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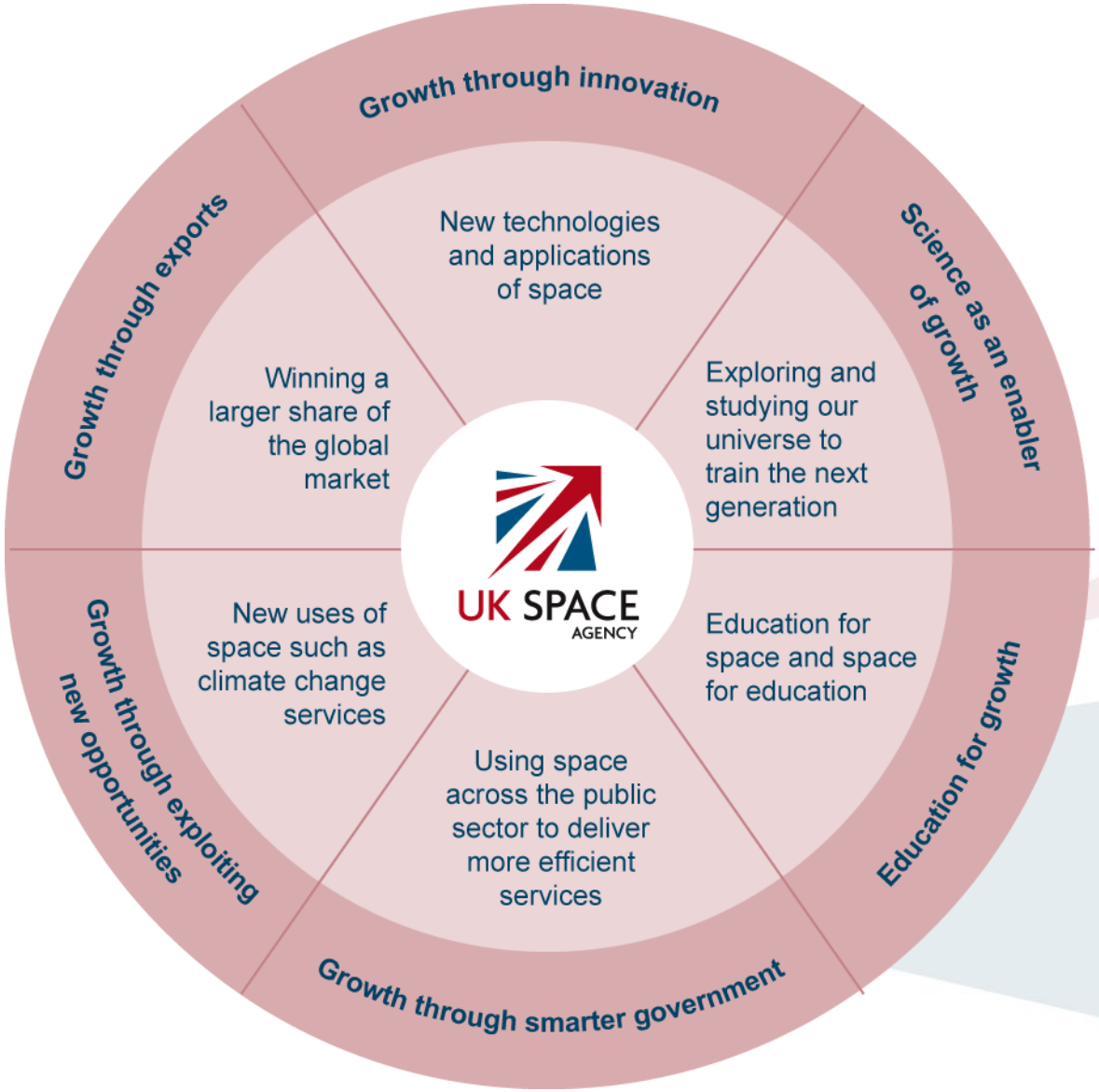
Introduction to UK Space Agency

