

Space Assets: Most Critical of All?

Nick Shave

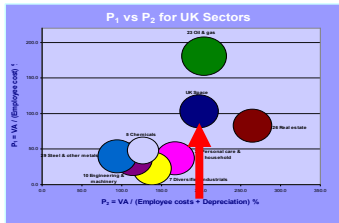
Senior Account Manager, Logica
Previous CPNI SPIIE Industry Co-Chair



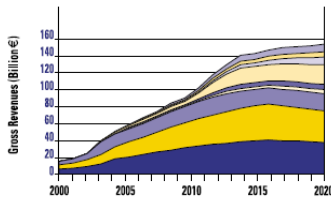
Does the UK do Space?

The UK Space Industry - 1

“I believe in the space industry. Britain has a comparative advantage and we will carry on backing Space.” David Willetts, Minister for Science, Innovation and Skills



Value Added: UK Space



Satellite Navigation market growth



David Williams, CEO Avanti
– Entrepreneur of the Year
2005

- **High value added**
 - direct space turnover £5.8bn
 - direct employment 19,000
 - additional spillover 2x this, supporting in excess of 70,000 people in UK
 - high return on investment
 - added value per employee £135k per worker at 4x national average, 2nd only to oil and gas
- **High growth**
 - 10% real growth since 2000, 4x economy
 - satellite operator revenue up 44% in 3 years
- **High skill**
 - most highly-skilled workforce in UK manufacturing 60% graduates

The UK Space Industry - 2



Skynet 5 secure communications



Inmarsat 4 mobile services



David Williams, CEO
Avanti – Entrepreneur
of the Year 2005

High technology

- investing £300M in R&D = 12% of added value
- 6x more R&D intensive than economy as a whole

Major players in world market

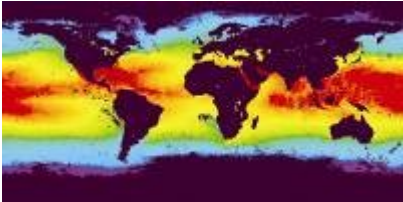
- UK has 7% of the global market
- balanced portfolio in both upstream and downstream markets (20/80)
- strong linkage upstream to downstream

- **World leaders**

- **Astrium** : Europe's leading space company
- **Paradigm**: First PFI for global military satellite comms
- **SSTL**: Low cost satellite market pioneer
- **Infoterra**: Leader in Earth Observation services
- **Inmarsat**: Leading global satellite operator
- **Avanti**: City funding for new Broadband satellite
- **Logica**: Software for $\frac{1}{3}$ of world's satellites

The UK Space Industry - 3

Meeting today's societal challenges



- Growing and ageing population
 - tracking / monitoring / closing the digital divide / delivering healthcare / lone-worker....
- Global security & counter terrorism
 - resilient & secure communications / robust and assured location and time / global observations
- Natural resources & climate change
 - assured and global view of earth resources / monitoring the essential climate variables / prospecting....
 - low carbon delivery of services
 - integrated transport systems / telematics

Example – The UK in Space: The SKYNET 5 Programme



- A UK Private Financed Initiative (PFI)
 - Privately owned and operated system providing advanced communications services to government customers
 - A 17 year contract to 2020 with a value of £3.6 Billion
 - 3 satellites & ground systems
- Paradigm (part of EADS) owns, manages and operates the Skynet 5 system
- Responsible for all aspects of service delivery, satellite control and network management
 - Key subcontractors: Logica & Serco
- Now providing resilient services to Cabinet Office CCS – The HITS Programme

