Satellite Applications Catapult
Imperial Space Lab

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Chief Technology Officer

01st July 2013

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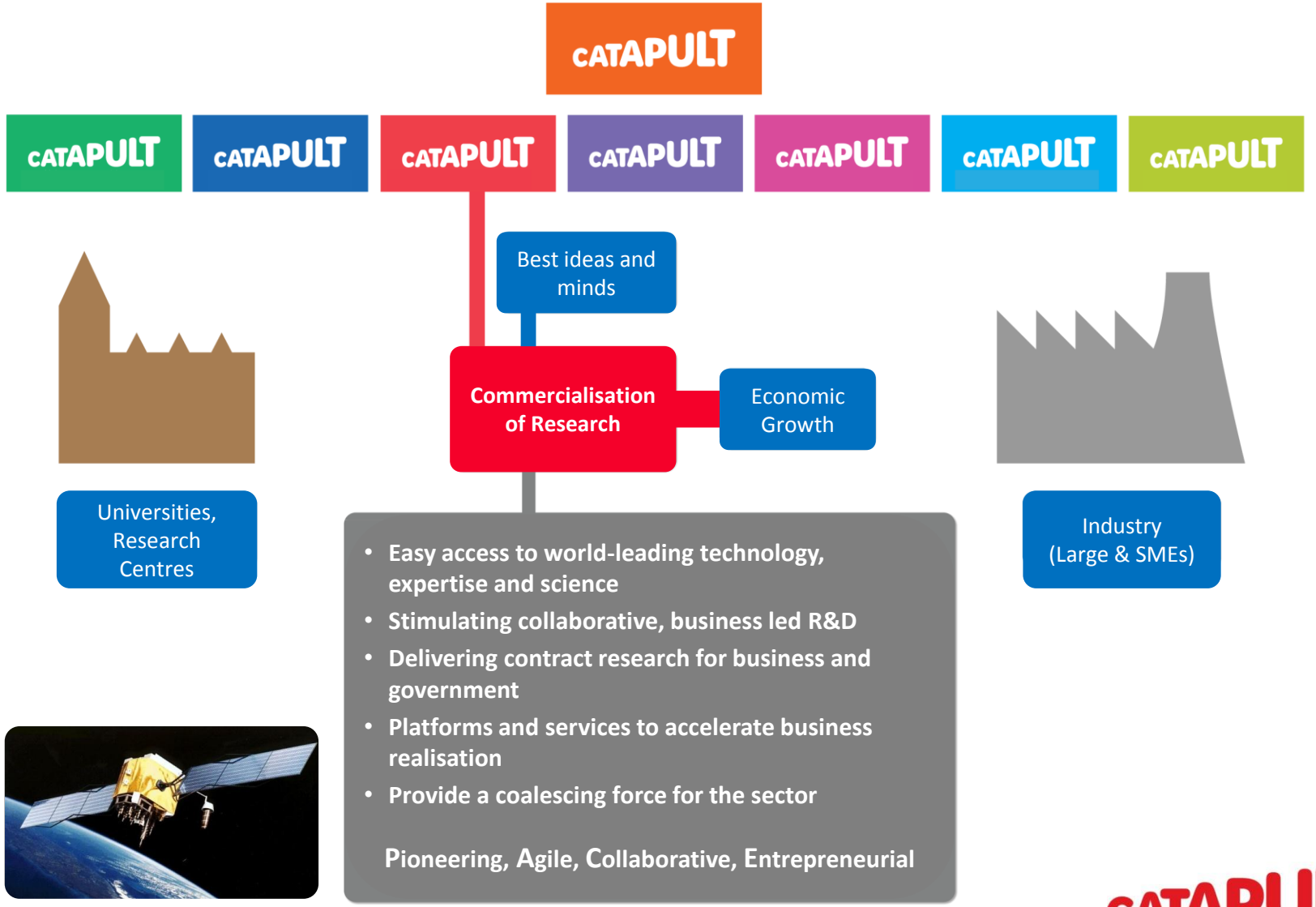
Satellite Applications