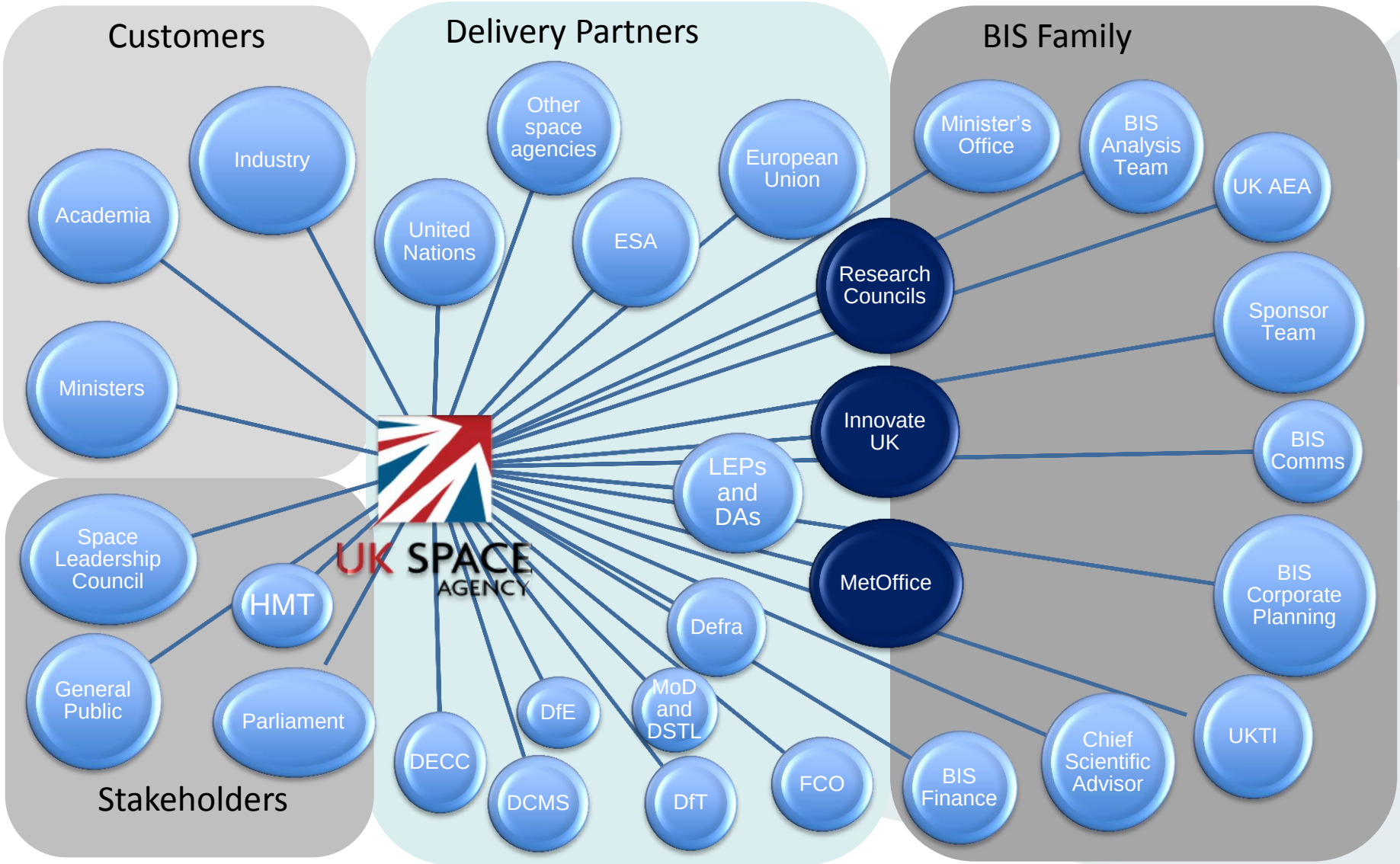
- Executive agency of the Department for Business, Innovation and Skills
- Responsible for all strategic decisions on the UK civil space programme and provide a clear, single voice for UK space ambitions.
- Our UK target is to capture 10% of the global market for space by 2030 (£40B), as set out in the Space Innovation and Growth Strategy.
- The £40 billion goal will be achieved through a mix of space infrastructure and space-enabled services, with the aim to grow downstream revenues **from £8 billion to £37 billion** and upstream from **£1 billion to £3 billion** (Space Growth Action Plan – IGS Market Analysis).

