Tethers Unlimited

A Wild Ride Through the TRL Valley of Death

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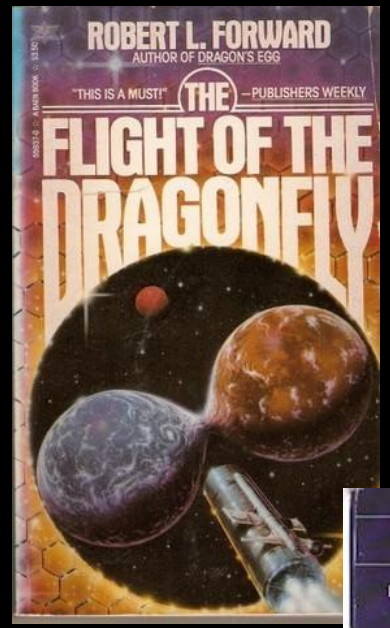
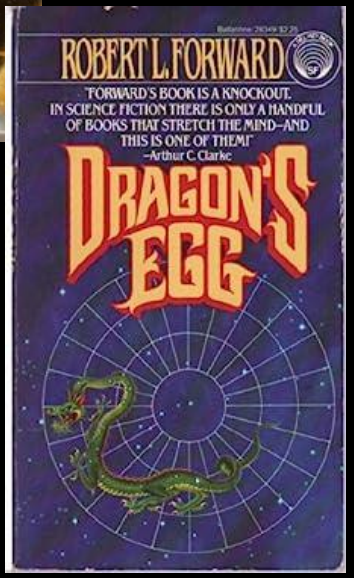
“Back and forth on this tether, it ain’t easy”

