



# NORTH HIGHLAND & MORAY SPACE CLUSTER STRATEGY

Version 1

September 2021

# North Highland and Moray Space Cluster Strategy

September 2021

Developed for Caithness and North Sutherland Regeneration Partnership (CNSRP) through Caithness Chamber of Commerce (CCoC).

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# Table of contents

Table of contents.....	1
Foreword.....	4
Acknowledgements.....	5
Executive Summary.....	7
<b>Chapter 1 - Space: The economic opportunity.....</b>	<b>15</b>
1.1 The global opportunity.....	15
1.1.1 Size and growth of the global space economy .....	16
1.1.2 Private investment in space.....	18
1.1.3 Forecasts of economic value.....	19
1.1.4 Launch Activity Growth .....	20
1.2 The opportunity for the UK.....	21
1.3 The opportunity for Scotland.....	21
1.4 The opportunity for North Highland and Moray.....	22
1.4.1 Area Drivers.....	23
<b>Chapter 2 - Space: Sector needs .....</b>	<b>25</b>
2.1 Introduction.....	25
2.1.1 Jargon-busting: Clusters, Ecosystems & Hubs .....	26
2.1.2 Anatomy of the space sector – the three streams.....	27
2.2 The Space supply chain .....	27
2.2.1 Upstream .....	27
2.2.2 Midstream.....	29
2.2.3 Downstream.....	29
2.3 Skills for Space.....	30
2.4 Infrastructure .....	33
2.4.1 Energy .....	33
2.4.2 Digital.....	33
2.4.3 Transport.....	33
2.4.4 Real Estate and Facilities.....	34
2.4.5 Liveability.....	34
2.4.6 Geography – Space Launch-specific .....	34
2.5 Regulatory & Legal.....	34
2.6 Inward Investment & Access to Finance.....	35
2.6.1 Inward Investment.....	35
2.6.2 Access to Finance .....	35
2.7 Transferable Lessons from Case Studies .....	36
2.7.1 Employment .....	36
2.7.2 Supporting ecosystem development.....	37
2.7.3 Incentives.....	38

<b>Chapter 3 - North Highland and Moray 2021: The existing ecosystem .....</b>	<b>40</b>
3.1 The North Highland and Moray Space Cluster .....	41
3.2 Existing Supply Chain .....	41
3.3 Existing Skills and Talent .....	42
3.4 Existing Infrastructure .....	42
3.4.1 Energy .....	42
3.4.2 Digital .....	43
3.4.3 Transport.....	43
3.4.4 Real Estate and Facilities .....	44
3.4.5 Liveability.....	44
3.4.3 Geography – Space Launch-specific .....	45
3.5 Readiness of Local Economy for the Opportunities of space .....	45
<b>Chapter 4 - Highland &amp; Moray beyond 2021: Towards a Space Cluster .....</b>	<b>47</b>
4.1 Gap analysis .....	48
4.1.1 Supply of Services and Skills for Space .....	48
4.1.2 Infrastructure for Space .....	48
4.1.3 Summary.....	49
4.2 Synergies: UK and European network of Space Ports & Centres of Excellence .....	53
4.3 Synergies: Local Growth Priorities .....	57
4.4 Synergies: Existing Supply Chain & Talent.....	58
4.5 SWOT Analysis.....	60
<b>Chapter 5 - Space: The ‘size of the prize’ for North Highland and Moray.....</b>	<b>61</b>
5.1 Introduction.....	61
5.2 Assumptions .....	61
5.3 Deadweight, Displacement and Leakage .....	63
5.4 Multipliers .....	64
5.5 Growth Scenarios and Time Horizon .....	64
5.6 Timelines for modelling .....	65
5.7 Employment and Gross Value Added .....	65
5.8 Estimating the wider value and job impacts unlocked by activities at Space Hub Sutherland for the Space Cluster .....	66
<b>Chapter 6 - Space: A Vision for North Highland and Moray.....</b>	<b>69</b>
6.1 Vision & Objectives .....	69
6.2 Action Needed.....	70
6.2.1 Business Support .....	70
6.2.2 Skills & Education .....	71
6.2.3 Research & Development.....	72
6.2.4 Infrastructure.....	72
6.2.5 Governance (Space Leadership Group) .....	74
6.3 Funding & Inward Investment.....	74
6.3.1 Public Funding .....	74
6.3.2 Private Finance .....	74
6.3.3 Inward Investment.....	75

6.4	Recommendations .....	75
6.5	Measures of Progress .....	76



## Foreword

Foreword to the Strategy for the North Highland and Moray Space Cluster. By Ian Ross, Chairman of Caithness and North Sutherland Regeneration Partnership.



I am delighted to present this Strategy and Action plan for the development of a new Space Cluster in the North of Scotland, with a particular focus on the North Highland and Moray. This sets out a justifiably ambitious approach to taking forward the actions that have been developed in the area over the last few years.

The report recognises the vision that 'By 2026 North Highland and Moray will have established one of the most significant Space Clusters in the UK' and aims to deliver a set of actions that will see real activity and positive progress in the North of Scotland Space sector.

The report demonstrates the very effective and wide ranging partnership based approach to the formulation of the strategy and action plan, with over 20 separate organisations taking part. This includes the UK and devolved governments, agencies, industry, academia and community bodies. I would highlight the important formation of the local Space Leadership Group for the areas identified and consider this a key means of ensuring that the key actions and tangible benefits will be delivered.

The strategy builds on recent documents from the UK Space Agency and BEIS; and also the Scottish Space Leadership Council. Partnership working with these bodies will form an important part of the delivery of this strategy.

The development of this Strategy and the gathering of organisations aiming to create a working Space Cluster, demonstrates the real opportunity that exists with the key assets of a Spaceport; a Launch Vehicle manufacturer approaching an operational state; and crucially the wealth of skills and resources that the North of Scotland is well placed to deliver for an emerging Space sector. This is the right place with the right people at the right time.

I congratulate those that have brought this strategy forward and look forward to seeing the results of this work in developing the Space sector in the North Highland and Moray.

W.J (Ian) Ross OBE

CNSRP Executive Board Chairman  
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## Executive Summary

The purpose of this strategy is to set the high-level direction for the development of North Highland and Moray as a centre of the burgeoning UK commercial space industry – a space cluster. This strategy is driven by both ambition – and evidence.

The strategy reviews the global space economy, space sector needs; the existing North Highland and Moray ecosystem and the requirements and key focus areas pertaining to achieving a sustainable Space Cluster. Space Hub Sutherland has a valuable opportunity to take a leading position not only in the emerging small satellite launch sector and in the wider space sector. This is captured in the vision for the space cluster:

'By 2026 North Highland and Moray will have established one of the most significant Space Clusters in the UK'

The Strategy contains six chapters. These are:

- **Chapter one:** the economic opportunity on a global, national and local basis.
- **Chapter two:** space sector needs of the upstream, midstream and downstream segments and how those needs can be met in a number of areas.
- **Chapter three:** the existing ecosystem in the North Highland and Moray.
- **Chapter four:** what the area has to offer currently in meeting space sector needs.
- **Chapter five:** the economic opportunity, the size of the prize for the North Highland and Moray.
- **Chapter six:** the steps that should be taken to develop the local Space Cluster.

### Chapter one: the economic opportunity on a global, national and local basis

Commercial space activity is creating rapid changes within key organisations, funding models and sources, and technological advances. The global space economy, incorporating both commercial space activity as well as government spending by space faring nations, has grown at an average annual rate of approximately 7% to reach a total of nearly \$447 billion in 2020.

As an enabler for all other space activities, the orbital launch industry has been the focus of a great deal of attention in recent years. The reliable and frequent access to space is essential if there is going to be a sustained expansion of commercial activities in space. Nearly \$31 billion has been invested in more than 400 space companies by non-government sources of capital since 2011, and a new annual record of \$8.9 billion was set in 2020. Behind the headline figures, it is important to note that most private funding has flowed to a relatively small number of companies and almost all of the capital was dedicated to launch vehicle development and satellite manufacturing and operations.

A further challenge facing the space industry is that the sources of private capital are not very diverse with the majority from government funding and venture capital. Governments have consciously supported the growth of space start-ups, including through direct and indirect investment in incubators and accelerators, however many businesses that emerge from these programmes fail to secure the additional investment or sales revenue to enable them to thrive. The space sector needs to be able to attract funding from a more diverse range of

funding sources, including institutional investment and debt. To do so, requires clearer identification of risks and potential mitigations and business strategies that provide investors with multiple paths to generating returns. There is a need to educate private investors on how the space industry works and how to reduce the risks of space investments to an acceptable level. To ensure that stakeholders and potential funders can make informed decisions on how to manage their resources and policies the space sector needs to develop a more comprehensive and integrated approach to estimating its direct value and how it supports wider value creation through the services and products that it enables across society.

Supporting the steady increases in traditional launches, advances in technology combined with lower launch costs have led to a boom in nanosatellites (spacecraft weighing 10kg or less) and small satellites being launched. In the case of both small-satellite launch vehicles and spaceports, there will likely be a first-mover advantage that enables some participants to take a commanding lead, and there is now a global race to secure that position. In this respect, the UK is positioned well, with space legislation in place, a regulatory framework being formulated, two launch sites funded for development, and commitments from three launch operators. Space Hub Sutherland is in a particularly good state, with two launch operators developing vehicles specifically with the spaceport in mind, and the capacity to bring in additional operators.

The development of Space Hub Sutherland is a natural addition to the portfolio of space activities already present in Scotland, offering customers a complete value chain from design and manufacture to launch and operation of satellites.

*According to Size & Health of the UK Space Industry 2020, 17% of all UK space jobs are based in Scotland. Looking across the entirety of the Scottish space sector, the value in 2017 was estimated to be £2.5 billion, and there are ambitions to grow to £4 billion per year by 2030.*

Space Hub Sutherland will support this goal in the coming years by spurring the creation of new businesses headquartered in Scotland to be closer to Sutherland and other space industry clusters.

## Chapter two: space sector needs

To understand the needs of the space sector, and how North Highland and Moray can seize its opportunities, Chapter two of the strategy defines a model comprising of three supply chain “segments” of the space value chain – Upstream, Midstream and Downstream.

The Upstream sector, often termed “space manufacturing” accounts for 10-20% of the potential space market. The development of Space Hub Sutherland and the vehicle assembly, engine testing and mission control centre at Forres means that the upstream sector provides a specific opportunity for North Highland and Moray.

In terms of the value, the Midstream segment currently accounts for 5-10% of the potential space market. The Midstream is less dependent on close physical proximity to space manufacturing and launch facilities than the upstream, but the skill sets, and supply inputs

are common to both segments, meaning that a midstream cluster is more likely to form around a focus of existing upstream activity.

The Downstream segment involves the processing (adding value to) data collected in space and sale to end consumers, and the development and manufacture of equipment and provision of ancillary services for the application of space data. Together, provision of these services and the development and manufacture of equipment account for 70-85% of the total space market – the largest segment.

*While the greatest economic opportunities are concentrated in the downstream segment, these industries are far more mobile and globalised – and can be located anywhere in the world, wherever the comparative advantage dictates that it is most economic for the firms to do so.*

Chapter two also addresses infrastructure gaps, leveraging workers from adjacent sectors such as Nuclear, Oil & Gas and Defence; providing support such as the development and rapid scaling of early-stage companies; the attraction, retention and skilling of a diverse workforce to support the sector.

The space sector employs the most highly educated workforce of any sector in the UK. The UK Government has announced ambitions for 119,100 people to be working in the space sector by 2030. In 2019, some 45,100 people were already doing so. Scotland accounts for 17% of space sector employees (around 7,700 jobs) and is home to 173 space organisations including 96 space sector company head offices.

In 2020, around two-thirds of space sector companies reported difficulty in recruiting into their company. For the North Highland and Moray to overcome these skills challenges will require leveraging the existing skills advantages that the region can offer in other sectors over elsewhere in the world and building and expanding on the many schemes that are already developed to support skills training and increasing diversity across the UK, Scotland and locally.

The strategy identifies the needs of the space industry with particular focus on case studies from the US, Europe, New Zealand and the UK. The case studies consider the supply chain, skills, infrastructure, regulatory environment, and access to investment.

Geography is a key component, as latitude and the availability of real estate for launch ranges is a factor in where the upstream space launch operations locate. Higher latitudes are more optimal for the launch of satellites into Low Earth Orbits and a location near the sea and remote from population centres mitigates the risks from abortive launch. While this is only relevant for one small part of the overall space sector, the potential for space launch and spaceports to form the nucleus of a wider cluster, including ground stations and vehicle assembly means that geography may also be a differentiator in the midstream and downstream segments.

### Chapter three: the local area ecosystem

In the North Highlands region, several firms are already engaged in high value manufacturing – including optics, imagery and advanced materials, supplying the Dounreay nuclear research facility and the oil and gas sector. None currently supply the space sector. Business services, construction and general support services are well represented.

In the Moray Region, the expanding Orbex launch vehicle development and manufacturing facility at Forres forms a growing nucleus for the space sector. There is the potential for a clustering of innovative businesses at the Forres Enterprise Park, complementing the existing aviation and defence sector supply chain and talent pool serving RAF Lossiemouth. The food and drink sector in Moray also sustains a highly skilled workforce and advanced engineering supply chain.

*Across the region, the Defence and Energy sectors are specifically contributing highly skilled technical engineers with continued investments and project opportunities.*

There are several local programmes that support the development of the skills required by space. The Moray Aerospace, Advanced Technology and Innovation Campus (MAATIC) and co-located Manufacturing Innovation Centre for Moray (MICM) at Lossiemouth, due to start on site in 2022 will create a supply of engineering talent – and incubation space for innovative engineering businesses, serving space and other sectors.

While a large number of premises in the North Highlands Region are not connected to the UK gas network, the region has a plentiful and expanding supply of renewable energy (wind and tidal) and benefits from the existing and planned onshoring of HV power cables, providing an affordable and stable energy supply.

In the Moray region more than 40,000 homes and businesses have access to the fibre network, making it one of the best-connected local authority areas in the Highlands and Islands region. However, there are still some areas of the North Highlands which lack access to superfast broadband or 4G mobile connectivity. Business facilities are available in North Highland and Moray with gigabit / full fibre connections. The onshoring of international data cables offers the potential for hyper-connectivity businesses in the medium to long term.

The region is ranked as one of the most deprived in Scotland for accessibility by land (road and rail), although connectivity within the Moray sub region is good. Air and sea links to the North Highland region are however well-developed, a legacy of the oil and gas industry.

While equatorial launch is more efficient, North Highland proves launch access to the Polar and Sun-Synchronous orbits due to the trajectories that can be achieved from the region. The north coast of Scotland provides geographic advantages for small rocket launch facilities. Within the North Highland and Moray there are multiple business parks and commercial facilities suitable to host SMEs and startups. While there is the potential for pressure on the local housing supply, community and educational services in the North Highlands region are of a high standard and able to accommodate growth. The liveability of

the region and outstanding natural environment are key strengths in attracting inward investment.

Responses to an online survey sent to businesses within the region demonstrated the self-sufficiency within the North Highland and Moray businesses with most respondents claiming that on average over 60% of their supply chain is local. The manufacturing, engineering and designs firms identified that key barriers to their future growth plans were 'Regulation/Red Tape', 'Macro Economic Disruption' and 'Quality of digital infrastructure'. In terms of space awareness, all respondents expressed interest at the opportunities proposed by Scotland's Space sector.

#### Chapter four: the area offering

Chapter four of the strategy considers the gap analysis between the needs of the Space sector and the existing ecosystem in North Highland and Moray.

*The gap analysis indicates that the cluster has advantages in terms of launch vehicle development and operations with potential for development of midstream applications (ground stations and data centres) in the mid to long run, due to the strategic advantages of the onshoring of HV power lines and international data cables.*

Supply of Services and Skills as well as infrastructure are examined with strengths identified in the areas of geography, existing aerospace and advanced engineering supply chain and potential cluster nuclei centred around Space Hub Sutherland in North Highland and Orbex in Moray. The analysis also identifies a lack of specialist space launch services, no specific comparative advantage for downstream growth and potential challenges in attracting talent to the area.

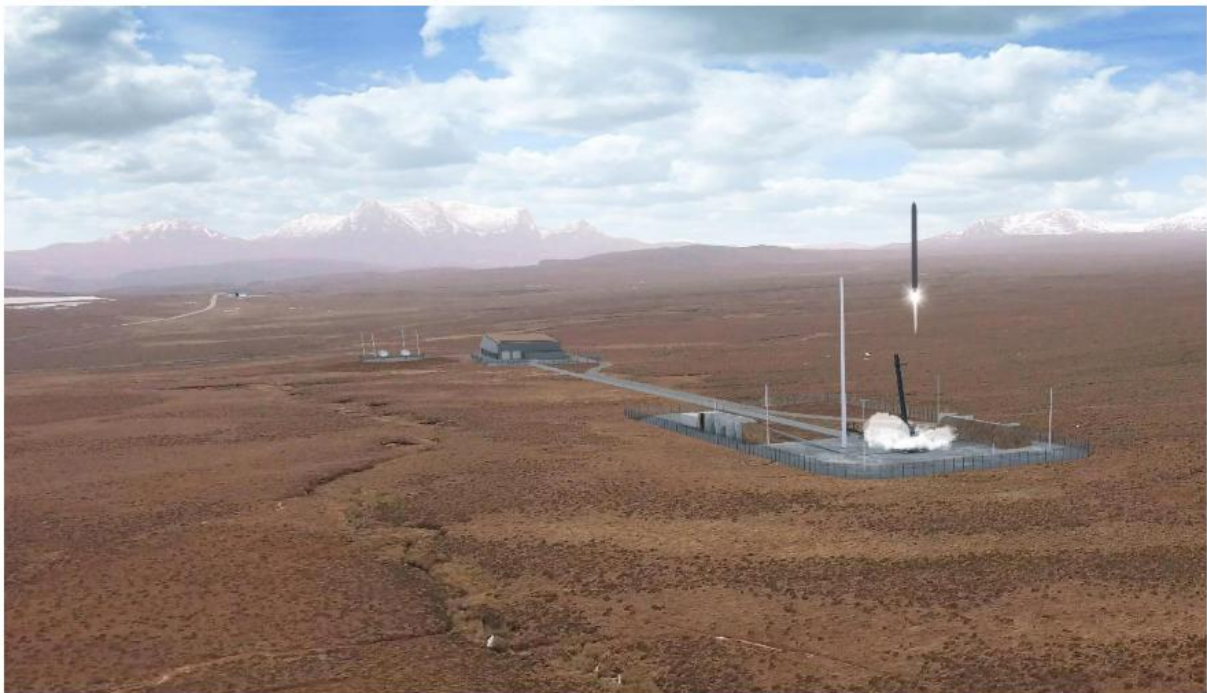
There are clear opportunities identified such as leveraging the synergies with the hydrogen economy, existing oil & gas, renewables, precision engineering and clean facilities from the food and drink sector, life sciences, nuclear and aerospace skills base. HVDC and data cable landings in the area provide power and data capability in support of midstream and downstream activity, while tourism and the visitor economy could build on the success and learnings of the NC500 and Malt Whisky Trail. Taking advantage of these opportunities would mitigate several risks the report identifies including the declining population in the area, competition from other UK and European space clusters for midstream and downstream growth and uncertainty around the size of the total addressable market for small launch of satellites in support of constellations.

