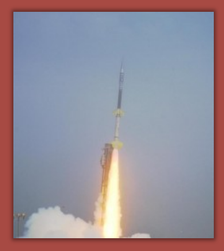
The Exo-Brake As A De-Orbit Mechanism: Analysis and Recent Flight Experience

M. Murbach[2], P. Papadopoulos[1,4], A. Guarneros-Luna[2], G. Pearhill[1, 2], M. Bodmer[1, 2], J. Mojica[2], A. Reuter[2], D. Atkinson[1, 3], M. Scales[2,4], K. Sok[1,2], J. Cortez[1], Benton[1], T. Shu[1,4], J. Punzalan[1,4], G. Nakashiki[1,4], J. Drew[1], J. Swenson[1], A. Tabrizi[1], J. Wheless[1,2], R. Shimmin[1], R. Alena[1], **[1]NASA Ames Research Center, [2]University of Idaho, [3]NASA Jet Propulsion Laboratory, [4]San Jose State University**

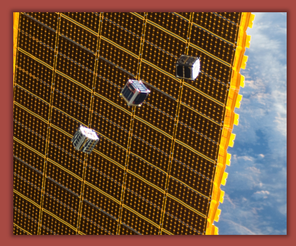
SOAREX - 6
Aug 22, 2008

- High-mach Reentry Test
- Shock shock interaction analysis



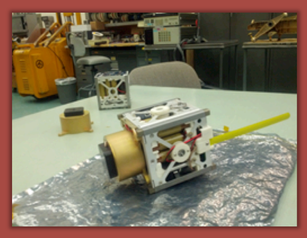
SOAREX - 7
May 28, 2009

- First flight of TDRV
- Highly stable self-stabilizing reentry probe



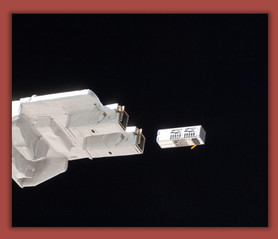
TES-1
Oct 4, 2012

- First US Cube-Sat deployed from the ISS
- System verification test



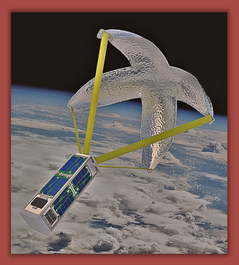
TES-2
Aug 21, 2013

- First US Cube-Sat deployed from the ISS
- System verification test



TES-3
Nov 19, 2013

- First 3U deployed from the ISS
- First Exo-Brake flight test

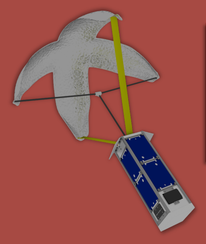


TES-4
March 3, 2014

- Evolved Exo-Brake flight test
- Flight material and subsystem investigation

SOAREX-8
Expected
July 7, 2015

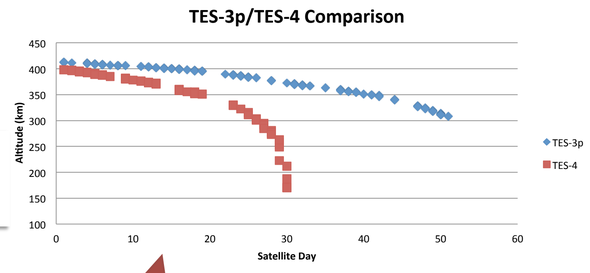
- Full scale Exo-Break flight test
- Advance COM suite



TES-5
Expected
Late 2015

- First modulated (steerable) Exo-Brake Advanced targeting

RAPID DE-ORBIT:



The Team

NASA + Universities

Key Technology Advances

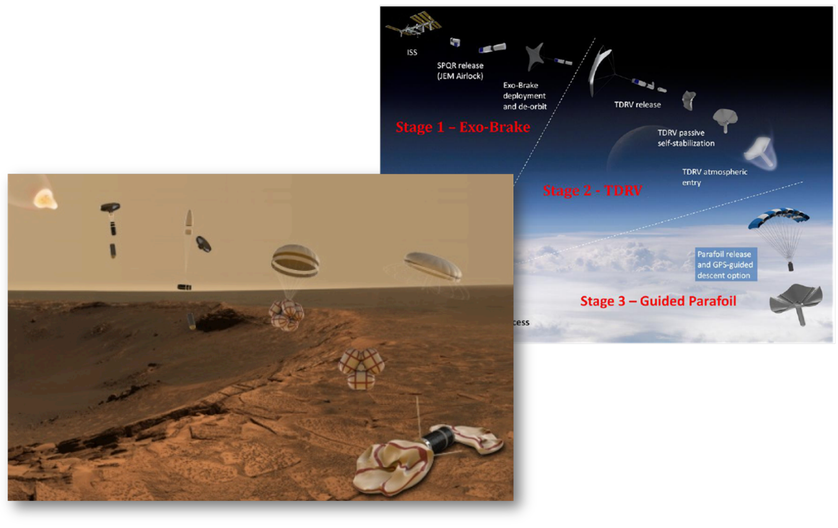
Exo-Break
- Novel and 'Safe' deorbit technique

Advanced CubeSat Com
- Development of a 'TDRS-for-CubeSats'
- Obviating the need for ground stations
- Rapid command uplink capabilities

ISS Design/Safety Process Nanosats
- ISS compatible design and testing process for rapid flight opprotunities

SCRAMP/TDRV (Tube deployed reentry vehicle)
- Self-stabilizing reentry probe
- Shock/Shock Interaction
- Transpiration studies

Applications

ISS/Orbital Platform Sample Recovery
- Recovering up to 3kg samples

ATROMOS Mars Surface NanoSatellite Mission Concepts
- Exploring critical, high-risk regions of Mars