

Instruments for Small Sats - the RAL Experience

Richard Holdaway

World's first 3rd-
generation synchrotron

World's most powerful laser

RAL Space

World's most powerful
source of pulsed neutrons



Space Science & Technology

- 45 year Heritage (through Appleton Lab)
- 230 staff
- Research, Development, Facilities
- 186 Instruments in Space
- 3600 Users, £20M turnover
- Customers: UK Govt, ESA,
Int'l agencies, Industry, Univ's



Merger of PPARC & CCLRC

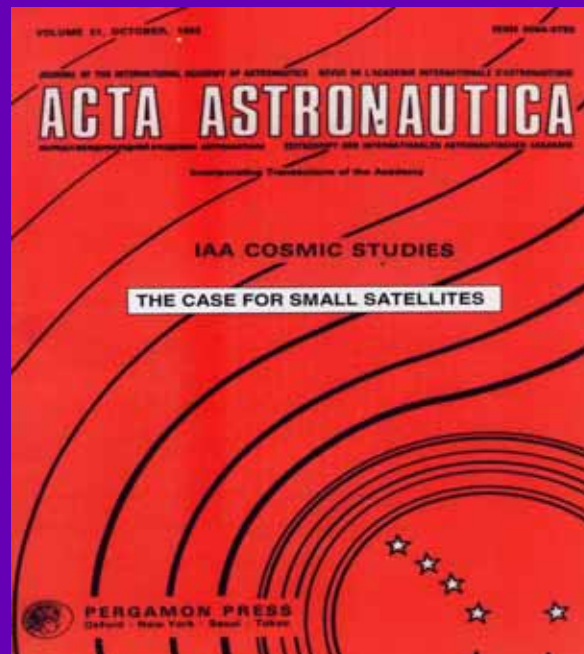
- **Science & Technology Facilities Council**
- **Harwell Science & Innovation Campus**
- **Joint Space Technology Programme**
- **ESA Centre**

“Faster, Better, Cheaper”

- The words: Dan Golden
- The intent: Make everything “better”
- The paradigm shift: Not every programme needs a Rolls Royce. Accept some failures
- The implication: Manage risk, not eliminate it
- The result - 1: Initially, chaos
- The result - 2: It works !
- The result - 3: We’re here today !

IAA study

- 1992/93 multi-national study including ESA, NASA, ISAS, Brazil, France, UK, Germany, Italy..
- “Can world-class Science & Technology be undertaken by Small Satellites ?”
- Conclusion was a very hefty “YES”



