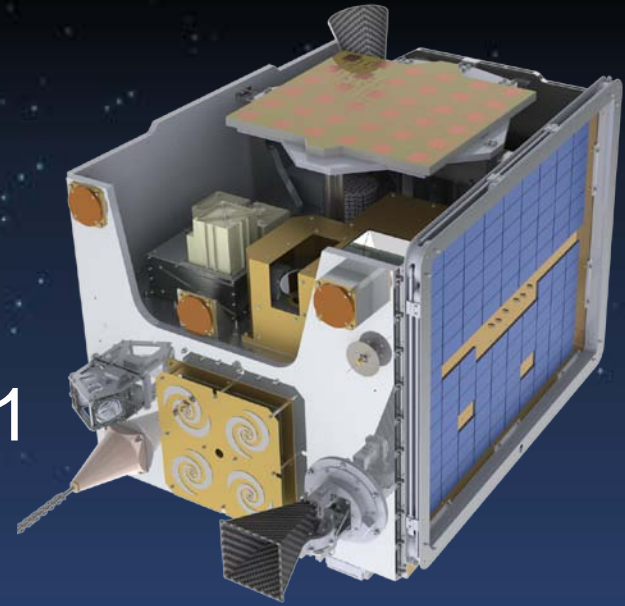


## STRaND-1 & TDS-1



## How the UK does Low Cost TechDemo Missions

Shaun Kenyon

Mission Concepts, SSTL

# In the next 15 minutes...

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- Introducing STRaND-1 and TDS-1
- Comparison of System Architectures
- Comparison of Payload Mass Fractions
- Comparison of Management Structures
- Comparison of Funding Models
- Comparison of Risk Profiles
- The Answer to The Question!
  - And what does this mean for British CubeSats?
- Q&A

# TechDemoSat... A Space Pack Mule



- SSTL-150 Class
- 25% Payload mass fraction
- 8 UK-provided payload experiments
  - Potential for software experiments
- Project Kick-off Oct'10
- Due For Launch Q4 2013
- Public Funding