#### Chapter five: the size of the prize

Chapter five of the strategy considers the 'size of the prize' for North Highland and Moray on 2026, 2030 and 2050 time horizons. Developing the UK's launch capability at Sutherland brings a multitude of benefits. It will provide vital local economic impacts for the region by offering a range of locally based employment opportunities and the chance to be at the forefront of an exciting emerging sector which will also bring indirect impacts to boost the already thriving tourism economy in the region. It will help to retain highly skilled



individuals in the North Highlands and offer opportunities to young people to help stem the flow of depopulation.



It is vital to sustain the emerging Moray space cluster as without a space port it is highly likely that existing launch providers will relocate. Space Hub Sutherland will unlock further development of the Moray space cluster and support UK and Scottish government objectives for growing the space sector.

Jobs figures are presented including direct jobs associated with the construction and operation of Space Hub Sutherland and indirect and induced jobs at a Highlands and Islands (including Moray), Scotland and UK level. GVA is also estimated at these same three levels. Three scenarios; baseline, Scenario 1 and Scenario 2 are presented highlighting different launch cadences and visitor numbers which in turn have an impact on jobs and GVA over the time horizons indicated. In 2020, it was estimated that the space economy contributed £6.6bn of GVA to the UK's economy and unlocked at least £360bn of GVA by supporting industries that are dependent on satellite services including navigation, meteorology, communications and earth observation.

*By 2030 it is anticipated that other launch providers will be using Space Hub Sutherland and that growth in the midstream and downstream segments will support 740 full time equivalent jobs and value for upstream, midstream and downstream activities of £56m GVA for the Highlands and Islands.*

## Chapter six: next steps

Chapter six of the strategy considers the way forward in developing the Space Cluster. Opportunities in the midstream could include ground station and data centre capability in the North and downstream applications could leverage space infrastructure to enhance activities in sectors where the area is already strong such as energy, the environment and



tourism. This will be achieved by aligning efforts with the findings of the UK Space Agency's Space Sector Skills survey through leveraging the existing area skills base and developing new offerings through the University of the Highland and Islands (UHI) and its partners.

*The strategy and recommendations which follow will be distilled into a clear action plan owned by the Local Space Leadership Group.*

The positive impact of the local rural communities, particularly around the Spaceport through cluster development could include projects such as a space education centre, social housing provision, small scale business support and a community-based fund for sustainable community initiatives.

They will meet regularly to ensure that the actions assigned are being taken forward and that the participating organisations have the drive and ambition to deliver. Progress will be reported on regularly and a review of progress on the Strategy should be planned for 2025/26.

No.	Recommendation	Timescale
1	Create specific programmes through universities and supply chain partners to <b>address the science/engineering skills shortages in space industry</b> leveraging nuclear, oil & gas and MOD know-how. (Address early years engagement, Space STEM, technician level training and sector specific qualifications).	4 years
2	Explore area wide interventions to <b>stimulate downstream growth</b> in the area (70-85% of the market). This would likely need an understanding of market need. While this will involve appropriate connectivity and property it is likely to focus on labour supply and working with academia to deliver a labour pipeline.	4 years
3	Consider the use of job creation and training fiscal incentives to <b>stimulate employment</b> and how they can focus on the space sector.	4 years
4	Review options for <b>Accelerator Programmes</b> as an enabler of start-ups and existing tech supply chain to diversify and engage (networking) with the (upstream in first instance) space sector.	Within 12 months
5	Ensure provision of the necessary <b>residential and business infrastructure</b> and resilience in the area to meet the needs of a growing high-tech data driven space ecosystem.	5 years
6	Develop an <b>incubation centre</b> (hub) associated with Space Hub Sutherland leveraging existing resources to give growing companies the opportunity to learn from an operational spaceport.	Within 36 months

No.	Recommendation	Timescale
7	Enhance talent attraction capability through focused efforts on <b>promoting the liveability</b> of the area.	2 years
8	Create a <b>Local Space Leadership Group</b> to champion the interests of the area and to drive forward the recommendations from the Strategy.	Within 3 months
9	Unlock further public and private investment through regional planning initiatives integrating other sectors leveraging a <b>'Space Growth Deal'</b> akin to the 'Moray Growth Deal'. This needs input from UK and Scottish Government who fund these initiatives.	Within 24 months
10	Educate the wider investment community on the benefits and risks of investing in the space industry in the area. Consider an <b>'Investor Ready'</b> approach to help both the company and investor.	24 – 48 months
11	Create a <b>dedicated structured and resourced effort</b> to attract inward investment (new businesses) to the area through a coordinated and collaborative approach.	Within 6 months
12	Create a shared vision across the private and public sector to realise the benefits locally and regionally through a <b>'Space Coast 2030'</b> conference.	12 months

## Summary

This strategy offers an excellent opportunity for North Highland and Moray to develop a Space Cluster which could deliver 740 jobs and £56m of GVA to the Highlands and Islands by 2030. The recommendations identified in the strategy have been developed through a detailed understanding of the space sector needs and the strengths and areas for development in the North Highland and Moray. These recommendations will lead to actions focused on inward investment, business support, infrastructure enhancements and skills development critical to the success of the Space Cluster. The creation of a Local Space Leadership Group to develop and drive forward the action plan will be instrumental in the Space Cluster achieving its forecast potential.

## Chapter 1 - Space: The economic opportunity

### Key Points

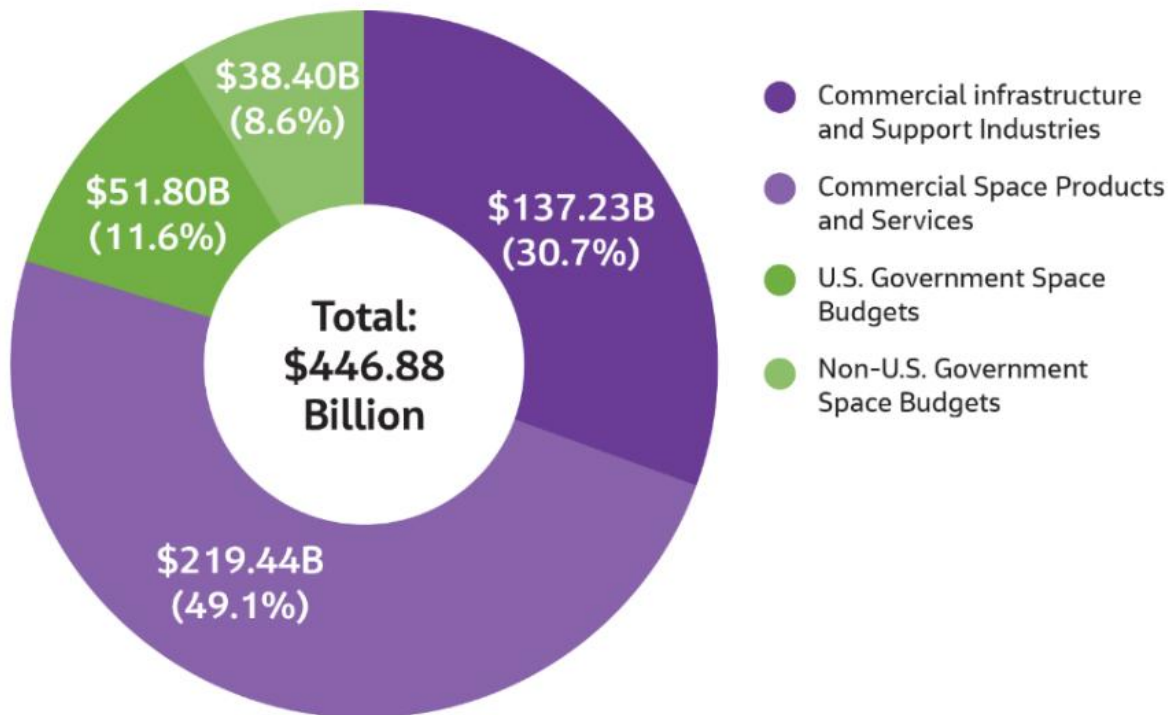
- The space industry is experiencing growth around the world, both in terms of government spending and commercial earnings. Multiple governments, including various levels of government in the UK, are investing in space to stimulate further economic growth for the benefit of their people.
- To date, the majority of private funding for space start-ups has gone to a handful of companies, almost all of which are focused on manufacturing or operating launch vehicles or satellites.
- There is interest in the space sector from private investors but most require further education on how the industry works and how to reduce risks associated with the sector to an acceptable level. This will then allow more conservative investors to enter the sector and unlock additional types of investment.
- Economic forecasts of space industry growth tend to be either too global or too sector- specific to be useful for planning national or regional economic development.
- A more comprehensive and integrated approach is required to support public and private investment. The economic benefit of space can be multiplied many times over when space is appropriately integrated with other sectors.
- The trends are favourable for small satellite launch sites and launch vehicle operators, but there is a need to move quickly to secure a lasting advantage. Space Hub Sutherland has a valuable opportunity to take a leading position in this emerging sector.

### 1.1 The global opportunity

The size of the global space economy continues to grow steadily but with rapid changes occurring in key organisations, funding sources and technological advances. From the emergence of SpaceX as the leading provider of commercial orbit launches and operator of the world's largest satellite constellation through to a wide range of entrepreneurial companies seeking to disrupt the status quo. Many different commercial launch vehicles are in various stages of development from concepts on paper, through to testing phase and government backed programmes. It is likely that only a small number of these will become operational. Demand is surging for constellations of small satellites in Low Earth Orbit, developing, and in some cases replacing, market opportunities associated with the large, more expensive Geosynchronous Orbit satellites that were the foundation for the first wave of commercial space activity.

New models of funding are arising including billions of pounds from equity funding, upending the traditional processes of both the commercial sector and government space programmes although the sustainability of these new funding approaches remains to be determined.

**Figure 1.1 Global Space Activity Nears \$447 Billion in 2020**



Source: Space Foundation database

Source: Space Foundation 2021

### 1.1.1 Size and growth of the global space economy

Over the past decade, the space economy, incorporating both commercial space activity as well as government spending by spacefaring nations, has grown at an average annual rate of approximately 7% to reach a total of nearly \$447 billion in 2020.<sup>1</sup> Commercial activity constituted 79.8% of the total in 2020. Within the commercial sector, most of the revenue is derived from direct-to-home satellite television, an industry whose growth has slowed in recent years.

The global space economy, incorporating both commercial space activity as well as government spending by spacefaring nations, has grown at an average annual rate of approximately 7% to reach a total of nearly \$447 billion in 2020.

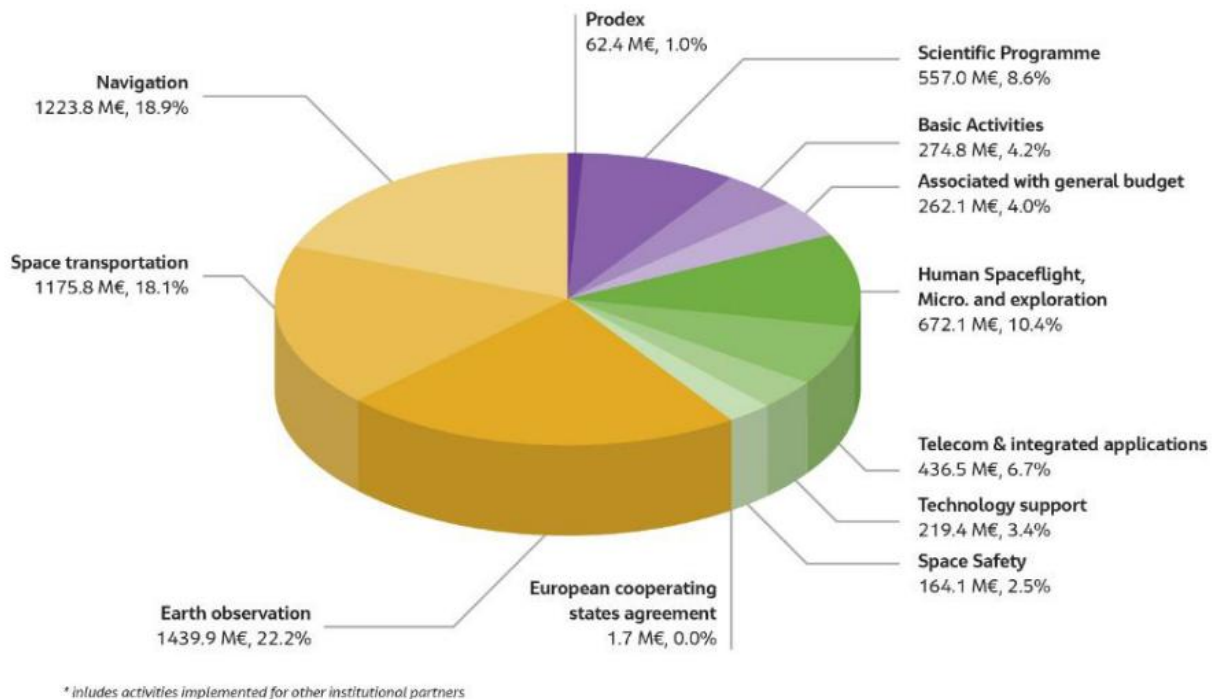
Telecommunication operators have diversified into provision of internet and other data services via satellite.

In Europe, the top four programmes funded through the European Space Agency (ESA) are Earth Observation, Space Transportation, Navigation (primarily paid for by the EU), and

<sup>1</sup> [The Space Report](#)

Human and Robotic Exploration. At the 2019 ESA Ministerial Council, the UK Government committed to contribute £374 million annually to ESA over the next five years.<sup>2</sup>

**Figure 1.2 ESA investment budget 2021 (Euro)**



Source: The European Space Agency

As an enabler for all other space activities, the orbital launch industry has been the focus of a great deal of attention in recent years. Many nations (and multinational organisations such as ESA) are aware that reliable and frequent access to space is essential if there is going to be a sustained expansion of commercial activities in space, and they are investing accordingly. This is one of the reasons why the Space Transportation line in ESA's budget is so large, although most of the funding is committed to a single project — development of the Ariane 6 launch vehicle.

To support launch vehicles, a range of locations across the globe are being considered for spaceports. Despite the ultimate goal of stimulating commercial space activity, these spaceports are rarely approached as commercial developments but are generally seen as a government infrastructure investment. In many cases, funding is provided both by a national government and the local or regional government where the proposed spaceport is located.

<sup>2</sup> UK Government, [UK invests in European Space Agency programmes](#), November 2019

### 1.1.2 Private investment in space

In the past decade, there has been a surge of investor interest in space, with a dramatic increase starting in 2015. Nearly \$31 billion has been invested in more than 400 space infrastructure companies by non-government sources of capital since 2009, and a new annual record of \$8.9 billion was set in 2020.<sup>3</sup> Of the total funds committed by non-government sources in the past decade, 64% has flowed to US companies, followed by UK companies at 15%.<sup>4</sup>

Nearly \$31 billion has been invested in more than 400 space companies by non-government sources of capital since 2011, and a new annual record of \$8.9 billion was set in 2020.

The influx of capital has changed the relationship between different players in the space industry with many organisations' moving from being the sole funder or customer for their contractors to one of many customers.

Behind the headline figures, it is important to note that the majority of private funding has flowed to a relatively small number of companies, and almost all of the capital was dedicated to launch vehicle development and satellite manufacturing and operation. Other emerging sectors such as private space stations, manufacturing in space, private exploration, and space resource harvesting have generated a substantial amount of hype but to date have attracted little capital. Another element that is often overlooked is that major space companies are still often dependent on government contracts. For example, SpaceX has received more than \$6.7 billion in private investment and more than \$9.2 billion in contracts and grants from the US government.<sup>5</sup> SpaceX also generates revenue from launches for commercial customers, but external investment (whether from government or private sources) remains critical for the company's survival and its development of new hardware.

A further challenge facing the space industry is that the sources of private capital are not very diverse with the majority from government funding and venture capital. As a source of funding, government processes tend to be slow and bureaucratic to ensure public resources are managed prudently, whereas venture capital firms tend to expect speed and offer limited oversight of the technology development in order to rapidly generate returns for their investors. Governments have consciously supported the growth of space start-ups, including through direct and indirect investment in incubators and accelerators, the most notable of which are the ESA Business Incubation Centres. Unfortunately, many of the businesses that emerge from

The Venture Capital (VC) system is designed to rapidly scale a product or service to capture a large market share and exit by means of a merger and acquisition (M&A) transaction or an initial public offering (IPO).

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<sup>3</sup> [Space Angels, Space Investment Quarterly: Q4 2020](#)

<sup>4</sup> [Space Angels, Space Investment Quarterly: Q4 2020](#)

<sup>5</sup> [Pitchbook, SpaceX](#), accessed 21 July 2021; [USAspending.gov, Recipient Profile: Space Exploration Technologies Corp.](#), accessed 21 July 2021



these programmes fail to secure the additional investment or sales revenue that would enable them to thrive, resulting in their disappearance after a few years. Managing the transition from incubators to operational status remains a challenge worldwide, and not just for the space industry.

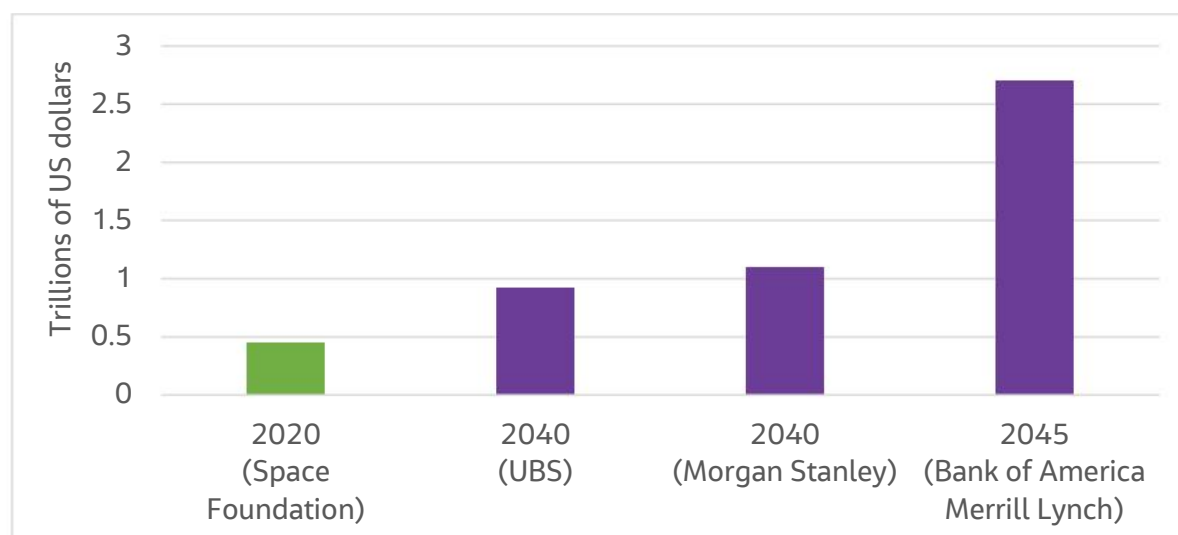
The Venture Capital (VC) system is designed to rapidly scale a product or service to capture a large market share and exit by means of a merger and acquisition (M&A) transaction or an initial public offering (IPO). While this has the potential to accelerate product development, the VCs may suddenly pull the plug on a start-up company if they do not see a sufficiently rewarding M&A or IPO in the near future. The best-case scenario is usually M&A executed by a traditional government space contractor. Ultimately, the VC system is not currently designed to reward companies that grow steadily and constantly produce innovation over time, which has unfortunate implications for the future of the space sector.

