

Space: The Economy, opportunities and the North-East Space Skills and Technology Centre (NESST)



“The most profound technologies are those that disappear. They weave themselves into the fabric of everything in life until they are indistinguishable from it.”



~ The Success Paradox | Mark Weiser
(Chief Scientist of Xerox PARC [1991])

David Moody CBE

Currently: Director of the North-East Space Skills and Technology Centre at Northumbria University:

- A £50m academic, industry and government investment set to transform the regional and wider UK Space economy.

Previously: (c.40years in the Royal Navy)

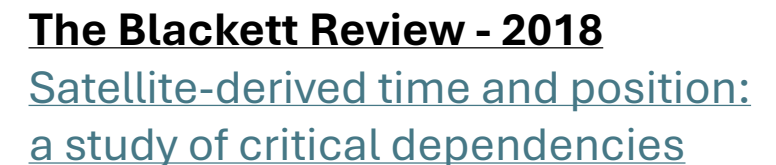
- Shaped the Military Space enterprise with a keen understanding of the military and civil need for Space.
 - Established a Ministry of Defence Space Capability team in 2015
 - Drove much of the military SKYNET satellite communications programme.
 - Contributed to the Defence & National Space Strategies and to the Space Industrial Plan.
 - Chaired the NATO Satellite Communications Capability Team
 - Head of Space Capability at UK Space Command
 - Delivered their first Earth Observation Satellite and significant improvements to the National Space Operations centre.

Throughout his Space journey, David has been striving to drive UK Space Sector success and increase the number of Space professionals as a key component of sector success within Industry and at Regional, National, and International levels.

UK Critical National Infrastructure

- **Chemicals:** Industrial chemical production and distribution.
- **Civil Nuclear:** Nuclear power generation and related facilities.
- **Communications:** Telecommunications, broadcasting, and postal services.
- **Data Centres:** Crucial facilities handling data storage and processing.
- **Defence:** Ministry of Defence assets and supporting industries.
- **Emergency Services:** Ambulance, Fire & Rescue, Coastguard, and Police.
- **Energy:** Electricity, gas, and oil supply infrastructure.

- **Finance:** Banking, financial markets, and infrastructure.
- **Food:** Production, supply, and distribution of food.
- **Government:** Key government buildings and services.
- **Health:** NHS and related health services.
- **Space:** Satellite infrastructure, tracking, and telemetry.
- **Transport:** Airports, railways, roads, and maritime services.
- **Water:** Public water supply and wastewater treatment





- Disruption of Space Based Services.
- Loss of Position, Navigation and Timing (PNT) Services.
- Severe Space Weather.

National Risk Register

2025 edition



HM Government

2024 Global Satellite Industry Revenues

The Satellite Industry in Context

(2024 revenues worldwide in billions of U.S. dollars)

Non-Satellite Industry

Government space budgets
Commercial human spaceflight

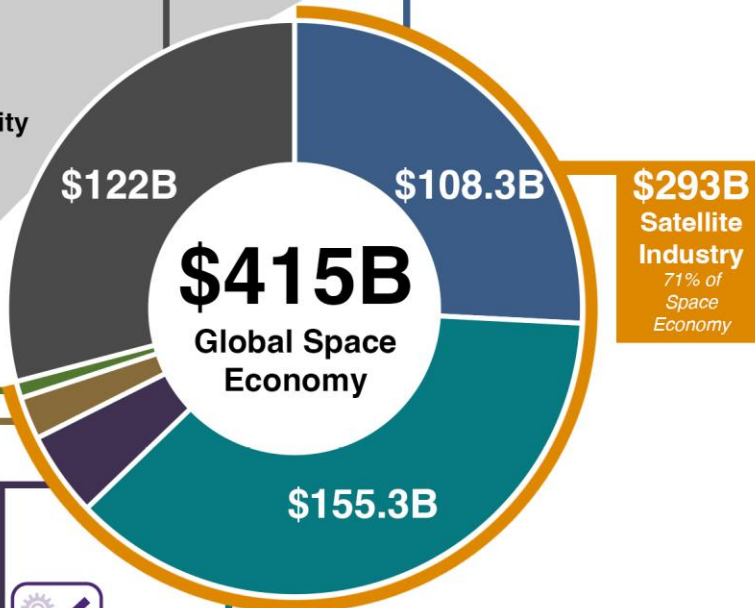
Satellite Services

Telecommunications
Remote Sensing

\$350M
Space
Sustainability
Activities



\$9.3B
Launch



Ground Equipment

Network Equipment
GNSS Equipment
Consumer Equipment



\$20B
Satellite
Manufacturing



Prepared by:



Satellite
Services

Revenues:
\$108.3B



Consumer **\$85.2B**

Satellite TV (DBS/DTH)
Satellite Radio (DARS)
Satellite End-User Broadband

Enterprise **\$19.7B**

Transponder Agreements
Managed Services Over FSS Bands
Mobile Voice and Data Over MSS Bands

Remote Sensing **\$3.5B**



Ground
Equipment

Revenues:
\$155.3B

\$18.6B
Consumer Equipment
(Satellite TV dishes, etc.)

\$118.9B
GNSS Equipment
(GNSS devices/chipsets)

\$17.7B
Network Equipment
(VSATs, gateways, etc.)

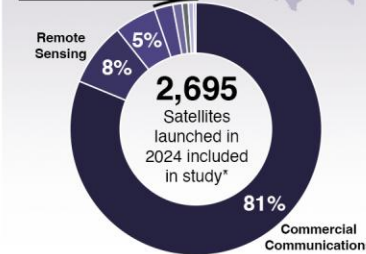


Satellite
Manufacturing

Revenues:
\$20B

\$6.2B
\$13.8B

R&D (2%)
Navigation (1%)
SSA/Satellite Servicing (<1%)
Scientific (<1%)
Civ/Mil Communications (<1%)

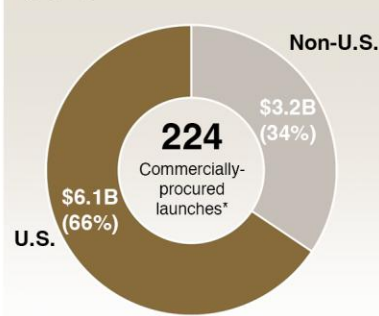


Satellites Launched by
Mission Type



Launch
Industry

Revenues:
\$9.3B



Commercial Launch Revenues
by Region

* 224 commercially procured launches from 259 total orbital.