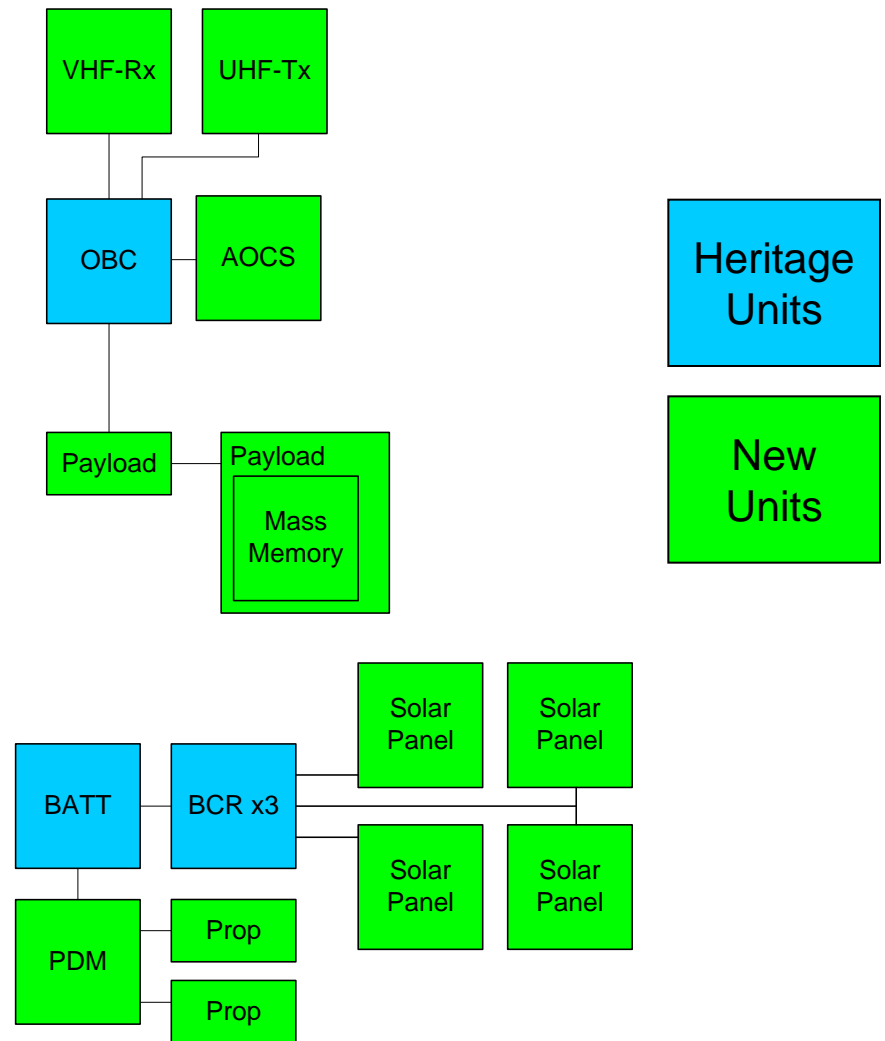
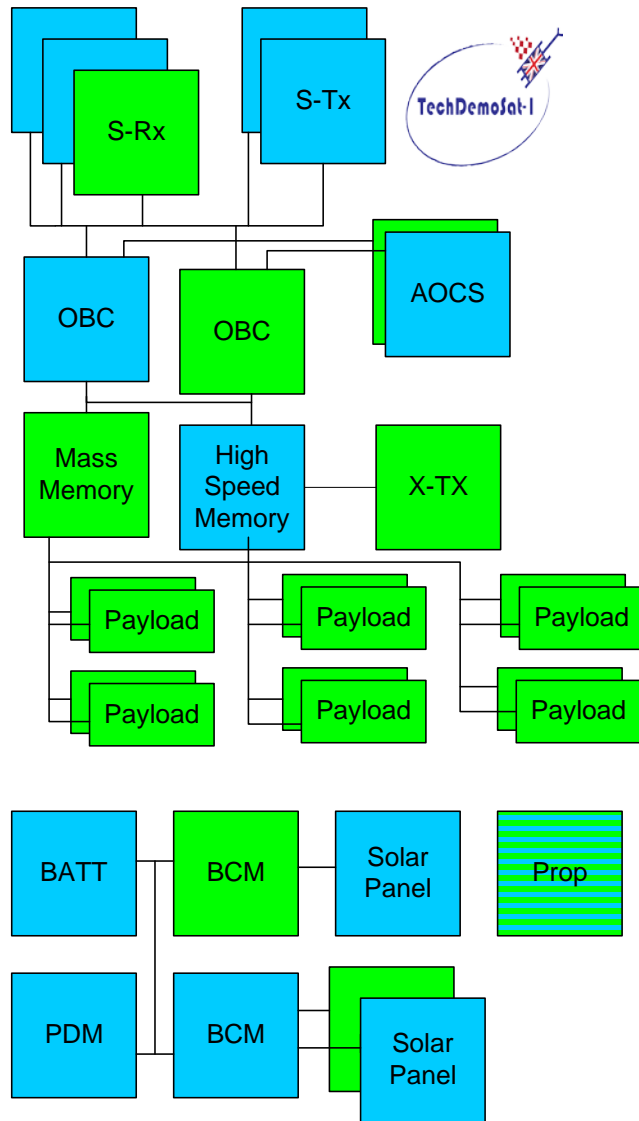
# STRaND-1... A Space Phoenix



- 3U CubeSat
- 30% payload mass fraction
- 5 Surrey-provided payload experiments
- Project kickoff Jan 2010 (volunteering)
- Full-time June'12 – Feb'13
- Launch 25<sup>th</sup> Feb 2013
- A Baptism of Fire!