The space sector needs to be able to attract funding from a more diverse range of funding sources, including institutional investment and debt. To do so, requires clearer identification of risks and potential mitigations and business strategies that provide investors with multiple paths to generating returns. There is a need to educate private investors on how the space industry works and how to reduce risks of space investments to an acceptable level.

### 1.1.3 Forecasts of economic value

As a relatively young economic sector, there are many different forecasts for growth of the space industry. To achieve a space economy size of \$926 billion to \$2.7 trillion (by 2040 or 2045, depending on the forecast) requires a compound annual growth rate of between 4.5% to 7.5% before inflation is factored in. While this is a respectable rate for some investors, it does not meet the criteria of others such as VC firms who are looking for returns of at least ten times their initial investment.

**Figure 1.3 Global Space Economy Forecast**



The value of space extends beyond the revenue generated by the industry itself and existing economic models find this difficult to capture. For example, the Global Positioning System (GPS) is estimated to have produced a cumulative private-sector benefit of approximately \$1.4 trillion for the United States alone from 1984 through 2017 (with most of the benefits accruing in the last decade of that period).<sup>6</sup> To ensure that stakeholders and potential funders are able to make informed decisions on how to manage their resources and policies the space sector needs to develop a more comprehensive and integrated approach to estimating its direct value and how it supports wider value creation through the services and products that it enables across society.

The Global Positioning System (GPS) is estimated to have produced a cumulative private-sector benefit of approximately \$1.4 trillion for the United States alone from 1984 through 2017 (with most of the benefits accruing in the last decade of that period).

#### 1.1.4 Launch Activity Growth

Supporting the steady increases in traditional launches, advances in technology combined with lower launch costs have led to a boom in nanosatellites (spacecraft weighing 10kg or less) and small satellites being launched. By April 2021, more than 4,000 active satellites were in orbit, having nearly doubled from 2,200 in December 2019<sup>7</sup> and operators of global spanning communications networks have ambitions to launch constellations that will require tens of thousands more. The parallel trends of demand for small satellites and an increase in launch activity bode well for the emerging small satellite launch industry. These satellites currently reach orbit either through ride-sharing on a large launch vehicle or through dedicated services provided by relatively inexpensive small vehicles.

In 2019, there were more than 70 small launch vehicles that were either operational or in development, mostly the latter. These efforts were spread across 15 nations or multinational partnerships.

In 2019, there were more than 70 small launch vehicles (those capable of carrying a maximum of 1000kgs to Low Earth Orbit) that were either operational or in development, mostly the latter.<sup>8</sup> These efforts were spread across 15 nations or multinational partnerships, highlighting the global competition for the small satellite launch market.

Launch vehicles require a spaceport that can accommodate the unique needs of small launch vehicle operators and their customers. In 2019, there were 40 active spaceports with 10 more in development and a further 13 in proposal stage.

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<sup>6</sup> RTI International, [Economic Benefits of the Global Positioning System \(GPS\): Final Report](#), June 2019

<sup>7</sup> Union of Concerned Scientists, [UCS Satellite Database](#), updated May 2021

<sup>8</sup> Carlos Niederstasser, A 2019 View of the Impending Small Launch Vehicle Boom, paper presented at the 70th International Astronautical Congress, October 2019

In the case of both small satellite launch vehicles and spaceports, the general expectation is that many will prove not to be economically viable in the long term. As with other emerging industries, there will likely be a first-mover advantage that enables some participants to take a commanding lead, and there is now a global race to secure that position. In this respect, the UK is positioned well, with space legislation in place, a regulatory framework being formulated, two launch sites funded for development, and commitments from three launch operators. Space Hub Sutherland is in a particularly good state, with two launch operators developing vehicles specifically with the spaceport in mind, and the capacity to bring in additional operators.

## 1.2 The opportunity for the UK

The UK is well positioned to take advantage of the economic opportunities presented by the emerging new era of space activity. The UK's existing space sector is vibrant and healthy with existing clusters in the Midlands of England and the Scottish Central Belt. It is hoped that this strategy will be a direct complement to the emerging **UK National Space Strategy**, and the recently-launched (July 2021) [UK Innovation Strategy](#), and play its part in establishing the UK Space sector as one of the most commercially vibrant in the world over the next decade.

Developing the Sutherland Space Cluster will contribute to the global scientific efforts to create a better connected and sustainable world. One of the most valuable tools in the push towards a more sustainable planet is the ability to gather and distribute large data, to better understand how, when and why our planet and societies are changing. Innovations within this space cluster will continue to allow scientists to record more about our planet. Emission levels, resource consumption, deforestation and even animal migrations can be accurately monitored with satellites, enabling scientists to work with incredibly insightful data at cheaper rates. Sutherland Space Hub provides a unique opportunity to host and expand the skillsets in the UK that enable the space industry to provide such incredible opportunities for science.

## 1.3 The opportunity for Scotland

The development of Space Hub Sutherland is a natural addition to the portfolio of space activities already present in Scotland, offering customers a complete value chain from design and manufacture to launch and operation of satellites. According to *Size & Health of the UK Space Industry 2020*, 17% of all UK space jobs are based in Scotland.

17% of all UK space jobs are based in Scotland - 7,500 Scottish space jobs, distributed amongst more than 130 space organisations.

That translates to more than 7,700 Scottish space jobs, distributed amongst more than 170 space organisations. Of these organisations, 96 are headquartered in Scotland and generate a combined income of £137 million, or 0.8% of total income generated by UK space organisations in 2018/19.<sup>9</sup>

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<sup>9</sup> London Economics, [Size & Health of the UK Space Industry 2018](#), January 2019

Looking across the entirety of the Scottish space sector, the value in 2017 was estimated to be £2.5 billion, and there are ambitions to grow to £4 billion per year by 2030.

The disparity between Scotland's 17% share of UK space employment and its 0.8% share of UK space income is due in part to the report's methodology, which attributes all of a company's income to the region where it is headquartered. Given that the UK space industry is heavily concentrated, with 13 organisations accounting for 82% of income and the remainder being split amongst 1,205 smaller organisations, it is not surprising that a large proportion of Scotland's space workforce is employed by large

organisations headquartered elsewhere. However, there are ambitions to grow the Scottish space sector to £4 billion per year by 2030.<sup>10</sup> Efforts such as the establishment of Space Hub Sutherland will support this goal in the coming years by spurring the creation of new businesses headquartered in Scotland to be closer to Sutherland and other space industry clusters.



#### 1.4 The opportunity for North Highland and Moray

With the development of Space Hub Sutherland as a new UK Launch site for vertical orbital launch and the subsequent attraction of Orbex to Forres, the North Highland and Moray are well positioned not only to benefit from future developments in the Launch sector but also for wider Space opportunities.

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<sup>10</sup> [Scottish space industry's ambition for £4bn growth trajectory](#), September 2020

The early positioning of these assets is complemented by a number of other factors in terms of supporting Space specific launch projects as well as wider Space opportunities. These are focussed on labour supply, connectivity and infrastructure.

Both the North Highland and Moray have benefited from the presence of a highly skilled workforce through the development of the Nuclear sector in the North and Aerospace activity from the former RAF Kinloss (now Kinloss Barracks) and current RAF Lossiemouth bases. The presence of these facilities has enabled a capability in the labour market through the supporting supply chains to perform advanced engineering, in a safety critical and demanding environment and ensuring that products and services are delivered within tight tolerances and strict inspection and certification regimes. This capability lends itself to a range of upstream, mid-stream and downstream Space activities.

Recent developments in the main fibre supply of next generation broadband have enabled both areas to respond to the growing remote delivery of services. This provision by BT, funded mainly by grant by HIE, has proven timely in terms of the current pandemic and will continue to prove valuable in offering data analysis services as well as the potential for the provision of hyper connectivity on the north coast. Landfall of an international subsea data cable meeting in Castletown, Caithness offers a real opportunity for hyperconnected services and data storage to be made available to the Space industry.

Infrastructure provision in the areas includes mainline rail access to both Forres and the railhead at Georgemas in Caithness. Both areas have 'A' road access with Space Hub Sutherland being accessible to articulated vehicles. Area Harbours currently support Oil & Gas and Offshore Wind activity with Scrabster currently undergoing a redevelopment to provide enhanced laydown and berthing for service, cargo and cruise vessels. Development land in the Enterprise Park Forres, other Moray sites and a number of sites in Caithness also ensure the ability to develop physical sites if needed. Existing arrangements from the Moray Growth Deal such as the development of the UHI led Moray Aerospace Advanced Technology and Innovation Campus (MAATIC) reinforce the scale of the ambition of the area. On a smaller scale it is also noteworthy to understand the ambition of the local community around the Space Hub Sutherland to consider the possibility of incubation units near to the Spaceport.

Both areas are well placed to build on a good reputation for Tourism with Moray having a significant presence of distilleries and the North Highlands benefiting from the growing North Coast 500 route. The emerging market for 'staycations' in the north as a consequence of COVID-19 travel restrictions has increased capacity in the area which serves to support future Space Tourism.

#### 1.4.1 Area Drivers

The population of the Caithness and Sutherland area is forecasted to drop by 3.9% based on local authority 2018 mid-year estimates compared with 2011 numbers. In 2011 the population over age 45 made up 52.5% of the population, higher than both the Highlands and Islands and Scottish averages. An ageing population compounded by the continued decommissioning of the Dounreay nuclear site over the next decade and a half underlines the need to attract working age people and families to the area to support the future economy.

Highland has been designated priority 3 (lowest) in the UK Government criteria for attracting funding support through the UK Community Renewal and Levelling Up agendas. This places an increasing importance on the successful attraction of private sector investment as an enabler for future growth.

An oversupply of renewable energy production in the North Highland and Moray areas provides a unique opportunity to embrace the decarbonisation initiatives as outlined in the Net Zero ambitions of both the UK and Scottish Governments. With over 70 consortiums bidding in the recent ScotWind leasing round for offshore sites around the North Highland and Moray coasts complementing the existing onshore capacity, the potential exists to embrace area hydrogen production in support of decarbonising heat and transportation in the area for both industrial and domestic applications. This will assist new and existing businesses to establish genuine green credentials in support of net zero Space related activity.



## Chapter 2 - Space: Sector needs

### Summary

- The space sector comprises of Upstream (the design and launch of rockets and their payloads), Midstream (covering satellite operations and data sales) and Downstream (satellite service provisioning, user equipment manufacturing and services utilising data for people and businesses).
- Space Hub Sutherland and the vehicle assembly, engine testing and mission control centre at Forres provides the North Highland and Moray region with a competitive advantage for upstream activities.
- The space sector creates jobs for highly skilled people and Scottish based companies already employ 17% of the UK's space sector workforce. Similar to other rapidly expanding, high tech-based sectors, the space industry is finding it challenging to recruit new employees and is also seeking to diversify its existing workforce to further boost productivity.
- Our case studies taken from the USA, New Zealand, Europe and the UK show that there is a ready market for small launch facilities and that investment in supporting the space sector brings a wide range of positive impacts for local, regional and national economic development.
- To maximise these potential benefits requires a shared vision and coordinated action from across the private and public sector.

### 2.1 Introduction

The purpose of this strategy is to set the high-level plan for the development of North Highland and Moray as a centre of the burgeoning UK commercial space industry – a **space cluster**. This strategy is driven by both ambition and evidence.

As may be expected for an emerging and disruptive industry, there are a range of different 'models' for the commercial space sector. Terms are sometimes used interchangeably with sometimes different definitions. This section (Chapter two) sets out our understanding of the space sector as a foundation for the logical analysis that follows.

This includes our understanding of: key terms and concepts; how the space sector is structured (or "segmented"); the needs of the sector its needs in terms of the supply of **goods** (the traditional supply chain), **skills** (or talent) and **infrastructure**, against which we have mapped the current or potential supply in North Highland and Moray to identify our priorities for the future. This section also includes three **case studies** – to provide a reality check on the theory and identify **lessons learned**.

### 2.1.1 Jargon-busting: Clusters, Ecosystems & Hubs<sup>11</sup>

Three key terms are worth definition at this point: **Cluster**; **Ecosystem** – and **Hub**.

A **cluster** is the concentration of specialised industries in particular localities benefitting from 'economies of scale', such as a shared supply chain (of both services *and* skills) and advantages of co-location such as easier sharing of ideas and collaboration on higher risk, innovative projects. This leads to more efficient development and production of new products – particularly in new and innovative sectors. Simply, the more densely concentrated businesses in a given sector are in a given area, known as "agglomeration" in economics theory, the more productive, competitive and successful those business are likely to be, and the greater the benefits for the local economy.<sup>12</sup>

The **Ecosystem** is the wider network in which the cluster forms. This includes:

- the **non-sector specific supply** chain – general services such as business services and facilities management;
- the **regulatory and legal environment** that can either enable or hinder the development of new products;
- The network of **state support** to provide the start-up funding, capacity building, business skills development that the market will not – due to perceptions of risk, lack of understanding of the opportunities, or where (simply) no single firm can make a profit;
- The **supply of private finance**, in particular Venture Capital (VC), to fund the start-up and scale-up of individual businesses.

A **Hub** is a *physical space* provided for innovative firms to operate on flexible, lower cost terms and co-locate with similar innovative firms. Hubs both help to lower the "barriers to entry" for new companies by reducing the cost of starting up and provide a platform for collaboration with other innovative firms. An example of this would be the Horizon Scotland hub<sup>13</sup> on the Enterprise Park in Forres. A hub is an *enabler* of a cluster, and – along with anchor businesses – a potential nucleus.

Other key means of support of innovative firms, and the promotion of clustering include:

- **Incubators** – physical workspaces specifically designed to nurture the most innovative firms at their very earliest stages, such as the ESA business incubation Centres<sup>14</sup>, and;
- **Accelerator** programmes, which provide intensive business support – in particular how to access finance - when these firms are ready to make the leap to operating and producing at scale.

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<sup>11</sup> [Harwell Space Cluster](#), September 2021

<sup>12</sup> OECD, [Agglomeration economies in Great Britain](#), June 2020

<sup>13</sup> [Horizon Scotland, Business and Innovation Centre](#)

<sup>14</sup> European Space Agency, [ESA Business Incubation Centres](#), accessed September 2021

## 2.1.2 Anatomy of the space sector – the three streams<sup>15</sup>

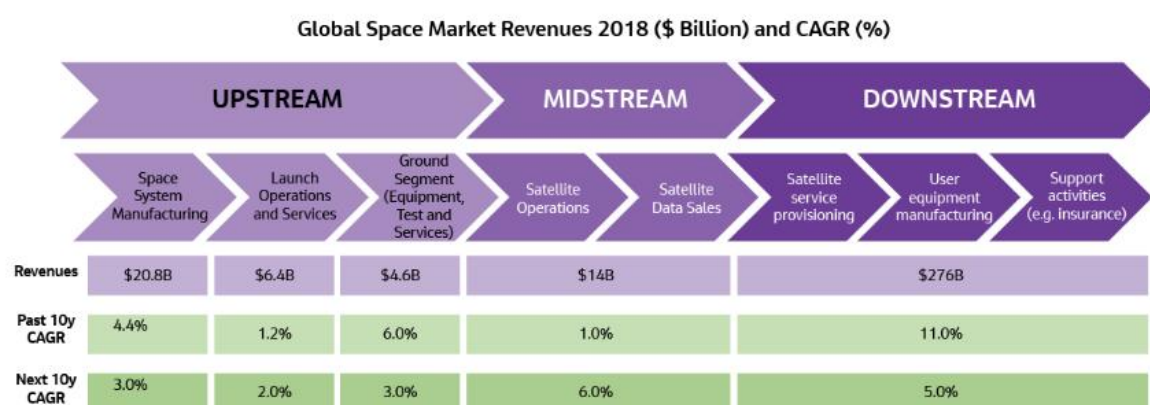
To understand the needs of the space sector, and how North Highland and Moray can seize its opportunities, it's useful to first define a **model** of the space industry.

As befits a rapidly evolving and disruptive industry, there are a number of different models in use to understand the structure of the global space sector. For clarity, this strategy and the action plan that underpins it is based on a **three-stage** model of the space value chain.

This model comprises three supply chain “segments” – **Upstream**, **Midstream** and **Downstream**. Firms in each of these segments play a role in ultimately supplying goods and services to consumers. This is illustrated in figure 2.1 below.

It should be noted that many firms will operate “horizontally” across sectors - and will supply space and other innovative / high tech sectors in particular aviation, defence and telecommunications.

**Figure 2.1 Segmentation of the Global Space Sector**



Source: Euroconsult Report 2019, SpaceTec Partners Analysis

\*CAGR = Compound Annual Growth Rate

## 2.2 The Space supply chain

### 2.2.1 Upstream

The first stage in the space supply chain is the **Upstream** segment – often termed “space manufacturing”. This segment involves the development and manufacture of software, components and Original Equipment for launch vehicles and satellites. This also includes supply and operation of ground-based facilities required for launch and establishment of the assets in space, such as space launch facilities (range control) and

The upstream sector accounts for 10-20% of the potential space market.

<sup>15</sup> [Industry 4.0 and the Future of UK Space Manufacturing; Summary Report: The Size & Health of the UK Space Industry](#)

mission control. In terms of value, the upstream sector accounts for 10-20% of the potential space market.

The development of Space Hub Sutherland and the vehicle assembly, engine testing and mission control centre at Forres means that the upstream sector provides a specific opportunity for North Highland and Moray. While space launch makes up only a small proportion of the total space market, the **upstream** sector and space launch is a particular focus of this strategy and action plan.

For this strategy, we have defined the needs of the **Upstream** segment as follows. This has been used for the Gap Analysis in Chapter four.

**Table 2.1 Space - The Upstream Segment**

Sub-segment	Supplier category
Space Systems Manufacturing	R&D – aerospace
	R&D - all sectors
	Advanced Engineering – aerospace
	Advanced Manufacturing – aerospace
	Advanced Engineering - all sectors
	Advanced Manufacturing - all sectors
Launch Operations	Propellant (gases) manufacture & processing
	Launch & Range Control
	Airport Services
	Specialist Logistics
	Payload integration
	Business services – insurance, HR and accountancy
	Tourism & hospitality
	General site services
Ground Systems	Ground Stations (data download and transmission)
	Mission Control

### Orbit heights and launch weights

Space launch is categorised into **Nano-launchers**, <50kg payload mass examples including Astra Rocket 3 (payload mass 25kg) and JAXA SS 520 (payload mass 4kg). **Micro-launchers**, 50-500kg payload mass, examples of micro-launchers include: Kuaizhou-1A (payload mass 250kg), Rocket Lab Electron (payload mass 200kg). **Small launchers**, 500kg-2,000kg payload mass, examples include: Firefly Alpha (payload mass 1,000kg), Isar Aerospace Spectrum (payload mass 1,000kg), Rocket Factory Augsburg (payload mass 1,200kg). **Medium launchers**, 2,000kg-6,000kg payload mass, examples include: Soyuz-2 (4,200kg payload mass), Northrop Grumman Antares (payload 8,000kg). **Heavy launchers**, 6,000kg-30,000kg payload upmass, examples: SpaceX Falcon 9 (payload mass 22,800kg), ULA Delta

IV heavy (payload mass 25,000kg). **Super Heavy**, >30,000kg payload upmass, Only SpaceX Falcon heavy (payload mass 63,000kg) is operational so far, future payload ambitions include, SpaceX Starship (payload mass 100,000kg), Blue Origin New Glenn (payload mass 45,000kg), NASA's SLS (payload mass 85,000kg).