- 42 Dugg, It Get Deeper Pt. 2, *Free Dem Boyz*

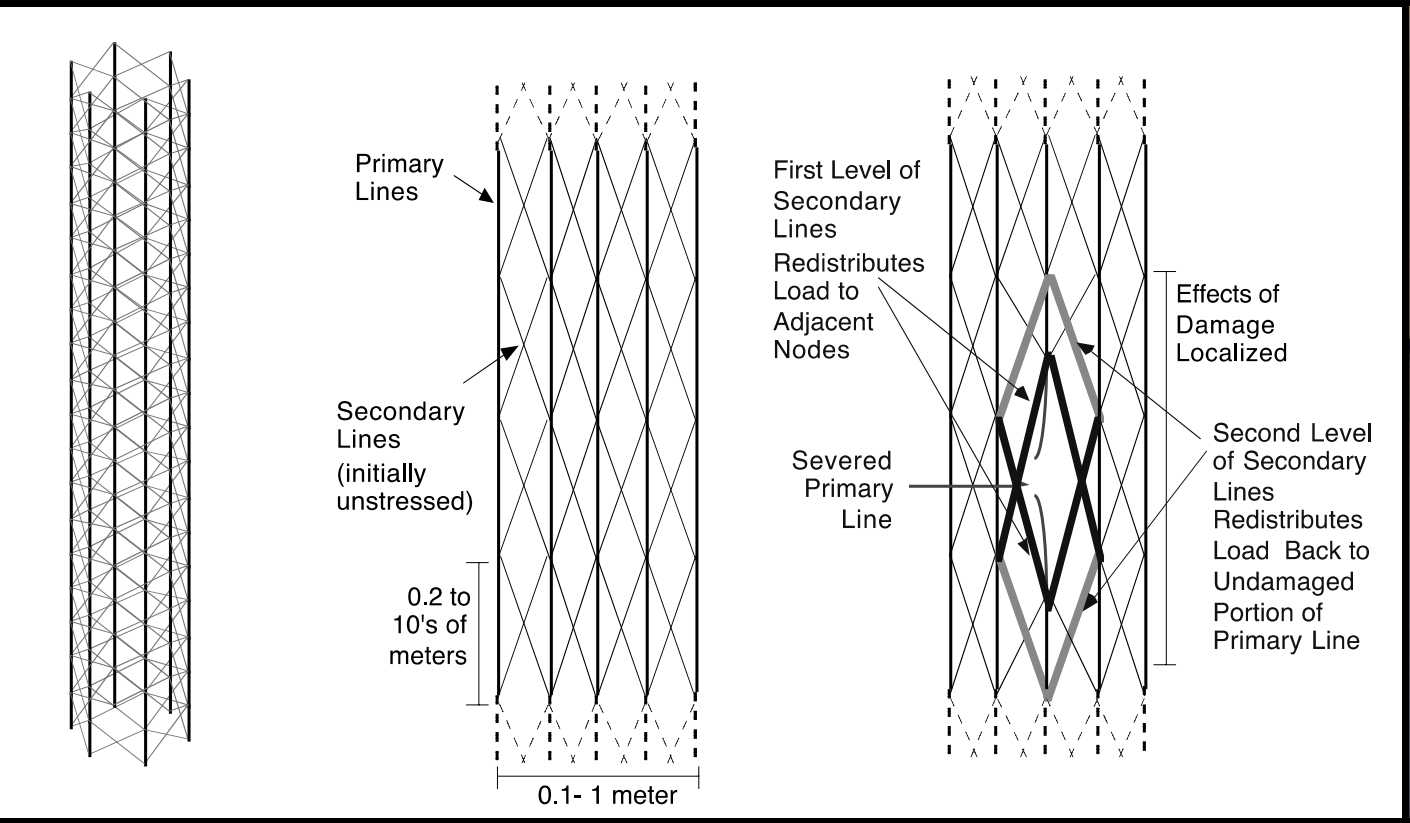
A Grad Student Walks into a Seminar…