Civil Space Strategy – six themes



Goal:
£40B sector
by 2030

The Agency works with many partners



UK Space Agency works in partnership with others

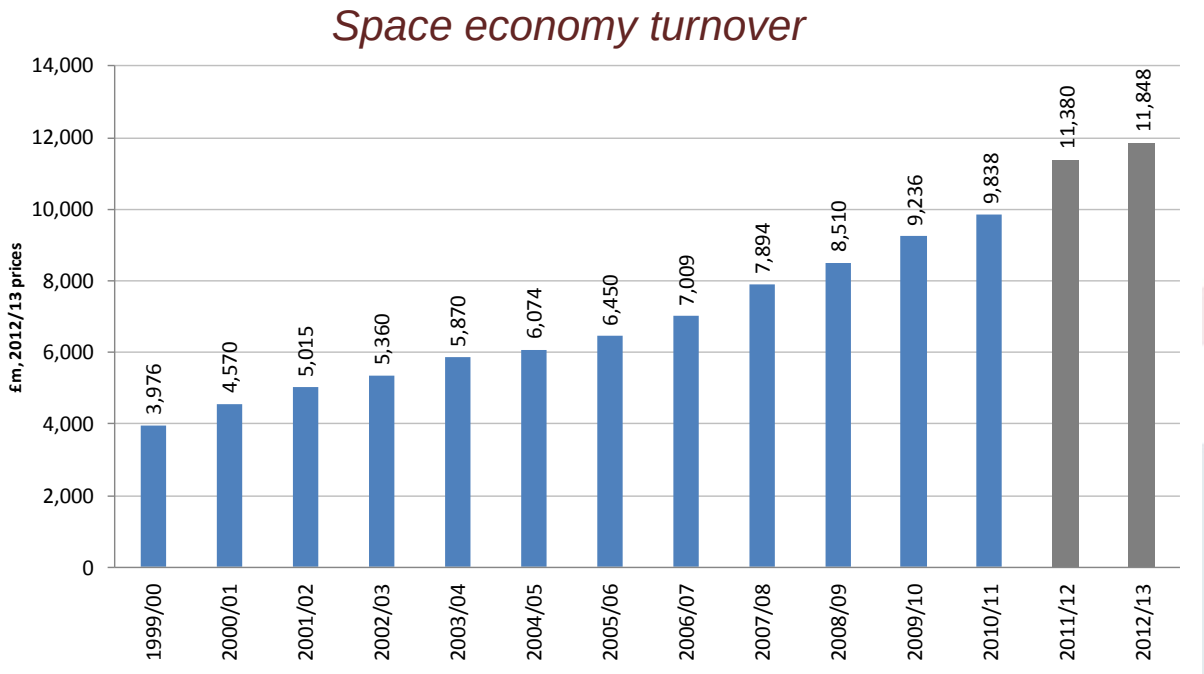
It works with partners such as the Research councils (especially NERC and STFC), with the MetOffice , with InnovateUK and the Sat Application catapult to exploit space data…
… with multiple departments across Whitehall
… and mostly with business

The Space Innovation and Growth Strategy

- First published in February 2010, created real momentum in the sector.
- Brought industry, academia and government together around the common cause of driving economic growth and provided the foundation for a transition of the UK space sector from a niche industry towards a high-technology, mainstream, industrial and science sector.