## 2.2.2 Midstream

The Midstream segment currently accounts for 5-10% of the potential space market.

In terms of the value, the Midstream segment currently accounts for 5-10% of the potential space market. The Midstream is less dependent on close physical proximity to space manufacturing and launch facilities than the upstream, but the skill sets and supply inputs are common to both segments, meaning that a midstream cluster is more likely to form around a focus of existing upstream activity.

As Low Earth Orbit (LEO) becomes increasingly congested with constellation satellites, the risk of collisions with space debris increases and the technology for the manoeuvre of micro satellites in space improves, the active management of assets in space – otherwise known as “space situational awareness”<sup>16</sup> is expected to grow. Along with the transfer of “raw” space data to earth via ground stations and its intermediary storage in data centres, this comprises the **Midstream** segment in the space value chain.

For this strategy, we have defined the needs of the Midstream segment as follows. This has been used for the Gap Analysis in Chapter four.

**Table 2.2 The Midstream Segment**

Sub-segment	Supplier category
Ground Systems	Ground stations (near earth observation and data download)
	Data Centres

## 2.2.3 Downstream

The downstream segment currently accounts for 70-85% of the total space market.

By far the largest and most valuable stage in the space supply chain is the “downstream” segment. This involves the processing (adding value to) data collected in space and sale to end consumers, and the development and manufacture of equipment and provision of ancillary services for the application of space data. Together, provision of these services and the development and manufacture of equipment account

for 70-85% of the total space market.

This includes firms engaged in the supply of:

- Satellite navigation services
- Direct to The Home (DTTH) broadcasting services;

<sup>16</sup> European Space Agency, [Space Situational Awareness – SSA](#), accessed September 2021

- Meteorology and climate services;
- Other earth observation services – including land use monitoring and asset management;
- Satellite internet

With the growth of constellation satellites – such as the Anglo-Indian OneWeb, the US StarLink and Amazon networks, and the Canadian Telsat, the consumer market for satellite internet services is expected to grow significantly over coming years.

While the greatest economic opportunities are concentrated in the **downstream** segment, these industries are far more mobile and globalised – and can be located anywhere in the world, wherever the comparative advantage (costs, ease of trade and business operations) dictates that it is most economic for the firms to do so.

For this strategy, we have defined the needs of the Upstream segment as follows. This has been used for the Gap Analysis in Chapter four.

**Table 2.3 The Downstream Segment**

Sub-segment	Supplier category
Downstream applications	Satellite data processing
	Satellite data applications: R&D
	Satellite data applications: manufacturing
	Telecoms & media - any
	Earth Observation (EO) - any
	Satellite navigation - any

## 2.3 Skills for Space

The space sector employs the most highly educated workforce of any sector in the UK with three quarters of employees holding at least a primary degree. The UK Government has announced ambitions for 119,100 people to be working in the space sector by 2030. In 2019, some 45,100 people were already doing so. Scotland accounts for 17% of space sector employees (around 7,700 jobs) and is home to 173 space organisations including 96 space sector company head offices.<sup>17</sup>

The space sector employs the most highly educated workforce of any sector in the UK.

<sup>17</sup> [The Size and Health of the UK Space Industry 2020](#)



In 2020, around two-thirds of space sector companies reported difficulty in recruiting into their company.

Over half of space companies across the UK (54%) are expecting to employ more staff in the coming three years. As with any rapidly developing sector, there are challenges in ensuring that a suitable set of skilled individuals are readily available to meet the demand arising from companies.

According to the UKSA Space Skills Survey 2020 Report, around two-thirds of space sector companies reported

difficulty in recruiting into their company with more of a challenge identifying people with specialist space skills. The lack of a single focus for training and development at undergraduate level and above as the types of jobs required are so niche makes it particularly challenging to develop space skills quickly.

Key reasons for recruitment difficulties in the sector (given in descending order of reported importance as reported by space companies) are:

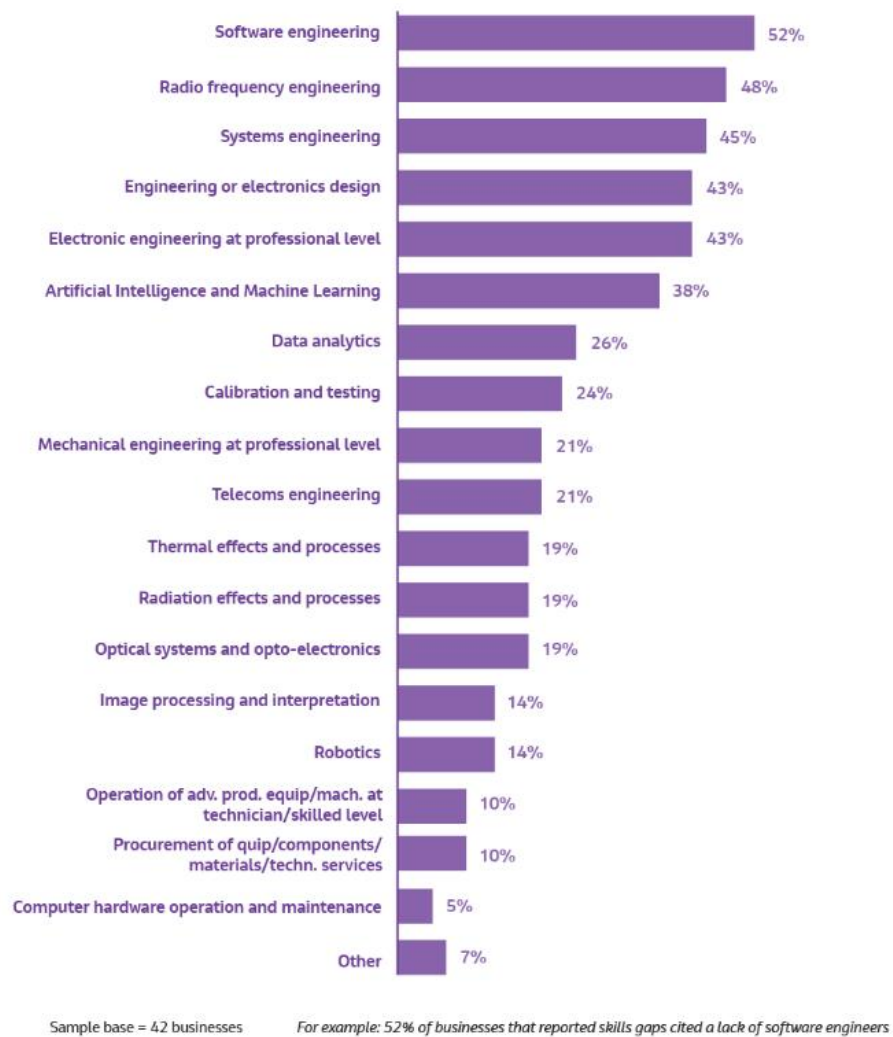
- 1) A lack of experience within the space sector
- 2) A lack of specialist skills, knowledge or qualifications
- 3) Challenges in attracting European candidates post Brexit (likely to be exacerbated by the global Covid pandemic)
- 4) Perceived competition attracting talent both from other sectors and within the space sector
- 5) Challenges to attract people to work in the locations where space sector companies are located
- 6) A lack of appropriate specialist training provided by UK educational institutions
- 7) Perceptions of uncompetitive pay or conditions
- 8) Shortfall of interest from young people in technology/science/engineering and maths
- 9) Perceptions of applicants lacking required behaviours, attitude, motivation or personality

Another pressing challenge for the space sector is to ensure diversity of staff to maximise productivity within the sector. The industry hires people from across the world, particularly from Europe, providing a depth of knowledge and cultural sharing and ensuring efficient engagement with international partners and clients. There is no reported under-representation of minority ethnic groups within surveys undertaken. However, women are still under-represented in the space sector, in part, due to lower proportions of females studying STEM subjects in schools and universities.

For the North Highland and Moray to overcome these skills challenges will require leveraging the existing skills advantages that the region can offer over elsewhere in the world and building and expanding on the many schemes that are already developed to support skills training and increasing diversity across the UK, Scotland and locally.

Space businesses reported the following skill gaps or limitations among their workforces. Multiple responses were allowed and encompassed a variety of engineering skills, artificial intelligence and machine learning, data analytics and calibration and testing skills gaps within the existing workforce.

**Figure 2.2 Proportion of businesses that report having skill gaps or limitations amount their workforce**



Source: UKSA Space Sector Skills Survey 2020

## 2.4 Infrastructure

### 2.4.1 Energy

By their nature, Research and Development (R&D) and manufacturing have higher energy needs than other industrial sectors such as warehousing. The **midstream** segment – in particular data centres for storage and processing of data are some of the most energy-hungry of all business operations, and access to High Voltage power networks is likely to be a key driver of where these data centres choose to locate – along with access to national and international data cable networks.

### 2.4.2 Digital

Access to digital infrastructure – gigabit broadband – to enable the reliable and high-speed transfer of data to and from points on the earth is critical for all high-technology and data-driven businesses. The space sector is no exception. Direct and convenient access to national and international data cable “backbone” networks is particularly vital to growth of the **midstream** segment, most importantly ground stations and data centres, which collect, store and then distribute data collected from space.



### 2.4.3 Transport

The efficient movement of *goods* is also particularly critical for the **upstream** segment (satellite and launch vehicle development and manufacturing), for safely moving assets, launch vehicles and gases (fuel and purge gases) to launch sites. Efficient and reliable transport of goods is vital to those parts of the **downstream** segment engaged in manufacture and supply of components and equipment. The free movement of *people* across

a cluster, to enable the face-to-face collaboration and sharing of ideas to drive innovation and productivity is also critical.

#### 2.4.4 Real Estate and Facilities

The availability of appropriate facilities for space businesses is also a key factor in attracting and retaining firms operating in the R&D and manufacturing sections of the **upstream** (satellite and launch vehicle development and manufacture) and **downstream** (equipment development and manufacturing) segments. Specialist facilities include clean rooms and flexible office space, expanding with the needs of these often small and agile businesses.

#### 2.4.5 Liveability

The *liveability* of an area can often be the determining factor in attracting new firms to locate in an area and attracting and retaining the human capital – talent – needed for any cluster to grow.

Liveability includes: the quality of community services such as schools, Further Education (FE) colleges and Higher Education (HE) institutions; health services; leisure opportunities; the supply of affordable, good quality housing, and; the quality of the natural environment. Ease of access to major towns and cities via good national and international transport links also contributes to the liveability of an area, and its appeal as a place to live, work and invest.

Liveability can be the decisive factor in a firm or an individual's choice to invest in an area – and can be a key differentiator in the competitive and globalised **downstream** sector.

#### 2.4.6 Geography – Space Launch-specific

Latitude and the availability of real estate for launch ranges is a factor in where the **upstream** space launch operations locate. **Higher latitudes** are more optimal for the launch of satellites into Low Earth Orbits and a location near the sea and remote from population centres mitigates the risks from abortive launch. While this is only relevant for one small part of the overall space sector, the potential for space launch and spaceports to form the nucleus of a wider cluster, including ground stations and vehicle assembly means that geography may also be a differentiator in the **midstream** and **downstream** segments.

### 2.5 Regulatory & Legal

A mature national legal and regulatory environment that reduces the risk of innovation and protects Intellectual Property (IP) is a critical enabler of any innovative industry, including space.

- International agreements that enable frictionless trade – in terms of supply of goods and of licensing of Intellectual Property (IP)
- International agreements that allow the reciprocal sharing of technology with other leading space nations, in particular the USA
- Intellectual Property law, ensuring that technologies and products developed are protected and indemnified against piracy
- Cybersecurity infrastructure, and the ability of a nation state to guarantee the security of intellectual property assets

- Rule of law and ability to guarantee security of physical assets (in particular launch operations)
- Business-friendly regulation for higher risk operations in the **upstream** segment - engine testing and space launch.

Like any growth sector, space businesses require a favourable national and local **planning environment**, including local planning guidance that gives developers and businesses confidence. This is particularly relevant for higher risk engine testing and launch operations, which require a higher level of scrutiny and examination.

## 2.6 Inward Investment & Access to Finance

### 2.6.1 Inward Investment

Inward Investment is the new investment of capital by firms headquartered outside of an area in the expansion of their existing local operations; their merger and acquisition of local firms – or the formation of new joint ventures with existing local firms.<sup>18</sup>

A key focus of Inward Investment activity is the attraction of Foreign Direct Investment (FDI) by firms from overseas. For a cluster to grow, a coherent and high value proposition to potential investors is critical – and may be the differentiator in the highly competitive **downstream** segment.

### 2.6.2 Access to Finance

Many of the firms in a new and disruptive industry, like space, will be wholly new businesses, often spinning out of research institutions. A high proportion of firms operating in a space cluster may be start-ups – developing products and solutions at proof of concept or validation stage. Due to the high risk and uncertain rewards of new and innovative technologies, private finance (usually in the form of equity, as these firms lack the assets against which to secure loans) is often hard to come by. These firms face very high set up costs, and even higher costs for moving from concept to prototype to full production.

The availability of public funding to provide the capital to individual firms that the market may not is vital for the development of any innovation cluster – and space is no exception. The injection of US public funds in the form of grants to satellite communication firms in order for them finance launches with SpaceX was critical to their later global success.<sup>19</sup>

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<sup>18</sup> [Department for International Trade Inward Investment Results 2019-20](https://www.sdi.co.uk/); <https://www.sdi.co.uk/>

<sup>19</sup> Export-Import bank of the United States, [Ex-Im Bank Approves \\$105.4 Million Loan to Finance SpaceX Launch](#), August 2013

## 2.7 Transferable Lessons from Case Studies

Interviews were undertaken with representatives from other spaceports and companies already active within the space industry to learn from the experiences of other locations in developing their local ecosystem and to identify transferrable lessons applicable to the North Highland and Moray region.

Representatives from the following organisations were interviewed and/or provided material to support the development of Sutherland's Space Strategy:

**Table 2.4 Organisations engaged with in developing this strategy**

Country	Organisation
USA	Kennedy Space Centre, NASA
USA	Space Coast Economic Development Commission
USA	Space Florida (Part of the State of Florida Government)
New Zealand	Rocket Lab
New Zealand	Ministry of Business, Innovation and Employment
Europe	European Space Agency
USA	Phase Four
UK	Orbex
UK	UK Space Applications Catapult
UK	UK Space Agency

### 2.7.1 Employment

#### **Infrastructure improvements to support the launch facility will stimulate a wide range of jobs beyond the space sector and local area**

Mahia in New Zealand is a small rocket launch site developed entirely by the private sector. While the local job numbers associated with the launch facility has provided high skilled employment the much larger boost in job creation arose locally from the upgrade to the local infrastructure required to support a launch pad, such as improved roads and broadband, has acted as an enabler to a wide range of organisations and improved productivity levels of existing companies.

The launch facility has also stimulated employment in the research and development and manufacturing of space vehicles at a national level with space clusters emerging in both Auckland and Christchurch.

#### **The importance of leveraging workers from adjacent sectors**

Given the space sector is a niche and rapidly growing sector, future employees are likely to arrive from adjacent sectors. For example, in New Zealand there was a deep pool of local knowledge and skills in carbon composites derived from yacht building for the America's Cup and medical technologies. Both of these are transferrable to the space sector. For the



Highlands and Islands, there is a need to ensure reskilling of the skilled workers available from the nuclear sector, oil and gas, food and drink, renewable energy sector and defence sector who are well represented in the local area.

In addition, while it is recognised that the Highland and Moray region provides a good quality of life, it is still a relatively remote location. While this is mitigated by well-developed air and sea services, the region may struggle to attract a globally mobile space workforce in the mid and downstream segments where co-location with a spaceport is not required. This strengthens the requirement to retrain the local existing highly skilled workforce.

There is a strong need to ensure job opportunities arising within the space industry are widely advertised and there are ample opportunities for interactions between companies from different sectors.

## 2.7.2 Supporting ecosystem development

### Provide support to the development of early-stage companies

The space sector employs highly skilled and highly adaptable workers – many of whom over time may wish to establish their own companies. This process will support the evolution of an ecosystem over time which can be further enhanced by carefully planned business support services. The most successful clusters within the space sector arise from the co-location of regulatory developers, private companies and public sector organisations. To support the ecosystem requires anchors from global space companies and attractors for innovative SMEs.

### Regulatory and trade environment

The Highland and Moray region will be competing with a range of countries to attract space companies and to find clients for space launch facilities. The Space Industry Regulations 2021 were introduced to compliment The UK Space Industry Act 2018 to provide a collective detailed regulatory framework for commercial space activities (involving both launch to orbit and sub-orbital spaceflight) and the development of spaceports in the UK. The new regulatory framework details more specifically the requirements for the spaceport operator licensing, public and operator safety requirements and the compliancy with international compliance of the United Kingdom.

As a comparator, New Zealand who were also starting with a history of no launch facilities was able to establish a space agency, pass launch-related legislation and manage an orbital launch attempt over a 2-year period between 2016 and 2017.

In June 2020, the US and UK signed a Technology Safeguards Agreement (TSA) which will allow US companies to participate in space launches from the UK. Several concerns have been raised about this agreement being unreasonably restrictive to members of the UK industry around sourcing of sub-component parts and if it restricts other countries from coming to the UK to use launch facilities.<sup>20</sup>

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<sup>20</sup> Claire Housley and Elizabeth Rough, The UK Space Industry, Briefing paper CBP 2021-9202, 22<sup>nd</sup> April 2021, House of Commons Library.

### 2.7.3 Incentives

Across the world, the public sector frequently uses incentives to encourage companies to locate, remain and expand within their borders. For example, The Florida Space Coast offers streamlined permitting, low operating costs, aggressive and targeted incentives and access to a wide and deep space related talent pool.

Academic evidence has shown that job creation tax credits and job training grants are more effective at supporting local economies than incentives such as investment tax credits, research and development tax credits and property tax reductions.<sup>21</sup>

Given the rapid growth of the space sector there are benefits for locations that can provide advice in how to scale up operation. For example, Orbex are looking to grow their existing workforce from 90 persons to around 400 locally within the next 5 years.

Phase Four are an in-space propulsion company that spun out of the University of Michigan. They specialise in cost effective electric propulsion systems and have been learning from locally based local automotive manufacturers about how to increase their manufacturing outputs. Phase Four are adopting Kanban techniques (a scheduling system for lean manufacturing adapted from Toyota) to allow them to build up to 50 propulsion systems per month.

#### Requirements for co-location of companies and the launch facility

The need for different types of companies to be co-located next to the launch pad is still unclear. While there will be a requirement for clean facilities to support last minute checks on launch vehicles and payloads, many of the other requirements will be delivered to site. This means that there is a requirement for excellent local logistics providers but other companies may not need physical proximity to the launch pad itself. Instead, a supportive business environment, access to highly skilled individuals and a well-established ecosystem will be of greater importance.