The Catapult



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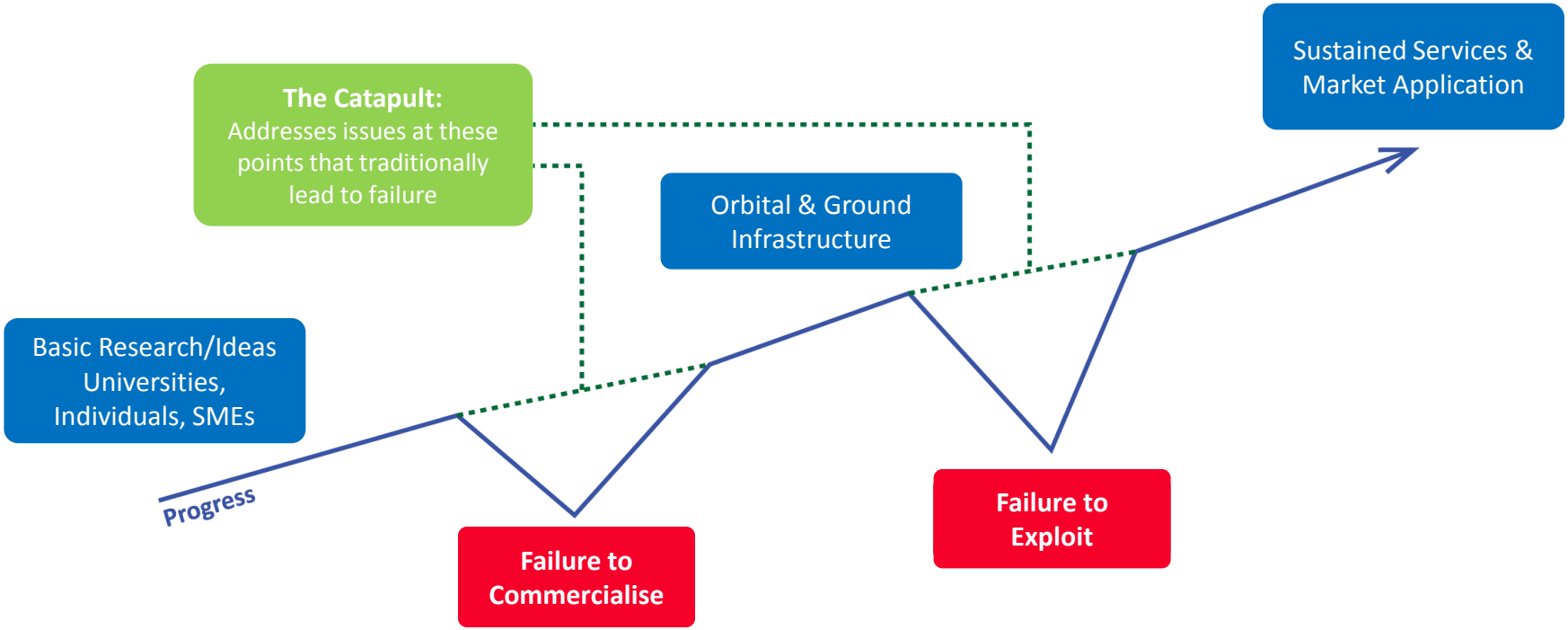
Background and Mission



£40bn Market by 2030

10%pa Growth

Major growth in satellite applications but significant barriers for new businesses

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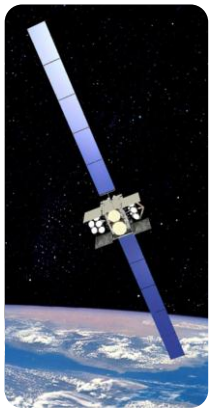
Overview



Upstream Markets
Manufacturers, Suppliers, Payload Builders

Mission Platforms

In-Orbit Demonstrator

Airborne Demonstrator

Flat Sat

Comms

EO

Nav

Technology Programmes

Apps Platforms

Downstream Markets
Transport, Security, Civil Protection, Climate, Energy, Natural Resources, Internet of Things.