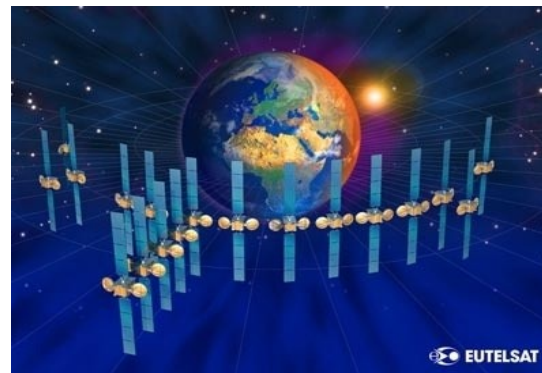


European Space Infrastructure: The Galileo Satnav System



Space and National Infrastructure

- UK government and industry are realising our growing dependence on space-derived services
 - Satnav services for positioning, timing, and other applications
 - Satcom systems, particularly for supporting resilience
 - Earth observation systems for growing range of applications
- Space is highly international in nature
 - Many systems we use owned and controlled outside UK



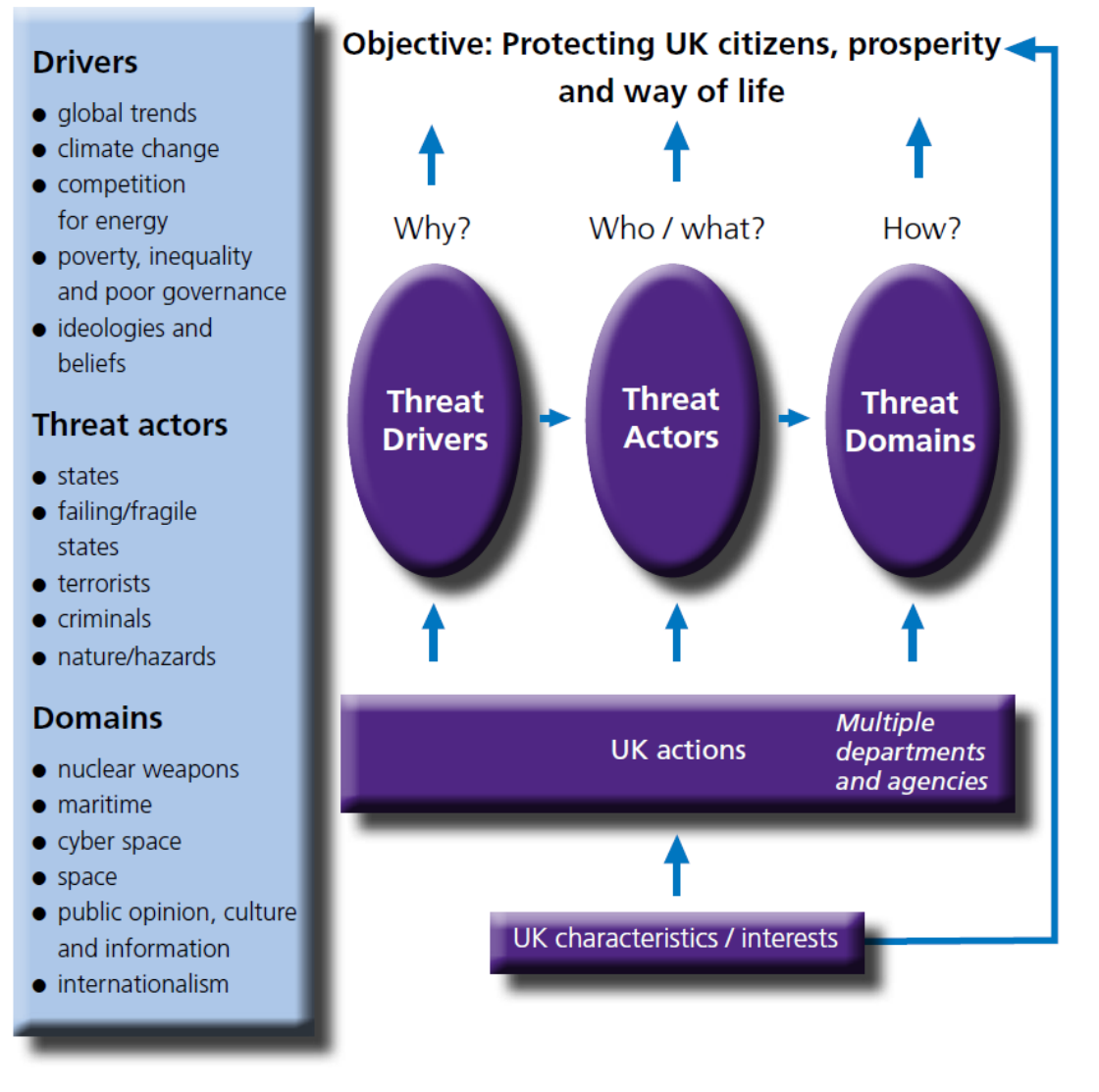
Background: Evolving UK Security Policy

Extract from:
UK National Security Strategy

Published by Cabinet
Office,
June 2009

Current SDSR
***Cyber & Space Being
considered
By Cabinet Office***

Figure 1: The United Kingdom's National Security Framework



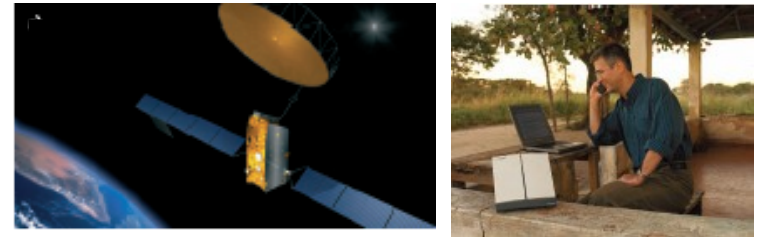
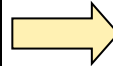
Space: Critical National Infrastructure?



CASE STUDY



	CPNI CNI Sectors	Lead Department
1	Communications	DBIS
2	Emergency Services	Home Office
3	Gov. & Public Services	Cabinet Office
4	Finance	Treasury
5	Energy	DECC
6	Food	DEFRA
7	Health	Dept of Health