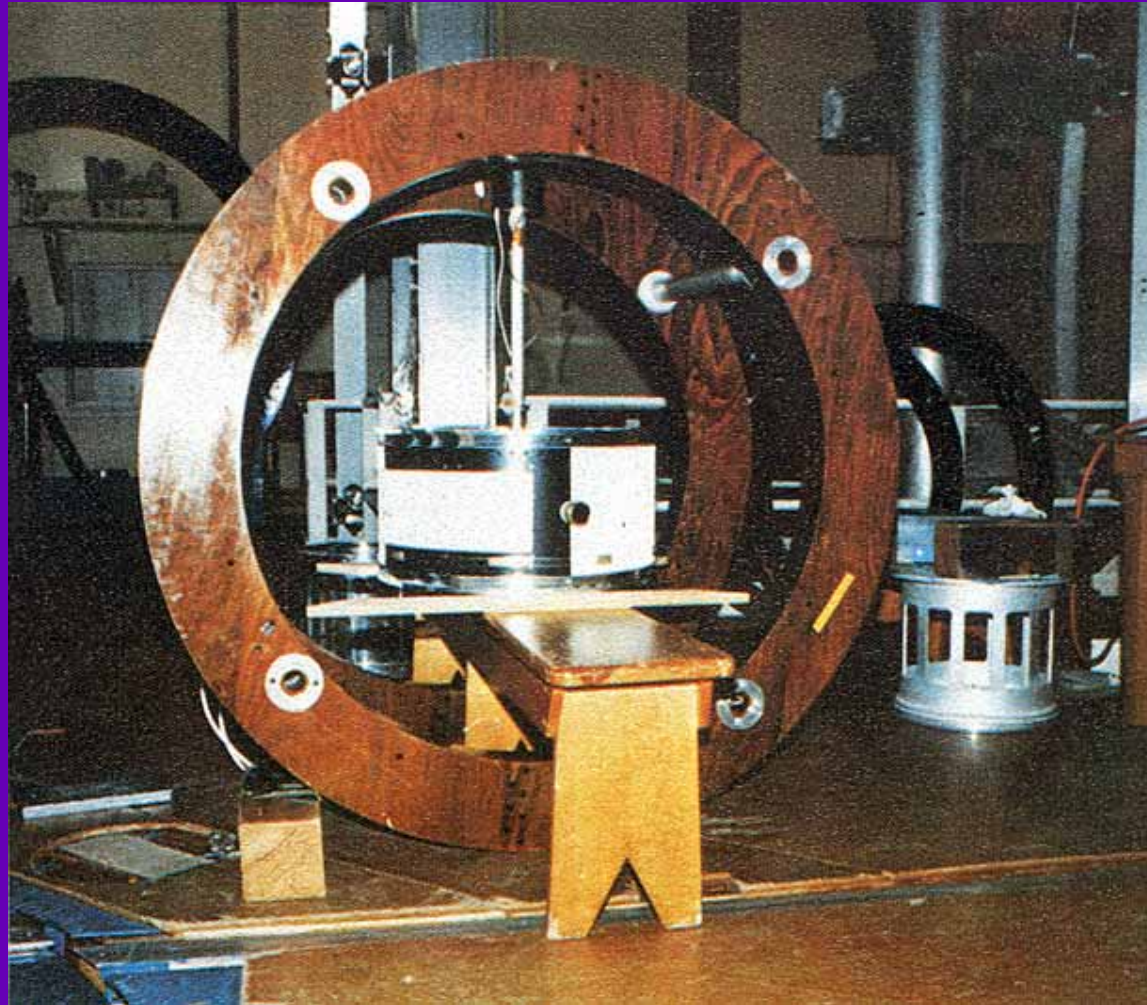
Key Issues

- **Faster development (Star Tiger)**
- **Lower cost**
- **More regular opportunities for missions**
- **Increased KT opportunities**
- **National Programme ?**
- **What do we “need”, not what do we “want”**
- **Compromises ? Some failures, some data loss?**
- **Logan Small Satellites Annual Conference**
- **RCSGSO Bi-Annual Conference**

