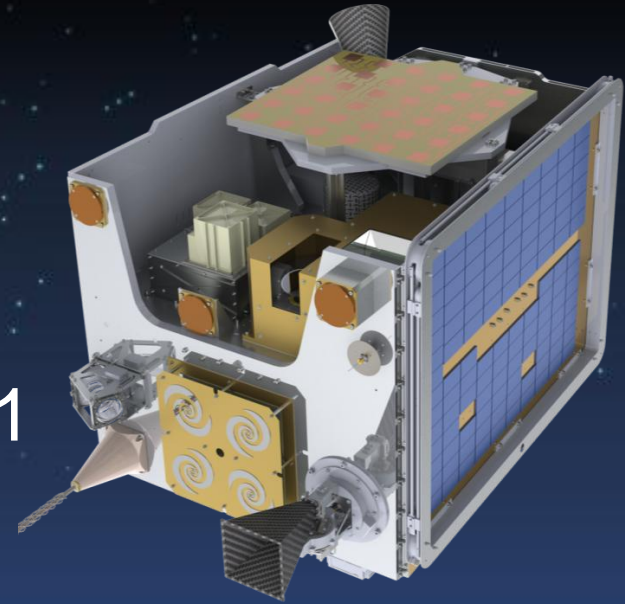


STRaND-1 & TDS-1



How the UK does Low Cost TechDemo Missions

Shaun Kenyon

Mission Concepts, SSTL

In the next 15 minutes...

- 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

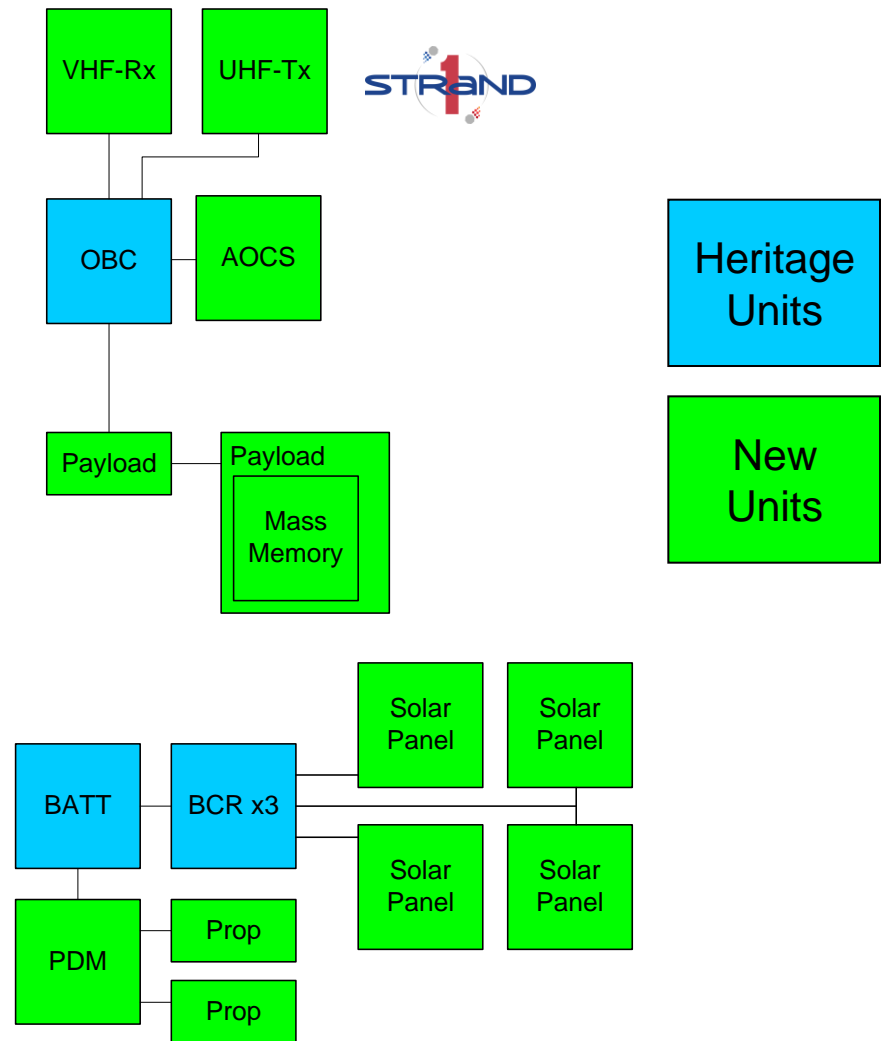
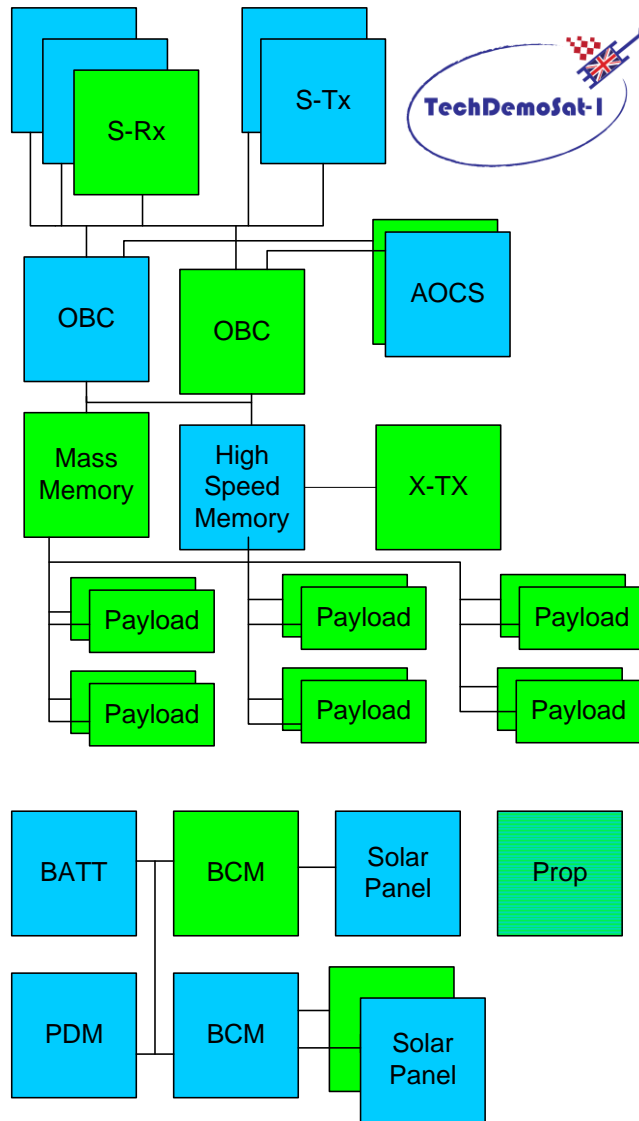
STRaND-1... A Space Phoenix



