Igniting the UK's new space age

Online Presentation | LaunchUK Roadshow

LAUNCH UK


UK SPACE
AGENCY


Department
for Transport


Civil Aviation
Authority

UK SPACE AGENCY

We are responsible for all strategic decisions on the UK civil space programme and provide a clear, single voice for UK space ambitions.

Purpose:
Delivering an excellent space programme with the maximum economic, scientific and policy benefit for the UK.

Vision:
Support UK industry to capture 10% of the global space market by 2030.

UK SPACE AGENCY

Wider UK GDP* supported by satellite services

GVA

£5.1bn

Direct contribution of the UK space industry to UK GDP

More than £250bn

- Telecommunications
- Navigation
- Earth Observation
- Meteorology

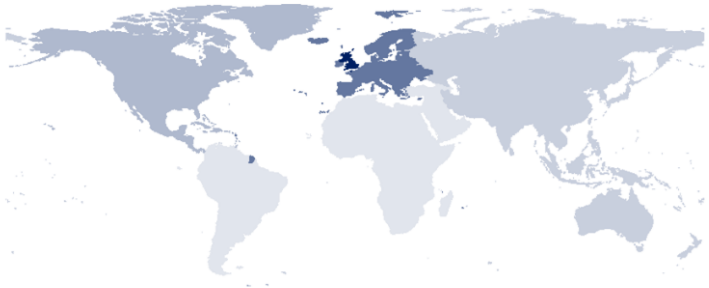
7 in 10

Organisations expect income growth over the next three years

£5.0bn

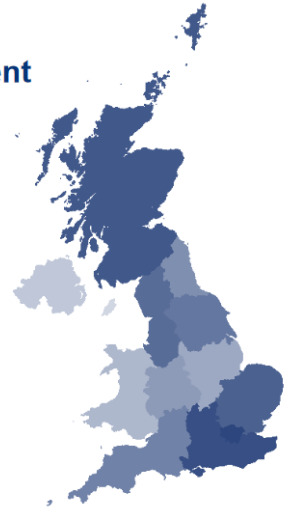
Exports in 2014/15

49%	19%	16%	16%
Rest of Europe	North America	Asia-Pacific	Other



Regional employment

26%	London
23%	South East
18%	Scotland
33%	Other



UK SPACE AGENCY

£13.7bn

Total Income in 2014/15

6.5%

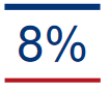
Share of global space economy in 2014/15

38,500

Employees in 2014/15

2.7x

Labour productivity compared to UK average

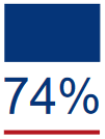


8%

Space Manufacturing

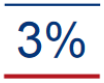
15%

Space Operations



74%

Space Applications



3%

Ancillary Services

6.5%

Annual growth rate 2012/13 – 2014/15

£415m

R&D expenditure in 2014/15

3 in 4

Employees holding a university degree or higher qualification

The cost of Satellites is reducing

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1998

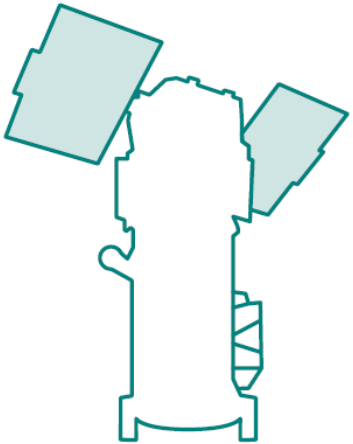
Compact Disc
600mb

2006

Memory Stick
32gb

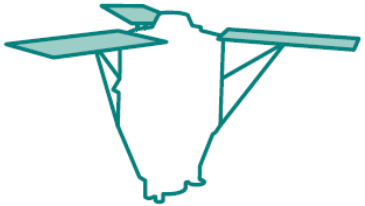
2012

SD Card
128gb



WorldView-3

Operator: **Digital Globe**
Weight: **2,900kg**
Cost: **$420m**



Pleiades-1A

Operator: **CNES/Airbus D&S**
Weight: **940kg**
Cost: **$424m**

Skysat

Operator: **Skybox Imaging**
Weight: **120kg**
Cost: **$20m**

Dove

Operator: **Planet Labs**
Weight: **5kg**
Cost: **$60k**

More countries are producing satellites

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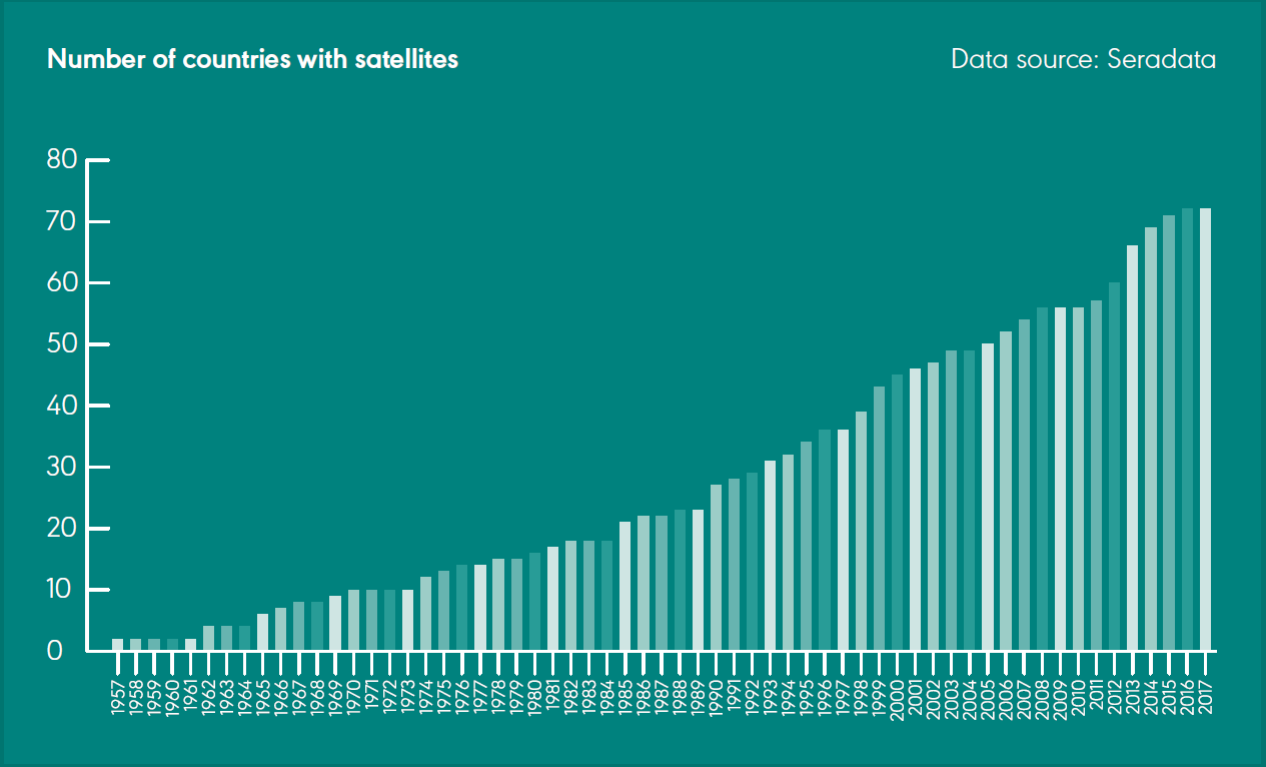

