How the UK does Low Cost TechDemo Missions

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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

- Payload: 25%
- Structure: 28%
- Harness: 5%
- AOCS: 10%
- Propellant: 1%
- Comms: 4%
- Environmental Control: 4%
- Propulsion: 4%
- Electric Power: 18%
- Power: 18%
- OBDH: 2%

STRaND-1 Mass Budget

- Payload: 30%
- Structure: 31%
- Harness: 8%
- Comms: 5%
- AOCS: 10%
- OBDH: 2%
- Power: 14%
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