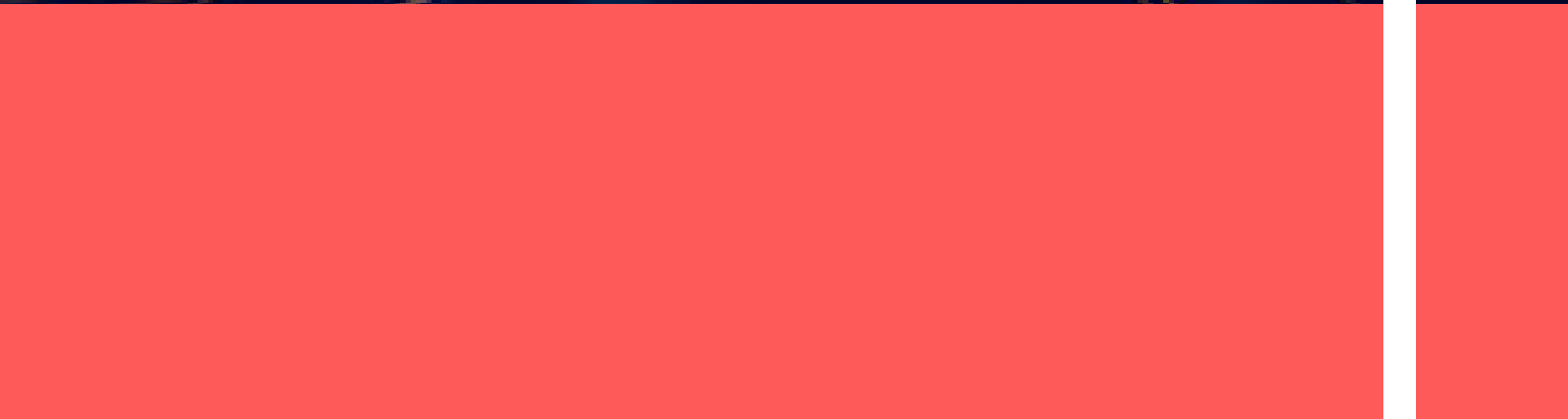
Monitor deforestation rates.

Optimise urban planning – traffic flow, residential and industrial areas for increased health and sustainability.

Medical and health care research.

Sustainability in space itself – removal of dead satellites.

Energy production and storage.





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