Changing Industry Dynamics: Increasing Affordability and Productivity, New Capabilities



GROUND EQUIPMENT

- Growing on-the-move connectivity
- 5.7 billion GNSS satellite-enabled smartphones, other devices
- Increased deployment of maritime, aviation terminals
- TV viewership changing from traditional models
- Initial testing of sat to cell services, limited availability



SATELLITE SERVICES

- Multi-orbit connectivity
- Integration of sat, terrestrial networks
- More affordable capacity
- More new commercial remote sensing choices and capabilities



SATELLITE MANUFACTURING

- Evolving customer trends
- Innovation across supply chain, industrial base
- Lower costs, higher production rates, more capable satellites



LAUNCH

- Increased launch activity
- Changing launch landscape

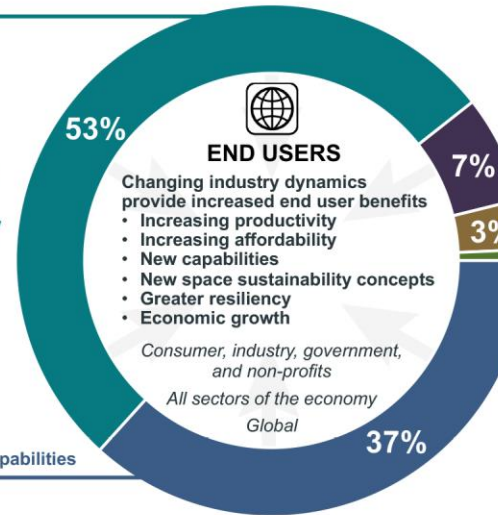


SPACE SUSTAINABILITY ACTIVITIES

New satellite activities contributing to in-orbit sustainability

Debris removal
Moving satellites
Life extension

SSA
Servicing
In-orbit assembly



Methodology and Definitions

✓ Spacecraft Manufacturing

- Design, production, and assembly of satellites, subsystems, and other vehicles intended for operation in space

✓ Geospatial Analytics

- Use of satellite-based data to understand spatial conditions; only includes firms that primarily use satellite remote sensing data

✓ Spacecraft Launch

- Manufacture or operation of orbital launch vehicles, subsystems, supporting infrastructure

✓ Satellite Remote Sensing

- Satellite-based collection of Earth data

✓ ISAM

- Services for on-orbit modification, relocation, or assembly of spacecraft; manufacturing of products in space

✓ Satellite Telecommunications

- Operation of satellites for distribution, relay of data

✓ Ground Equipment

- Ground-based systems needed to manage spacecraft, distribute/receive data

✓ Space Domain Awareness (SDA)

- Monitoring and analysis of space objects

✓ Commercial Human Spaceflight

- Space travel services for tourism, research, or other commercial purposes

✓ Positioning, Navigation, and Timing (PNT)

- Satellite-based services to provide location determination, navigation guidance, time synchronization

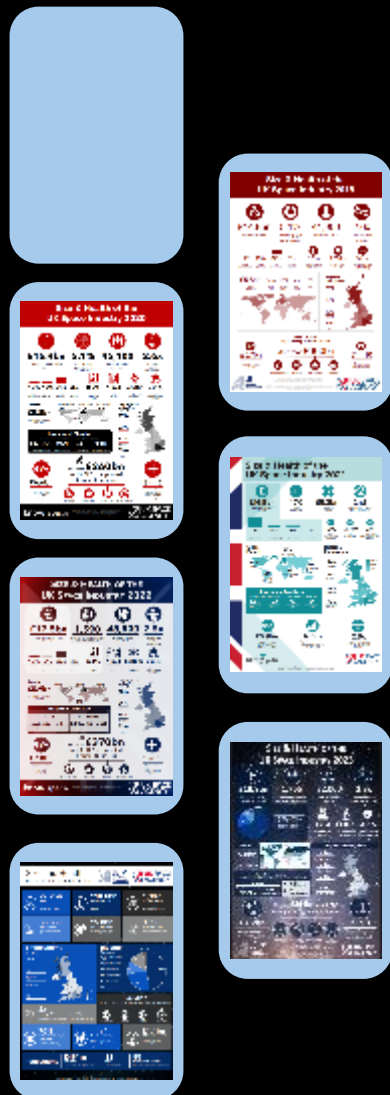
The UK Space Economy

Date



The UK Space Economy

2016



Size & Health of the UK Space Industry 2016



Regional employment



Wider UK GDP* supported by satellite services



More than **£250bn**



The UK Space Economy

2018

UK Space Economy 2018 - Overview

£14.8bn Total Income in 2016/17

5.1% Share of global space economy in 2016/17 (after GBP depreciation)

41,900 Employees in 2016/17

2.6x Labour productivity compared to UK average

UK Space Economy 2018 - Regional Breakdown

£5.5bn Exports in 2016/17

54% Rest of Europe

16% Northern America

14% Asia & Oceania

16% Other

UK Space Economy 2018 - Regional Employment

29% London

22% South East

18% Scotland

31% Other

UK Space Economy 2018 - Wider UK GDP supported by satellite services

£5.7bn Direct contribution of the UK space industry to UK GDP

More than £300bn

7 in 10 Organisations expect income growth over the next three years

Size & Health of the UK Space Industry 2018

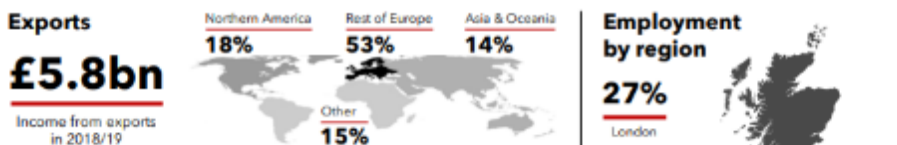
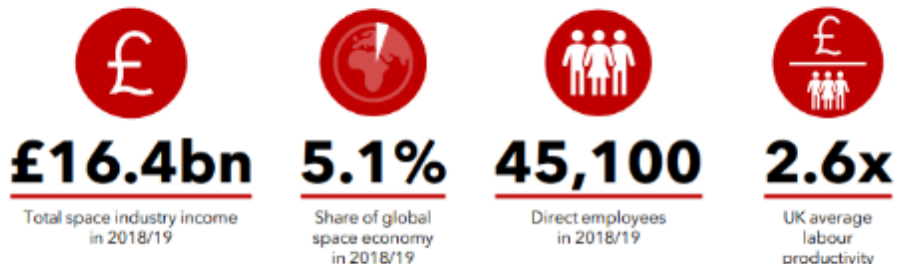