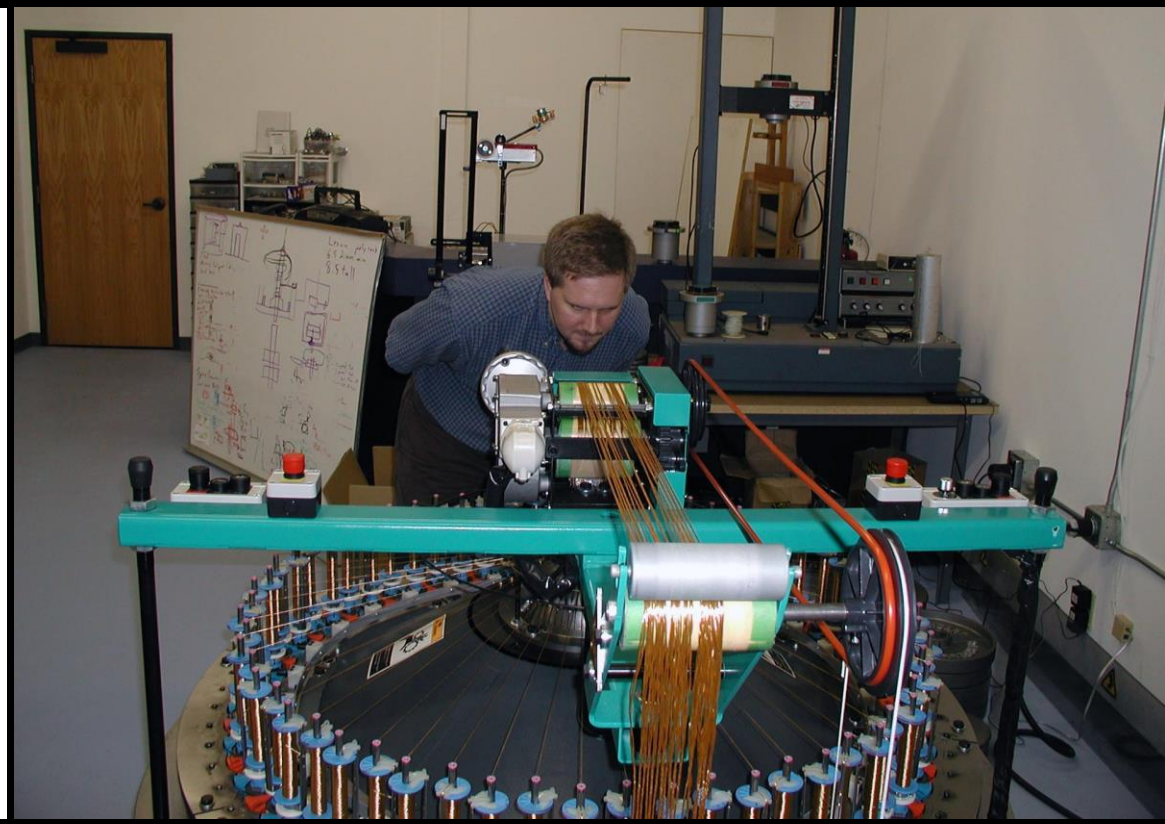
Dr. Robert L. Forward





Macrame from Hell: The Hoytether™

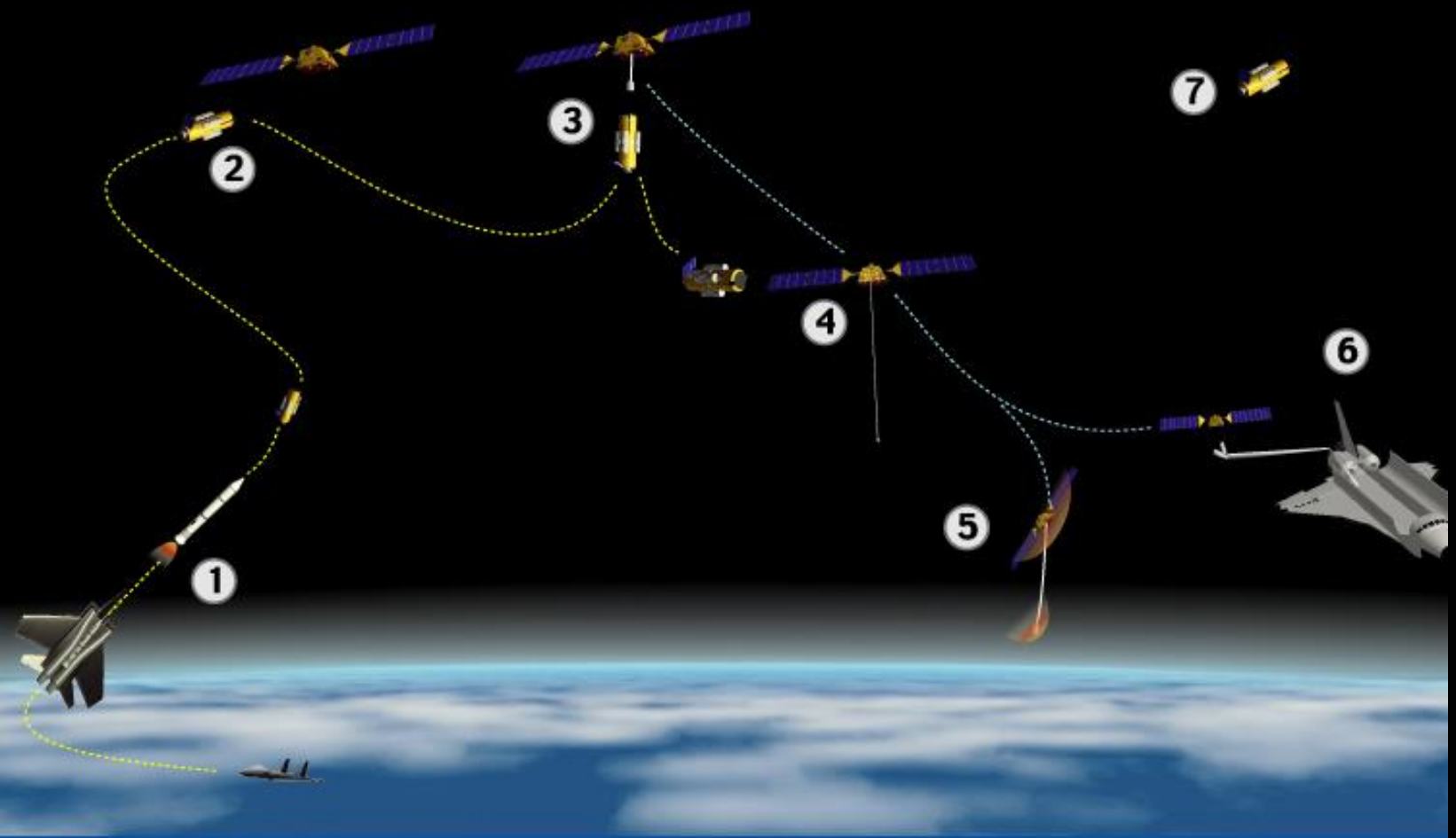


