CATAPULT
Satellite Applications

Centre for
Instrumentation

Technology Challenges and Needs

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University of Leicester

Mission design

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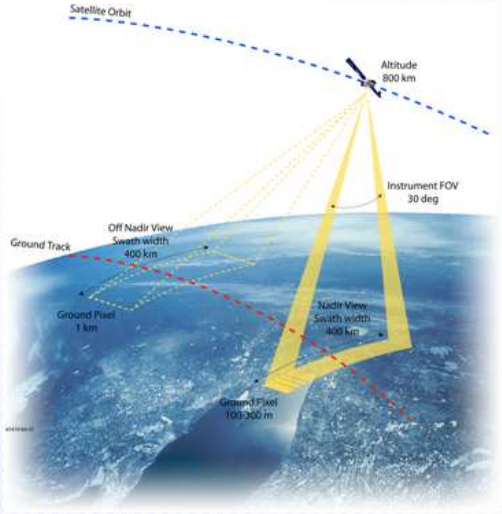
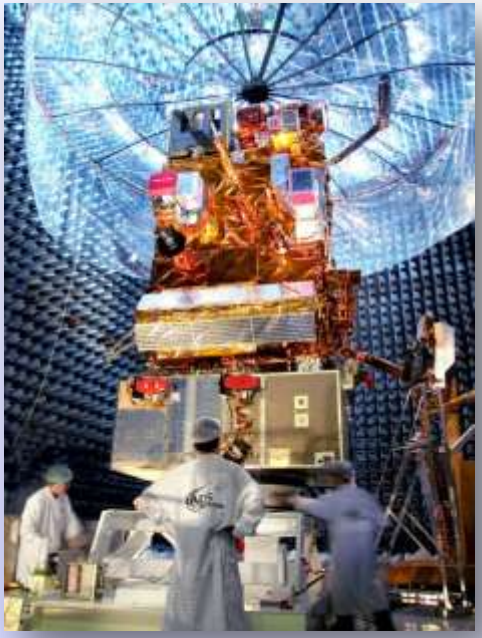
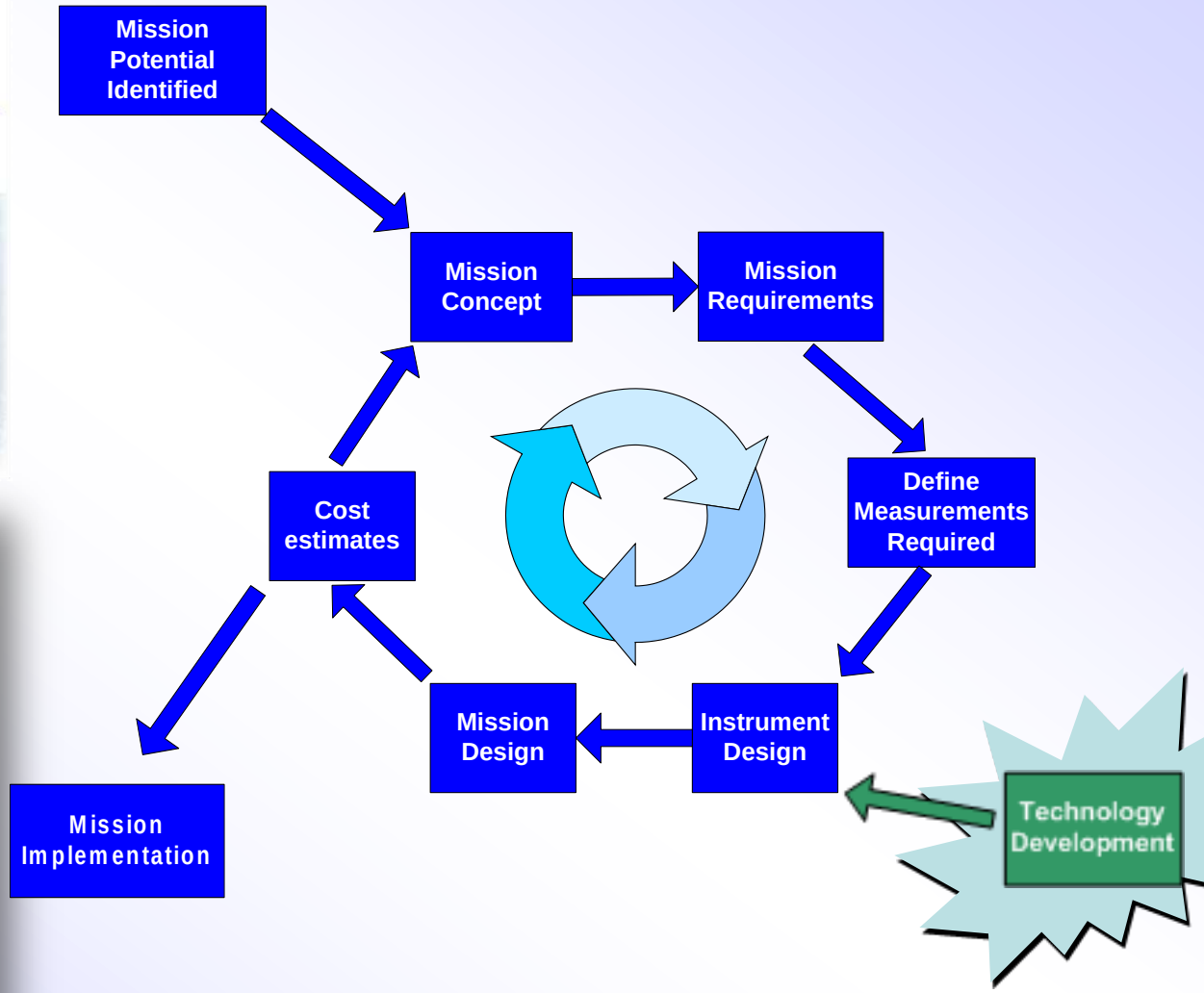
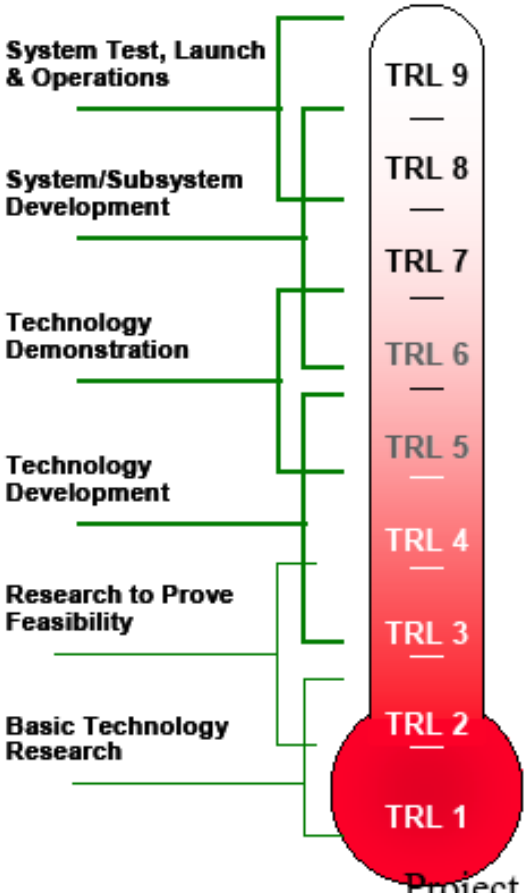