The UK Space Economy

2020

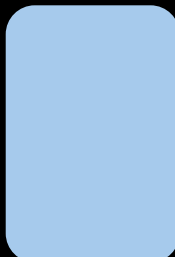


Size & Health of the UK Space Industry 2020



The UK Space Economy

2021



Size & Health of the UK Space Industry 2021

£
£16.5bn
Total space industry income

47K
Direct employees

£5.3bn
Income from exports

#2
2nd
Global ranking in private space investments

74%
Space Applications

14%
Space Manufacturing

9%
Space Operations

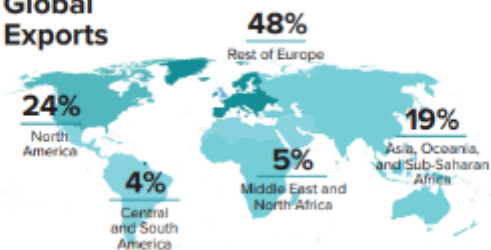
3%
Ancillary Services

1,293
Space organisations identified

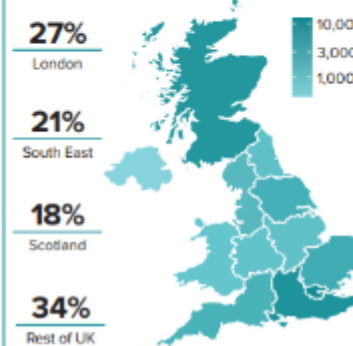
£836m
R&D expenditure

73%
Employees with a bachelor's degree or higher

Global Exports



Regional Employment



Investment Dashboard

Investments into UK head-quartered space companies 2012 to 2021

£6bn
Total funds invested

145
Unique investors

90
Investment deals

38
Invested companies

GVA
£6.9bn
Direct contribution of the UK space industry to UK GDP

4 in 5
Organisations expecting income growth over the next three years

£
2.6x
UK space industry labour productivity vs. national average

BRYCE
TECH

UK SPACE
AGENCY

Note: Based on analysis of 1,293 UK-based space-related organisations in 2019/20.
Source: BryceTech (2022), Size & Health of the UK Space Industry 2021.

The UK Space Economy

2022



SIZE & HEALTH OF THE UK SPACE INDUSTRY 2022



The UK Space Economy

2023



SIZE & HEALTH OF THE UK SPACE INDUSTRY 2023

£
£18.9bn

Total space industry income in 2021/22



1,765

UK-based organisations with space-related activities



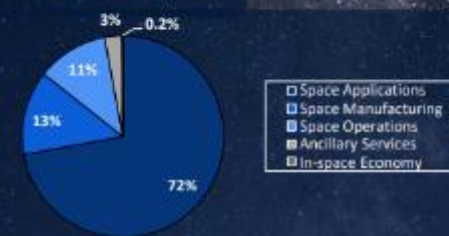
52,000

Direct employees in 2021/22



2.3x

Labour productivity compared to UK average



1 in 4

Employees are female



£1.0bn

R&D expenditure in 2021/22



4 in 5

Employees with a primary degree or higher

Exports

£5.8bn

Income from exports in 2021/22



Regional employment

33%

London

18%

South East

12%

Scotland

36%

Rest of the UK



Investment Monitor

Investments into UK-headquartered space companies 2013-2023

2013-2023	2023
Total funds invested	£8.85bn
£19.3bn	Total funds invested
361	70
Investment deals	Investment deals



£7.2bn

Direct contribution of the UK space industry to UK GDP

At least **£364bn** of UK GDP is supported by satellite services



Navigation



Meteorology



Communications



Earth Observation



2 in 3

Organisations expect income growth over the next three years

LE
London
Economics

"Size and Health of the UK Space Industry 2023"
Based on analysis of 1,766 UK-based space-related organisations
*UK-based financial business entities only
Background image: © Science Photo Library (2023) © Science Photo Library (2023) © Science Photo Library (2023) © Science Photo Library (2023) © Science Photo Library (2023)

UK SPACE
AGENCY

The UK Space Economy

2024



Size and Health of the UK space industry 2024



£7.2bn

GVA

The industry's direct contribution to UK GDP



£18.6bn

sector income

Total space industry income in 2022/23



1,907

organisations

UK-based organisations with space-related activities



55,550

employees

Direct employees in the UK space sector



£5.8bn

export income

Income generated from exports (31% of total)



3 in 5

expect growth

60% of survey respondents expect income to increase

Employment by region

London
33%

South East
17%

Scotland
13%

South West
8%

Rest of the UK
29%



Income by segment

Space Applications - DTH broadcasting

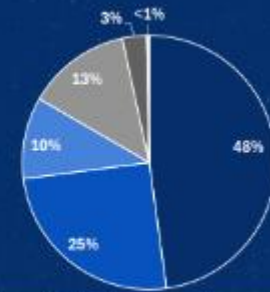
Space Applications - Other

Space Operations

Space Manufacturing

Ancillary Services

In-space Economy



£454bn

18% of total UK GDP* is supported by satellite services



2x

average UK labour productivity

UK space sector labour productivity is twice the UK average.