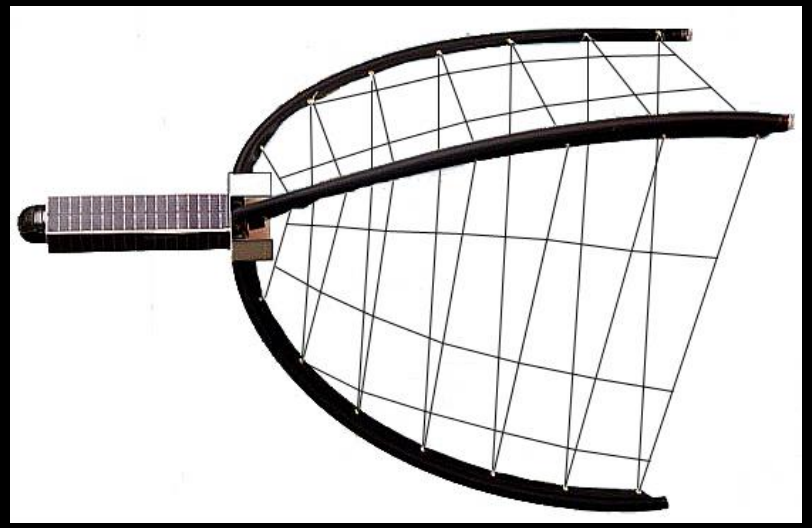


An Idea Before its Time:
The Terminator Tether

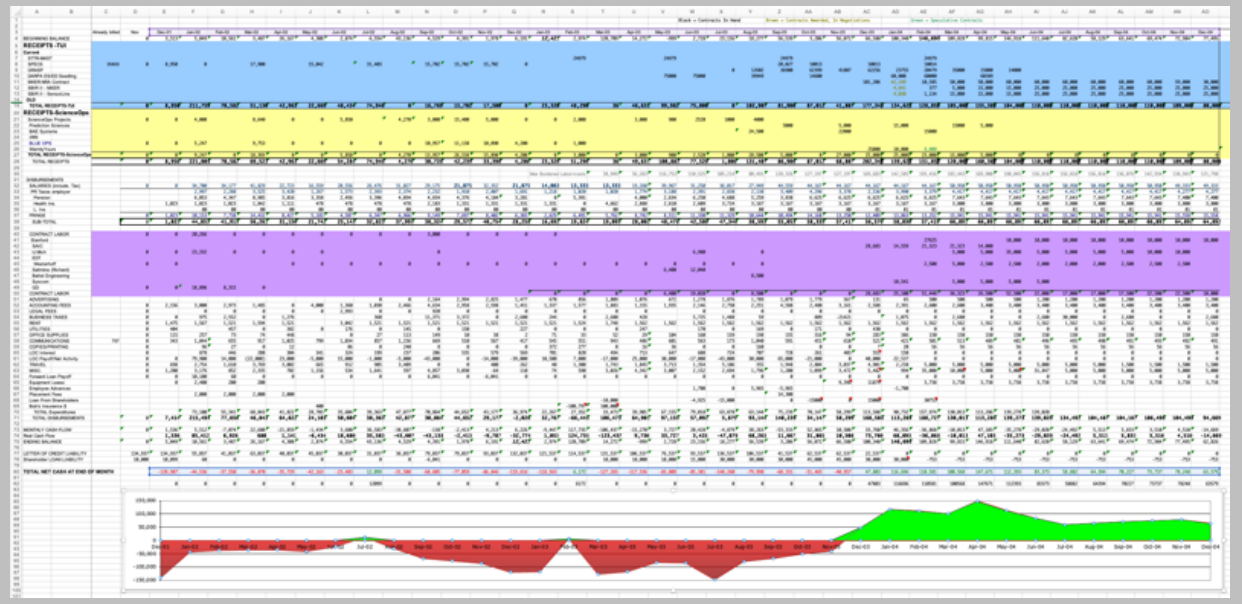
Deorbit Corp.