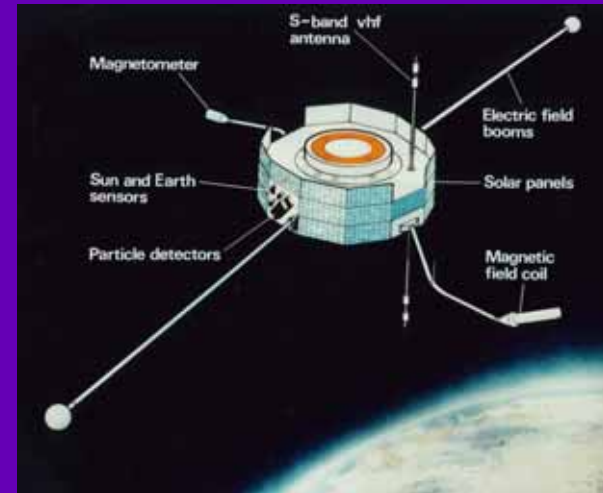
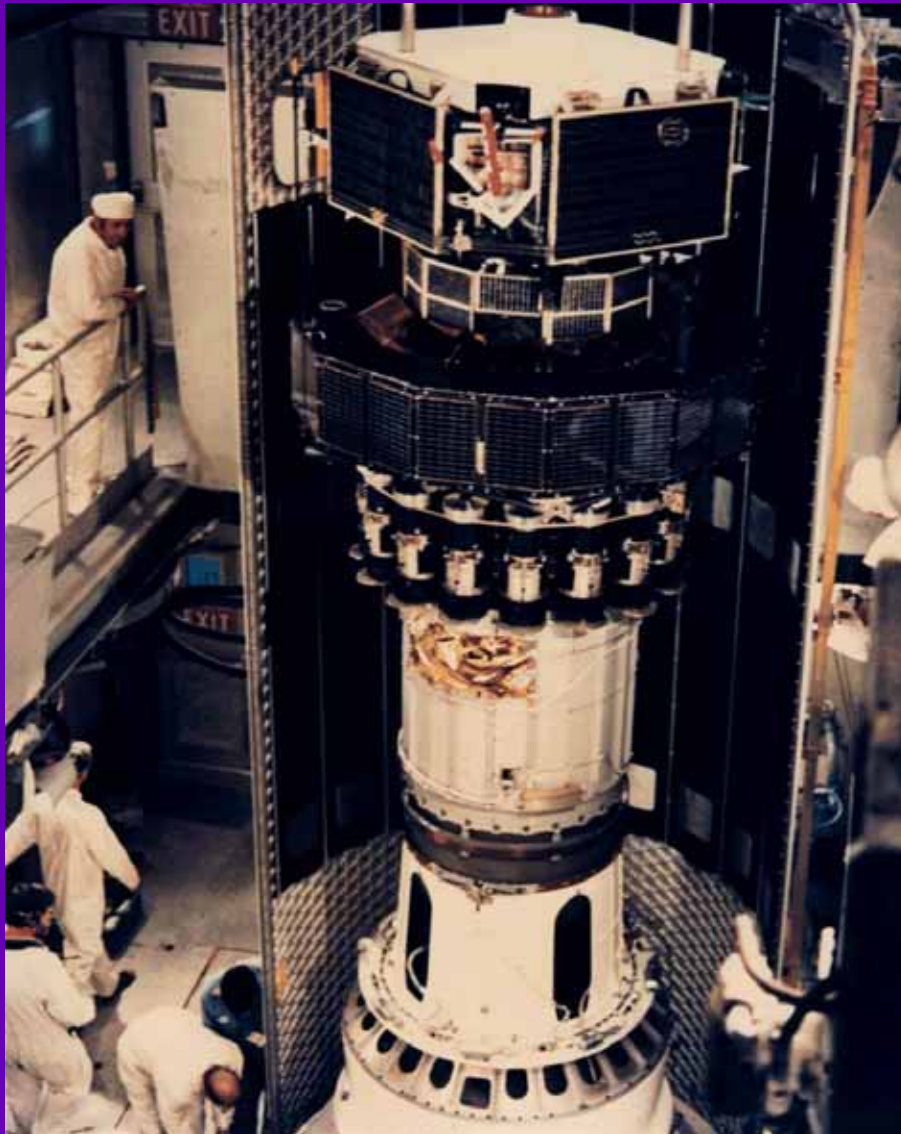
Solutions

- **Don't need large satellites for everything**
(but we can't use Small Satellites for everything)
- **Manage risk, not avoid it**
- **FBC applies to Ground System and Space Segment**
- **Well-focused COTS programme**
- **“Right” amount of PA/QA**
- **Autonomous systems (expert systems and AI)**
- **Autonomy: EUVE at Berkeley; ACE at RAL; ROCSAT-3 at NSPO/NCKU; NEAR at APL; JPL, SSTL, USAFRL, Penn State**