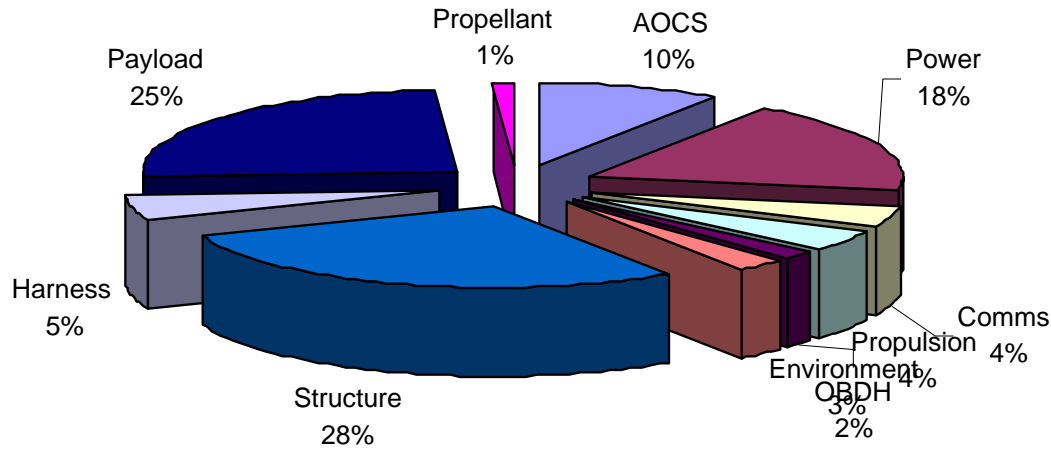


# How the Architectures Compare

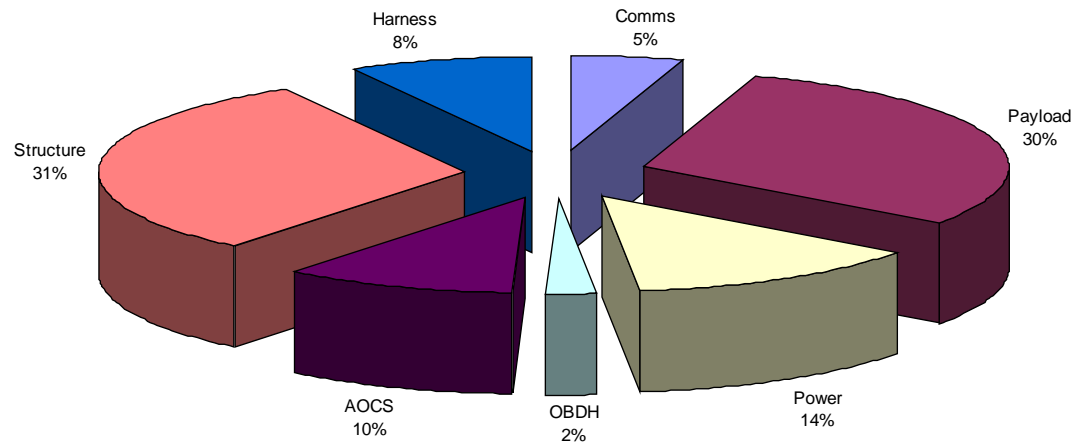


# Mass Breakdowns

## TechDemoSat Mass budget



## STRaND-1 Mass Budget



# How They Were Organised



- Ad Hoc Volunteer Group
  - Roles sometimes unclear
- Industry standard milestones rejected in preference to ad hoc peer review
- Payload Providers deeply involved in platform design
  - Difficult to make objective trades
- Core team distributed over multiple sites
- Standard SSTL Project organisation
  - Clear roles, core team
- Industry standard milestone reviews
- Payload Providers work with Platform team
  - Platform design balanced for all payloads
- Co-located Core team



# How They Were Funded



- Purely SSTL-SSC costs incurred
  - Initially as a 50%-50% “no funds exchanged” mission between SSTL and SSC
  - Volunteer effort
  - SSTL-funded launch
  - Full-time paid-for project for last 6 months
  - Total costs <£1M
- Technology Strategy Board / SEEDA public funding for platform, launch and operations
  - Payload providers find their own funding – TDS-1 effectively a “free ride” into space
  - SSTL additional investment for own research
  - Total costs <£10M

# Risk Profiles



- SSTL / SSC Risks only
- Single string system design
- Documentation light
- Process light
- No component traceability for in-house units
- Reduced test campaign
- Lower TRL payloads with more speculative benefits
- Shared risks over multiple stakeholders
- Dual *functional* redundancy
  - Fly new with old
- SSTL standard test campaign philosophy
- Higher TRL payloads with more directly applicable near term benefits

## So.. How *Does* The UK do Low Cost Tech Demo?

- Tune the mission risk profile to the budget
  - Bigger missions need more certainty in payoff
  - Smaller missions can be more speculative
- Public money is sacred
- What does this mean for British CubeSats?
  - Costs are lower, so can afford to take more risks for greater TRL jumps
  - Can sometimes be at odds with “sacred” public funding

*Anything that isn't pushing the limits of possibility  
is a waste of a CubeSat*

Thank You