GRASPing at Satellites



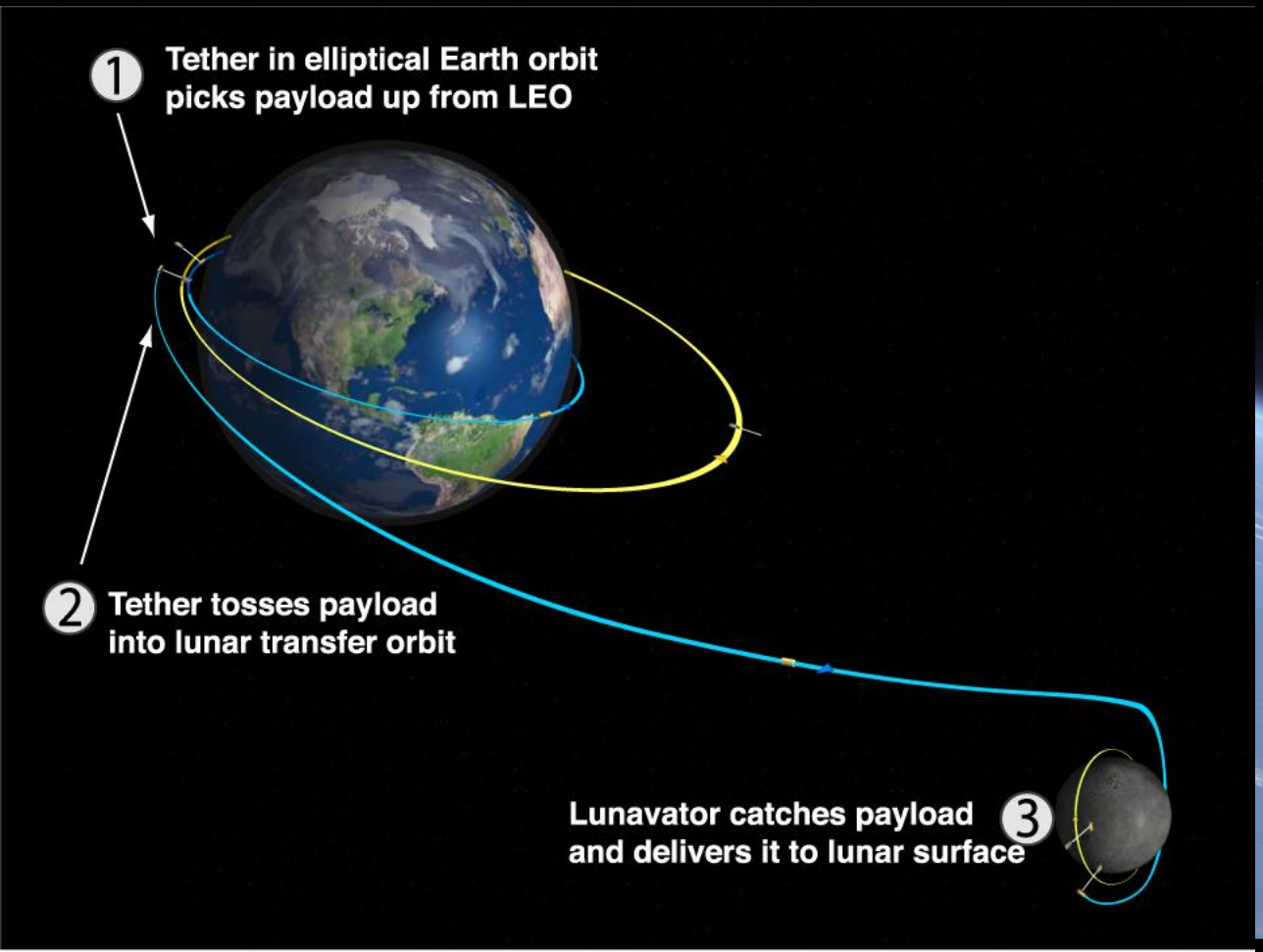