Lower barriers of learning and costs of innovation

Drives demand

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Facilities

Applications Innovation Centre

Operations Centre

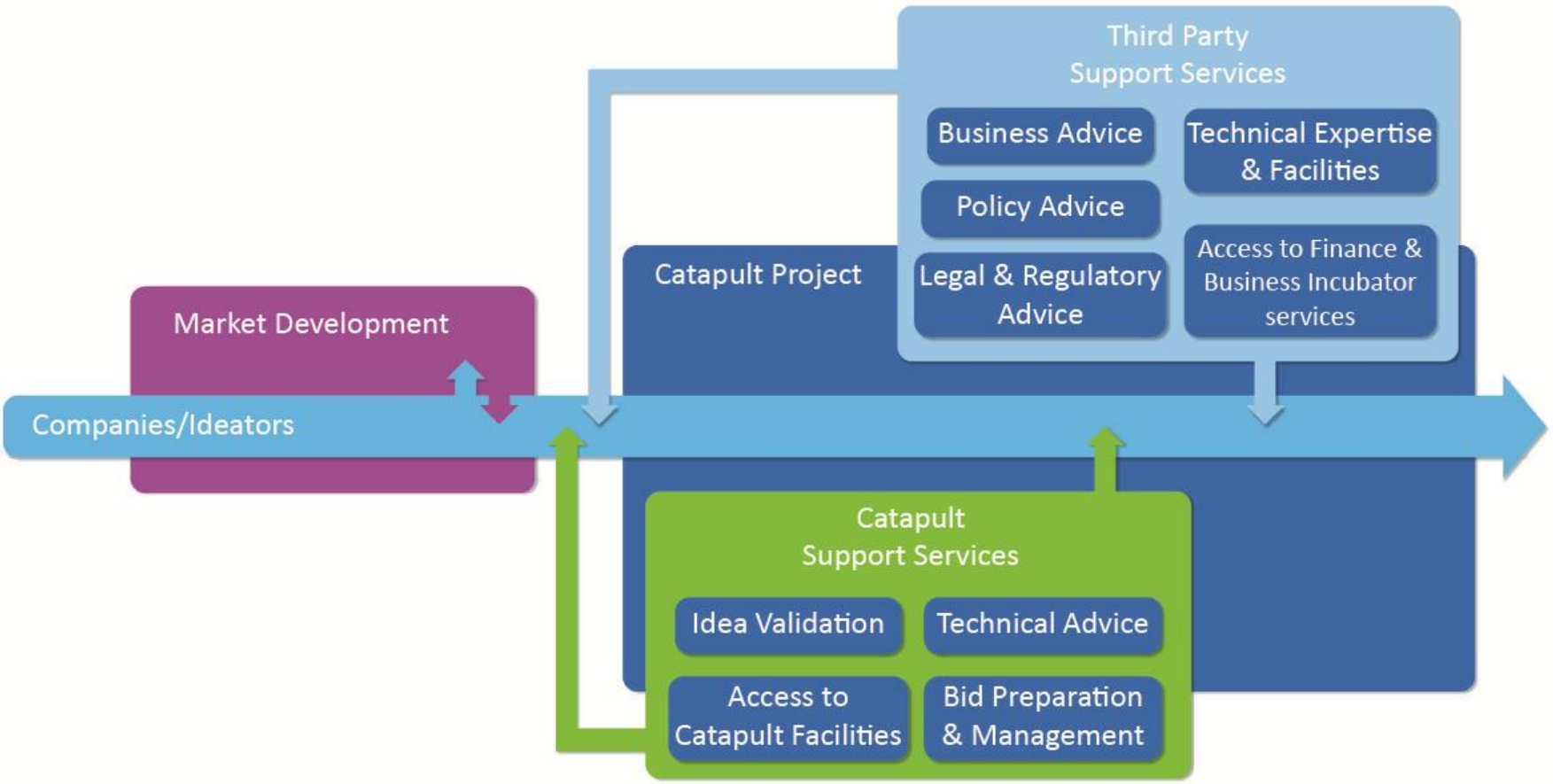
Visualisation

Public Regulated Service

Security & Resilience Unit

Concept Requirements Design Development Integration Verification Validation Operation Showcasing

Integrated Support



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The Catapult Network

Big Data -> CEMS
M2M -> Satcomms
and IoT

Connected Digital Economy

Platforms, Technologies, Routes to Market

Satellite Components of Solutions, Test Cases

Satellite Applications

User Requirements, Ideas, Routes to Market

New Solutions

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

Off-Shore Renewable Energy

Future Cities

Urban Planning inc Heat islands
Monitoring Building Usage
Precision Farming

Transport Systems

Transport Infrastructure Monitoring
Maritime Emergency Response
Automated Vehicles
Communications and Positioning