More satellites need launch

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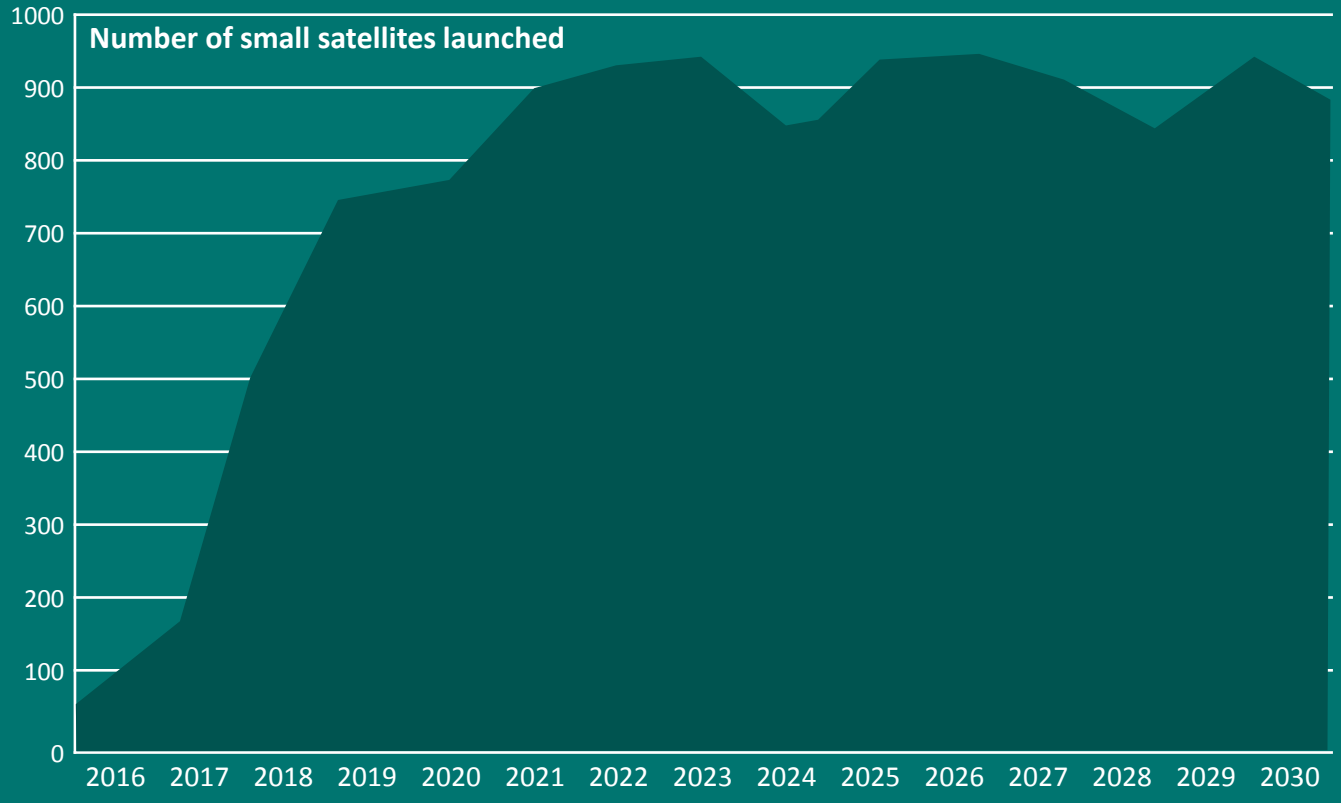

Source: Frost and Sullivan

Two growing markets

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Small-satellite launch

Sub-orbital flight

Increasing demand for launch services

New commercial launch vehicles

Edge of space flight experiences

Micro-gravity science

Market potential

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£25bn

global market to launch and sustain new small satellite constellations over 20 years.

£10bn

global market for Sub-orbital flights providing access to microgravity for research and space experiences.

Fracture in the UK supply chain

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Design and build | Launch | Operate | Process | Develop applications

Our ambition

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Enable the **launch of small satellites** and **sub-orbital flights** from **UK spaceports**.

Make the UK the **first country in Europe** where commercial operators can launch small satellites into orbit and offer sub-orbital flights.

Launch small satellites into low Earth orbit, generating opturnities for the satellite sector and defence.

Enable specialist vehicles to enter **sub-orbital flight**, generating opportunities for science and tourism.

Support **UK businesses** to develop the skills and capabilities to **participate in the end to end value chain.**

The story so far

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David Willets first announces UK Government intent to explore regulation of spaceflight in the UK

Spaceflight Bill in the **Queens Speech** which was strongly welcomed by industry, who need legislation to start work

Space Industry bill introduced into Parliament and Minister for Science, **Jo Johnson** announces funding **for joint launch proposals**

What Government is doing

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Sustainable Market

We are engaging with industry to stimulate sustainable interest in the UK launch market and in the operation and use of UK spaceport services.

International Engagement

We are learning from other nations' experiences, and will use our global links to help companies who want to operate in the UK.

Regulatory Framework

We are legislating for a new regulatory framework to ensure UK spaceflight activities are safe.