Turnover & growth

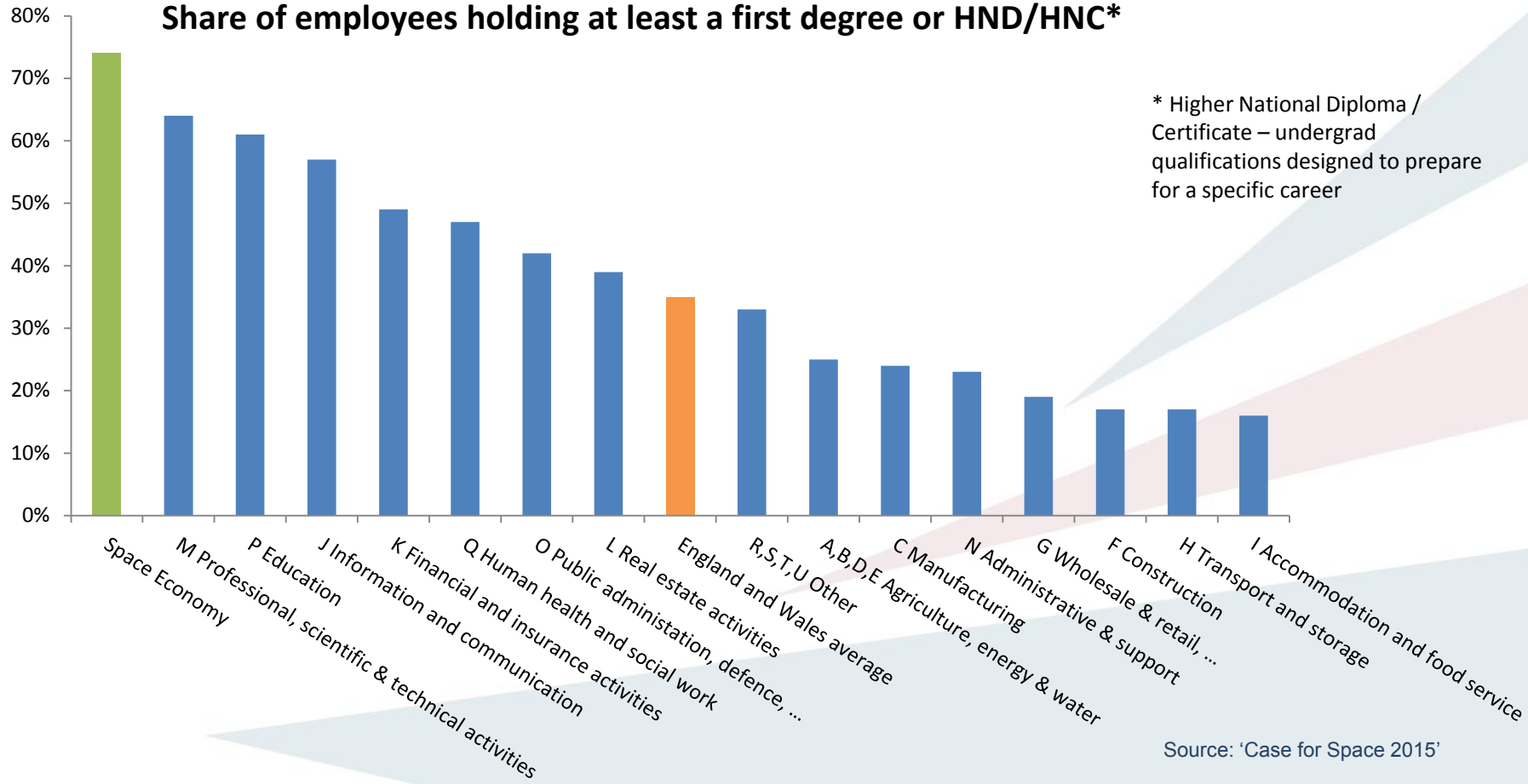
- UK space economy had aggregate turnover of £11.8bn in 2012/13
- Compound annual growth rate of 8.6% since 2008/09



Note: due to improvements in methodology 2011/12 and 2012/13 figures include additional space applications companies, so actual growth between 2010/11 and 2011/12 will be lower than that shown here
Source: 'Case for Space 2015', commissioned from London Economics by the UK Space Agency, Innovate UK, Satellite Applications Catapult and UK Space trade association.

Launch of Sentinel 1-A, April 2014

Skills and qualifications



- Employees in the space sector are on average some of the most qualified in the UK
- For the four space sub-sectors, figures are 94% for space applications, 92% for ancillary services, 83% for space manufacturing and 56% for space operations
- On average, 3 out of 4 space sector employees hold a higher education qualification

Space as an enabler

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Valuation of sectors supported by space-enabled services (2013)

SIC category	Sector	"Space Intensity"
A	Agriculture, forestry and fishing	●●●●○
B	Mining and quarrying	●●●○○
C	Manufacturing	●○○○○
D	Electricity, gas, steam and air conditioning supply	●●○○○
E	Water supply, sewerage, waste management, and remediation activities	●○○○○
F	Construction	●●●○○
G	Wholesale and retail trade; repair of motor vehicles and motorcycles	●○○○○
H	Transport and storage	●●●●○
I	Accommodation and food service activities	●○○○○
J	Information and communication	●●●○○
K	Finance	●●●○○
L	Real estate activities	●○○○○
M	Professional, scientific and technical activities	●●○○○
N	Administrative and support service activities	●●○○○
O	Public Administration and Defence; Compulsory Social Security	●●●○○
P	Education	●●○○○
Q	Human health and social work activities	●●○○○
R	Arts, entertainment and recreation	●○○○○
S	Other service activities	○○○○○
T	Activities of households	○○○○○
	TOTAL	