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Satellite Technology Trends

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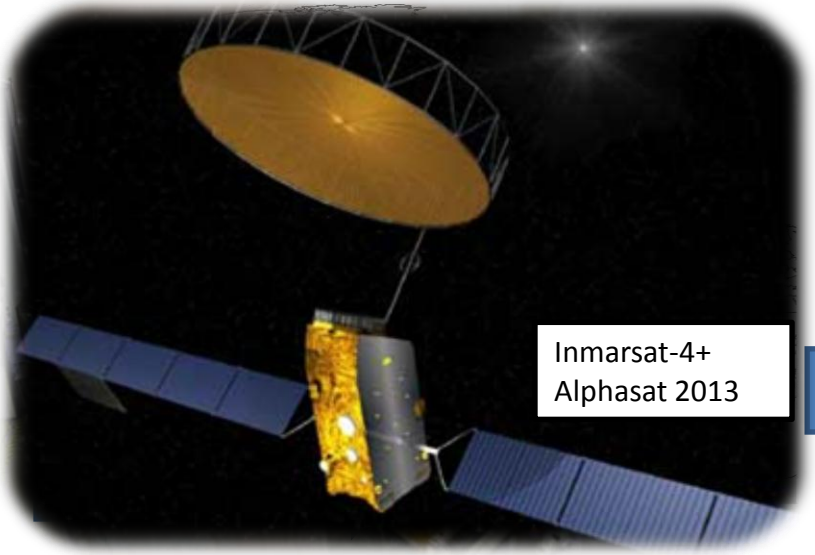
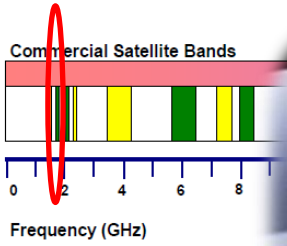
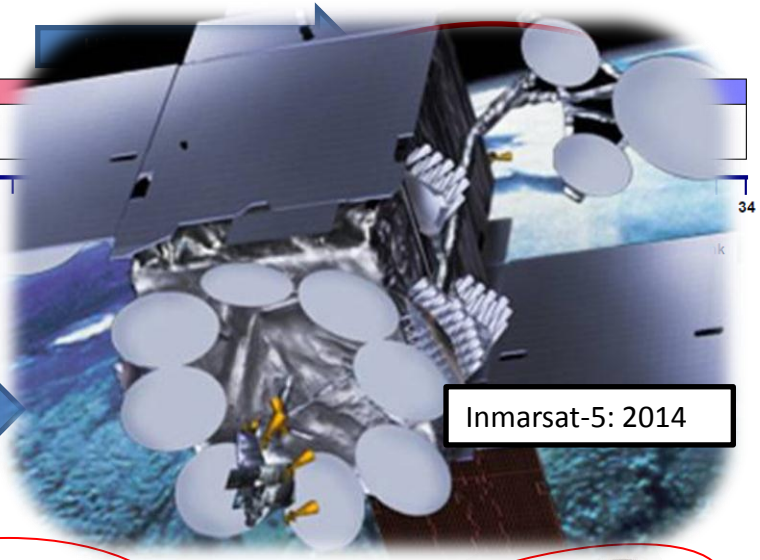
Technology Innovations and Trends in Telecommunications