Drivers
Data demand
Small sat cost
Constellations
Launch tech
Future tech
Urgency
First mover advantage
Confluence of drivers 2020+
Other entrants to market
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Action
Develop legislation
Grow the UK launch market
Secure international agreements
Implement a regulatory and licencing regime
Realise the benefits of UK based launch services
Benefits
Launch eco-system
Local opportunities
Space sector growth
UK Export
Science & STEM

Why we need to develop a market strategy for space launch

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50+ Potential New Launch Services	**26** proposals for UK operations from 2020	**7** sites pursuing spaceport status in the UK
1000s of satellites need launch	**100s** of potential UK suppliers	**25bn** value of global small launch

Vision for the UK spaceflight market

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A globally competitive spaceflight sector, that builds on the UK's strengths and international outlook, to supply launch operators, satellite manufacturers and application developers with world leading services and components.

All empowered by commercial launch services from UK spaceport(s), that are inspiring the next generation of scientists and engineers, helping to grow new skills and technology.

Vision for the UK spaceflight market

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Develop

UK's strengths international outlook

Promote

world leading services and components

commercial launch services

Build

next generation scientists and engineers

skills and technology

Inspire

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Build	Develop	Promote	Inspire
			
Spaceports & UK services	New tech and services	UK to a global audience	Future talent, skills & tech

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Build

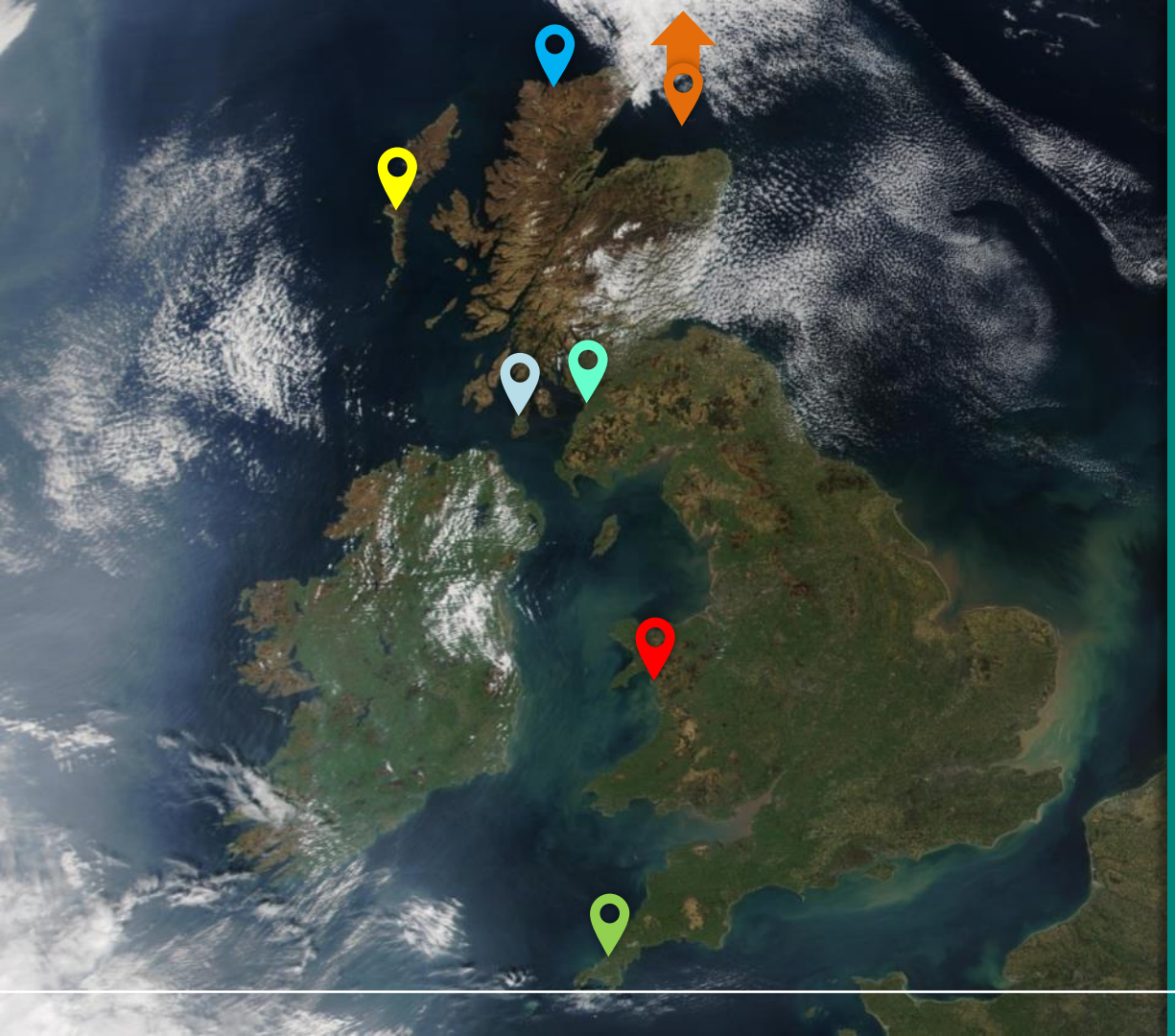
Spaceports & UK services

By 2025, infrastructure and launch vehicles that have been rapidly established in the UK are servicing the global small satellite launch and sub-orbital spaceflight markets.

Build spaceports

Build launch systems

Build customer interest



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- **Prestwick** | Scotland
- **Western Isles** | Scotland
- **Shetland** | Scotland
- **Sutherland** | Scotland
- **Snowdonia** | Wales
- **Campbeltown** | Scotland
- **Newquay** | England

Kick-starting build

- The UK Space Agency invited grant proposals that contained an outline business plan to launch small satellites or provide sub-orbital spaceflight from a UK spaceport from 2020.

- Proposals had to be provided jointly by at least one potential spaceports and vehicle operator. No limit on the total grant, and no limit to the number of grants that may be provided. Exceptional case needed for grants over £10 million.

- 26 proposals were submitted in response to the call, from spaceports all over the UK, working with vehicle operators from the UK, other European nations and the US.

- Multiple proposals have been recommended for further consideration, to ensure any grant funding delivers the best outcome for the UK. Announcements about any awards of grant funding are expected later in this financial year.

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Develop

By 2025, UK companies supply key components and services for the global small satellite launch and sub-orbital spaceflight services. Small satellites that have been built, tested and launched from the UK provide data for global applications.