70%

with primary degree or higher

Survey respondents' employees with a bachelor's degree or higher



1 in 4

female employees

Almost one quarter of employees from surveyed organisations were female



£1.1bn

R&D expenditure

Total expenditure on Research & Development in 2022/23

Investment

£481m

invested

Total invested into UK-based space organisations in 2022/23

92

deals

Total number of investment deals

85

investment targets

UK-based space organisations received investments

Space: 2075

PERSPECTIVE



HOUSE OF LORDS

UK Engagement with
Space Committee

Report of Session 2024–26

The Space Economy: Act Now or Lose Out

Ordered to be printed 20 October 2026 and published 4 November 2025

Published by the Authority of the House of Lords

SKYNET 5

Military Communications
Satellite

Launched 2007 - 2013

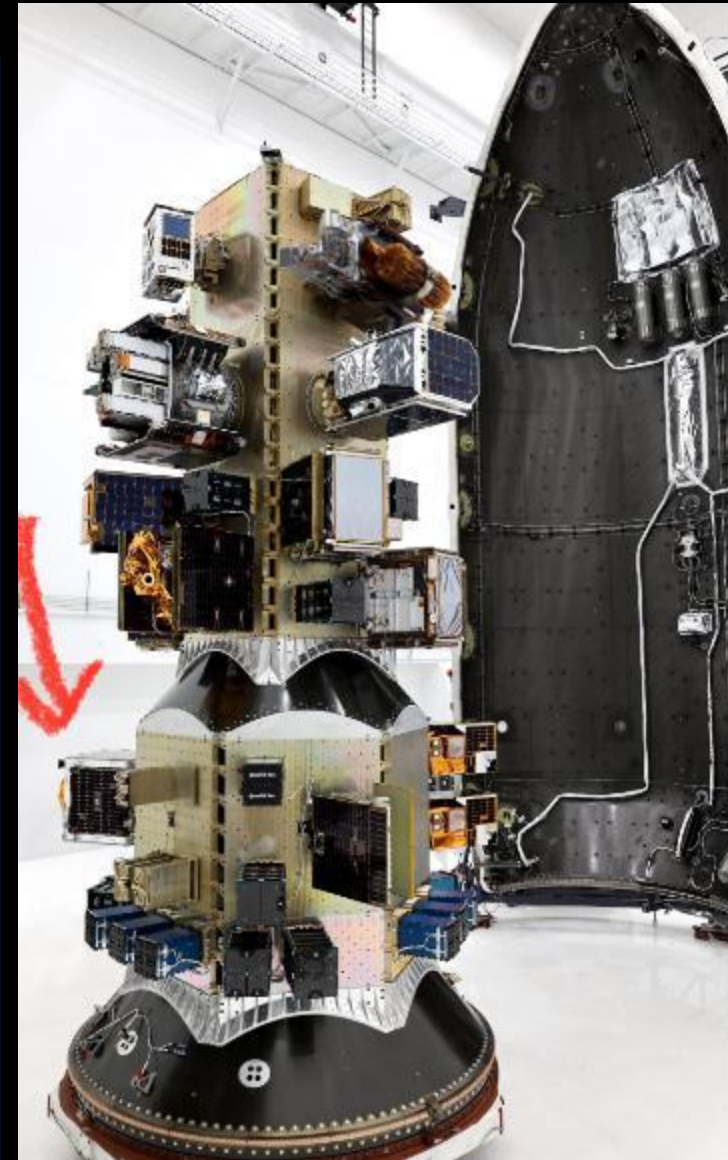




TYCHE

Earth Observation
Satellite

Launched 16 Aug 24





NESST

NORTH EAST SPACE SKILLS
AND TECHNOLOGY CENTRE



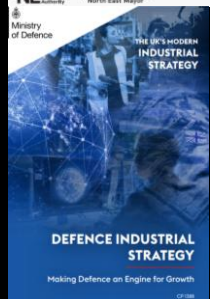
IN PARTNERSHIP WITH:



Funded by
UK Government

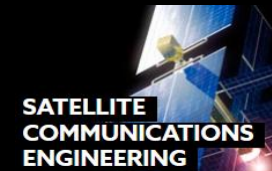


Initial artist impression only



A 5,400 m² re-development on Northumbria University's city centre campus.
NESST will hold facilities & equipment to enable:

- R&D facility for satellite manufacture & assembly
 - Clean Room Manufacturing, Assembly, Integration and Test facilities
 - Additive manufacture, rapid prototyping, Precision manufacturing and micro fabrication
 - Space readiness testing facilities for CubeSats to medium-scale satellites
 - Vibration, vacuum, thermal and radiation testing
 - Specialist research facilities for optical communications research
 - Including photonics, optics and sensor characterisation
 - Mission Operation Centre
 - Space domain awareness and observation
 - Immersive design, training and collaboration spaces for supply chain development
-
- Assembly, Integration and Test facility - 335 m² (3,600 ft²)
 - 11 Laboratories & 2 Visualisation Suites - 642 m² (6850 ft²)
 - Events & Seminar Suite, Academic & Industry Offices, Lecture Theatres



In Partnership With:

OUR SPECIALIST AREAS

A satellite with large solar panels is shown in space, with a bright light source in the background.

SATELLITE COMMUNICATIONS ENGINEERING

EXPLORE HOW WE ARE
DRIVING INNOVATION IN
SATELLITE TECHNOLOGY →

A close-up of a bright, fiery solar flare or sunspot on the surface of the sun.

SOLAR AND SPACE PHYSICS

DISCOVER HOW WE ARE
ADVANCING SPACE WEATHER
FORECASTING TO HELP
MITIGATE RISKS FROM SPACE
WEATHER →

A network of white dots connected by lines, representing a global communication or data network, set against a dark space background.

SPACE LAW AND POLICY

JOIN US AT THE CUTTING
EDGE OF SPACE LAW
ACADEMIA AND RESEARCH →

A snowy mountain peak under a blue sky with some clouds.

EARTH OBSERVATION AND ASTRONOMICAL INSTRUMENTATION

HOW WE LEAD UK
UNIVERSITIES IN
UNDERSTANDING OUR
CHANGING CLIMATE →

A close-up of an astronaut in a white spacesuit, with the American flag visible on the sleeve.

SPACE PHYSIOLOGY

FIND OUT HOW WE SUPPORT
ASTRONAUTS ON THEIR
RETURN TO EARTH →

A robotic arm with two eyes and various sensors, set against a dark background.

ROBOTS AND ARTIFICIAL INTELLIGENCE

LEARN HOW WE APPLY AI
SOLUTIONS FOR NON-
TERRESTRIAL NETWORKS →

A satellite with solar panels is shown in orbit above the Earth's surface.