Technology Readiness

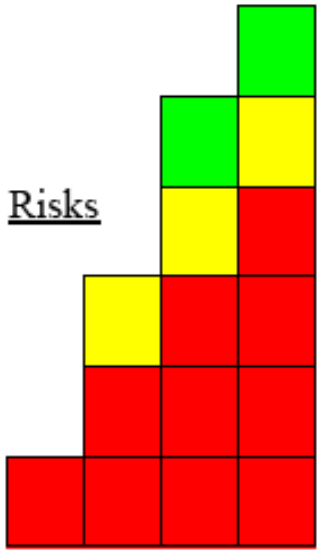
TRL - philosphy



Technology is with access to space one of the enabling activities of ESA

The requirements on technology are increasing, performance, reliability, etc so as to make impact on science and provide services

Failure to have technology at the right readiness level at each project phase is a major sources of risks for schedule delays and cost overruns



Technology development shall be sufficiently and timely supported

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Technology Transfer is fundamental to the delivery of an integrated CEOI

TT can be important

- TT is important to the EO sector as an opportunity for the growth of a sustainable non-space business based on the substantial investment in space hardware ***("spin out")***
- But also there is a requirement for innovation ***("spin in")*** to drive the implementation of observables.
- Space R&D becomes part of a generalised technology roadmap – ***("spin-along")***