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

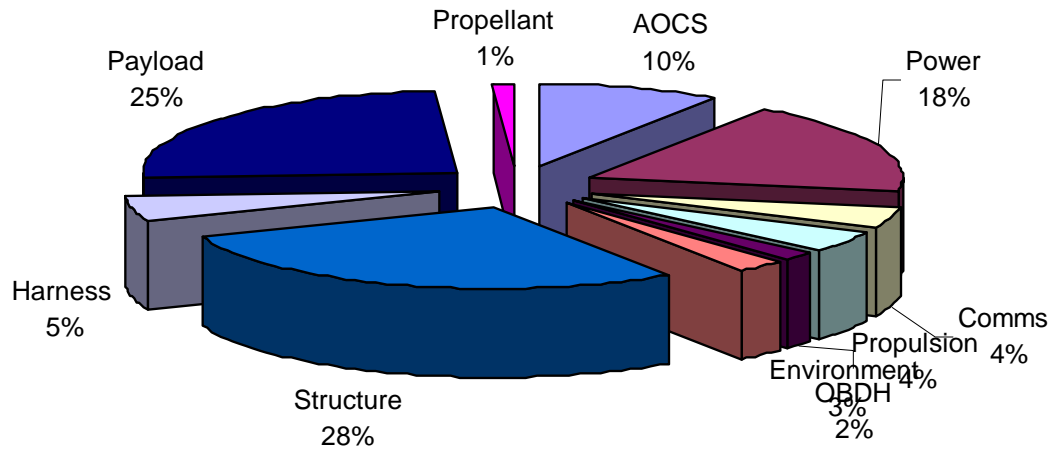


How the Architectures Compare

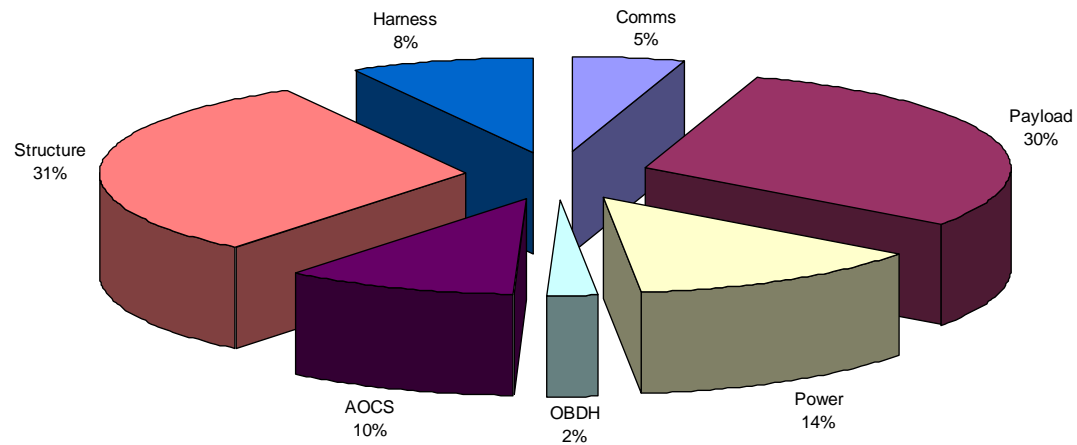


Mass Breakdowns

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

