The Catapult

- Easy access to world-leading technology, expertise and science
- Stimulating collaborative, business led R&D
- Delivering contract research for business and government
- Platforms and services to accelerate business realisation
- Provide a coalescing force for the sector

Pioneering, Agile, Collaborative, Entrepreneurial
**Background and Mission**

**The Catapult:** Addresses issues at these points that traditionally lead to failure

Basic Research/Ideas
- Universities,
- Individuals, SMEs

Disk & Ground Infrastructure

Failure to Commercialise

Failure to Exploit

Sustained Services & Market Application

£40bn Market by 2030

10%pa Growth

Major growth in satellite applications but significant barriers for new businesses
Overview

Upstream Markets
Manufacturers, Suppliers, Payload Builders

Mission Platforms
- In-Orbit Demonstrator
- Airborne Demonstrator
- Flat Sat

Technology Programmes

Apps Platforms

Downstream Markets

Lower barriers of learning and costs of innovation

Drives demand
Facilities

Applications Innovation Centre

Security & Resilience Unit

Operations Centre

Public Regulated Service

Visualisation

Concept Requirements Design Development Integration Verification Validation Operation Showcasing
Integrated Support
The Catapult Network

- Off-Shore Wind Resource Mapping
- Wind and Wave Forecast and Monitoring
- Communications and Positioning

- Transport Systems
- Maritime Emergency Response
- Automated Vehicles
- Communications and Positioning

- Urban Planning inc Heat islands
- Monitoring Building Usage
- Precision Farming

- Connected Digital Economy
- Platforms, Technologies, Routes to Market

- Satellite Applications
- Satellite Components of Solutions, Test Cases

- Transport Infrastructure
- Off-Shore Renewable Energy

- Future Cities
- Big Data -> CEMS
- M2M -> Satcomms and IoT

- User Requirements, Ideas, Routes to Market
- New Solutions

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Satellite Applications Catapult

Satellite Technology Trends
Technology Innovations and Trends in Telecommunications

- Bigger satellites, Higher Freq Bands
- Smaller & Cheaper Devices
- Faster & Cheaper Services

- Inmarsat-4+: Alphasat 2013
- Inmarsat-5: 2014
Technology Innovations in Earth Observation

Smaller Lower-cost satellite constellations

Data relay satellites for real-time access
Other Key Technology Innovations and Trends

Galileo Public Regulated Service + Commercial services

**Trust**, Accuracy, Resilience

→ Autonomous systems

Ubiquity of smart-phones

Positioning, Sensors, Processing + Storage

Crowd sourcing...Location Based Services and Applications

→ **Trust** and security models required

Emergence of rich open app development frameworks

Standardisation + speed of development

→ Lower cost of entry and support
Future Missions Technologies...

MEMS, smart materials, deployable structures,
Additive manufacturing
Massive advances in laser technologies
New propulsion and power technologies
→ Airborne-platforms → “Stratellites”
→ Novel orbits and architectures/ Formation flying
→ Repairable/ reusable satellites
Satellite Applications Catapult

Example Use-cases

Application of Satellite technologies
Example: Maritime Operations → Situation Awareness & Information

- Plan
- Survey Impact
- Intervene
- Monitor
- Construct

Transport Systems
Natural Resources and Environment
Internet of Things
Security and Civil Protection
Example: Future Public Services

- Tethered LTA HAPS
- Untethered LTA HAPS and HTA HAPS

5G, 4G, Wireless
3G, LTE services
2.5G services

In vehicle systems
Ka or S-band Satellite antenna
Local wireless (802.11, 802.15, 802.22 etc)
Local TETRA relay

Inmarsat, Iridium, Eutelsat

Terrestrial
High Altitude Platforms
Satellite
Spectrum of Risk/Opportunity

- **Maritime**
  - Incremental
  - High value/margin
  - Small scale
  - Institutional
  - Existing Business Models
  - Limited opportunities

- **Civil Protection**

- **Vehicle Autonomy**

- **Personal devices**
  - Disruptive
  - Low margin
  - Massive scale
  - Consumer
  - New Business Models
  - Significant opportunities

**Existing Business Models**

**New Business Models**
Conclusions

• Emerging Satellite Services and Technologies offer huge potential for Satellite Applications

• Extraordinary benefits arise from collaborating in an open innovation environment

• The Satellite Applications Catapult provides
  – A conduit for exploitation of research
  – Facilities and Services for development of Applications

• What does the Catapult need from Imperial?
  – Coordinated direction of research activities
  – Joint collaboration on proposals with a research element
  – A framework for knowledge exchange activities
Satellite Applications Catapult

Thank You

Paul Febvre
CTO

Paul.Febvre@sa.catapult.org.uk