Making it happen

- It is not enough to identify an opportunity
  - *Need to do more than attend a KE show, or have a sales executive throw an idea 'over the wall'*
- Active intervention, resources and collaborative hard work are needed to make the various cultures work well together for spin-in and spin-out
- One must be prepared to use diverse funding and internal investment to achieve goals
- A well-resourced collaborative environment is needed
  - *Internally - use the 'spin-along' model*
  - *Externally with funded collaborative funding bodies such as the Centre for Earth Observation Instrumentation*
  - *National Space Technology Programme*
  - *Satellite Application Catapult*
  - *TSB*
  - *Others; KTPS, KTNs, ESA ITI, STFC PIPPS, EU H-2020*

Actors for spin-along/out

The space or market champion: For spin-in, a space domain champion is needed to drive the process. For spin-out a Market domain champion is needed. These individuals provide the innovative driving force to access the new market.	 
The technology champion: The technology champion seeks to identify and develop innovative offerings from his/her local technology group(s). This person may be a senior technologist or technology-aware business developer. The space/market champions work with the technology champion to create new business.	
Technology specialists: The technology specialists underpin the process with deep domain knowledge and development skills.	

It is unusual to find all of these actors in a single organisation

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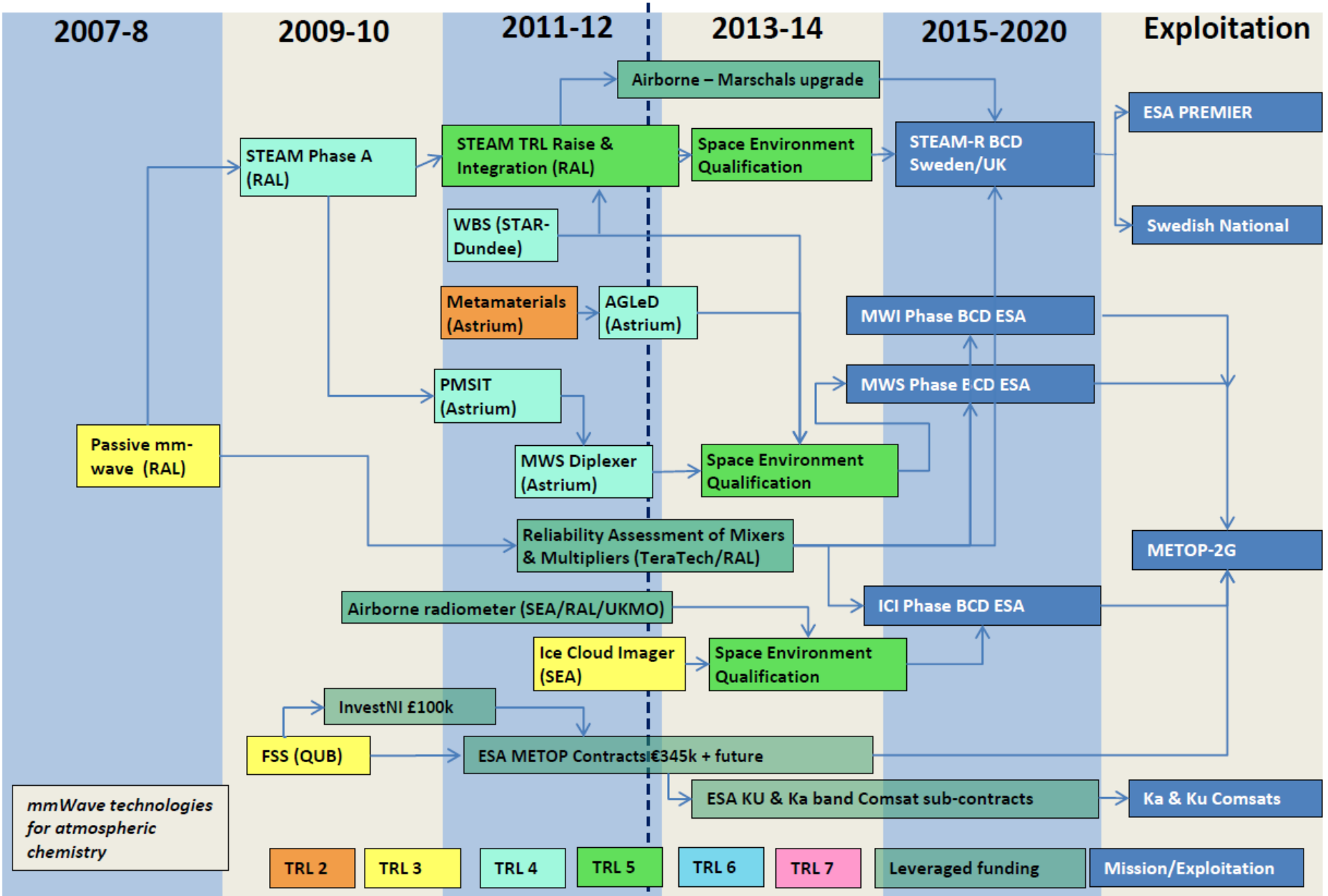
Some Examples from CEOI

