UK Space Sector Knowledge Sheet

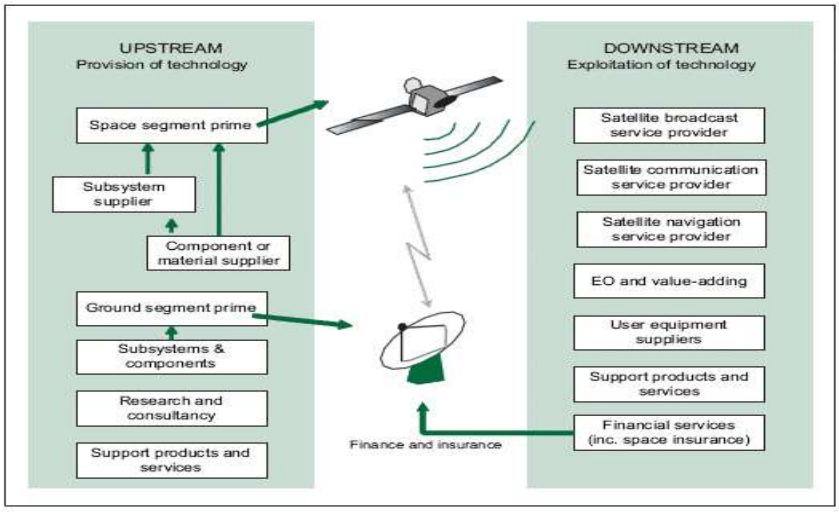
The Space Industry

The Space Industry is made up of 2 subsectors, upstream and downstream.

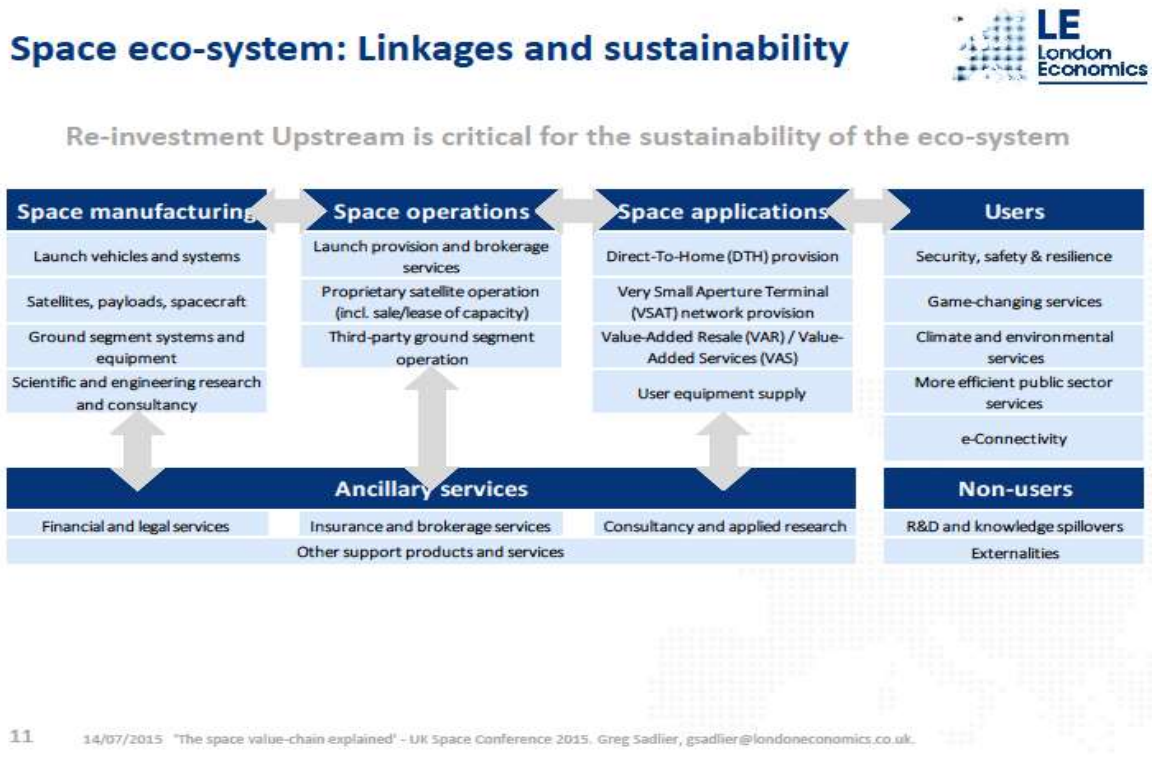
Upstream – Space infrastructure, spacecraft, launchers and satellites. Currently generates £1.7 billion of sector income and forecast to rise to £3 billion by 2030 with the market for small and nanosatellites growing rapidly

Downstream – The use of space technology to develop non space products on earth. This represents the main element, £12 billon (74%) of the income generated by the UK space industry and is forecast to grow to £37 billion by 2030, with the key areas of growth being in defence, environment, maritime and telecommunications.