SPACE ENGINEERING

DISCOVER HOW SPACE COULD
BE THE KEY TO ZERO CARBON
POWER →



Space Technology Expertise

- **Optical Communications**, including:
 - Free-Space Optical Communications
 - High-speed data links
 - Autonomous inter-satellite laser link acquisition (supporting mega constellations)
 - Miniaturised laser system with nested optical telescopes
- **Optical Ground Stations** including modelling and Adaptive Optics
- **Earth Observations**, including:
 - Calibration and validation of satellite altimetry
 - Remote observations to improve power grid resilience
 - Observing and modelling the Polar Regions (UKRI's Centre-for-Polar-Observation-and-Monitoring)
- **Space-based power**, including laser power beaming efficient space-based photovoltaics materials, photovoltaics, thin film, characterisation
- **Space-readiness testing facilities** for CubeSats to medium-scale satellites
- **Advanced materials** and structures of satellite and spacecraft
- **AI for Satellite Communications** including LLM, Machine Learning, Data Intensive operations
- **Space Environment** including Space Weather and Radiation Belt modelling
- **Space Law, Governance and Policy** including Space Sustainability
- **Semi-conductor** and maser technology
- **Human Physiology** and astronaut health

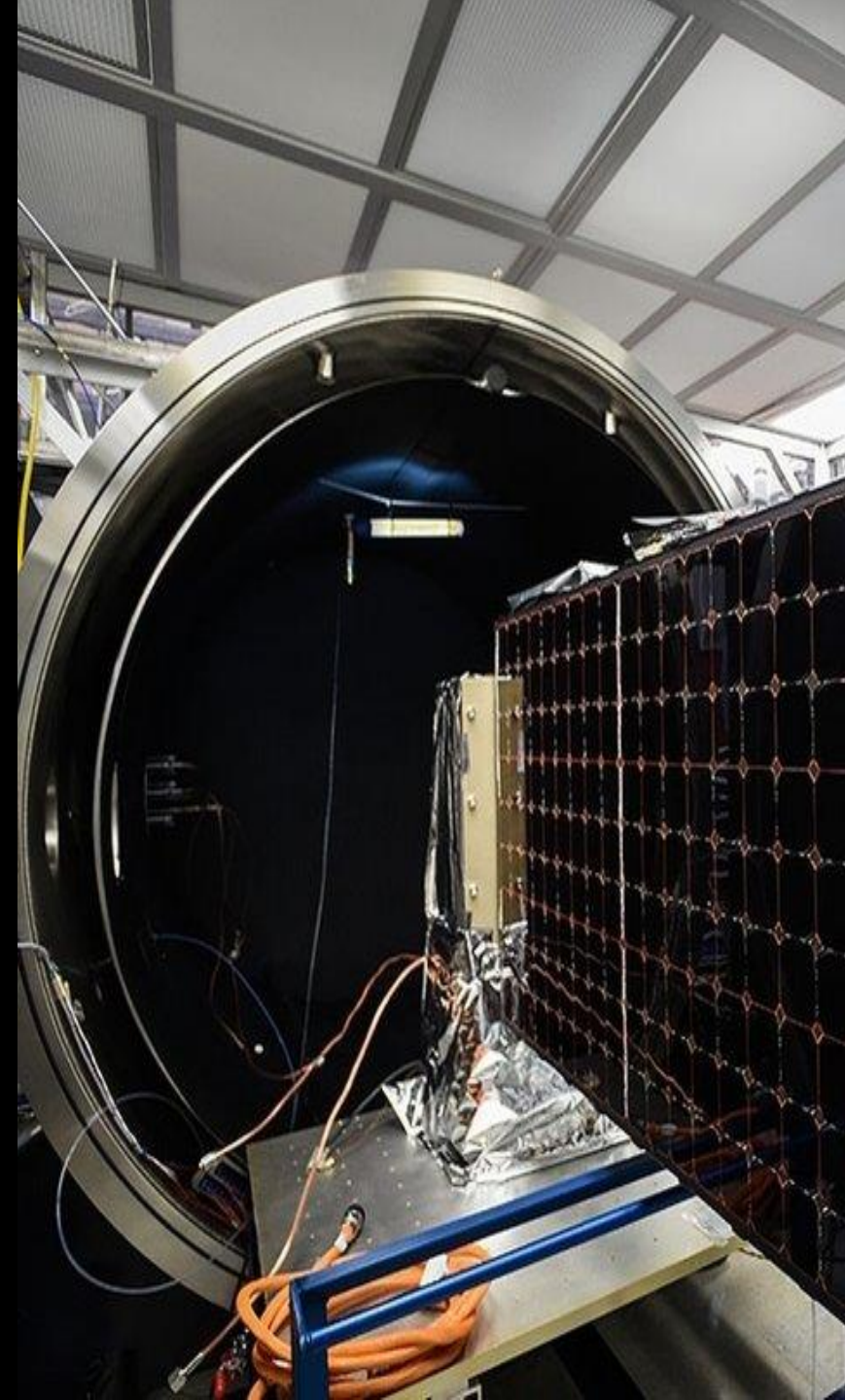




Infrastructure and Facilities

A 5,400 m² re-development on Northumbria University's city centre campus. NESST will hold facilities and equipment to enable:

- R&D facility for satellite assembly
 - Clean manufacturing and contamination rooms
 - Additive manufacture and rapid prototyping
 - Precision manufacturing and micro fabrication
- Space readiness testing facilities for CubeSats to medium-scale satellites
 - Vibration, vacuum, thermal and radiation testing
- Specialist research facilities for optical communications research
 - Including photonics, optics and sensor characterisation
- Mission Operation Centre
 - Space domain awareness and observation
- Immersive design, training and collaboration spaces for supply chain development



What NESST will deliver

- **Research** and development facility for:
 - University/business collaboration and innovation
 - Spin-out and supply chain company development
 - Technology development
 - Testing and space certification
- **Reskilling** and upskilling to:
 - Address the shortfall in highly skilled workers
 - Support high value, high skilled, regional job creation
- **Regeneration** of an area of inner-city Newcastle to:
 - Support the levelling-up agenda
 - Provide a much-needed regional infrastructure project
- **Regional innovation** and business development to:
 - Deliver growth in the northeast and wider UK space economy
 - Enable cluster integration
 - Support UK export market