The New Zealand government has acknowledged that the launch facility has benefitted the initial seeding of the space sector within the country but going forward intend to have a stronger push for supporting companies in the downstream part of the sector where they see opportunities for greater job creation and economic growth.

#### Linking research and development with commercial companies to create new opportunities

With the growth of propulsion technology, it is increasingly likely that commercial constellations will be launched on larger rockets with small rockets assisting with replenishment. However, there will inevitably be new opportunities for lighter payloads that will need launch facilities. The close interaction between universities, wider research and development and commercial companies needs to be supported to ensure early adoption of new technologies.

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<sup>21</sup> Bruce D. McDonald III, J.W. Decker, Brad A. M. Johnson, [You don't always get what you want: the effect of financial incentives on state fiscal health](#), February 2020

## Growing and Diversifying the Workforce

Given the space sector's requirements for high level skills and the current struggle to attract women into the sector there are a wide range of approaches adopted internationally and locally to help make the space sector a welcoming, inclusive and attractive sector to work within.

### Educational programmes

Both NASA and ESA have well developed education programmes engaging with schools, colleges and universities, from early years through to post-graduate level. They are increasingly providing online content which is incorporated into local curriculums. This is important for increasing awareness of the opportunities that the space sector offers for improving everyday lives through to providing opportunities for employers and the future workforce to engage with each other.

### Early years engagement

Critical for diversifying the space workforce is early years engagement so that children and in particular young girls start to picture themselves working in the industry and are not discouraged from studying the subjects that will make that a possibility in the future. In line with this is the need to train up teachers, who themselves may be lacking STEM skills.

### Retaining existing highly skilled workers in the region

Retraining of highly skilled workers is essential for the space sector and is critical to retain the highly skilled workforce being released from Dounreay and the Ministry of Defence activities in the North Highland and Moray region.

### Effective supply chain management

The space industry is already well recognised for providing training and work placement opportunities for new entrants into the sector. To further stimulate the development of the space ecosystem requires effective supply chain management as well as individual companies providing training opportunities. For example, NASA mandates through a penal contracting system that its primary contractors use SMEs and importantly, SMEs who are owned by under-represented groups, within their subsequent supply chain to provide services for NASA. This encourages more diverse entrants into the space sector. Similarly, effective supply chain management can boost the provision of apprenticeships and training opportunities if these are mandated within supply chain contracts. A new level 4 space engineering technician apprenticeship has been set up by the University of Leicester, UK Space Agency and Airbus and is expected to have more than 50 apprentices begin their training by the end of 2021. A level 6 (degree level) apprenticeship standard is currently in development.

## Chapter 3 - North Highland and Moray 2021: The existing ecosystem

### Summary

- In the North Highland region, a number of firms are already engaged in high value manufacturing – including optics, imagery and advanced materials, supplying the Dounreay nuclear research facility, the oil and gas sector. None currently supply the space sector.
- In the Moray Region, the expanding Orbex launch vehicle development and manufacturing facility at Forres forms a growing nucleus for the space sector. There is the potential for a clustering of innovative businesses at the Forres Enterprise Park, complementing the existing aviation and defence sector supply chain and talent pool serving RAF Lossiemouth. The food and drink sector in Moray also sustains a highly skilled workforce and advanced engineering supply chain.
- There are also a number of local programmes that support the development of the skills required by space. The Moray Aerospace, Advanced Technology and Innovation Campus (MAATIC) and co-located Manufacturing Innovation Centre for Moray (MICM) at Lossiemouth, due to start on site in 2022 will create a supply of engineering talent and incubation space for innovative engineering businesses, serving space and other sectors such as defence.
- While a large number of premises in the North Highlands region are not connected to the UK gas network, the region has plentiful and expanding supply of renewable energy (wind and tidal) and benefits from the existing and planned onshoring of HV power cables.
- While digital connectivity is limited in rural areas of the North Highlands region, business facilities are available in North Highland and Moray with gigabit / full fibre connections. The onshoring of international data cables offers the potential for hyper-connectivity businesses in the medium to long term.
- The region is ranked as one of the most deprived in Scotland for accessibility by land (road and rail), although connectivity within the Moray sub region is good. Air and sea links to the North Highlands region are however well-developed, a legacy of the oil and gas industry.
- The north coast of Scotland provides geographic advantages for small rocket launch facilities. While there is the potential for pressure on the local housing supply, community and educational services in the North Highlands region are of a high standard and able to accommodate growth. The liveability of the region – and outstanding natural environment are key strengths in attracting inward investment.

### 3.1 The North Highland and Moray Space Cluster

The focus of this strategy is the **North Highlands**, focused around **Space Hub Sutherland** (centred around the Dounreay Travel to Work Area) and **Moray**, focused around the **Orbex testing, manufacturing, and mission control centre at Forres** (centred around the Elgin Travel to Work Area).

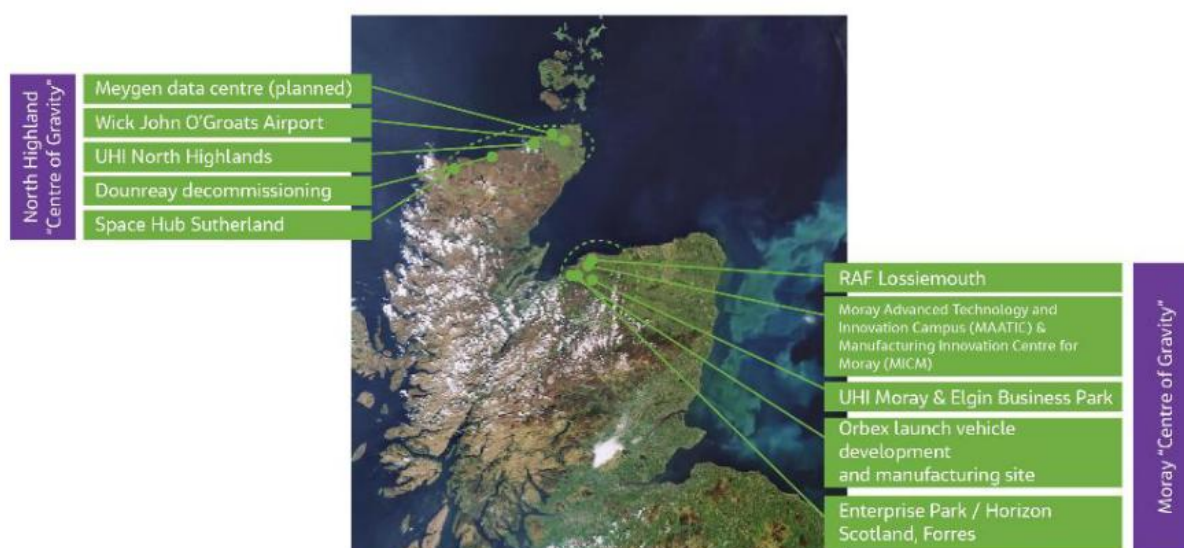
These two 'zones' or 'centres of gravity' form the potential nuclei for the **North Highland and Moray Space Cluster**.

In support of this strategy a comprehensive local ecosystem audit was undertaken by Caithness Chamber of Commerce, supported by Moray Chamber of Commerce and Highlands and Islands Enterprise (HIE). The detailed evidence base prepared is provided at **Appendix 1** and summarised in this chapter.

Figure 3.1 below sets out the regional spatial context, and existing or short-term planned space sector activity and key existing local assets relevant to developing a space sector cluster in the medium to long term.

**Figure 3.1 A North Highland and Moray Space Cluster**

**Ground zero: A North Highland & Moray Space Cluster**



### 3.2 Existing Supply Chain

The supply chain audit has shown that in the **North Highlands** sub-region, a number of firms are already engaged in high value manufacturing – including optics, imagery and advanced materials, supplying the Dounreay nuclear research facility, the oil and gas sector. None currently supply the space sector. Business services, construction and general support services are well represented.

In the **Moray** sub-region, the expanding Orbex launch vehicle development and manufacturing facility at Forres forms a growing nucleus for the space sector – suggested by the location of a UK Launch Services Ltd (UKLSL) regional office in the Horizon Scotland hub.



<sup>22</sup>There is the potential for a general clustering of innovative businesses at the Forres Enterprise Park, served by the 'Horizon Scotland' growth hub, complementing the existing aviation and defence sector supply chain and talent pool serving RAF Lossiemouth. The food and drink sector in Moray also utilises a highly skilled workforce and advanced engineering supply chain.

### 3.3 Existing Skills and Talent

Across the region, the Defence and Energy sectors are specifically contributing highly skilled technical engineers with continued investments and project opportunities.

The Moray Aerospace, Advanced Technology and Innovation Campus (MAATIC) aims to create hundreds of new student places and provide the skills needed for working in the aviation sector. It is one of the key projects of the £100m Moray Growth Deal. The MAATIC project concept and design phase is due to start in March 2021 and will take the project to the next step towards the construction phase due to start in April 2022. Discussions between HIE, UHI, Moray College and private partners such as Boeing and Orbex on the services to be provided at the centre have a growing focus on space.

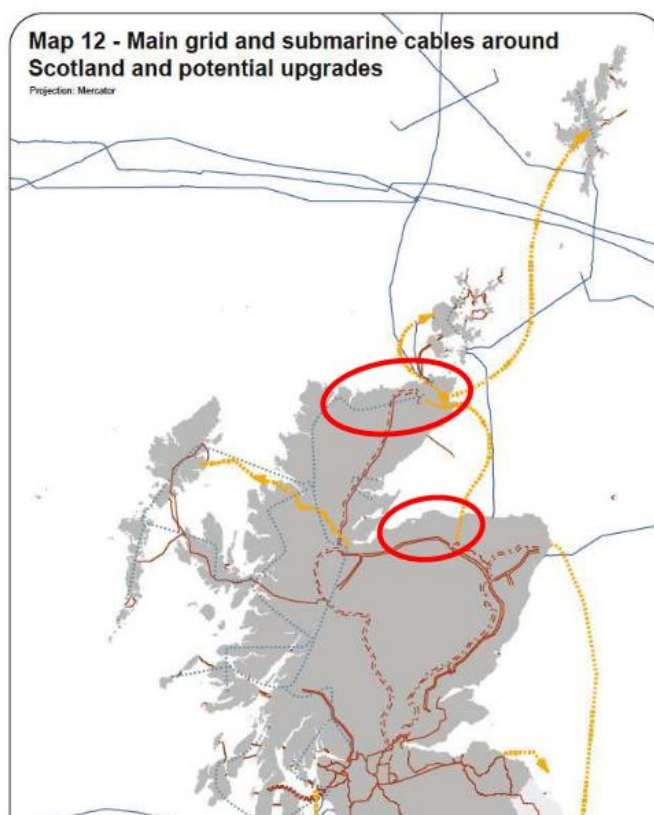
Additionally, both the North Highland and Moray Colleges are providing industry specific training and assessment centers to enable the students to train and practice skills required for work within Oil and Gas industry.

North Highland and Moray Colleges are also participants within the Developing the Young Workforce Programme managed by the Scottish Government which aims to better prepare young people for the world of work.

### 3.4 Existing Infrastructure

#### 3.4.1 Energy

While much of the North Highlands (28%) is not on the UK gas network, energy for heat and light in urban centres and business parks is affordable and stable. As summarised in figure



**Figure 3.2 Strategic Power and Digital Infrastructure (Including onshoring of sub-sea Power and Data Cables) in the North Highland and Moray Region<sup>22</sup>**

<sup>22</sup> [Marine Scotland Information](#), accessed September 2021



3.2, the region hosts existing and planned landing points of offshore power cables. With the expected coming onstream of offshore and onshore wind farms in the region and plans for the manufacture of hydrogen using renewable sources, and the opportunities of tidal power in the Pentland Firth, the region can be expected to offer a plentiful and expanding supply of renewable energy (wind and tidal) in the medium to long term.

#### 3.4.2 Digital

In the Moray region more than 40,000 homes and businesses have access to the fibre network, making it one of the best-connected local authority areas in the Highlands and Islands region. However, there are still some areas of North Highlands which lack access to superfast broadband or 4G mobile connectivity. Hopefully the government programme R100 will address this.

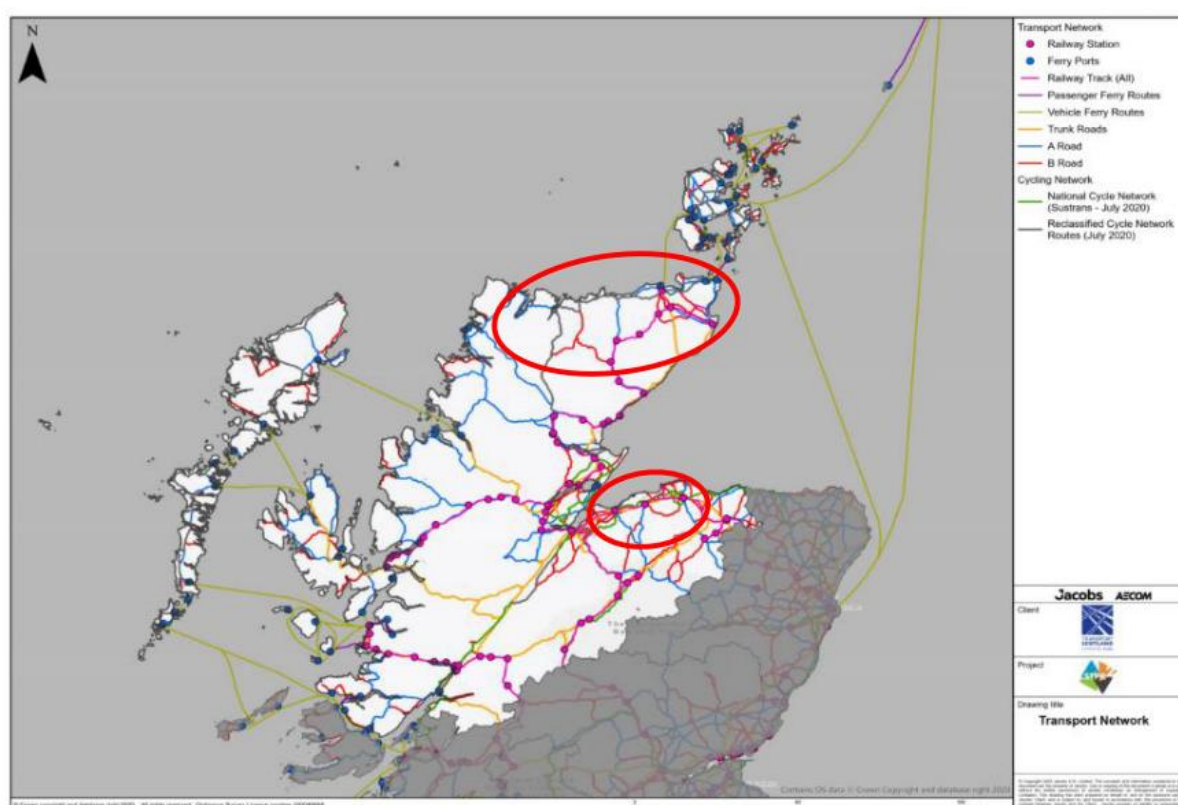
Business facilities are available in North Highland and Moray with gigabit / full fibre connections – in particular Enterprise Scotland Business Park and other serviced sites in the region.

The onshoring of international data cables in the region, in particular the Farice international cable near to Castletown in the inner sound of the Pentland Firth, and potential to connect to the UK digital backbone network also offers the potential for hyper-connectivity businesses in the medium to long term.

#### 3.4.3 Transport

Road and rail links into the North Highland sub region have limited capacity, with commuting from the economic centres in the central belt not currently feasible. Transport links within the Moray region are more efficient, although rapid access to the growing space cluster in Glasgow and other centres in England is challenging due to distance.

Figure 3.3 Transport Links in North Highland and Moray<sup>23</sup>



### 3.4.4 Real Estate and Facilities

Within the North Highland and Moray there are multiple business parks and commercial facilities suitable to host SMEs and startups. Importantly – given the key role for the state support of early-stage companies, Highlands and Islands Enterprise (HIE) the regional development agency, own and operate Enterprise Park, Forres and many sites in the H&I region. Highland and Moray councils also provide advice on commercial property available to buy or lease in the surrounding areas alongside locations suitable for specific industrial use.

Highlands and Islands Enterprise (HIE), working with Highland and Moray Councils, provides support services linking businesses in the region or wishing to locate in the region to premises and business support services, with a team of account managers.

### 3.4.5 Liveability

The liveability of the North Highland and Moray area is a key factor in attracting talent and investment to the area.

The North Highland and Moray Space Cluster is fortunate enough to be located within some of Scotland's most ecologically diverse terrain, with a range of terrestrial, freshwater and marine habitats. This incredible wealth of ecosystems contributes to a strong flow of natural

<sup>23</sup> [Initial Appraisal: Case for Change Highlands and Islands Region](#)

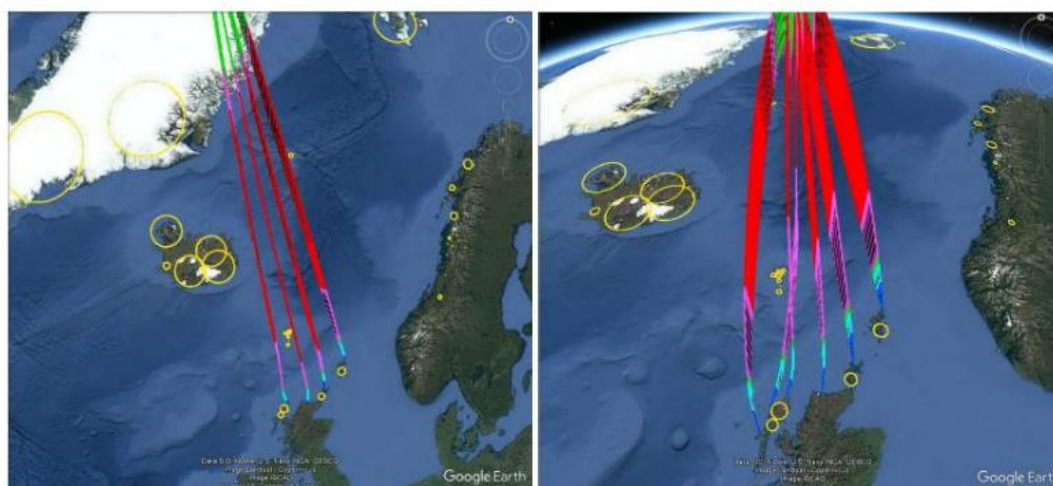
capital in the region, providing direct benefits to those living and working in the surrounding communities. With the landscape giving way to vast recreational activities and giving a passive boost to an individual's wellbeing, time spent within green and blue space in North Highland and Moray makes the region an incredible place to live and work.

Education and healthcare facilities in the North Highlands sub-region are under-capacity and achieving good outcomes for students. However, changes in work patterns with more home working and increased demand for holiday let properties in the UK has placed pressure on the local housing market impacting affordability across both sub-regions. Significant housing developments have been identified in the Moray Local Plan, and current pressure on the housing market may be expected to ease in the medium term as these sites are developed out.