CEOI Roadmap to Exploitation – Passive Microwave

Draft 10th Dec 2012



LIDAR, integrated optics & heterodyne radiometry

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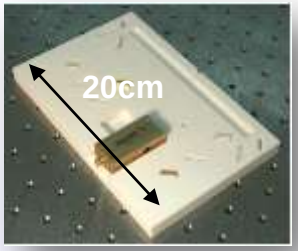
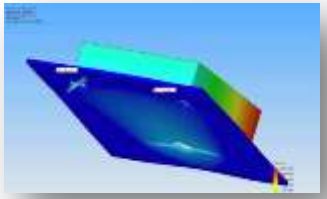
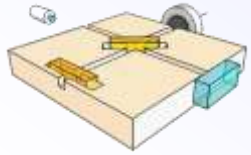
QinetiQ, UCL, Universities of Leicester & Sheffield



Miniature hollow waveguide DIAL CO_2 sensing @ 2.06 µm



Space environment engineering & testing



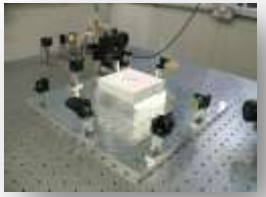
Space and terrestrial LIDAR & DIAL gas sensing 1.5 – 10µm.

Miniature rugged active instruments for remote emission monitoring, security etc

RAL

Laser heterodyne radiometer for gas sensing 5-50 µm

RAL + QinetiQ



Miniature instrument (smaller than a house brick) for vapour and gas sensing @ 5 -50µm.

Spin out to passive instrument for terrestrial and planetary gas sensing for security and emissions monitoring

CompAQS – spectroscopy for air quality monitoring

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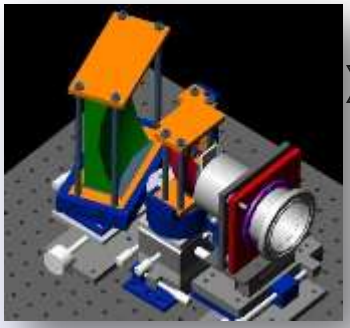
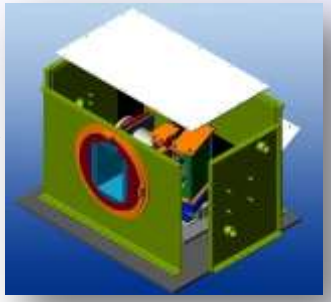
University of Leicester, SSTL



A compact UV-Visible DOAS spectrometer for air quality monitoring CompAQS

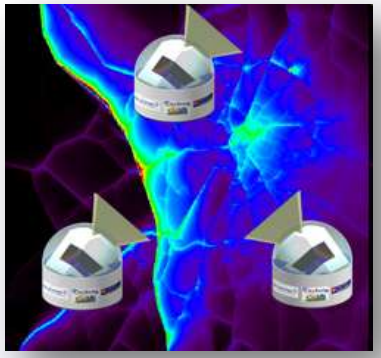
Breadboarding & performance verification



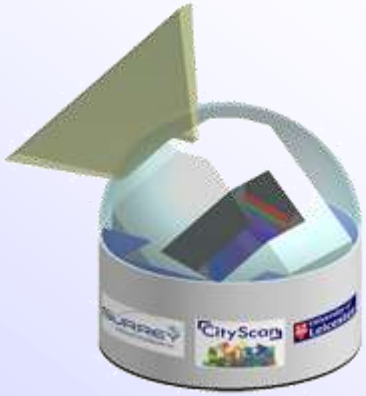
Lab instrument

Space applications – including operational air quality monitoring from LEO & GEO.

Also for HAP applications



Terrestrial instrument for urban atmospheric pollution measurement in real time.



Terrestrial instrument R&D benefits space/HAP version

Spin out with RDA funding

Technology Transfer Programme

- Delivered by Qi^3 and NPL for CEOI
- Affiliated to Sensors & Instrumentation KTN
- Elements
  - Technology Mining
  - Knowledge Exchange Brokering
  - Publicity

An occasional surprise….

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Summary

- CEOI active in TT
  - Key element for EO sector
- TT delivers assessment of spin in/out of current portfolio
- Non-formal benefits of TT significant
  - industry-academia link
- TT fundamental to CEOI mission