New tech and services

Develop products and services

Develop facilities

Develop global links

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Ground Services

Manufacturing

Insurance Services

Hospitality

Range

Payload Integration

Legal Services

Propellant

Logistics

People Services

Airfield services

Aircraft services

Launch Capability

Rocket Engines

Fairings

Turbo pumps

Guidance

Control systems

Rocket body

Stage separators

Launch Pad

Gantry

Fuel handling

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Promote

UK to a global audience

By 2025, UK industry is leading and shaping UK launch activities, with growing influence over the global space sector. UK companies supply key components and services to small satellite launch and sub-orbital spaceflight services all over the world.

Promote industry leadership

Promote UK launch operations

Promote UK suppliers & service providers

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Inspire

By 2025, space launch inspires increased participation in STEM and space careers, and motivates the development of new skills, expertise and capability within industry, academia and education.

Future talent, skills & tech

Inspire the next generation

Inspire new science and innovation

Inspire the general public

Why we need regulation

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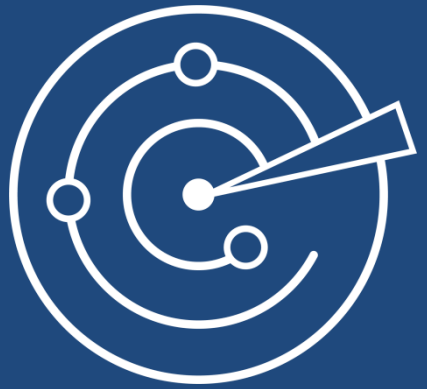
Launch not currently regulated in the UK



Need to ensure safety of new launch services

Lack of regulation is a barrier to future growth

Categories of regulated operations

Vertical launch	Horizontal launch to orbit	Single stage to orbit space planes	Horizontally launched sub-orbital spaceplane	High Altitude Balloons
UK SPACE AGENCY	Civil Aviation Authority	Civil Aviation Authority	Civil Aviation Authority	Civil Aviation Authority

HSE oversees all safety on the ground

UKSA regulates all vertical spaceports, launch vehicles, in obit operations and tracking into orbit

CAA regulates all airspace, spaceplanes and horizontal spaceports

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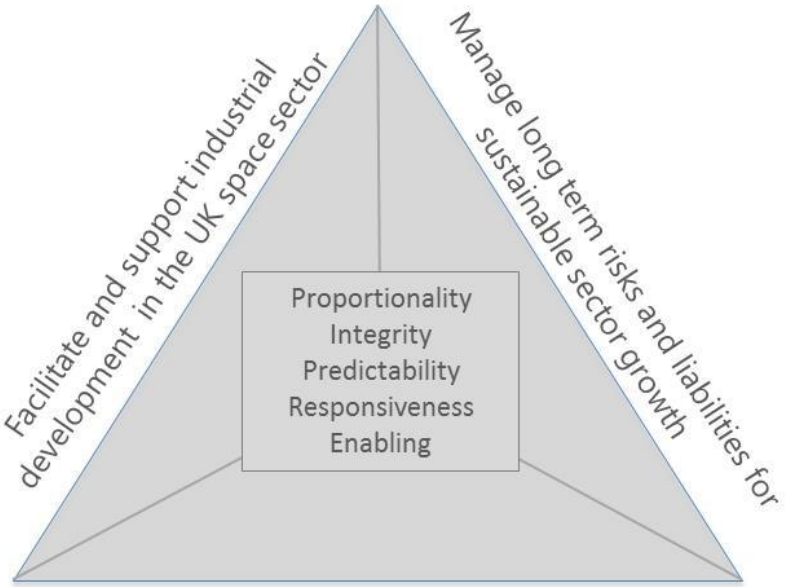
Our regulatory ethos

Our objectives and principles



Our approach

We will:

1. balance risk appropriately amongst our three objectives
2. be joined up, providing a single entry portal and one license for each activity
3. make policy in an open and transparent way, in partnership with our stakeholders

Department for Transport | UK SPACE AGENCY | HSE | Civil Aviation Authority

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Key issues

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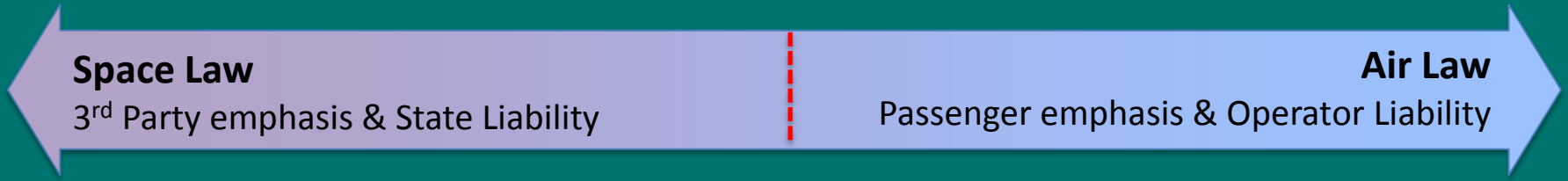
Liabilities



Security

- Extends current Civil Aviation security powers to space planes and space ports and applies new safeguards where needed
- Considers holistic threat picture and takes account of national security and international agreements (e.g. ITAR)

Safety

- Safety is paramount – will follow HSE approach to reduce risk to "As Low As Reasonably Practicable
- Licensing of individual events – certification likely to be some years away
- Risk assessments driven by risk to General Public
- Health & Safety Laboratory currently assessing risk methodologies for secondary legislation