NESST Skills Programme

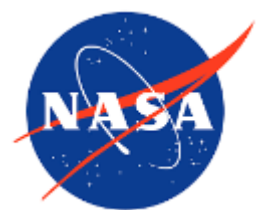
- **North East Space sector employed ~2,800 FTE in 2021.**
 - By 2030 forecast to needs >9,000 FTE.
- **Opportunity to offer a wide range of high quality jobs and long-term employment stability.**
- **NESST will directly address the UK space sector's skills challenge**
 - Connecting and collaborating with the regional and national space cluster2 to co-develop skills training and curriculum to meet the requirements of the sector
 - Development of curriculum, modules and qualifications at UG and PG level
 - Development of re-skilling, and up-skilling short course and training programmes
 - Deliver a centre for doctoral training (CDT) to educate the brightest minds and generations of new researchers
 - Work in partnership with colleges and partners to provide a pathway to higher education
 - Develop and deliver alternate routes to education through apprenticeship and vocational training
 - Inspire the next generation through STEM and other outreach activities



Business



Funders



UK and the region



Economic Impact Assessment

Over the 30-year appraisal period (2025-2054) operation of NESST could support up to **350 net annual FTE jobs** in the NE of England:

- Up to 120 direct annual FTE jobs would be created at the Facility.
- Up to 160 indirect annual FTE jobs could be supported through the wider supply chain supporting the R&D and small-scale manufacturing activities.
- Up to 80 induced annual FTE jobs could be supported through the wider economy.

Over the 30-year appraisal period (2025-2054) operation of NESST could generate **£264m in net total GVA** in the NE of England (in 2023 prices and NPV terms):

- £115m of direct net GVA would be generated through the operation of the facility.
- £83m of indirect net GVA would be generated through the wider supply chain.
- £66m of induced net GVA would be generated through the direct and indirect employees spending a proportion of their wages in the regional economy.

This is a **27.3:1 benefit to cost ratio** against initial SCIF Government investment.





Ministry
of Defence

THE UK'S MODERN INDUSTRIAL STRATEGY

DEFENCE INDUSTRIAL STRATEGY

Making Defence an Engine for Growth

CP 1368

High-Growth-Potential Frontier Industry Clusters



- 1 The Central Belt (Faslane, Glasgow, Edinburgh, Rosyth)**
 - World-renowned shipbuilding, including Type 26 and 31 frigates.
 - A national leader in satellite manufacture, launch and downstream applications.
 - One of the UK's largest Quantum, Photonics and Semiconductor clusters, anchored by key assets including NMIS, Fraunhofer CAP, and the National Robotarium.

- 2 The North East**
 - Strengths in manufacturing, engineering, fabrication and digital technologies with a growing data, innovation and cybersecurity focus.
 - Strong advanced material electronics sector, with Octric Semiconductors and a Compound Semiconductor Applications Catapult.
 - A fast-growing space cluster, soon to be supported by the new North East Space Skills and Technology Centre.

- 3 Belfast**
 - Recognised as a leading cyber security hub, augmented by Queen's University Belfast's Centre for Secure Information Technologies. Home to a concentration of innovative defence firms, including Thales, Bae Systems, and Leonardo.



Creating Real Opportunity

The Interim North East Local Growth Plan

March 2025

NE North East
Combined
Authority

Kim McGuinness
North East Mayor



Overview of Growth Plan

Creating strong foundations and transforming communities

Maximising our unique economic opportunities



Home to a growing and
vibrant economy for all

- Innovation and business dynamism
- Digital North East

- Creative industries and content
- Tech, digital and AI
- Knowledge intensive professional services
- Life sciences, pharmaceuticals and process industries



Home of the green energy revolution

- Net Zero

- Offshore wind and energy transition



A welcoming home to global trade

- Investment and trade
- Infrastructure and key sites

- Advanced manufacturing including electric vehicles
- Defence, security and space



Home of real opportunity

- Skills & qualifications
- Economic activity, health and wellbeing
- Tackling child poverty

- Foundational economy including hospitality, health and social care



A North East we are proud to call home

- Better housing
- Green Transport which works for all

- Visitor economy
- Rural and coastal businesses



Defence, Security and Space

- Within the LGP we highlight the role that the NE can play in supporting both UK energy and national security
- We recognise the cross-over of businesses and skills requirements across the energy and defence sectors
- We also expect this to be a rapidly growing sector, with significant opportunities for the region