Figure 1. The traditional definition of UK Space Industry



Or more recently it been defined by the links between the upstream and downstream sub-sectors



A-Level requirements

Any subjects allow some form of entry into the sector, however the technical routes generally require STEM A-levels.

E.g. *Space System Engineer* – GCSEs: 3 Sciences + Maths
A-Levels: Physics + Maths + Further Maths
Degree: Physics or Engineering

Astrobiologist – GCSEs: 3 Sciences + Maths
A-Levels: Biology+ Chemistry +Maths
Degree: Biology or Chemistry

Work Experience

Challenging as there are limited opportunities in the sector (most often in STFC locations such as the Rutherford Appleton Laboratories, Oxon.) so generally work experience in related areas (engineering, technology or IT) is considered acceptable.

Work Experience Links

Gap Year Placement / Pre-university Placement Scheme (All year)

Industrial Cadets

International Association for the Exchange of Students for Technical Experience (Summer)

Jodrell Bank Work Experience (Summer) - One week at the astronomical research centre of the University of Manchester

NPL Academy - One week at the National Physical Laboratory

Nuffield Science Bursary (Summer) - A funded placement doing research

Renishaw Engineering Experience (July)

Research Internship in Science and Engineering (Summer)

STFC Work Experience - Placement at government laboratories near Oxford

Work Experience Placement (Summer)

Year in Industry Scheme (All year)

Degree Options

Generally a BSc/BEng or Masters is required. The degree can be technical or not technical dependent on the requirements of the job.

Apprenticeship Options

These include entry level apprenticeships via Intermediate (Level 2) or Advanced (Level 3) Apprenticeships in engineering. Also a Higher Apprenticeship in Space Engineering is now available from Loughborough College, supported by the National Space Academy, Liecs.

Companies in the UK Space Sector

These are located all over the UK, from large multinational organisations to small and medium sized enterprises (SMEs), with the largest concentrations found in London, the South East, the South West, the East of England and Scotland.

Examples of the companies and government bodies operating in the sector include;

- Airbus Defence and Space
- Surrey Satellites Technology Ltd
- Reaction Engines
- Thales Alevia Space
- Inmarsat
- Magna Parva
- CGI
- STFC

- Oxford Space Systems
- The Met Office
- Satellite Applications Catapult
- SCISYS

Career options in the Space Sector

Behind the public face on the sector, the Astronauts, stand thousands of people including;

- *Engineers*: Mechanical Engineers, Electronic Engineers responsible for the design and manufacture of spacecraft, satellites and related instrumentation.
- *IT:* Software Engineers, Mathematicians and Data Analysts responsible for the development and implementation of software to control and monitor spacecraft and analyse data for weather, navigation and communications purposes
- *Scientists:* Geologist, Physicists, Biologists, Climatologists, Chemists and Space Medics, designing experiments and analysing space and satellite data.
- *Nontechnical Careers*: These include sales, public relations, business strategy, educational outreach, insurance, journalism, law and even tourism (a future market!)

Key skills for working in the Space Sector

Employers in the sector are looking for a variety of employability skills including;

- Problem solving
- Communication of ideas
- Communication across cultures
- Management of money and budgets
- Team working
- High levels of numeracy
- Language skills

The Use of Satellite Technology

The sectors and that make use of space and the data that it produces include areas such as agriculture, resource exploration, disaster monitoring, risk evaluation, environmental protection and telecommunications. Figure 2 provides an illustration of the critical role of satellites in maintaining the UK's national infrastructure. (*Source: London Economics analysis of Space applications)*

Figure 2. The Influence of space-enabled applications across the UK's critical national infrastuctures

Note: 'Alternative solution': Application could be achieved with terrestrial (non-satellite) solutions, but satellite services may be chosen based on cost or performance grounds. 'Enhancing solution': Satellite services offer clear cost efficiency and/or performance superiority. 'Enabling solution': Applications for which satellite services offer an enabling solution.
*: Alternative solution for critical broadcasting, but enables live broadcasting. **: Location-Based Services. ***: Unmanned Aerial Systems.
Source: London Economics analysis of space applications.

UK Space Sector key markets and growth areas

The UK space sector is strong in the following areas;

- Navigation
- Observation Imagery
- Satellite Manufacture
- Satellite Operation
- Satellite Software
- Space Data Collection
- Space Security
- Space Research
- Telecommunications
- Weather Forecasting

In addition the following areas have been identified as offering good growth potential to the sector:

- International communications and navigation services and applications
- Earth observation systems
- Systems for space surveillance to alert us to natural and man-made hazards
- space tourism
- Provision of information systems to support carbon trading
- Innovative launch systems
- Services to support space exploration
- clearing space debris

10 Top Tips to Help Launch a Career in the Space Sector

1. **STUDY STEM SUBJECTS** - Physics and mathematics are the most important subjects at secondary level, whilst degree disciplines in mathematics, physics, computer science, astrophysics, materials science, engineering (aerospace, electronic and mechanical) and the spatial sciences (Geography, Geology, Geophysics, Meteorology) are all good routes into the industry.