8	Transport	Dept for Transport
9	Water	DEFRA



In 2006, the UK Gov Civil Contingencies Secretariat decided to replace the UK Emergency Communications Network with a new infrastructure:

Satellite communications was chosen due to its resilience and independence.

600 Inmarsat BGAN terminals are now in service with emergency response organisations...

Dependence on Space Example

Transport & Emergency Services: **Significant**



Dependence on Space Example

Energy sector: Increasing



- Power distribution networks: GPS timing becoming critical + satcom for M&C
- Management of pipelines: satcom (VSAT) essential for the UK Transco 275,000 km network
- Energy distribution forecasting and logistics: satellite weather data + GPS
- Oil and gas exploration: satellite imagery is essential

CPNI Space Industries Information Exchange

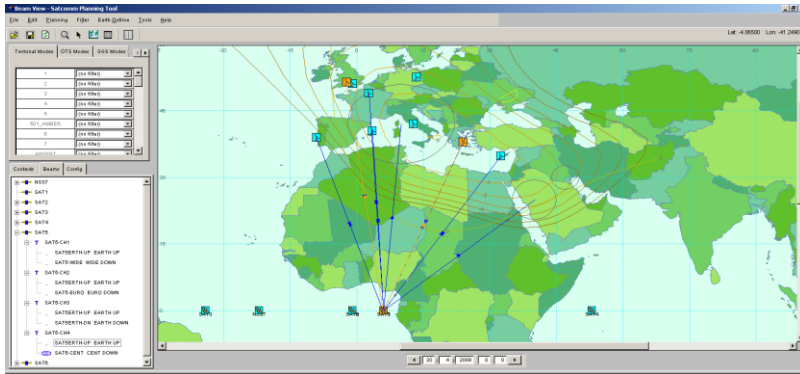
- Established March 2009
- Aim: Identify and protect UK civil space infrastructure & derived services
- Members from UK space industry, service providers and UK government
- Study underway (Logica/QinetiQ) to quantify the actual space dependency in the Energy, Telecoms & Finance sectors