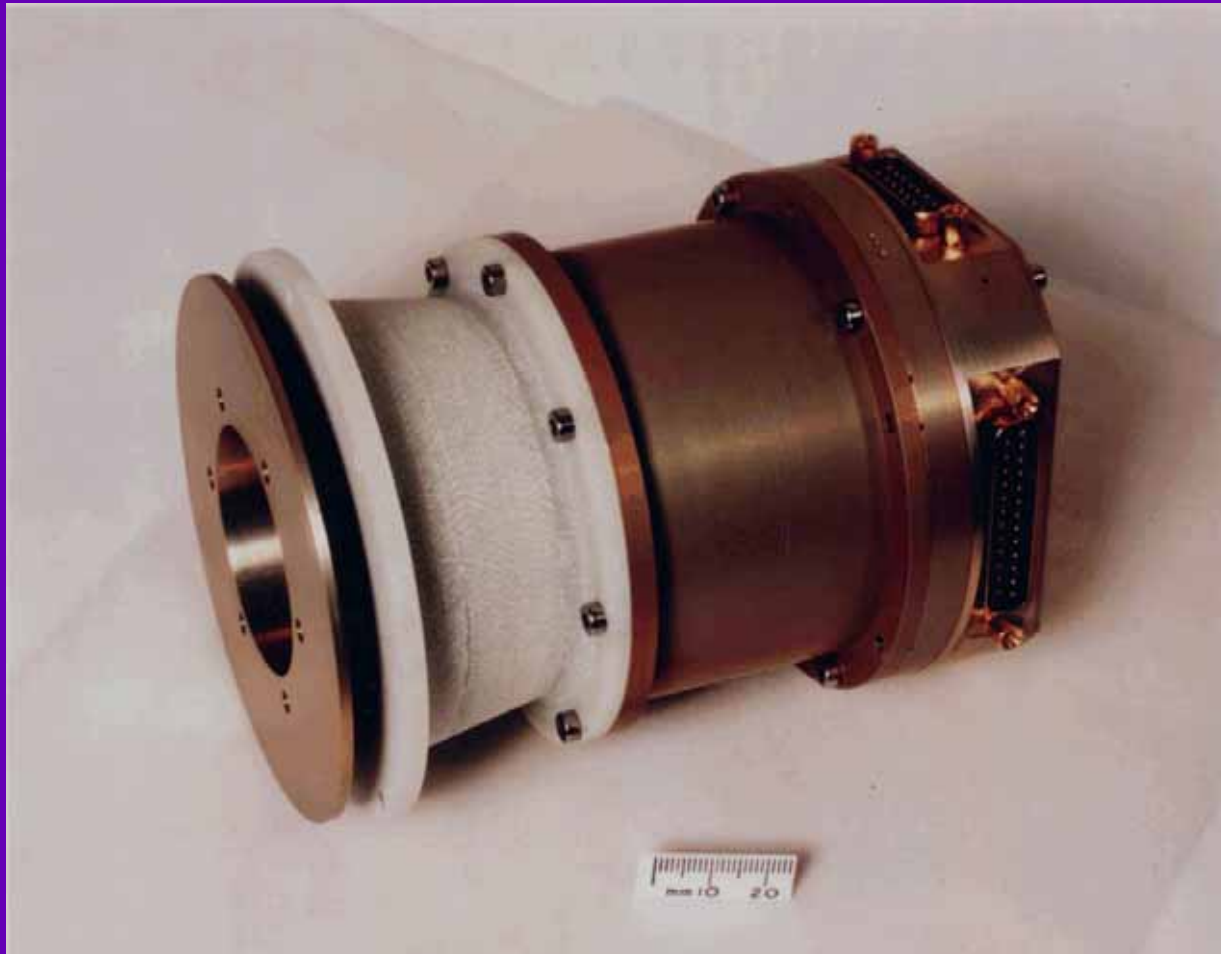
First Small RAL Sat - Firewheel



AMPTE



BADR-B & Morocco-Sat



TOPSAT



Rosetta



Small Sat Ground Stations



Where next ?

- **Work closely with ESA. US already convinced**
- **Positive engagement with Research Councils**
- **Ensure we understand the limits of Small Sats**
- **We need a sustainable National Programme**
- **Lateral thinking on what is possible**
- **Skunk-works catalyst**
- **Joint Space Technology Programme under CSR**
- **Support initiatives such as today**
- **Be much better at self-publicity on capability**
- **Ensure UK maintains its world-ranking position**