2. **EXPLORE APPRENTICESHIPS AND GRADUATE ENTRY SCHEMES** – Larger companies such as Airbus Defence and Space run both. There is also the Higher Apprenticeship in Space Engineering at Loughborough College.

3. **ILLUSTRATE BREADTH OF SKILLS** - The space sector relies on innovation and collaboration, so employers like to see evidence of wide interests, adaptability and practical skills as well as good qualifications. The importance of programming skills can't be emphasized enough and knowledge of commercial and management practices is also useful.

4. **ACQUIRE LANGUAGE SKILLS AND CULTURAL UNDERSTANDING** - Space activities are increasingly international, so foreign languages and an understanding of different cultures will be useful assets.

5. **FIND OUT ABOUT PLACEMENTS AND FUNDING OPPORTUNITIES:**
Some good examples for students at all levels include:
- The 'Year IN Industry' runs placements for students before (and during) their degree;
- Headstart
- The Engineering Education Scheme
- ESA (European Space Agency) Internships
- Space Placements in INdustry (SPIN) for undergraduates

6. **TALK TO PEOPLE** - Join a network of people keen to share their love of space. The Royal Aeronautical Society, British Interplanetary Society, Remote Sensing and Photogrammetry Society, Royal Astronomical Society, and Institute of Physics are all keen to encourage student members. UK Students for the Exploration and Development of Space (UKSEDS) has many university branches and is part of the world's largest space enthusiast students' organisation.

7. **KEEP IN TOUCH** - Use the excellent information provided by space agencies, including the UK Space Agency, European Space Agency and NASA. They have excellent websites and newsfeeds, as well as social media accounts such as Facebook and Twitter.

8. **GET OUT THERE** - Visit places and companies that provide industry insights. This includes airshows, such as Farnborough International; the National Space Centre in Leicester; Royal Observatory, Greenwich; Spaceport; the Science Museum; Glasgow Science Centre and many, many, more. Science and engineering STEM Ambassadors from companies such as Airbus and SSTL, and the STEM Centre run outreach schools and hands-on workshops. This can include visits to manufacturing sites.

9. **GET INVOLVED** – Many UK universities run outreach programmes. The South East Physics Network offers student and teacher workshops to promote careers in space. The Science and Technology Facilities Council (www.stfc.ac.uk) offers research school outreach projects and ambassadors. The University of Leicester Space School (SSUK) and the University of Strathclyde Scottish Space School (amongst others) run residential programmes for different age groups. The public can also get involved in citizen science schemes such as those on the Zooniverse.

10. **GET COMPETITIVE** - Space has thrived on competitions to uncover talent such as the X Prize and the Ukayroc Rocketry Challenge. There are many competitions aimed at engaging young people with industry challenges and the opportunity to work with industry mentors. These also include Mission X and the UK Space Design Competition.

(Source: National Space Academy)

Other Links of Interest

These links are suggestions for a starting point for researching careers and work experience and their inclusion here does not indicate any endorsement.

Advice on careers

IOP (Institute of Physics)

Futuremorph

ESA (European Space Agency)

Physics.org space careers page

UKSEDS (UK Students for the Exploration and Development of Space) careers page here

ESA Education

Work experience and internship schemes in the space sector

Jodrell Bank Centre for Astrophysics

Work Experience/Placements with STFC

ESA student placements

Airbus Defence & Space

Space Internship Network (SpIN)

Graduate Schemes

Airbus Defence and Space (formerly Astrium)

Surrey Satellite Technology Ltd (SSTL)

European Space Agency (ESA)

Thales UK

Qinetiq

RAL Space

Telespazio VEGA

HE Space

Apprenticeships

Airbus

Thales UK

Qinetiq

STFC Apprenticeships (Science and Technology Facilities Council)

Recruitment agencies for the space sector

HE Space

Sapienza

Space Schools and residential Space Camps

Senior Space School (for ages 16-18) – University of Leicester

Junior Space School (for ages 13-15) – University of Leicester

Space School (for ages 11-18) – University of Kent - Astronomy Weekends

Scottish Space School (for ages 15-17) – Strathclyde University of Glasgow. A week long residential summer school. Open to Scottish school students only.

Summer School Alpbach (Students and Graduates) - Austria

European Space Camp (for ages 17-20) – Norway - Andøya Rocket Range. A week long residential summer school held in Norway – Open to UK students, must meet requirements.

Other links

The Ogden Trust BLOGden

Women in Space

The Ogden Trust

PDF resources on space careers:

These may be of use to careers guidance professionals, teachers, or anyone looking for a starting point to research careers in the sector.

UK Space Industry - some example companies

Links for Space Careers Information

Work Experience for the space sector

(Source: National Space Academy)