UKSA and CAA regulatory approach

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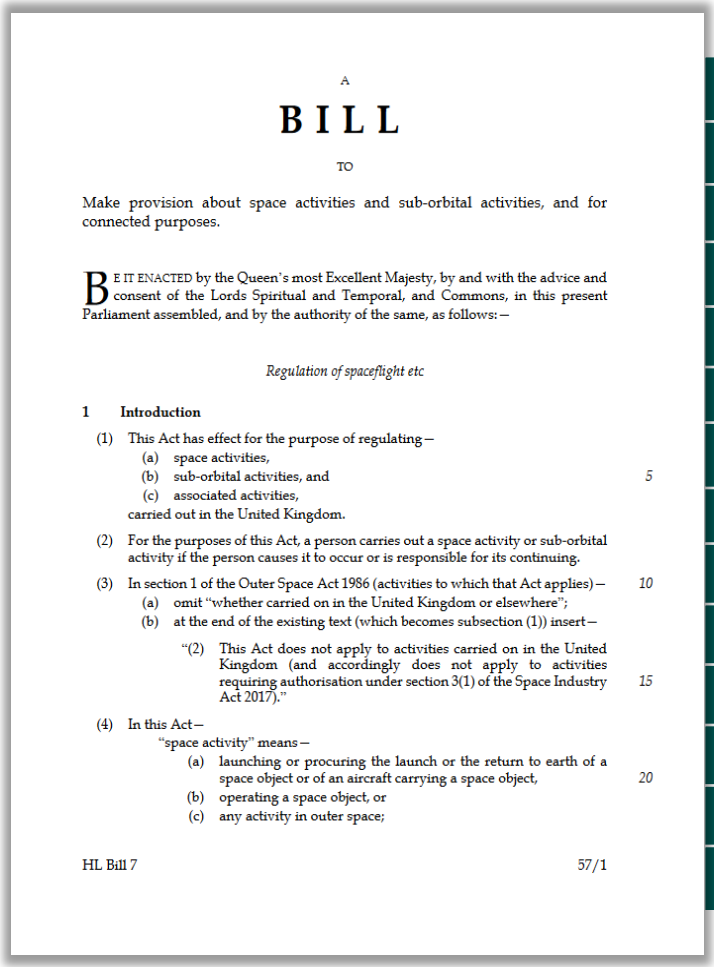
- **Safety of the uninvolved general public** is our primary concern
- Will take a pragmatic, risk based approach; proportionate and relevant rather than overly prescriptive
- Regulation will take account of licences issued by other nations
- Will use existing requirements/standards and guidance material where available and applicable
- **Will work with industry to ensure regulations are proportionate and do not stifle development**



A

BILL

TO

Make provision about space activities and sub-orbital activities, and for connected purposes.

BE IT ENACTED by the Queen's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:—

Regulation of spaceflight etc

1 Introduction

(1) This Act has effect for the purpose of regulating—
  (a) space activities,
  (b) sub-orbital activities, and
  (c) associated activities,
carried out in the United Kingdom.

(2) For the purposes of this Act, a person carries out a space activity or sub-orbital activity if the person causes it to occur or is responsible for its continuing.

(3) In section 1 of the Outer Space Act 1986 (activities to which that Act applies)—
  (a) omit "whether carried on in the United Kingdom or elsewhere";
  (b) at the end of the existing text (which becomes subsection (1)) insert—

"(2) This Act does not apply to activities carried on in the United Kingdom (and accordingly does not apply to activities requiring authorisation under section 3(1) of the Space Industry Act 2017)."

(4) In this Act—
"space activity" means—
  (a) launching or procuring the launch or the return to earth of a space object or of an aircraft carrying a space object,
  (b) operating a space object, or
  (c) any activity in outer space;

HL Bill 7 57/1

Regulations	Definitions, duties, prohibitions
Operator licenses	Operators, Spaceports, T&Cs
Range	Definitions, services, licensing
Delegation	Appointment of other regulators
Participants & staff	Consent, fitness, qualifications
Safety	regulations, accidents, assistance
Security	Definitions, services, licensing
Enforcement	Appointment of other regulators
Liabilities	Consent, fitness,
Land powers	regulations, accidents, assistance
Sanctions	Offences, penalties, sanctions
Appeals	Panel, rights, circumstances
Miscellaneous	Charging, advice, other countries
General	Amendments, interpretation…

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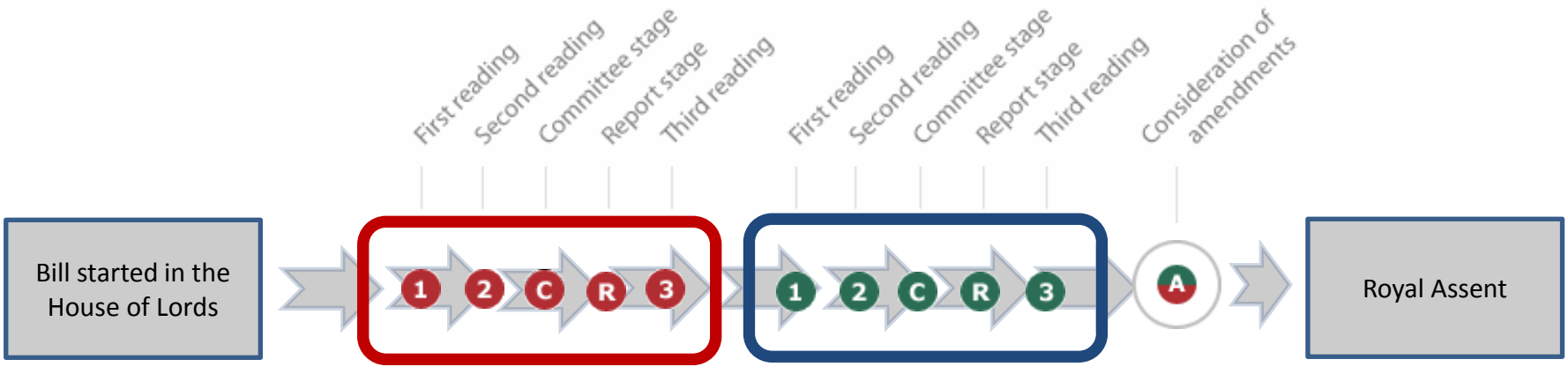
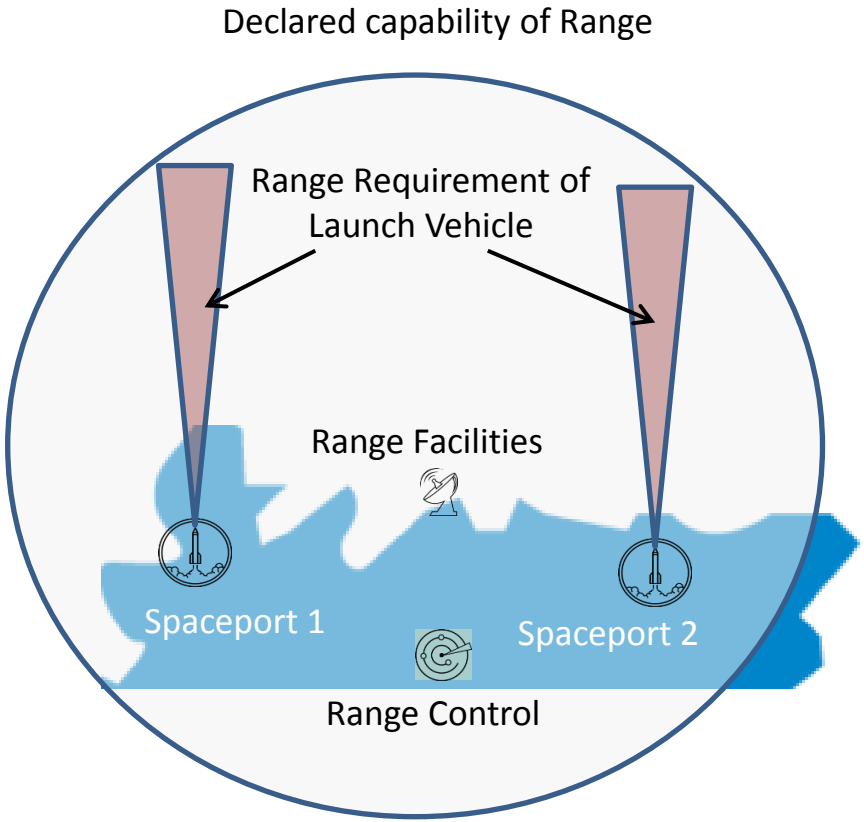
The Parliamentary process