Source: 'Case for Space 2015'
Note: 4/5 should not be interpreted as 80% reliant, rather that the sector is greatly enhanced by space technologies and would be severely disrupted in their absence

- While the sector itself is relatively small (0.3% of UK GDP), it is growing and the wider effects of space are expansive
- All nine national critical infrastructures rely on space, and almost all UK sectors would be disrupted in the absence of space services
- For this reason space/satellites is recognised as one of the eight great technologies

Leadership in science

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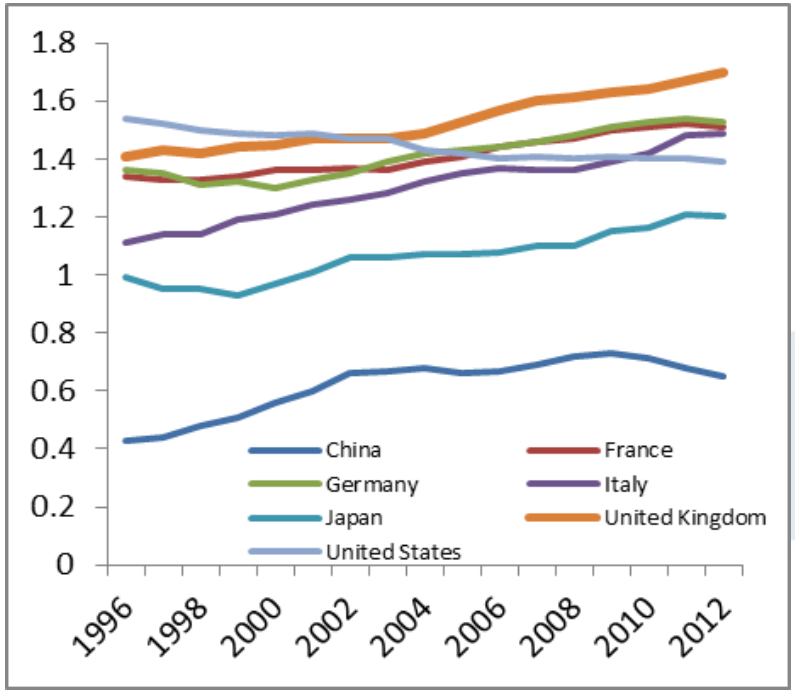
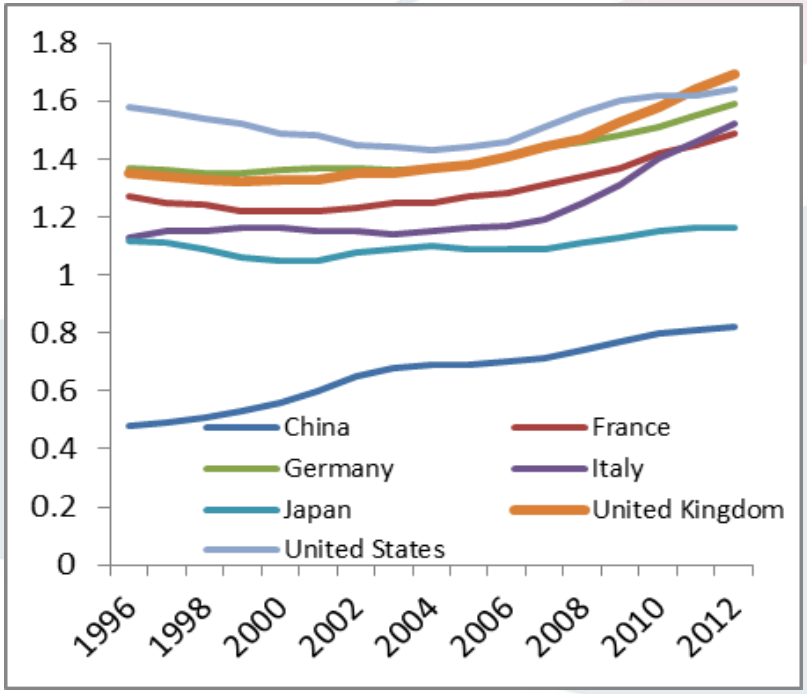
- UK investments produce excellent science
  - Field Weighted Citation Index (FWCI) compares citation performance between countries – score of 1.0 indicates citation performance in line with global average
  - UK is particularly strong in space-related science, and is the **world leader in the FWCI for physics & astronomy and earth observation & planetary science** papers