### 3.4.3 Geography – Space Launch-specific<sup>24</sup>

North Highland provides launch access to the Polar and Sun-Synchronous orbits due to the trajectories that can be achieved from the sub-region. Each of these orbits are considered a Low Earth Orbit (LEO) and are favoured for earth observation as the orbit passes over the same location at the same local time.

**Figure 3.4 Launch trajectories achievable from Northern Scotland**



Source: *Sceptre Final Report*, Elecnor Deimos Group, 2017

## 3.5 Readiness of Local Economy for the Opportunities of space

In support of this strategy, an online survey was addressed to businesses in the Caithness and Moray Chamber areas to understand the reach of their own supply networks, growth plans and awareness of the opportunities of space sector.

The majority of respondents (19 of the 21 responses) supplied one or more of the parallel industries to the space sector – such as renewable energy, defence, nuclear or oil and gas, although none were currently supplying the space sector

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<sup>24</sup> [Sceptre Final Report 2017](#)

The responses demonstrated the self-sufficiency within the North Highland and Moray businesses with the majority of respondents claiming that on average over 60% of their supply chain is local.

The manufacturing, engineering and designs firms identified that key barriers to their future growth plans were 'Regulation/Red Tape', 'Macro Economic Disruption' and 'Quality of digital infrastructure'.

In terms of space awareness, all respondents expressed interest at the opportunities proposed by Scotland's Space sector. In terms of their SME entering the space market, most respondents answered that seeking networking opportunities would be the best strategy to learn how they can help support the emerging sector. Lastly, the barriers most likely faced by the companies looking to enter the market are, 'Regulation/Red Tape', 'Uncertainty of the market', and 'Supply of Talent and Skills'.

## Chapter 4 - Highland & Moray beyond 2021: Towards a Space Cluster

### Summary

#### *Strengths*

- Prestige – First to launch in the UK?
- Potential cluster nuclei – Forres & Space Hub Sutherland
- Geography – appropriate for polar launch
- Quality of local services, education and environment
- Existing aerospace, advanced engineering supply chain
- Existing non-specialist supply chain
- Local leadership and partnership, planning policy and site readiness

#### *Weaknesses*

- Specialist space support services – launch and range control, finance and business services (import / export, health & safety)
- Geography – remote from other clusters, barrier to attracting talent?
- Space not a Moray Growth Deal priority
- No specific comparative advantage for downstream growth
- Local digital connectivity (North Highland)
- Local road transport infrastructure (North Highland)

#### *Opportunities*

- Synergies:
  - Existing skills base: Oil and Gas, Nuclear
  - Offshore renewables
  - Food and drink (Moray)
  - Life sciences
  - Defence and aerospace – RAF Lossiemouth, MATIC

- Mid and downstream – offshore renewable / HVDC & data cable landings enable green ultra-high energy need and hyper-connected businesses
- Tourism & visitor economy – North Coast 500
- Synergies with Hydrogen economy, Greenports (Cromarty Firth), wider Scottish Space offer

### **Threats**

- Demographic trends - declining population
- Competition from other small launch sites
- Competition from other UK & Europe space clusters for midstream and downstream growth
- Regulation and policy – terms of TSA, UK and Scottish Government priorities
- Limitations of small launch market and Total Addressable Market
- Bulk of constellation satellite launch is likely captive to heavy launch operators (e.g., Space X) – gap in market for small launch

## **4.1 Gap analysis**

### **4.1.1 Supply of Services and Skills for Space**

The *current capability* of the North Highland and Moray area to meet the needs of the upstream and midstream sector, as set out Chapter two, is provided in table 4.1, and the downstream sector in table 4.2. The two sub-regions – **North Highland** (including Thurso, Dounreay and the launch site on the Moine Peninsula) and **Moray** (comprising the Orbex mission control and launch vehicle facility at Forres, and planned engine testing facility).

Within the table cells coloured red indicates no current provision. Amber indicates that there is some current provision in the local economy area – in terms of at least one existing specialist supplier or three existing suppliers that could potentially convert to supply these services to the space sector. Green indicates existing firms able to supply these specialist services. A qualitative assessment of the potential for North Highland and Moray area to develop a local capability in each line of supply has been conducted based on existing provision, and underlying infrastructure and local skills supply.

An indication of the potential economic value of each line of supply has been derived from the estimated GVA per job (using a proxy sector) compared to the UK / Scotland average – and where the greatest value may be secured for the local economy.

### **4.1.2 Infrastructure for Space**

Table 4.3 provides an overview of the strategic infrastructure required for developing a space cluster – and the current provision in North Highland and Moray, as set out in Chapter two.



### 4.1.3 Summary

This gap analysis indicates that the North Highland and Moray cluster has current advantages in terms of launch vehicle development and launch operations – with potential for development of midstream applications (ground stations and data centres) in the mid to long run, due to the strategic advantages of the onshoring of HV power lines and international data cables.

Figure 4.1 Upstream and Midstream Segment – Supply and Skills Gap Analysis

Segment	Sub Segment	Supply Need	Existing Supply Chain (SMEs and Skills)					Potential for clustering in North Highlands and Moray	Economic Impact (GVA per job, Multiplier, Effects)
			North Highland		Moray		UK		
			Suppliers	Skills	Suppliers	Skills	Suppliers		
Upstream	Space Systems Manufacturing	R&D – Aerospace						High	High
		R&D – All Sectors						High	High
		Advanced Engineering – Aerospace						High	High
		Advanced Engineering – All Sectors						High	High
		Advanced Manufacturing – Aerospace						High	High
		Advanced Manufacturing – All Sectors						Medium	High
	Launch Operations	Propellant Manufacture and Processing						Medium	Medium
		Launch and Range Control						Medium	High
		Airport Services						High	High
		Specialist Logistics						Medium	Medium
		Payload Integration						High	High
		Business Services						High	Medium
		Tourism and Hospitality						High	Medium
		Estate Management						High	Medium
Upstream / Midstream	Ground Systems	Ground Stations						Medium	High
		Mission Control						High	High
	Satellite Operations	Asset Management (SSA)						Medium	High
		Data Centres						Medium	High

Figure 4.2 Downstream Segment – Supply and Skills Gap Analysis

Segment	Sub Segment	Existing Supply Chain (SMEs and Skills)					Potential for clustering in North Highlands and Moray	Economic Impact (GVA per job, Multiplier, Effects)
		North Highland		Moray		UK		
		Suppliers	Skills	Suppliers	Skills	Suppliers		
Downstream	Satellite Data Intermediary Services						Too early to say	High
	Satellite Data Processing						Too early to say	High
	Satellite Data Applications: R&D						Too early to say	High
	Satellite Data Applications: Manufacturing						Too early to say	High
	Telecoms & Media – Any						Too early to say	High
	Earth Observation (EO) – Any						Too early to say	High
	Satellite Navigation – Any						Too early to say	High

Figure 4.3 Space Sector (all segments) - Infrastructure Gap Analysis

Category	Criteria	North Highland		Moray		North Highland & Moray
		Raiting	Overall Raiting	Raiting	Overall Raiting	Overall Raiting
Energy	How constrained is the current energy network (HV and gas) in its ability to meet the needs of new energy-hungry businesses?	Partially	AMBER	Partially	GREEN	AMBER
	Is there existing or potential to establish energy infrastructure to meet the needs of ultra-high energy-hungry businesses in the area?	Yes		Yes		
Digital	What is the current availability of superfast, ultrafast and full fibre in the area compared to the national (Scotland) average?	Below Average	AMBER	Average	AMBER	AMBER
	How does the Fixed Broadband compare to other proposed vertical launch site council areas (eg Shetland, Comhairle nan Eilean Siar) in Scotland?	Above Average		Above Average		
	Is there good existing mobile data coverage in the area from at least two suppliers (2021 OFCOM data)?	Partially		Yes		
	Does the region have any strategic advantages for the establishment of strategic digital Infrastructure – e.g. proximity to national data backbones or onshoring of international data cables?	Yes		Yes		
Transport	How does the capacity and performance of the highway network serving the area compare to the national (Scotland) average?	Below Average	RED	Average	AMBER	AMBER
	How do the frequency and affordability of the public transport (rail and bus) services serving the area compare to the national (Scotland) average?	Below Average		Average		
	Are other modes of travel - air and sea - available to move people and goods in and out the area?	Yes		Yes		
Real Estate and facilities	Is there an existing supply of flexible and serviced office space, appropriate to the needs of innovative, high-growth firms in the area?	Partially	AMBER	Yes	GREEN	GREEN
	Are (publicly-funded) services available to support inward investment, and to link innovative businesses with places to locate in the area?	Yes		Yes		
Liveability	Local housing supply – how affordable are local house prices compared to national (Scotland) average?	Average	AMBER	Average	AMBER	AMBER
	Local schools and colleges – how do local schools and FE / HE compare to national (Scotland) average for quality of provision?	Average		Above Average		
	Local health and social services – how does the availability of primary and secondary health care and other social services compare to the national / UK average	Average		Above Average		
	Shopping and recreation; ease of access to a variety of retail facilities, cinemas, theatres, sporting facilities and other recreation?	Below Average		Average		
	How does the quality of local amenity (green space) and access to natural environment compare to wider UK?	Good		Good		
Geography – space launch and space data specific	Does the region have an appropriate latitude for LEO launch?	Yes	GREEN	N/A	N/A	GREEN
	Are local residents and businesses positive towards the opportunities of space launch?	Yes		N/A		
	Is land available for locally for safe launch operations (safe distance from built up areas, proximity to the sea)	Yes		N/A		

## 4.2 Synergies: UK and European network of Space Ports & Centres of Excellence

At time of writing (Summer 2021), Space Hub Sutherland is one of a number of proposed spaceports across the UK – three offering exclusively vertical launch (all in Scotland) and four offering horizontal launch (two in Scotland, one in England and one in Wales).

As a statement of national ambition and reflecting the UK's advantageous northerly and island location on the edge of European landmass, the UK hosts more potential spaceports than any other European nation (seven) – a figure comparable to the entire EU (eight). None of these spaceports are yet operational, and each is at a different stage of maturity.

While estimates for the Total Addressable Market (TAM) for small launch varies, it is likely that the combined offer of these multiple sites will stimulate considerable commercial interest in the upstream market segment – where the North Highland and Moray space cluster has particular advantages. As these space ports are commercial propositions, ultimately the market will decide which progress to launch and long-term viability.

**Figure 4.4 Spaceport Landscape in Europe**



Source: Space Tec Partners



The national network of **Satellite Applications Centres of Excellence**<sup>25</sup>, coordinated by the Satellite Applications Catapult and supported by the UK Space Agency, are intended to enable innovative space businesses – across all segments – to Connect Locally, Develop Nationally, Transform Globally.

The network comprises three established Centres of Excellence in England – The North East<sup>26</sup>, South Coast<sup>27</sup> and South West<sup>28</sup> – centred around the Main Base of the Satellite Applications Catapult at Harwell, Oxfordshire UK<sup>29</sup>. The Satellite Applications Catapult and UK Space Agency are also supporting a number of other areas within the UK to develop their space clusters or hubs. These Centres of Excellence offer the opportunity for synergies, particularly in terms of developing **midstream** and **downstream** applications.

The Satellite Applications Catapult together with the UKSA have developed [the Space Enterprise Community](#) (SEC) platform – a free-to-use, online platform, and the virtual front door to the UK space sector. The platform will host live feeds, events, opportunities, groups, and forums, providing many ways for organisations and individuals within the space community to interact and identify opportunities for collaboration. Proactive engagement with the SEC will be an opportunity for the North Highland and Moray Space Cluster to develop a strong and distinctive presence in the UK space sector, promoting collaboration and stimulating inward investment as the cluster evolves.

A particular development initiative that may provide a template for other local space clusters is the **Disruptive Innovation for Space Capability (DISC)** facility<sup>30</sup> at Harwell. This hub – providing specialist facilities for space sector SMEs - will offer useful lessons for development of similar facilities as the UK space industry evolves.

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<sup>25</sup> Catapult, [Centres of Excellence](#), accessed September 2021

<sup>26</sup> Catapult, [North East Centre of Excellence](#), accessed September 2021

<sup>27</sup> Catapult, [South Coast Centre of Excellence](#), accessed September 2021

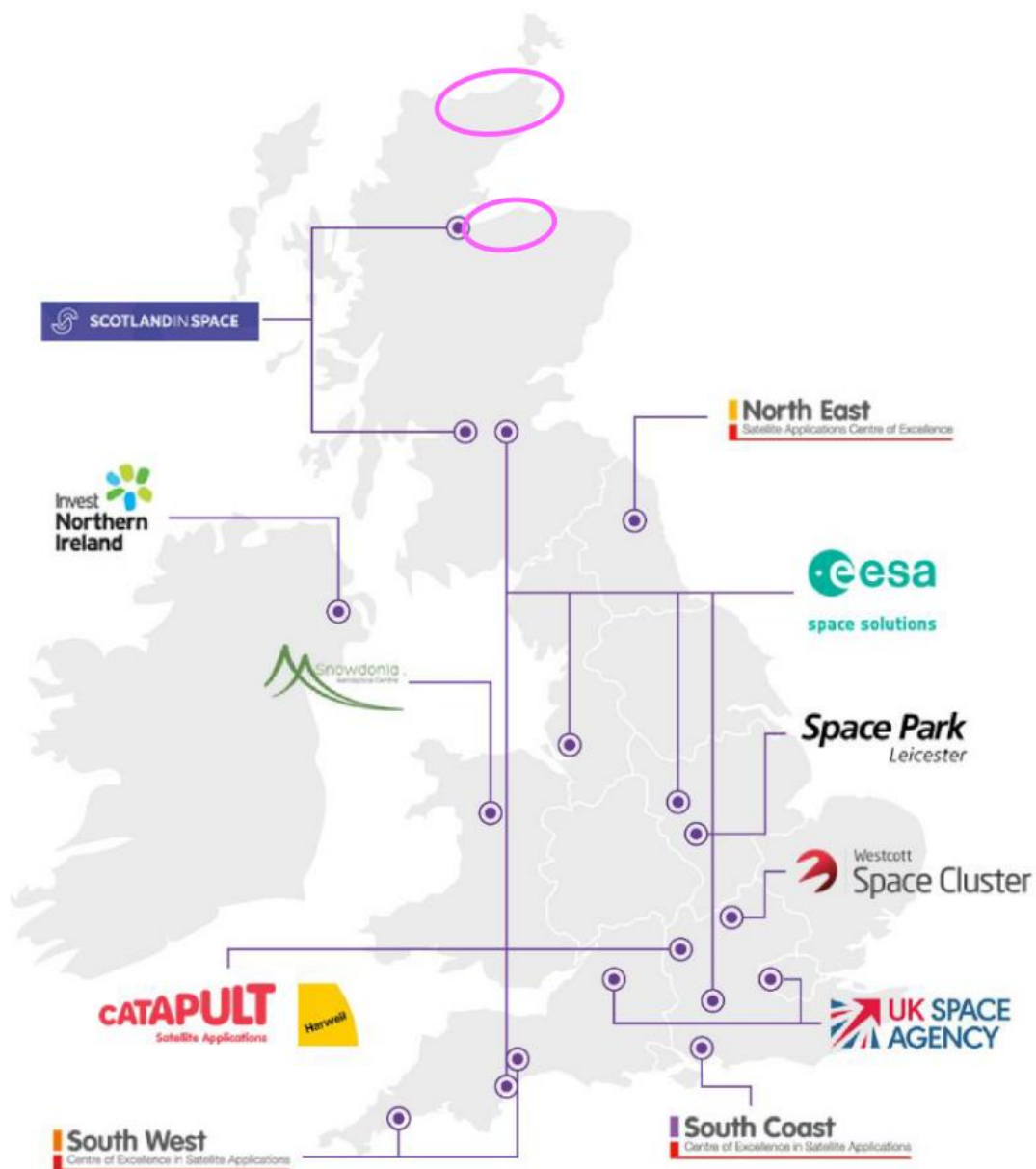
<sup>28</sup> Catapult, [South West Centre of Excellence](#), accessed September 2021

<sup>29</sup> [Harwell Space Cluster](#), accessed September 2021

<sup>30</sup> Catapult, [Disruptive Innovation for Space](#), accessed September 2021



Figure 4.5 UK Space Network<sup>31</sup>



Similar benefits may also be realised by engaging with the European Space Agency Space Solutions Network<sup>32</sup>. While the UK may not be able to access the European structural funds, the ESA network provides access to investors and collaborators across Europe – synergies and contacts that may be decisive in attracting firms to a nascent space cluster.

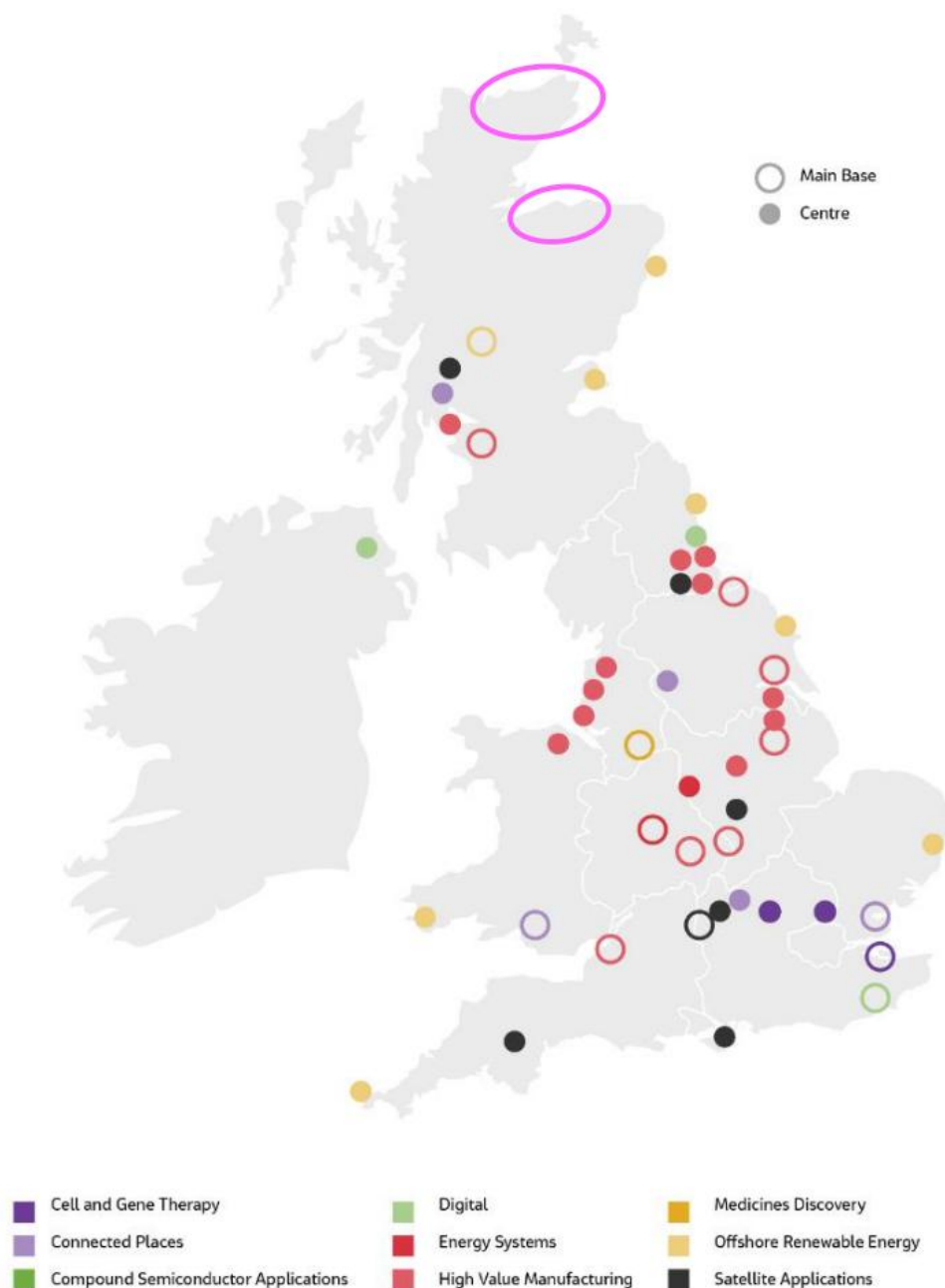
As the space sector overlaps with other sectors – with many firms in the downstream segment offering services horizontally – and developing applications that can be used across the telecommunications, advanced manufacturing and transport sectors and space - there

<sup>31</sup> Catapult, [Accelerating business growth, stimulating markets](#), accessed September 2021

<sup>32</sup> European Space Agency, [ESA Space Solutions](#), accessed September 2021

are also synergies with the wider network of Catapults across the UK. In particular, this includes **Digital**<sup>33</sup>, **High Value Manufacturing**<sup>34</sup> and **Connected Places**<sup>35</sup> Catapults. These are shown in figure 4.6.