Vertical launch to orbit licencing principles



- Containing the risk.
- Interrelation of Spaceport, launch and range facilities.
- Estimation of the consequences of a failure.
- The risk of fatalities in these areas.
- Individual Risk (IR) assessment not an Expected Casualties (EC) calculation

CAA overview

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- **The CAA is the UK's independent aviation regulator. CAA spaceflight policy work is funded by the DfT under the terms of a Civil Aviation Act, Section 16 Agreement.**

- **In support of the Space Industry Bill (presently with the House of Lords), the CAA is developing regulatory policy and guidance material for licenced sub-orbital and spaceport activities.**

- **The core CAA team consists of technical experts from the various aviation disciplines including: Aerodromes, Airspace, Airworthiness, Flight Standards and Safety Analysis**

Sub-orbital spaceplane operations

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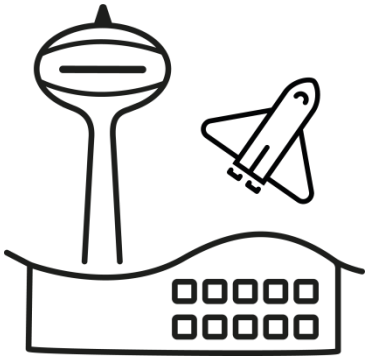
- **Sub orbital spaceplanes do not go into orbit, but they can carry human occupants up to 100km.**
- **Civil aviation certification standards do not apply – instead a system safety process and operating requirements will be used to reduce risk for crew and spaceflight participants.**
- **Third-party risk will be assessed using a hazard modelling and statistical calculation methodology.**
- **Occupants will need to give their informed consent to accept the risks of the spaceflight.**
- **Spacecraft operators will need a licence granted by the CAA. Carrier aircraft will also be overseen by the CAA.**

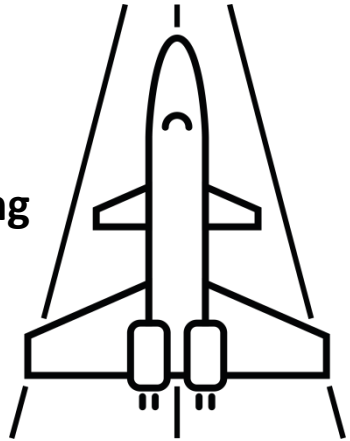
Horizontal launch spaceports



- **Pre-requisite for a horizontal launch spaceport to be either an EASA certified or UK licensed aerodrome – provides an existing regulatory framework to support spaceplane and carrier aircraft launch operations.**
- **Spaceport licence can be issued prior to a launch vehicle operator being identified – application based on a proposed generic type of vehicle.**
- **Performance based approach through a Safety Management System – how does the spaceport licence applicant intend to manage the ground based risks associated with the proposed operation?**

Horizontal launch spaceports

- **3rd party individual risk analysis – to assess if the site is suitable to support space activity;**
- **Assessment of high risk sites in the vicinity of the spaceport.**
- **An environmental assessment;**
- **An explosive site plan – to manage the risk of storing and handling fuels and oxidisers.**
- **Requirement for an emergency response plan – to manage the response to an emergency**

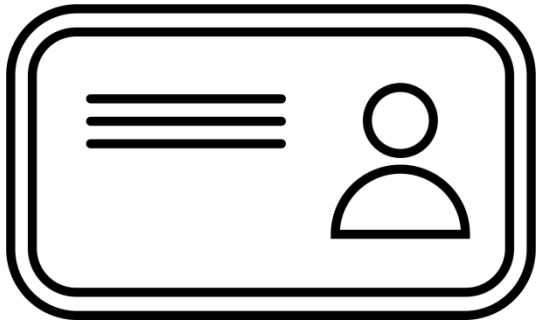


Airspace Complexity

- **Competing priorities - effect of segregated airspace on existing users?**
- **Change of Airspace use through Airspace Change Process**
- **Coastal location, no overflight of populated areas.**
- **Airspace over the High Seas**

UK Space Activity Licensing

- Why are we licensing?
- Who are we licensing?
- How are we licensing?