CPNI

Centre for the Protection
of National Infrastructure



Threats and Mitigations



- **Active threats to ground infrastructure and communications links:**

- terrorist attack
- jamming and/or denial of service
- interception of data

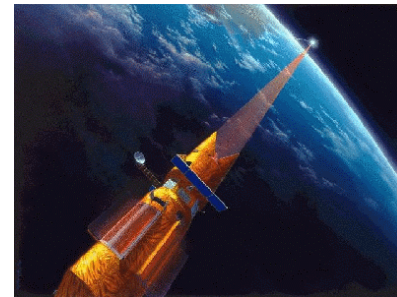
- **Threats to space infrastructure:**

- anti-satellite weapons, sensor dazzle, etc.
- natural space environment
- space debris and meteoroids

Iridium-33 & COSMOS-2251 collision in 2009

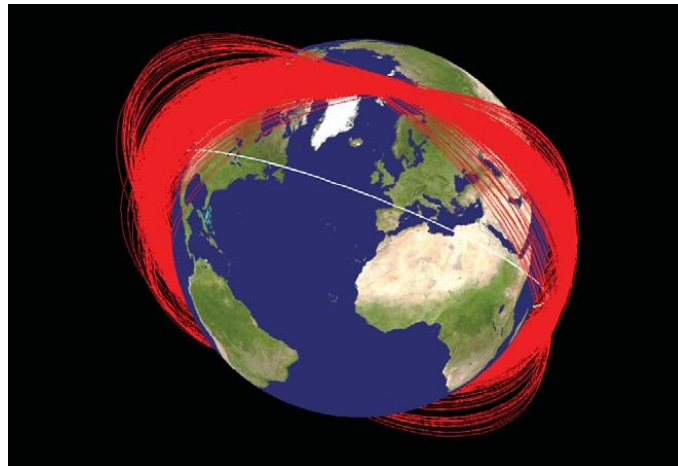
- **Mitigations:**

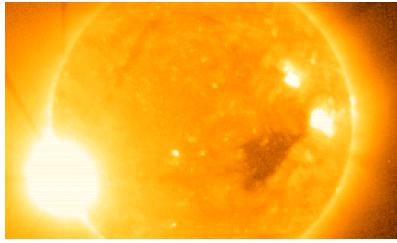
- protection of ground infrastructure – treat as Critical National Infrastructure for key facilities
- maintain UK technical skills base – build on strengths (e.g. small satellites, payload, software)
- actively participate in European & US space security programmes (*ensure these programmes address UK needs*)



ASAT Test by China, 11 Jan 2007

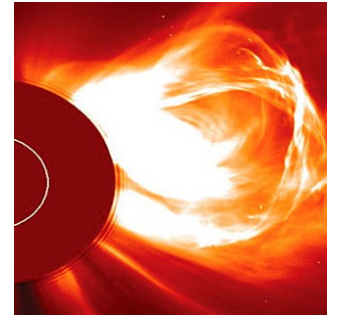
- A Chinese weather satellite at altitude 865 kilometres with a mass of 750 kg was destroyed by a kinetic kill vehicle
- Launched with a multistage solid-fuel missile from Xichang Satellite Launch Center
- Largest recorded creation of space debris in history with at least 2,317 pieces of trackable size (golf ball size and larger)





Severe Space Weather

The Carrington Event (1859)



- On September 1–2, 1859, the largest recorded geomagnetic storm on the Sun occurred, a “Solar Superstorm”
 - Aurorae were seen around the world, most notably over the Caribbean
 - Telegraph systems all over Europe and North America failed
- Solar storm of March 1989: 6 million people in Quebec lost power for 9 hours
- If a Carrington type event occurred today (US Academy of Sciences report, 2008):
 - Power outages for 130 million people in US, radio blackouts and satellite malfunctions
 - Telecommunications, GPS navigation, banking and finance, and transportation affected
 - Some problems would correct themselves with the fading of the storm: radio and GPS transmissions could come back online fairly quickly
 - Other problems would be lasting: e.g. a burnt-out multi-ton transformer can take weeks or months to repair.
 - The total economic impact in the first year alone could reach \$2 trillion, 20 times greater than Hurricane Katrina

Conclusions

- The UK does Space !
- Space derived services are becoming more critical to our daily lives
 - Positioning, timing, communications, and Earth observation domains
- Space systems provide important resilience support
- Space threats are increasing
- The UK is responding



Thank you

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