Building from a strong base

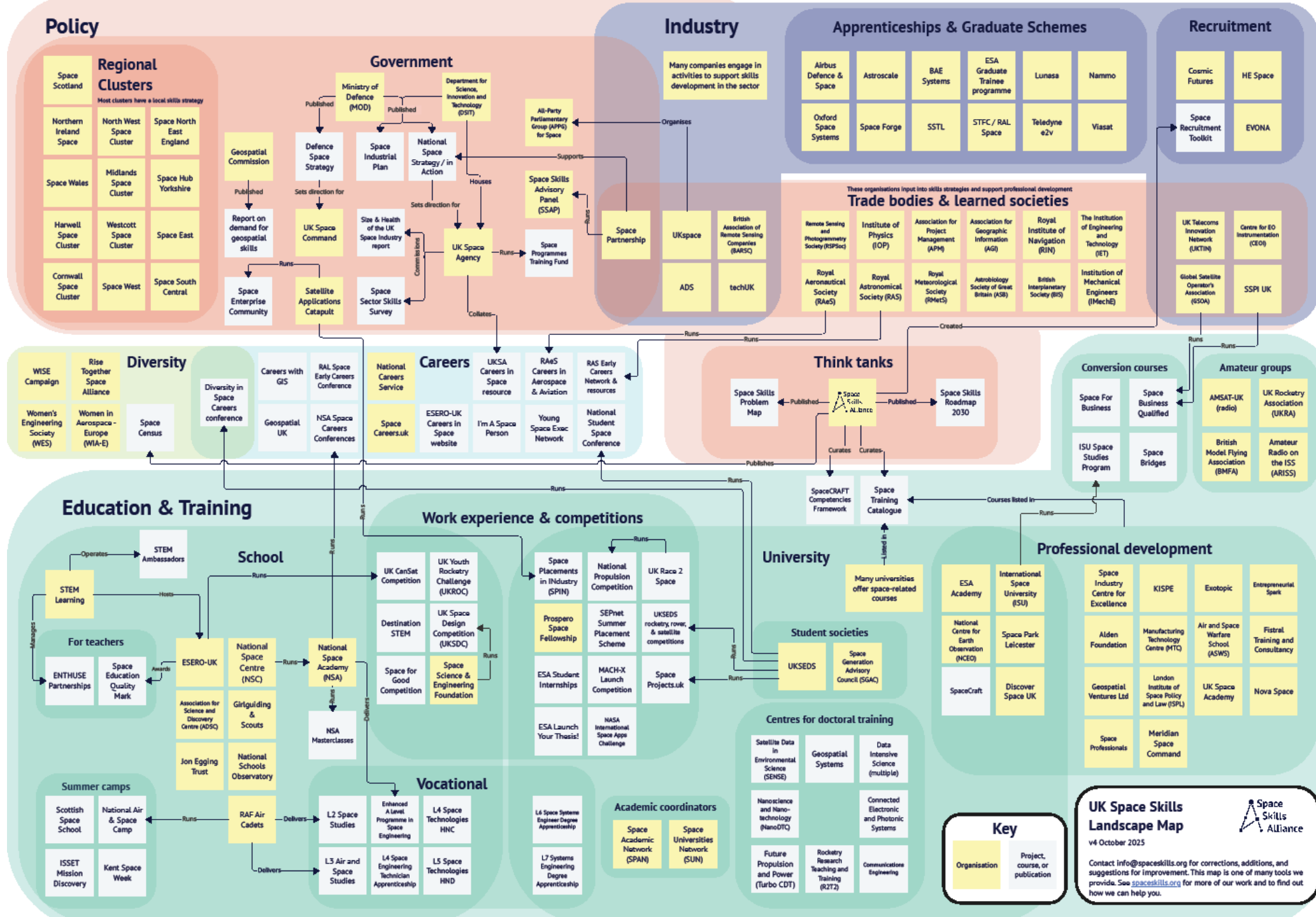
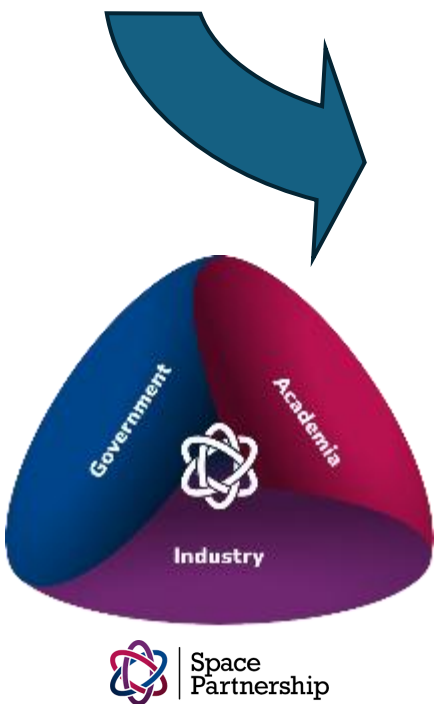
- The defence and security sector contributes around **£14 billion** to the regional economy and employs 48,000 people in the wider region.
- **Established and emerging specialisms** in engineering and fabrication and the advanced material electronics sector and adjacent sectors.
- North East defence firms have attracted half a billion in **innovation funding** since 2002
- A **large defence cluster**, with over 1,400 firms including industry leaders Leonardo, Pearson Engineering, British Engines, Airbus, Lockheed Martin UK Space, BAE Systems, Filtronic and A&P.
- Specialist bases include RAF Spadeadam, RAF Boulmer and HMS Calliope.
- **Data and cyber security** are a growing presence, supporting multiple sectors.
- **Mature regional space cluster**, with strong links to Durham, Newcastle and Northumbria Universities.
- Octric Semiconductors UK recently purchased by UK Government.
- **World class skills and research capabilities** across the region's universities.

Priorities

- **Grow the North East defence sector**, including by making the region a national hub for cutting-edge digital defence technologies and supporting growth of region's advanced materials cluster.
- Attract innovative **technology-based companies** and increase the market for locally-sourced content.
- Enable the North East Regional Defence and Security Cluster (**NERDSC**) to build and grow capacity and skills, including through a major supply chain development programme, and forge links with other regions and nations through exports.
- **NETPark expansion**, including potential satellite manufacturing inward investment.
- Support the Space North East England (**SNEE**) cluster to build upon the success of the last ten years.
- Maximise impact from Northumbria University's North East Space Skills and Technology Centre (**NESST**) - a £50m R&D and innovation investment opening in 2026 - alongside the £5m Durham Space Research Centre.
- Drive further **R&D and innovation** in the region to address technology challenges.

Scale of opportunity

- UK Annual Defence & Security Sector is **worth £51bn rising to £87bn by 2030.**
- **15%** of Ministry of Defence spend in the North East is with SMEs - the largest proportion of any region.



Chartered Surveyors

1. Land & Geospatial Surveying (GNSS & Satellite Imaging)

- **High-Precision Positioning (GNSS):** Chartered surveyors use GNSS receivers (linking to GPS, Galileo, GLONASS, BeiDou) for centimetre-level accuracy in land measurement, boundary definition, and setting out projects (e.g., roads, foundations).
- **Georeferencing & Mapping:** GNSS data is combined with LiDAR and drone data to georeference 3D point clouds accurately to national grids.
- **Cadastral Mapping:** Satellite imagery and high-resolution data are used for updating land registration maps, identifying boundaries, and solving disputes.

2. Property Valuation & Management (Earth Observation)

- **Automatic Change Detection:** Using high-resolution multispectral imagery, surveyors can track structural changes, new developments, or land use changes over time without visiting the site.
- **Portfolio Management:** Satellite intelligence allows for the monitoring of large property portfolios for defects, roof degradation, or illegal site activities.
- **Defect Identification:** Thermal infrared sensors detect anomalies in building insulation, heat loss, and water ingress, indicating maintenance needs.