Inmarsat-4+
Alphasat 2013



Bigger satellites,
Higher Freq Bands



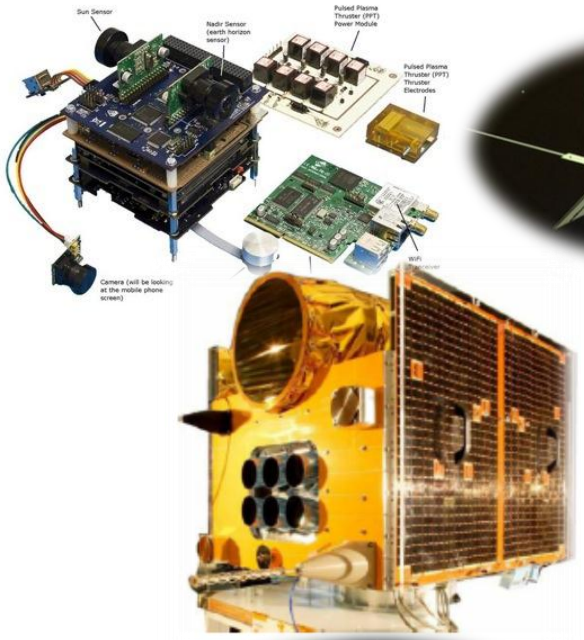
Inmarsat-5: 2014

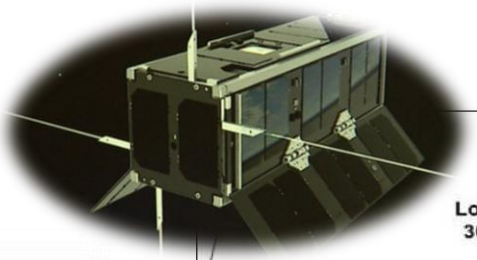
Smaller & Cheaper Devices

Faster & Cheaper Services

Technology Innovations in Earth Observation

Smaller Lower-cost satellite constellations





Data relay satellites for real-time access

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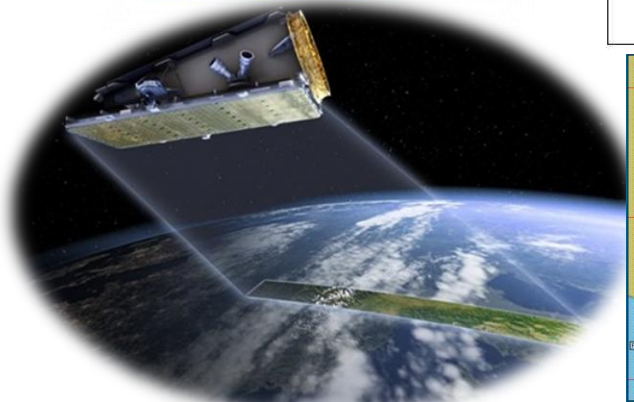
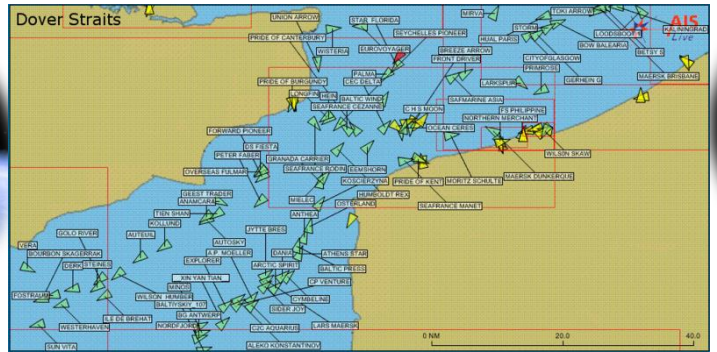
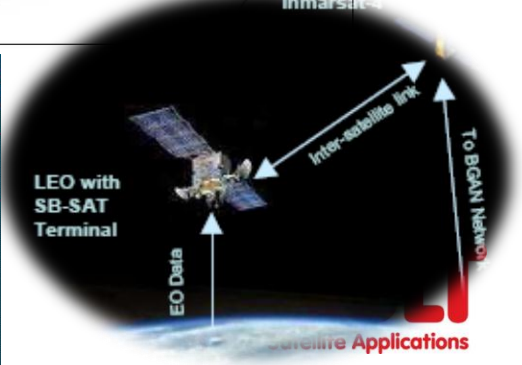




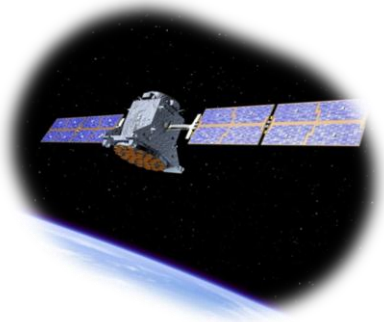


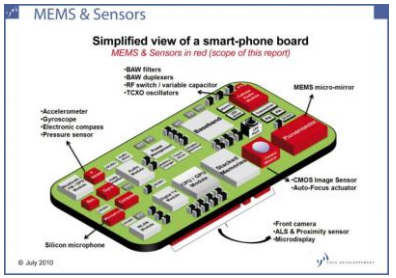
Other Key Technology Innovations and Trends

Galileo Public Regulated Service + Commercial services

Trust, Accuracy, Resilience

→ Autonomous systems





Ubiquity of smart-phones

Positioning, Sensors, Processing + Storage

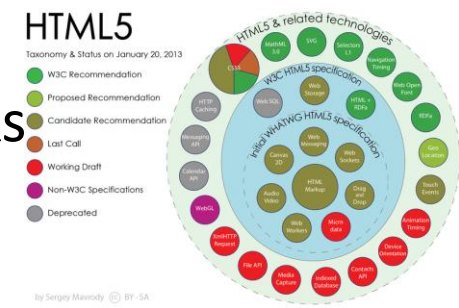
Crowd sourcing…Location Based Services and Applications