**Figure 4.6 UK Catapult Network**<sup>36</sup>



<sup>33</sup> [Digital Catapult](#)

<sup>34</sup> Catapult, [Manufacturing a Green Recovery](#), accessed September 2021

<sup>35</sup> Catapult, [Connected Places Catapult is the UK's innovation accelerator for cities, transport, and places](#), accessed September 2021

<sup>36</sup> Catapult, [Accelerating business growth, stimulating markets](#), accessed September 2021

### 4.3 Synergies: Local Growth Priorities

The current HIE Economic Plan 2019-2022<sup>37</sup> prioritises the following sectors:

- Energy
- Tourism
- Food & Drink
- Life Sciences

This is complimented by a programme of investment identified under the Moray Growth Deal<sup>38</sup> which prioritises development of high value, innovative industries (in particular aviation and life sciences), and the **Moray 2026 Plan for the Future**<sup>39</sup> which identifies **a growing, diverse and sustainable economy** as is the top priority at the heart of the future success of Moray.

Key synergies with the needs of space are summarised in the table below.

**Table 4.1 Local economic growth priorities - Synergies with development of a local space cluster**

Sector	Synergies
Energy	<ul style="list-style-type: none"><li>▪ Shared supply chain. With <b>Hydrogen</b> economy: gases for launch vehicles, health and safety. With <b>offshore renewables</b>: Shared supply of STEM skills</li><li>▪ Shared constraints and opportunities, and need for transport (road transport) and energy (distribution) infrastructure improvements to fulfil potential</li></ul>
Tourism	<ul style="list-style-type: none"><li>▪ Space launch and space “brand” as a catalyst for tourism, building on the “North Coast 500” brand</li><li>▪ Shared constraint, and need for transport (road transport) infrastructure improvements to fulfil potential</li></ul>
Food & Drink	<ul style="list-style-type: none"><li>▪ Shared supply chain and talent – precision engineering, clean facilities needed by both food and drink and Space sector</li><li>▪ Shared constraint, and need for transport (road transport to efficiently move goods and people into the area and to national and international markets) and energy (distribution) infrastructure improvements to fulfil potential</li></ul>
Life Sciences	<ul style="list-style-type: none"><li>▪ Shared supply chain and talent – precision engineering, STEM skills, clean facilities</li></ul>

<sup>37</sup> [Highlands and Islands Enterprise, 2019-2022 Strategy](#)

<sup>38</sup> [UK Government confirms £32.5 million investment in Moray Growth Deal](#), August 2020

<sup>39</sup> Moray Community Planning Partnership, [Moray 2026 – a plan for the future](#), 2016

Sector	Synergies
	<ul style="list-style-type: none"> <li>▪ Similar plant and facilities needs – hub space can be dual purposed for life sciences, health care (telemedicine) and satellite applications</li> <li>▪ Similar finance and funding needs for start-up and scale up innovative businesses. Space, green energy, food tech and have potential to present a coherent and diverse portfolio, focussed in one area, to the VC market</li> <li>▪ Shared constraints and need for transport (road transport) improvements to fulfil potential</li> </ul>

Given the imperative to provide world-class digital connectivity, there is also a key synergy with the community based [Connecting Scotland programme](#) and [the Digital Scotland Superfast broadband](#) programme.

#### 4.4 Synergies: Existing Supply Chain & Talent

North Highland and Moray has a mature supply and skills (talent) supply in the following sectors.

- Oil & gas
- Nuclear
- Defence

**Table 4.2 Local economy – Synergies with development of a local space cluster**

Sector	Synergies
Oil & Gas	<ul style="list-style-type: none"> <li>▪ Shared supply chain – specialist logistics, project management, facilities and asset management, health and safety, professional services, manufacturing, component supply (pipework, high purity clean room manufactured components)</li> <li>▪ Shared talent base – remote asset management, earth observation</li> </ul>
Nuclear	<ul style="list-style-type: none"> <li>▪ Shared supply chain – specialist logistics, project management, facilities and asset management, health and safety, professional services</li> <li>▪ Shared talent base – STEM and physics/mathematics skills and expertise required for both nuclear and space applications</li> </ul>
Defence	<ul style="list-style-type: none"> <li>▪ Shared supply chain – specialist logistics, facilities management, health and safety, professional services</li> <li>▪ Specific synergies with upstream and midstream sector - space launch and launch vehicle development, avionics and propulsion</li> </ul>

Sector	Synergies
	<p>(engines), project management, air traffic control, specialist rocketry and ballistic skills and technical expertise</p> <ul style="list-style-type: none"> <li>▪ Shared talent base – Engineering, aviation, air traffic, near earth observation and rocketry systems skills and expertise</li> </ul>

## 4.5 SWOT Analysis

A summary of the strengths, weaknesses, opportunities and threats (SWOT) for developing a North Highland and Moray Space Cluster is provided below.

**Table 3. SWOT analysis**

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>▪ Prestige – First to launch into LEO in UK?</li> <li>▪ Potential cluster nuclei – Forres and Space Hub Sutherland</li> <li>▪ Geography – ideal for polar launch</li> <li>▪ Quality of local services, education and environment</li> <li>▪ Existing aerospace, advanced engineering supply chain</li> <li>▪ Existing non-specialist supply chain</li> <li>▪ Local leadership and partnership</li> <li>▪ Planning Policy and site readiness</li> </ul>	<ul style="list-style-type: none"> <li>▪ Specialist space launch services – launch and range control</li> <li>▪ Geography – remote from other clusters, barrier to attracting talent?</li> <li>▪ Space not a Moray Growth Deal priority</li> <li>▪ No specific comparative advantage for downstream growth</li> <li>▪ Local digital connectivity (North Highlands)</li> <li>▪ Local road transport infrastructure (North Highlands)</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>▪ Synergies: <ul style="list-style-type: none"> <li>• Existing skills base: Oil and Gas, Nuclear</li> <li>• Offshore renewables</li> <li>• Food and drink (Moray)</li> <li>• Life sciences</li> <li>• Defence and aerospace – RAF Lossiemouth, MATIC</li> </ul> </li> <li>▪ Mid and downstream – offshore renewable / HVDC &amp; data cable landings enable green ultra-high energy need and hyper-connected businesses</li> <li>▪ Tourism &amp; visitor economy – North Coast 500</li> <li>▪ Synergies with Hydrogen economy, Greenports (Cromarty Firth), wider Scottish Space offer</li> </ul>	<ul style="list-style-type: none"> <li>▪ Demographic trends - declining population</li> <li>▪ Competition from other small launch sites</li> <li>▪ Competition from other UK &amp; Europe space clusters for midstream and downstream growth</li> <li>▪ Regulation and policy – terms of TSA, UK and Scot Gov priorities?</li> <li>▪ Limitations of small launch market and Total Addressable Market</li> <li>▪ Bulk of constellation satellite launch is likely captive to heavy launch operators (e.g. Space X) – gap in market for small launch</li> </ul>



## Chapter 5 - Space: The 'size of the prize' for North Highland and Moray

### 5.1 Introduction

Space Hub Sutherland will play a critical role in bringing income and employment to the North Highland and Moray region. It will help to retain highly skilled individuals in the North Highlands and offer opportunities to young people to help stem the flow of depopulation. It is vital to sustain the emerging Moray space cluster as without a space port it is highly likely that existing launch providers will relocate.

Together with the rapid development of the landmark Orbex manufacturing facility at Forres and investments in defence, aerospace and life sciences in Moray, given form and shape by the space cluster development strategy, Space Hub Sutherland, as an iconic local asset, has the potential to catalyse private investment and business growth supporting the UK and Scottish governments ambition for seizing the global opportunity of the space sector.

There are already around 7,700 people working in the Space Sector across Scotland.<sup>40</sup> This chapter estimates the number of additional jobs and value created from Space Hub Sutherland and potential growth in the wider space sector within the Highlands and Islands region. Investments in the space port will lead to increases in employment beyond those who may be directly employed either building or operating the facility. A global standard approach to estimate the amount of total employment and value that is created through a particular investment is a statistical technique using multipliers. Two types of multipliers are typically calculated: Type 1 calculates the amount of employment created in a supply chain to a particular industry (known as indirect effects) and Type 2 calculates the amount of employment created due to the uplift in spending overall (known as induced effects). The figures calculated are in addition to the direct employment from the construction and operation of the Space Hub Sutherland.

Furthermore, the payloads launched into space by rockets at Space Hub Sutherland will unlock further employment and value in the midstream and downstream parts of the space sector. We have for the first time, made a conservative estimate to the numbers of jobs and value associated with this.

### 5.2 Assumptions

For the sake of continuity, the Jacobs' economic impact model adopts the same ratios of cost per launch and investment to calculate Gross Value Added and Full Time Equivalent (FTE) jobs as applied within the evidence base for the planning application for the space port.<sup>41</sup> This covers impacts associated with the following activities:

- Construction of the space port
- Spaceport and site management

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<sup>40</sup> [Space Industry in Scotland](#)

<sup>41</sup> Frontline, Economic Impact Assessment of Preferred Option for Space Hub Sutherland (SHS), December 2019

- Launch activities
- Tourism
- Accommodation to support launch activities

However, based on more recent information and studies we have updated assumptions about the launch cadence that is anticipated, the expected numbers of tourists to the site and Orbex's announcements about anticipated employee numbers. Furthermore, we have included construction activities associated with the maintenance of the spaceport facility as well as the original build. The following assumptions have been made for the base-case scenario:

### Construction and maintenance of spaceport

- The construction of the spaceport will take 2 years with an investment profile at 10% in Year 1 and 90% in Year 2 (as used in the Frontline report).
- From Year 3 onwards we have assumed a maintenance budget for the space port of 5% of capex costs based on a benchmarking comparator.
- This will provide employment for construction and civil engineer workers during the construction phase and thereafter for site maintenance.

### Space port and site management

- The Jacobs' Economic Impact Model retains the assumptions used within the original planning model of 17 FTEs at the space port when it is fully operational with 12 launches per year. For preceding years, FTEs are pro-rated according to the number of launches.
- The operation of the site will provide employment in technical support, site security, administration amongst other roles.

### Launch activities

- The first launch from the site will be towards the end of the second year of construction, this will ramp up to 3 launches in the following year, 7 launches in the next year up to a maximum of 12 launches per year from year 5 and beyond. For comparison, RocketLab in New Zealand has successfully launched 21 missions since its first rocket launch in May 2017.<sup>42</sup>
- The original Frontline economic impact model associates the numbers of employees with the number of planned launches. As not all of the work undertaken at Orbex is directly linked to the Sutherland Space Port facility, we have extended the initial assumptions to account for planned growth publicly announced by Orbex. Orbex have stated that they intend to increase their number of employees in the Highland and Moray region from 90 at the end of 2021 to 400 by 2030.

### Visitor numbers

- Visitor numbers including sector and specialist visitors and tourists have been updated based on a study by The Moffat Centre for Travel & Tourism Business Development at

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<sup>42</sup> Rocket Lab, [Completed Missions](#), Accessed September 2021

Glasgow Caledonian University<sup>43</sup> who provide anticipated visitor numbers per launch to be as follows. The increase in visitors from year 3 is associated with a proposed introduction of a visitors' centre and incremental improvements in local facilities such as retail and hospitality:

**Table 4. Visitor number assumptions**

Year of Launch	1	2	3	4
Visitor numbers per launch (midpoint of The Moffat Centre estimate)	442	323	368	368
Number of launches	1	3	7	12
Visitors per annum	442	970	2,578	4,419
Attraction life cycle stage	Growth Novelty Interest	Maturity	Decline	Decline and Stabilisation

#### Accommodation to support launch activities

- We retain assumptions from the Frontline report that in addition to the local workforce operating the space port, 30 workers will be located temporarily by the space port to support each planned launch and they will stay for an average of 28 nights per launch.
- This will provide an increase in demand for local accommodation, food and drink and entertainment activities close to the Sutherland Space Port and an increase in jobs related to those activities.

### 5.3 Deadweight, Displacement and Leakage

Jacobs' economic impact model accounts for **deadweight** (the amount of space sector activity that would have been achieved without investment into Space Hub Sutherland), **displacement** (activities which would have existed but are attracted to the Highland and Moray region from elsewhere to the detriment of economic activity in the former location) and **leakage** (where money leaves the area to other locations). For continuity, we have adopted the total deadweight, displacement and leakage GVA figures used within the original Frontline report. These are:

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<sup>43</sup> Prof John Lennon, Space Hub Sutherland Visitor Forecast Plan, The Moffat Centre for Travel & Tourism Business Development, Glasgow Caledonian University, August 2021

**Table 5. Deadweight, Displacement and Leakage assumptions by sector**

Sector	Highlands and Islands (%)	Scotland (%)	UK (%)
Construction	15	20	25
Site management	0	0	0
Launch activities	40	25	15
Tourism	50	60	75
Accommodation	50	60	75

Source: Frontline, *Economic Impact Assessment of Preferred Option for Space Hub Sutherland (SHS)*, December 2019

## 5.4 Multipliers

Again, for the sake of continuity, the Jacobs' economic impact model adopts the same multipliers as applied within the evidence base for the planning application for the space hub. In addition, we have adopted the UK multiplier to account for construction related activities within the Jacobs model. Multipliers used in the model are:

**Table 6. Type II (combined indirect and induced) multipliers assumptions**

	FTE	GVA
Highlands and Islands		
Space	1.9	1.65
Tourism	1.11	1.22
Construction	1.75	1.88
Scotland		
Space	2.8	2.3
Tourism	1.22	1.44
Construction	1.75	1.88
UK		
Space	2.8	2.3
Tourism	1.22	1.44
Construction	1.75	1.88

## 5.5 Growth Scenarios and Time Horizon

As set out in the introduction to this report, the space sector is growing steadily but with underlying rapid changes in the types of organisations involved, the implementation of different technologies and the funding being made available. Therefore, in addition to the baseline scenario set out above, we have modelled two different growth scenarios to better understand the uncertainty associated with the growth of the space sector. We identify how changes in the number of launches and visitor numbers may impact on job numbers and value created overall.

### Scenario 1 – slower ramp up and fewer launches in the longer run.

For scenario 1, the ramp up in the number of launches is slower and the maximum capacity of rocket launches is 9 per annum. In addition, visitor numbers are reduced to the lower end of the Moffat Centre's estimates. The assumptions are as follows:

**Table 7. Visitor number and launch assumptions - scenario 1**

Year of launch	1	2	3	4	5	6
Visitor numbers per launch (low point of The Moffat Centre Estimate)	412	303	343	343	343	343
Number of launches	1	2	4	6	8	9
Visitors per annum	412	606	1,372	2,058	2,744	3,087

### Scenario 2 – Quicker ramp up of launches and more visitors attracted

For scenario 2 the ramp up to achieve the maximum of 12 launches per year is achieved more quickly and the visitor numbers are increased to the upper end of the Moffat Centre's estimates. The assumptions are as follows:

**Table 8. Visitor number and launch assumptions - scenario 2**

Year of launch	1	2	3
Visitor numbers per launch (low point of The Moffat Centre Estimate)	472	343	393
Number of launches	1	7	12
Visitors per annum	473	2,401	4,716

## 5.6 Timelines for modelling

For the baseline and two scenarios employment numbers and value created are estimated over three time horizons:

**Short term:** 4 years to 2026 (to provide a focus for the growth deal)

**Medium term:** 9 years to 2030 (to provide a focus that aligns with the UK Space Strategy)

**Long term:** 29 years to 2050 (to provide a focus that aligns with infrastructure planning at a national level)

## 5.7 Employment and Gross Value Added

The following figures have been estimated for annual average full time equivalent jobs (rounded to nearest 10). These figures account for the full development lifecycle of Space Hub Sutherland from construction through to operation i.e., to 2026 – the average employment supported by the investment between 2021 and 2026.

**Table 9. FTE estimates**

	Baseline model			Scenario 1			Scenario 2		
Year	2026	2030	2050	2026	2030	2050	2026	2030	2050
Highlands and Islands	290	390	480	210	280	360	330	410	490
Scotland	470	660	840	330	470	630	550	700	860
United Kingdom	520	730	940	360	520	700	600	760	950

The following figures have been estimated for average annual Gross Value Added (GVA) which is a measure of the value of goods and services produced in an area, industry or sector of an economy. Similar to employment these figures account for the full value created across the entire development lifecycle of Space Hub Sutherland from construction through to operation i.e., to 2026 – the average Gross Value Added created by the investment between 2021 and 2026.

**Table 10. GVA estimates**

	Baseline model (£m)			Scenario 1 (£m)			Scenario 2 (£m)		
Year	2026	2030	2050	2026	2030	2050	2026	2030	2050
Highlands and Islands	15	22	29	10	16	21	20	25	29
Scotland	23	36	47	14	25	35	31	40	49
United Kingdom	25	40	53	15	28	39	34	45	54

## 5.8 Estimating the wider value and job impacts unlocked by activities at Space Hub Sutherland for the Space Cluster

Developing the UK's launch capability at Sutherland in combination with a robust cluster strategy brings a multitude of benefits. It will provide vital local economic impacts for the region by offering a range of locally based employment opportunities and the chance to be at the forefront of an exciting emerging sector which will also bring indirect impacts to boost the already thriving tourism economy in the region.