3. Construction & Development (Remote Sensing & GIS)

- **Site Selection & Feasibility:** Satellite data aids in identifying suitable land, analysing topography, and measuring potential environmental constraints (e.g., flood zones) for new developments.
- **Construction Monitoring:** Satellites provide data to track building progress, monitor infrastructure development, and ensure compliance with building plans.
- **Digital Twins:** Data from space-based sources are integrated with GIS and Building Information Modelling (BIM) to create "living" replicas of assets for better management.

4. Environmental & Rural Management

- **Disaster Management & Risk Mapping:** Surveyors use satellite data to quantify flood, fire, and land subsidence risks, which are critical for insurance and safety planning.
- **Carbon Accounting & Biodiversity:** Earth observation is used for assessing rewilding projects, measuring biomass, monitoring deforestation, and verifying carbon sequestration.
- **Agricultural Monitoring:** Using spectral indices (e.g., Normalised Difference Vegetation Index (NDVI)), surveyors can monitor crop health, vegetation stress, and soil moisture to advise on land value and sustainable farming.

5. Utilities & Infrastructure

- **Leak Detection:** Spaceborne Synthetic Aperture Radar (SAR) is used to detect water leaks beneath the ground, independent of cloud cover or weather.
- **Geotechnical Stability:** Satellites can monitor ground movement or instability in critical infrastructure.

By leveraging these space-enabled technologies, surveyors provide faster, safer, and more accurate reports, enhancing both economic and environmental sustainability for their clients.



The Future?



NASA'S \$20 BILLION PLAN TO BUILD A PERMANENT MOON BASE

A sustained human presence on the Moon by 2033

\$20 BILLION INVESTMENT
 NASA has committed about \$20 billion over 7 years to build a permanent base on the Moon.
 Source: ABC News

THE GOAL IS NO LONGER JUST "FLAGS AND FOOTPRINTS" BUT TO STAY.
 The Moon is our proving ground for the journey to Mars.

PHASED ROADMAP TO 2033

- NOW – 2026 FOUNDATION**
Technology development, testing, and early lunar missions.
- 2026 – 2029 SCOUT & TEST**
Robotic and uncrewed missions to scout the lunar surface and test power systems.
- 2029 – 2032 BUILD & DEPLOY**
Deploy semi-permanent infrastructure: power stations, rovers, communication systems, and early habitation modules.
- 2033 AND BEYOND SUSTAIN & EXPAND**
Establish a sustained human presence with crewed missions every six months, growing the base over time.

ACCELERATING ARTEMIS
 NASA is accelerating the Artemis program. Artemis IV and V missions are slated for 2028 to begin regular astronaut landings.

ARTEMIS IV 2028
 First crewed landing of Artemis era

ARTEMIS V 2030
 Expanded missions and infrastructure delivery

CREWED LANDINGS EVERY 6 MONTHS
 Gradually building a permanent lunar base.

THE LUNAR BASE WILL INCLUDE:

- HABITATS**
Pressurized modules designed for long-term human occupation.
- PRESSURIZED ROVERS**
For safe, long-range exploration of the lunar surface.
- NUCLEAR POWER**
Reliable, 24/7 power systems to support base operations.
- SOLAR POWER**
Supplemental renewable energy to reduce dependence on Earth.

POWERED BY PARTNERSHIPS
 NASA will work with U.S. commercial partners to deliver systems, transport cargo, and support sustainable operations.

SPACEX BLUE ORIGIN

WHY THE MOON?
 A strategic stepping stone to the future.

- 1/6th Earth's gravity: Ideal for testing technologies and preparing for Mars.
- Abundant resources: Water, helium-3, and minerals can support life and fuel.
- Proving ground: Develop technologies for deep space exploration.

\$20 BILLION INVESTMENT BREAKDOWN

Source: ABC News

7 YEARS
 Total program duration (2026–2033)

~\$20 BILLION
 Total investment

EVERY 6 MONTHS
 Crewed landings goal

SUSTAINED PRESENCE
 The ultimate goal is a long-term human foothold on the Moon.

“We’re going to the Moon to stay, to learn, to prepare, and to lead the next giant leap for humanity.”
 – NASA Administrator Jared Isaacman



THE \$20 BILLION STARTING POINT

Early lunar infrastructure funding vs. the full cost of a sustained human presence
 NASA'S PLAN IS A BEGINNING, NOT THE END.

NASA ARTEMIS SURFACE PLAN (2026–2033)
~\$20 BILLION

- Early infrastructure
- Robotic + initial crew missions
- Technology validation

Program slice (~7 years) — not full base deployment

WHAT A SUSTAINED LUNAR PRESENCE REQUIRES (2030–2050+)

- LOW-END OUTPOST**
Minimal capability, intermittent crew
\$300–500B
- OPERATIONAL BASE**
Continuous presence, regular missions
\$1–2 TRILLION
- INDUSTRIAL / REDUNDANT SYSTEM**
Full-scale, resilient, scalable infrastructure
\$2–3T+

This is a multi-decade effort. Costs scale by **10–100×** when moving from demonstration to sustained operations.

WHY COSTS SCALE 10–100×

- Launch & transport cadence
- Surface power (solar + nuclear)
- Life support & redundancy
- Logistics & resupply chains
- Construction & ISRU (resource use)
- Crew operations (decades)
- Maintenance & replacement cycles

PHASED REALITY: A MULTI-DECADE JOURNEY

- 2025–2030**
Missions & technology validation
- 2030–2040**
Early base construction & infrastructure buildup
- 2040–2050+**
Sustained presence, expansion & industrialization

COST BREAKDOWN (2030–2050+)

TOTAL ESTIMATED COST: **\$1–2 TRILLION**
 Over 20+ years (does not include Mars missions)
 Source: NASA OIG, SpaceNews, Aerospace Corp., McKinsey, The Planetary Society

WHY THE INVESTMENT PAYS OFF

- \$1 INVESTED IN SPACE GENERATES \$7–\$14 IN ECONOMIC RETURN ON EARTH**
- CREATES 100,000+ HIGH-SKILLED JOBS GLOBALLY**
- DRIVES TECHNOLOGY BREAKTHROUGHS THAT BENEFIT LIFE ON EARTH**
- BUILDS THE FOUNDATION FOR MARS AND BEYOND – THE NEXT GIANT LEAP FOR HUMANITY**

\$20B STARTS THE MISSION. TRILLIONS SUSTAIN A CIVILIZATION.