→ ***Trust*** and security models required

Emergence of rich open app development frameworks

Standardisation + speed of development

→ Lower cost of entry and support



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Future Missions Technologies…

MEMS, smart materials, deployable structures,

Additive manufacturing

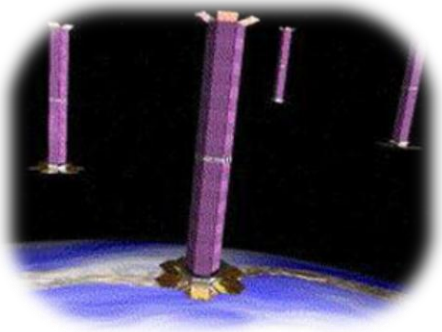
Massive advances in laser technologies

New propulsion and power technologies

→Airborne-platforms → “Stratellites”

→ Novel orbits and architectures/ Formation flying

→ Repairable/ reusable satellites



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Example Use-cases

Application of Satellite technologies

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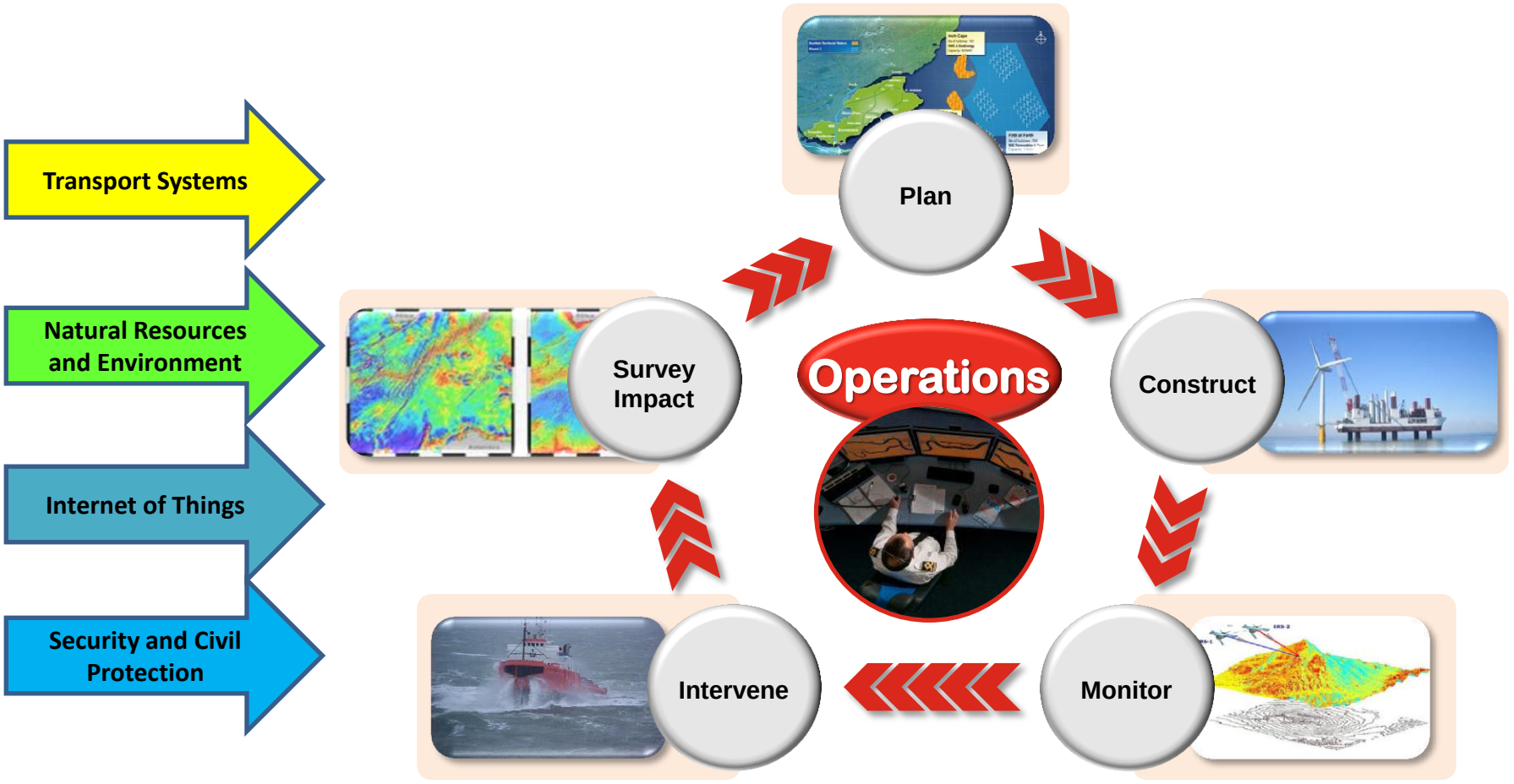
Example: Maritime Operations → Situation Awareness & Information