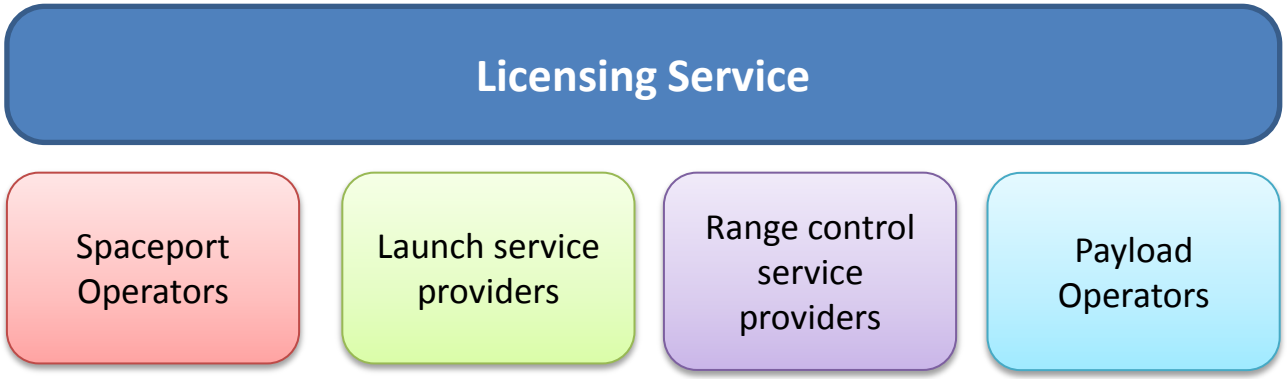


Why are we licensing

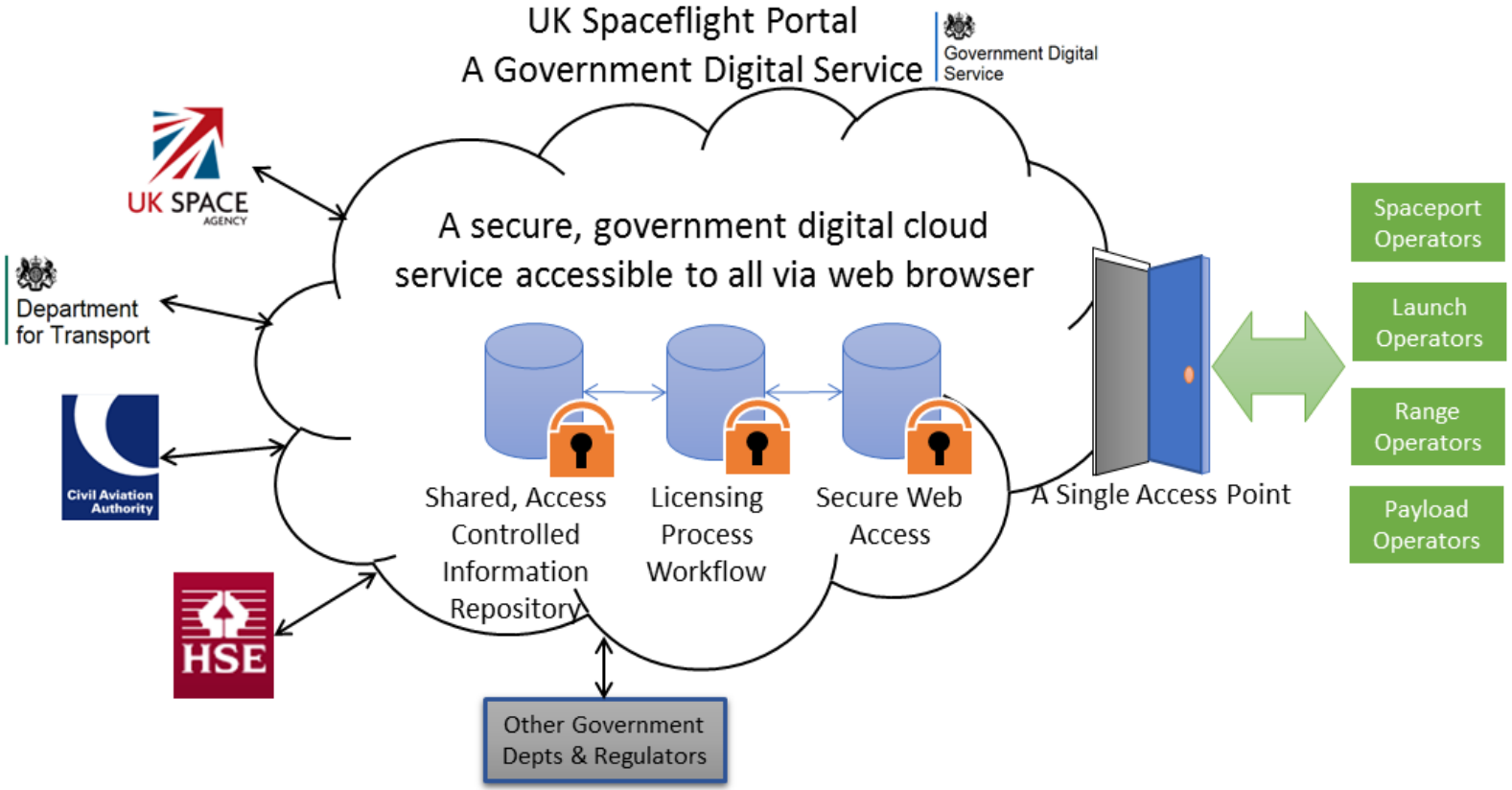
Licensing Service

To assess and manage risk surrounding space activity	To ensure compliance with the law	To support the sharing of good practice between operators	To record and audit UK space activity	To recover costs of regulation for UK Govt
Risk approach work with HSL, MPL calculation work Insurance work	Primary and secondary legislation activity Writing of guidance Understanding of products required to submit application	Standards database, Work with international partners	Case management tools and interaction with other regulators Memoranda of Understanding	Charging schemes