FWCI for earth observation & planetary sciences



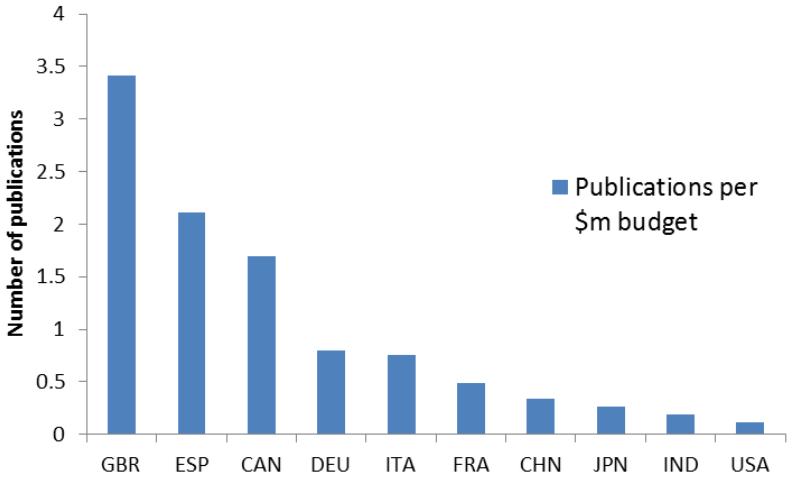
FWCI for physics & astronomy



Source: Elsevier, Scopus citation index, 2015

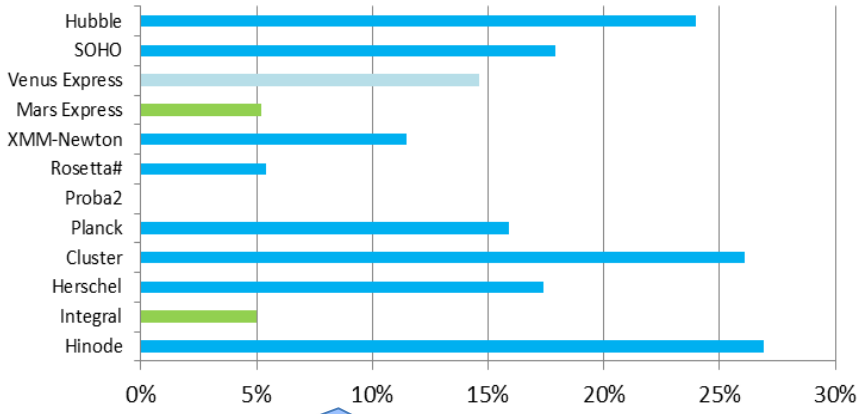
Leadership in science (2)

Published scientific papers on satellite technologies



Sources: OECD, The Space Economy at a Glance 2014 (publications per $m spend); European Space Agency (science returns)

UK's proportion of scientific papers by European Space Agency mission



Blue missions are ones where the UK had Principal Investigator (PI) status – providing funding directly leads to better returns

- Providing funding is closely correlated with better scientific returns
- To the extent that publications and public funding are correlated, the UK gets particularly strong returns with the **greatest productivity in scientific outputs** per unit of spend
- Providing a small share (7.5%) of the European marginal costs of the International Space Station and life sciences programme (and none of the large construction costs) also gives the UK access to all data produced in experiments, which the UK capitalises on (13% of scientists in relevant calls)
- For Hubble, UK paid 14.5% of the European contribution but gained 24% of the European scientific papers produced