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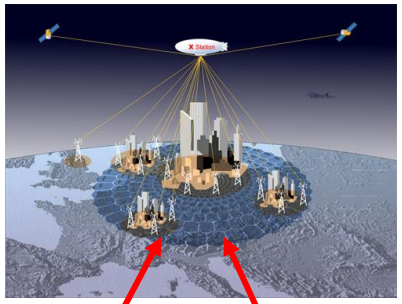
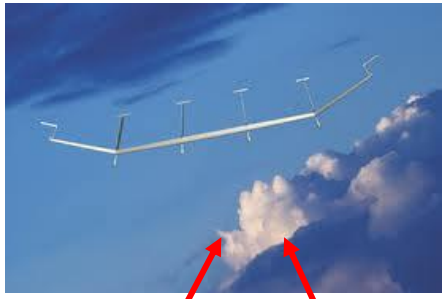
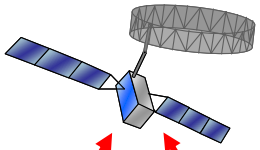
Example:
Future Public Services

Tethered LTA HAPS

Untethered LTA HAPS
and HTA HAPS





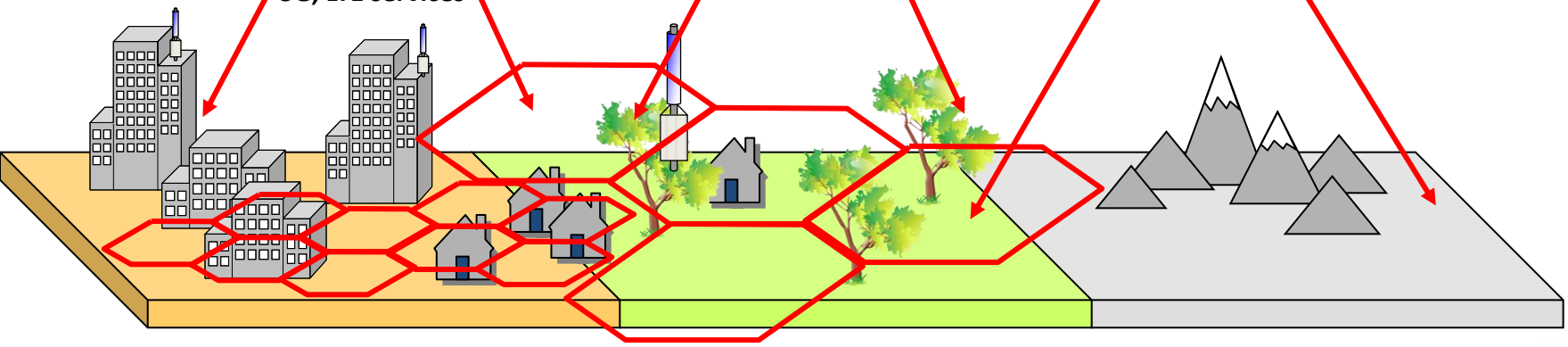


Inmarsat,
Iridium,
Eutelsat

5G, 4G,
Wireless

3G, LTE services

2.5G services



Terrestrial

High Altitude Platforms

Satellite

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Spectrum of Risk/Opportunity

Maritime | Civil Protection | Vehicle Autonomy | Personal devices

Incremental	Disruptive
High value/ margin	Low margin
Small scale	Massive scale
Institutional	Consumer
Existing Business Models	New Business Models
Limited opportunities	Significant opportunities

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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

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Thank You

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