Who are we licensing



How are we licensing



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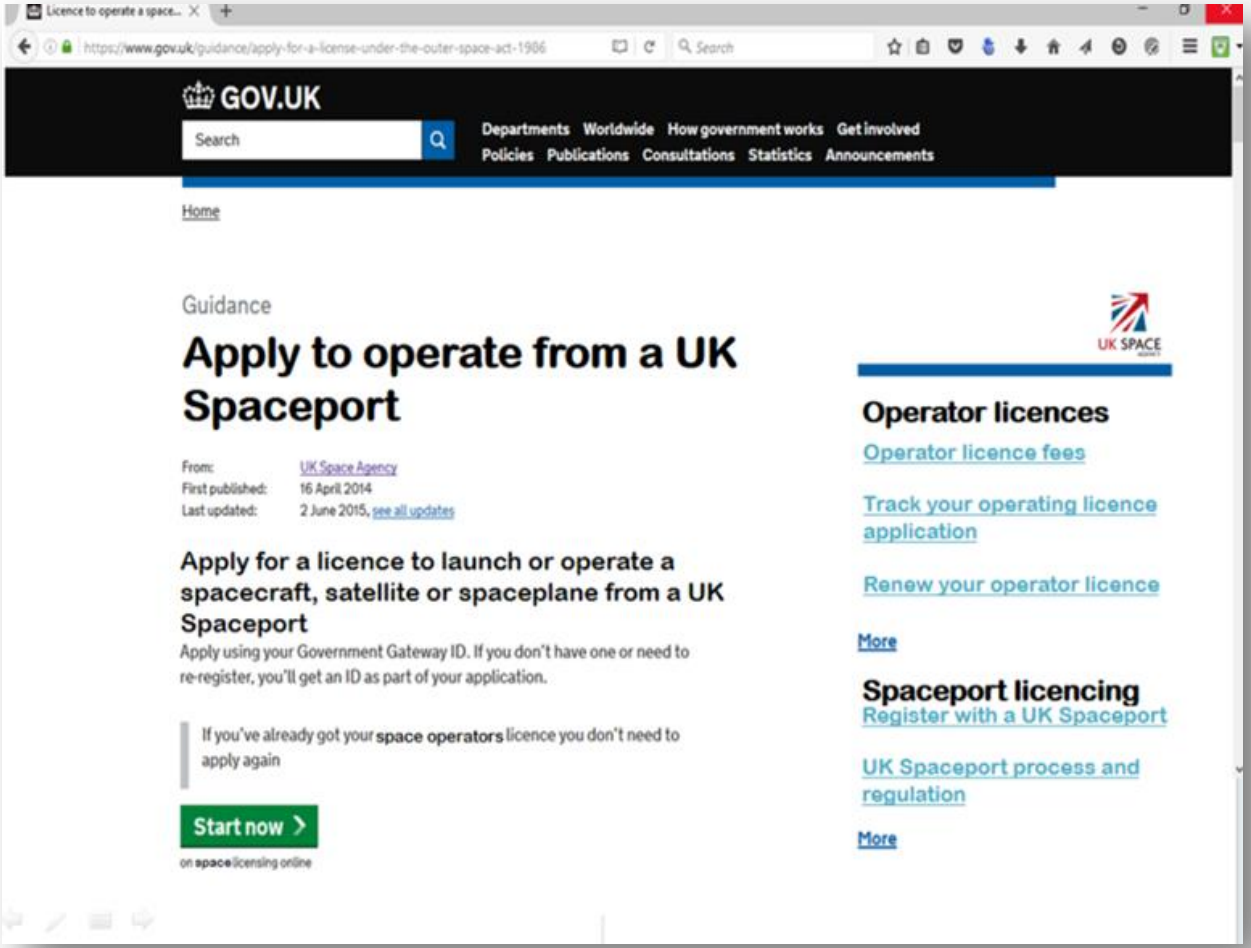
Licence to operate a space...
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From: UK Space Agency
First published: 16 April 2014
Last updated: 2 June 2015, see all updates
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Apply using your Government Gateway ID. If you don't have one or need to re-register, you'll get an ID as part of your application.
If you've already got your space operators licence you don't need to apply again
Start now
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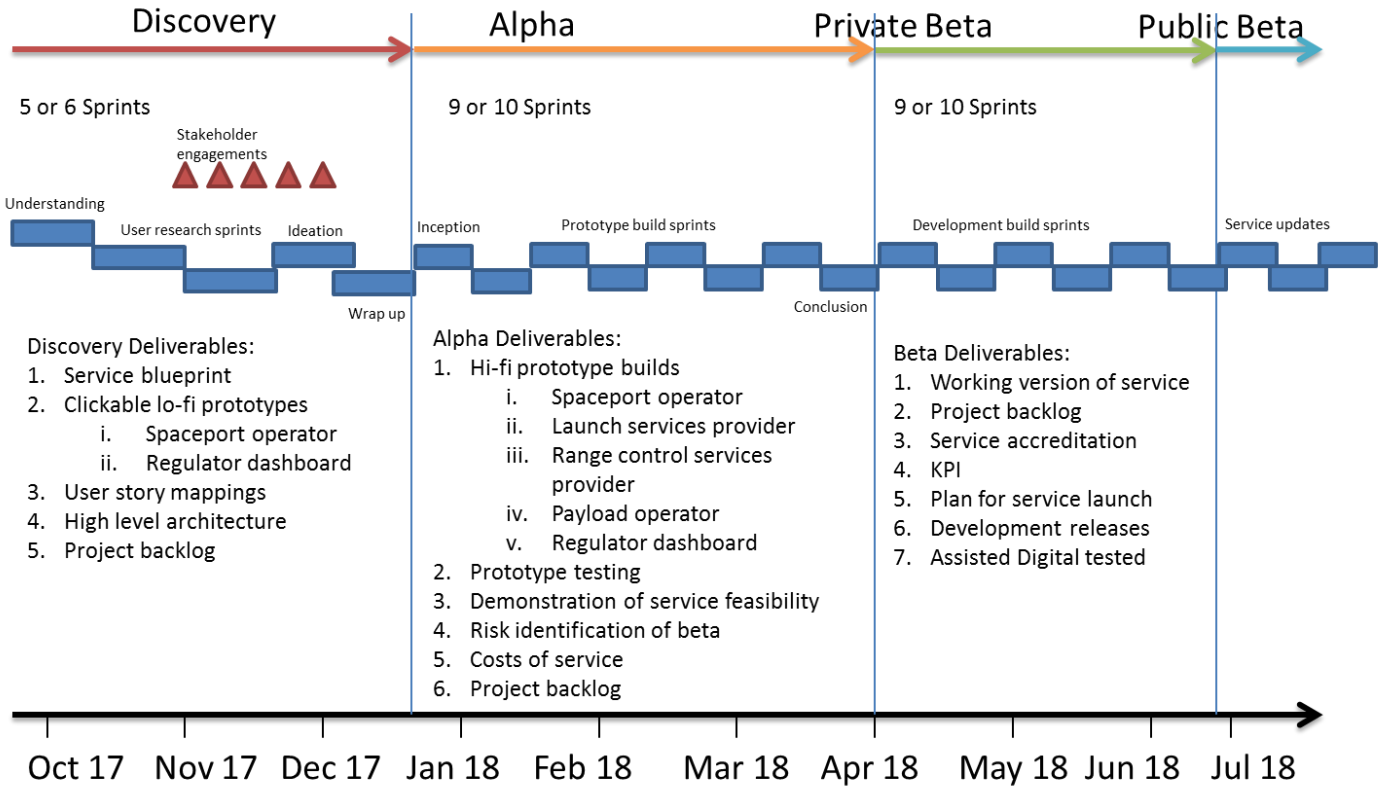
Operator licence fees
Track your operating licence application
Renew your operator licence
More
Spaceport licencing
Register with a UK Spaceport
UK Spaceport process and regulation
More

Digital licensing service



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Questions

You can contact us at one of the email addresses below. Please note that your email may be forwarded to officials in the Department For Transport, UK Space Agency and Civil Aviation Authority

For enquires about the Space Industry Bill please contact:
SpaceflightBill@DfT.gsi.gov.uk

For all other spaceflight related enquires please contact:
satellitelaunchprogramme@ukspaceagency.bis.gsi.gov.uk