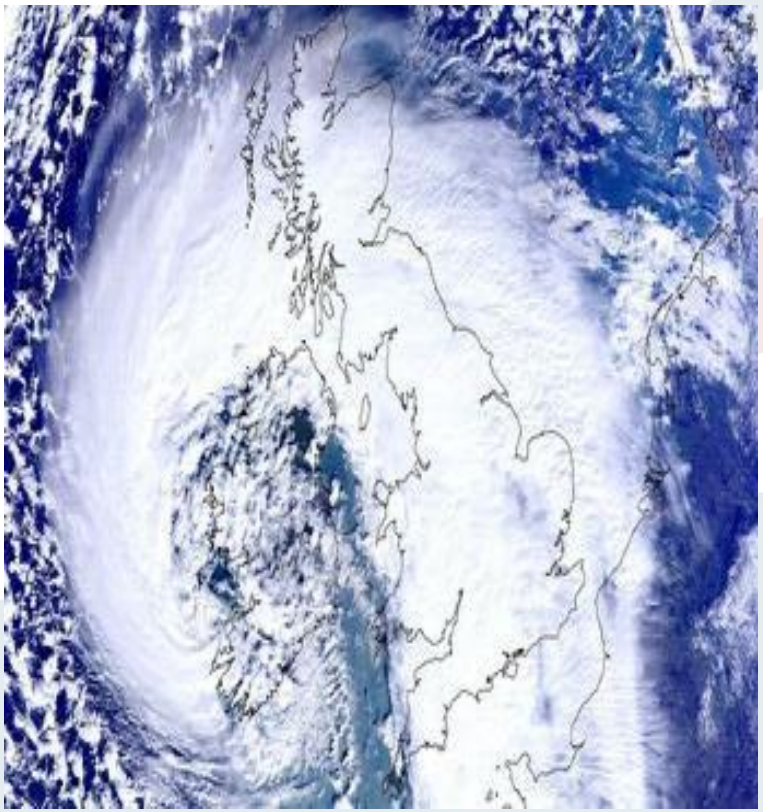
Place- universities in space science:

Number	Research Institution
1	University of Aberdeen
2	Aberystwyth University
3	Astronomy Technology Centre University of Edinburgh
4	University of Bath
5	Birkbeck, University of London, Imperial College London, Kings College London, The Natural History Museum, University College London
6	University of Birmingham
7	University of Bradford
8	University of Brighton
9	University of Bristol
10	British Antarctic Survey
11	University of Cambridge
12	Cardiff University
13	Cranfield University
14	Durham University
15	University of Exeter
16	Glyndwr University
17	University of Greenwich
18	University of Kent
19	Lancaster University

Number	Research Institution
20	University of Leeds
21	University of Leicester
22	University of Liverpool
23	Loughborough University
24	University of Manchester
25	Manchester Metropolitan University
26	National Physical Laboratory
27	Northumbria University
28	University of Nottingham
29	Open University
30	University of Oxford
31	Plymouth University
32	University of Portsmouth
33	Queen's University Belfast
34	RAL Space
35	University of Reading
36	Royal Botanic Gardens, Kew
37	University of Sheffield
38	University of Southampton
39	University of St Andrews
40	University of Strathclyde
41	University of Surrey, Surrey Space Centre
42	Swansea University
43	University of Glasgow
44	University of Warwick

Satellite Applications – The perfect storm

- Technological advances in satellite capability – smaller & cheaper – reducing cost of access to space.
- Access to free data (e.g. Copernicus Sentinels, Galileo)
- Political commitment and funding for developing operational applications and services
- Skills and people across UK public and private sector



Investing in the use of satellite data

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National Programmes

- UK SA International Partnership Space Programme
- UK SA Space for Smarter Government (with SA Catapult)
- Research Councils R&D
- Innovate UK investment

European Programmes

- ARTES – Integrated Applications Programme
- Copernicus
- Galileo
- Horizon 2020

Venture capital opportunities

- Seraphim Space & Special Situations Fund
  - a partnership between industry, government and academia to develop, grow and exploit new space-related opportunities was conceived as part of the UK's Space Innovation and Growth Strategy
  - backers include Thales Alenia Space, Airbus Defence & Space, Telespazio, Com Dev International, Avanti Communications and e2v.

Challenge for academia

- Take a user perspective – what are the problems and challenges that satellite applications can help find a solution?
- Be open to new ideas. Look for links outside your area of expertise.
- Look for partners in new areas– people that you may not have worked with before.
- Use these new partnerships to tap into the full range of funding options to develop your ideas.