As a highly innovative industry, the space sector encourages a wide range of other activities that can be difficult to forecast. Technologies developed for the space sector have since found many other beneficial uses and commercial opportunities on earth. NASA has tracked more than 2000 spinoffs since 1976 from memory foam to revolutionizing the design of HGVs using aerodynamic research.<sup>44</sup> Similarly, ESA's Technology Transfer Programme has

<sup>44</sup> NASA, [Home | NASA Spinoff](#), accessed September 2021



supported over 150 separate technological innovations over the past decade, fostering the creation of around 20 new companies and 2,500 jobs.<sup>45</sup>

Space Hub Sutherland will be a key enabler for the emerging space cluster in the North Highland and Moray region. As the first vertical space launch facility in the UK, it will be able to leverage first-mover advantages. These include developing strong brand recognition, establishing key supply chains, and retaining and growing the existing highly skilled workforce in the North Highland and Moray region. Space Hub Sutherland will also play a critical role in supporting the further development of other space ports across the country by identifying and sharing areas of improvements once the facility is established and operational.

The space cluster in the North Highland and Moray region will provide an opportunity to leverage and grow existing training facilities across the region boosting the economic activities of the University of the Highlands and Islands and other training providers as they develop new courses and facilities to meet emerging skills requirements.

Efforts are currently underway to engage and attract additional companies who are involved in space situational awareness to locate in the Highland and Moray region. Furthermore, companies involved in space applications including defence and earth observation are likely to be attracted to the emerging space cluster.

The approach used for the economic impact model by Frontline for the Space Hub Sutherland investment was to determine the value added and employment created by the establishment and running of the Spaceport and Launch Service Operator. It accounts for upstream activities, the design and build of the spaceport itself, the activities of the launch service operator on that site and the associated indirect and induced impacts. It does not attempt to estimate the further value unlocked by having a spaceport on the midstream and downstream activities of the wider space sector.

It is challenging to put a figure on the extent of opportunities that will be unlocked by Space Hub Sutherland and its associated space cluster. The Jacobs' economic impact model has been extended to account for the value potentially unlocked for the midstream and downstream activities that will be supported by the payloads being launched from the space port. The UK already has a thriving space sector with many midstream and downstream activities already underway despite the lack of a UK based launch facility. Therefore, we have chosen to apply a transparent and conservative approach to model the likely increase in GVA and employment in the midstream and downstream activities derived from the new Sutherland Spaceport facility based on the experience of New Zealand who have developed a similar launch capacity to what is proposed at Sutherland.

In New Zealand upstream activities account for 40% of the GVA of the space sector with midstream and downstream accounting for the remaining 60%. We have assumed that any increase in the upstream activities will have a linear impact on the downstream activities

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<sup>45</sup> European Space Agency, [ESA - Spin-off technologies](#), accessed September 2021

giving a multiplier of 2.49. That is for every £1 of GVA created by upstream activities a further £1.49 is unlocked in the midstream and downstream part of the space sector.

Similarly, for FTEs, 52% of the space sector in New Zealand are employed within upstream activities with midstream and downstream activities accounting for the remaining 48%. We have assumed that any increase in the upstream FTEs will have a linear impact on the downstream FTEs giving a multiplier of 1.91. That is for every 1 new FTE created by upstream activities a 0.91 FTEs are created in the midstream and downstream part of the space sector.

In 2020, it was estimated that the space economy contributed £6.6bn of GVA to the UK's economy and unlocked at least £360bn of GVA by supporting industries that are dependent on satellite services including navigation, meteorology, communications and earth observation.<sup>46</sup> In our estimates we have identified that by 2030, Space Hub Sutherland will support the following full time equivalent jobs (rounded to 10) and value for upstream, midstream and downstream activities (rounded to nearest £m):

**Table 11. Local, regional and national FTE and GVA estimates**

	FTE	GVA (£m)
Highlands and Islands	740	56
Scotland	1260	90
United Kingdom	1400	99

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<sup>46</sup> [The Size and Health of the UK Space Industry 2020](#)

## Chapter 6 – Space: A Vision for North Highland and Moray

### 6.1 Vision & Objectives

The space sector is rapidly emerging and evolving. The vision for the North Highland and Moray Space Cluster is, 'By 2026 North Highland and Moray will have established one of the most significant Space Clusters in the UK'.

It is clear to the group who have developed the strategy that time is of the essence, the global space sector is dynamic and many changes are occurring now. This strategy therefore states that it is vital if the vision is to be achieved that action is taken now and that partners who are committed to the success of the cluster work together to achieve the vision.

The objectives in the development of the Space Cluster Strategy discussions with the Steering Group have been to:

- develop plans to help existing businesses in the North Highland and Moray region;
- to support the attraction of relevant companies and organisations into the area;
- develop skills, and academic resources to assist the Space Cluster;
- identify alternative sectors that can use space technology and
- to develop a financial strategy for the sustainable growth of this emerging sector.

The Space Cluster Strategy has focused on opportunities around Upstream including Space System Manufacturing, Launch Operations (LEO only) and Ground Systems; Midstream including Satellite Data Capture and Storage and Downstream including Satellite Applications and User Equipment Manufacturing.

The opportunity for North Highland and Moray has been highlighted in the wider context of Scottish, UK and Global opportunities and these have been sense checked by identifying the needs of the space sector, undertaking an ecosystem audit of the area and performing a gap analysis which has determined a list of recommendations (see section 6.4) and action plan.

It is also envisioned that the development and operation of Space Hub Sutherland will strive to contribute to the global efforts of reducing, mitigating, and adapting to the challenges of our changing climate. The Space Hub itself will ensure operational emissions are accurately accounted for and so to be best incorporated within UK climate targets, specifically the 78% emission reduction target by 2035. With COP26 in November, the climate policy of Space Hub Sutherland must be constantly reviewed and re-aligned with national initiatives and global agreements, this responsibility will fall upon the Local Space Leadership Group.

This strategy and recommendations express the will of the steering group to take action and realise the opportunities that lie before the North Highland and Moray areas in a sustainable manner through to 2030. The steering group also recognise that the Space sector continues to evolve and anticipate that the Cluster will need to be responsive to changes in the industry and academia if it is to optimise the impact it can have both in the area and beyond.

## 6.2 Action Needed

### 6.2.1 Business Support

#### The launch sector in the area

The North Highland and Moray cluster starts with some significant opportunities in the upstream Launch Sector. The presence of the Space Hub Sutherland spaceport in the North of Sutherland, with its ambitions to be the greenest space port in the world, offers an excellent start to vertical launch in the UK as well as a supportive community in the North Highlands that are seeking to make this a real success. In developing this opportunity, the Space Launch Company, Orbex, has demonstrated its early commitment to the area in opening a manufacturing facility in Forres, near to the Highland capital of Inverness in 2019. Since then, Orbex has continued to develop its launch vehicle, Prime, and its presence in the area. Both of these initiatives have seen real progress with a realistic prospect of orbital launch within 2 years of this strategy coming forward.

Given the opportunity that this creates in this area, it is likely that other elements of support for launch and the downstream elements of Space will seek to be near to these facilities and proximity to the main launch location will add to the opportunity for some companies. Future developments should consider the environmental agenda.

By 2030 we would also anticipate that other Launch Service providers will be using the Space Hub Sutherland site for orbital launch. While cadence is currently limited by planning for 12 launches per annum it is likely that initial launch slots will permit launch vehicles of a similar size to the Orbex Prime launcher to use the site. The development of these Launch service providers' presences in the area will also be an opportunity for further jobs and support roles.

#### Developing a range of centres for excellence

This strategy looks to focus its effort in developing a range of centres that will offer not just a participating contribution to the Space sector in the UK, but to seek real excellence and business success that will encourage further development in the area. It is based on the adage that "nothing succeeds like success".

We see developments around the Launch segment benefiting from the orbital launches that will take place at Space Hub Sutherland. This will see expertise and knowledge be used and grow around the Spaceport. It will see a centre around the immediate vicinity of Melness and Tongue with local people being trained in the operational skills needed to operate a successful Spaceport with those numbers being increased by bringing in skilled and experienced staff particularly in the early stages. As the launch cadence increases, we anticipate that more of these peripatetic staff will chose to base themselves in the area.

We also see that Caithness with its engineering heritage and skilled staff will also grow into a centre for the Launch sector. This is likely to be focused around the towns of Thurso and Wick where the rundown of the nuclear facilities at Dounreay and Vulcan will free up skilled staff who can contribute to wider Space developments.

The development of the Orbex capability in Forres also offers a real opportunity to develop a centre of Space manufacture in Forres. Their growing presence at the Enterprise Park can offer the chance for likeminded companies to locate and grow the sector.

### 6.2.2 Skills & Education

The development of a skilled workforce is a vital consideration. While the area offers an existing range of skilled workers further activity is required. The UK Space Agency's Space Sector Skills Survey highlighted some key points for the development of requirements for industry.

These included:

- Most space companies are looking to recruit. Of those, most are struggling to find candidates with the right skills and experience. Particular gaps are around software and satellite operations.
- The range of skills needed is very wide, which means there is "no obvious single focus for training that would address a substantial proportion of the recruitment difficulties".
- Retention is also a problem for some, particularly for large companies, mostly because of pay and poaching.
- Most companies do some kind of training, but there are some significant gaps in training provision.
- There is interest in a generic space graduate development programme to address some of these issues.

Therefore by 2030 the area will have focused on providing good training for its people in entering the Space sector through a number of routes. These will include traditional routes such as Modern Apprentices and other engineering graduate routes. The development of the Launch sector will also see a rise in the demand for trained staff in these roles.

The ongoing use of STEM in motivating young people to have an early engagement will continue and will be given an extra impetus by the high profile of local launch and also the ongoing range of global Space activity.

Significant elements of this requirement will involve a wide range of partners supported by the growing presence of the University of the Highlands and Islands in both Moray and North Highland.

**Recommendation one:** Create specific programmes through universities and supply chain partners to address the science/engineering skills shortages in space industry leveraging nuclear, oil & gas and MOD know-how. (Address early years engagement, Space STEM, technician level training and sector specific qualifications).

**Recommendation two:** Explore area wide interventions to stimulate downstream growth in the area (70-85% of the market). This would likely need an understanding of market need. While this will involve appropriate connectivity and property it is likely to focus on labour supply and working with academia to deliver a labour pipeline.

**Recommendation three:** Consider the use of job creation and training fiscal incentives to stimulate employment and how they can focus on the space sector.

### 6.2.3 Research & Development

The development of innovative solutions is one of the main driving forces in the Space sector. The cluster will work with existing industry partners, academia and innovation agencies and initiatives to develop this important activity within the area. The relationship within the cluster between space specialists and scientific research will be strengthened by the local partnerships with the Environmental Research Institute - University of Highlands and Islands.

Bodies to engage include, University of Highlands and Islands, Scottish Space Academic forum, Northern Innovation Hub, Innovate UK the KTN, UK Space Agency and the Satellite Applications Catapult.

We will follow the Scottish Government approach for innovation through:

- Encouraging more businesses innovation through direct contact with HIE and Business Gateway contacts.
- Using public sector needs to stimulate private sector innovation
- Developing centres of excellence in the sector in the area and
- Make the best use of University knowledge and expertise to provide industry with the best tools to innovate.

**Recommendation four:** Review options for Accelerator Programmes as an enabler of start-ups and existing tech supply chain to diversify and engage (networking) with the (upstream in first instance) space sector.

### 6.2.4 Infrastructure

The infrastructure of North Highland and Moray will need to be reviewed to assess and where necessary provide a competitive environment for the development of the Space Cluster.

As noted above this will include social infrastructure as well as more easily identifiable infrastructure that is normally used for commercial developments.

In accordance with the ecological goals outlined within COP26, the protection and restoration of local ecosystems will be of upmost importance within all construction and operational activities of the Space Hub, Cluster and any necessary additional infrastructure.



Specifically of interest to the Cluster includes the following:

- Property audit and site provision – The range and size of properties that can be used in the area for the range of companies interested in the Space sector. We will also assess the range of sites that can be used for future property locations.
- Broadband and connectivity – The roll out of the Next Generation Broadband has done much to enhance the provision of connectivity in large parts of the rural Highlands and Islands. Further work needs to be undertaken to better understand the requirements for the range of Space sector connectivity elements. These include Launch Services, Launch Control, Mission Control, Ground Station and Data Centre connectivity, data analysis and the provision of access to these services for those working from home.
- Better Transport Connections – This includes the potential for rail, road and improved rural air mobility. These can be improved and therefore an early investigation should be carried out. An early example of transport innovation is the establishment of the Sustainable Aviation Test Environment (SATE) within the UKRI Future of Flight programme (trialing of alternatively powered aircraft). Other innovative approaches should be explored.
- Development of rural housing – Many parts of the North Highland and Moray Space cluster rely on a hinterland of rural communities. Those communities have a range of available properties including residential, holiday homes and crofting uses. There is a need to ensure that housing is available for incoming workers and also to provide suitable housing options for those in the area who would wish to live and work in this rural community. A number of initiatives can help with this. The Cluster will enable this to proceed.
- Provision of incubator / spin out space – As noted above it is an important part of Cluster development to encourage and enable spin out opportunities, to facilitate business growth near to the Space Hub Sutherland site and to provide a soft-landing zone for potential inward investors. This will be reviewed and plans developed to bring this forward.
- Development of visitor / education provision – The sector will drive interest in the location that is delivering Launch from the UK. There is a need to consider possible sites and partners for the delivery of an Education / Visitors centre that can tell the story of the Space sector to a wide group of visitors including the evolving STEM cohort.

It is anticipated that each of these areas will be investigated and considered by the Local Space Leadership Group.

**Recommendation five:** Ensure provision of the necessary residential and business infrastructure and resilience in the area to meet the needs of a growing high-tech data driven space ecosystem.

**Recommendation six:** Develop an incubation centre (hub) associated with Space Hub Sutherland leveraging existing resources to give growing companies the opportunity to learn from an operational spaceport.

**Recommendation seven:** Enhance talent attraction capability through focused efforts on promoting the liveability of the area.

### 6.2.5 Governance (Space Leadership Group)

It is intended that a Space Leadership Group will be formed from interested parties to take forward the Space Cluster strategy and ensure that the benefits are realised in the area.

It is proposed that the Space Leadership Group would meet at least quarterly and would discuss progress and engage with the relevant agencies and authorities to ensure that progress was being made. The Space Leadership Group should decide the structures which will assist in delivering the strategy.

Membership of the Leadership Group would include representatives from Government, local Government, Agencies, Industry, Academia and Community organisations. Given the importance of supporting and developing the community, the Space Leadership Group will seek to work with communities by informing relevant community councils, community liaison groups and other community representatives.

The recommendations mentioned later in this chapter will require the Leadership Group working in parallel and in alignment with the work of others. This is particularly true for recommendations 3, 5 and 7. This would be discussed as an early action for the Leadership Group to agree the engagement with other relevant groups.

**Recommendation eight:** Create a Local Space Leadership Group to champion the interests of the area and to drive forward the recommendations from the Strategy.

## 6.3 Funding & Inward Investment

### 6.3.1 Public Funding

A range of agencies will be involved in the development of the Cluster and discussions will be held with UK and Scottish Governments to best assess how they can assist the Cluster to bring forward benefits. The Cluster will review sources such as UKSA, KTN and other programmes to identify relevant sources. There will be dialogue with other public sources for relevant funding on a project by project basis.

**Recommendation nine:** Unlock further public and private investment through regional planning initiatives integrating other sectors leveraging a 'Space Growth Deal' akin to the 'Moray Growth Deal'. This needs input from UK and Scottish Government who fund these initiatives.

### 6.3.2 Private Finance

The Cluster team recognises that public funding cannot be the only source to drive the success of the Cluster. It will therefore look to encourage private investment while creating a competitive environment and adopt an "investor ready" preparation programme. Attention will be given to the evolving Space market and new opportunities that come forward.

Hosting multiple specialist businesses within the cluster itself provides a fantastic opportunity to outline a culture of sustainable business practice. ESG metrics are a global measure of business sustainability and ensuring companies are meeting a suitable average

amongst its peer group would provide the building blocks of this framework. Upholding this good practice in ESG will also ensure that the cluster is a beacon for sustainable investment in the region as well.

There are also opportunities for government to work with private investors in innovative ways, whether through enabling the creation of new investment vehicles or by exploring different approaches for contracting with the companies receiving private investment. This is an area that needs study and a national strategy in its own right.

**Recommendation ten:** Educate the wider investment community on the benefits and risks of investing in the space industry in the area. Consider an 'Investor Ready' approach to help both the company and the investor.

### 6.3.3 Inward Investment

The Cluster recognises the benefits to be gained from a positive inward investment programme into the area. It values engagement of and participation with organisations such as the Department for International Trade and Scottish Development International but also recognise the value of working with UKSA, UK Space, the Scottish Space Leadership Council, the Spaceport Alliance and other groupings.

It does believe that there needs to be a specific proactive effort from the Cluster to attract companies to the area. This plan will be drawn up and presented to the Space Leadership Group in 2021. This will build on whatever plans are offered by others.

**Recommendation eleven:** Create a dedicated structured and resourced effort to attract inward investment (new businesses) to the area through a coordinated and collaborative approach.

**Recommendation twelve:** Create a shared vision across the private and public sector to realise the benefits locally and regionally through a 'Space Coast 2030' conference.

## 6.4 Recommendations

No.	Recommendation	Timescale
1	Create specific programmes through universities and supply chain partners to <b>address the science/engineering skills shortages in space industry</b> leveraging nuclear, oil & gas and MOD know-how. (Address early years engagement, Space STEM, technician level training and sector specific qualifications).	4 years
2	Explore area wide interventions to <b>stimulate downstream growth</b> in the area (70-85% of the market). This would likely need an understanding of market need. While this will involve appropriate connectivity and property it is likely to focus on labour supply and working with academia to deliver a labour pipeline.	4 years

No.	Recommendation	Timescale
3	Consider the use of job creation and training fiscal incentives to <b>stimulate employment</b> and how they can focus on the space sector.	4 years
4	Review options for <b>Accelerator Programmes</b> as an enabler of start-ups and existing tech supply chain to diversify and engage (networking) with the (upstream in first instance) space sector.	Within 12 months
5	Ensure provision of the necessary <b>residential and business infrastructure</b> and resilience in the area to meet the needs of a growing high-tech data driven space ecosystem.	5 years
6	Develop an <b>incubation centre</b> (hub) associated with Space Hub Sutherland leveraging existing resources to give growing companies the opportunity to learn from an operational spaceport.	Within 36 months
7	Enhance talent attraction capability through focused efforts on <b>promoting the liveability</b> of the area.	2 years
8	Create a <b>Local Space Leadership Group</b> to champion the interests of the area and to drive forward the recommendations from the Strategy.	Within 3 months
9	Unlock further public and private investment through regional planning initiatives integrating other sectors leveraging a ' <b>Space Growth Deal</b> ' akin to the 'Moray Growth Deal'. This needs input from UK and Scottish Government who fund these initiatives.	Within 24 months
10	Educate the wider investment community on the benefits and risks of investing in the space industry in the area. Consider an ' <b>Investor Ready</b> ' approach to help both the company and investor.	24 – 48 months
11	Create a <b>dedicated structured and resourced effort</b> to attract inward investment (new businesses) to the area through a coordinated and collaborative approach.	Within 6 months
12	Create a shared vision across the private and public sector to realise the benefits locally and regionally through a ' <b>Space Coast 2030</b> ' conference.	12 months

## 6.5 Measures of Progress

The Cluster will develop a range of measures to demonstrate progress. These will include activities undertaken by the Cluster but will also measure real achieved progress as well as planned impacts.

A full range of metrics to measure will be presented to the Space Leadership Group this year.