Valley of Death, Part I

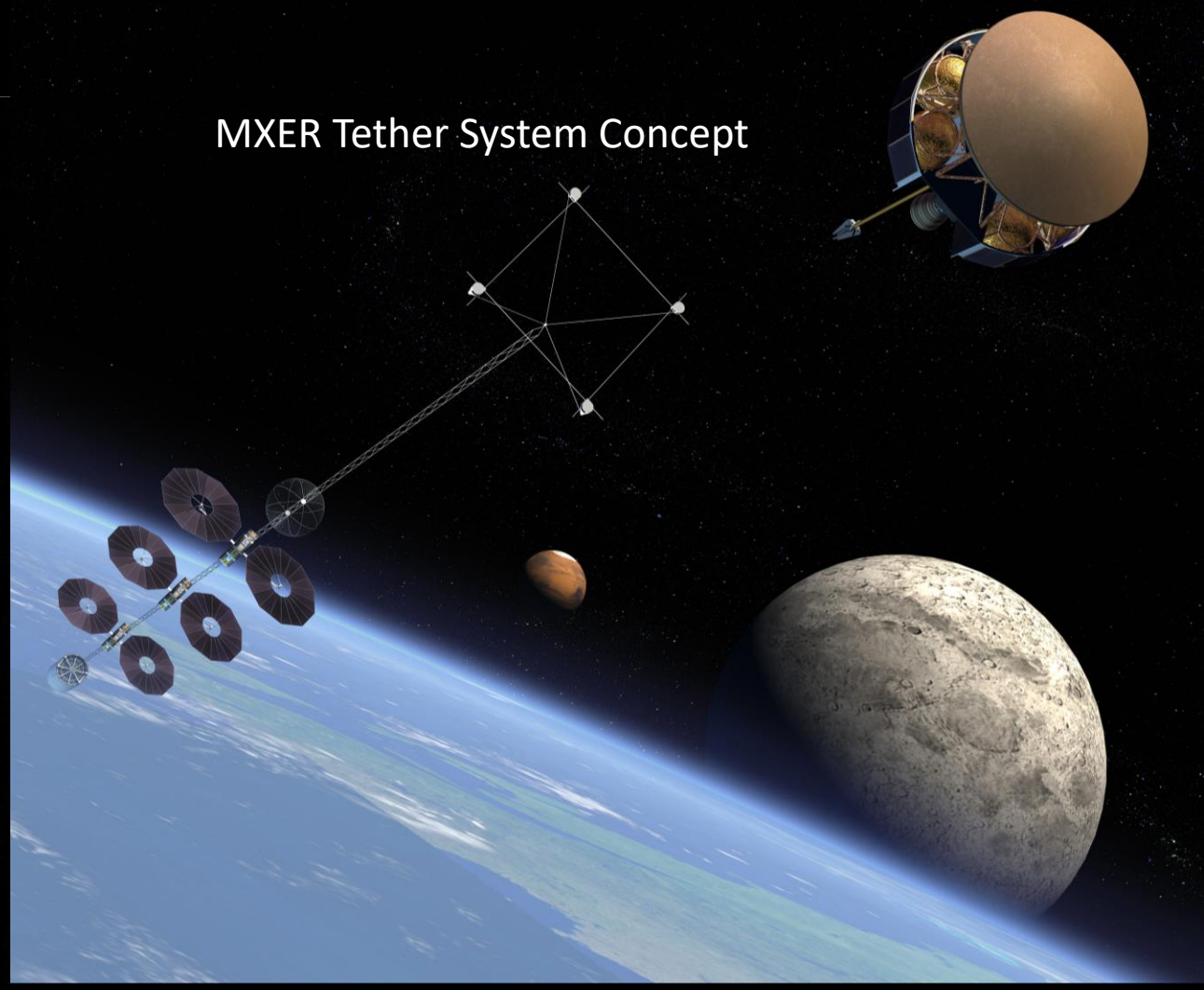


ScienceOps

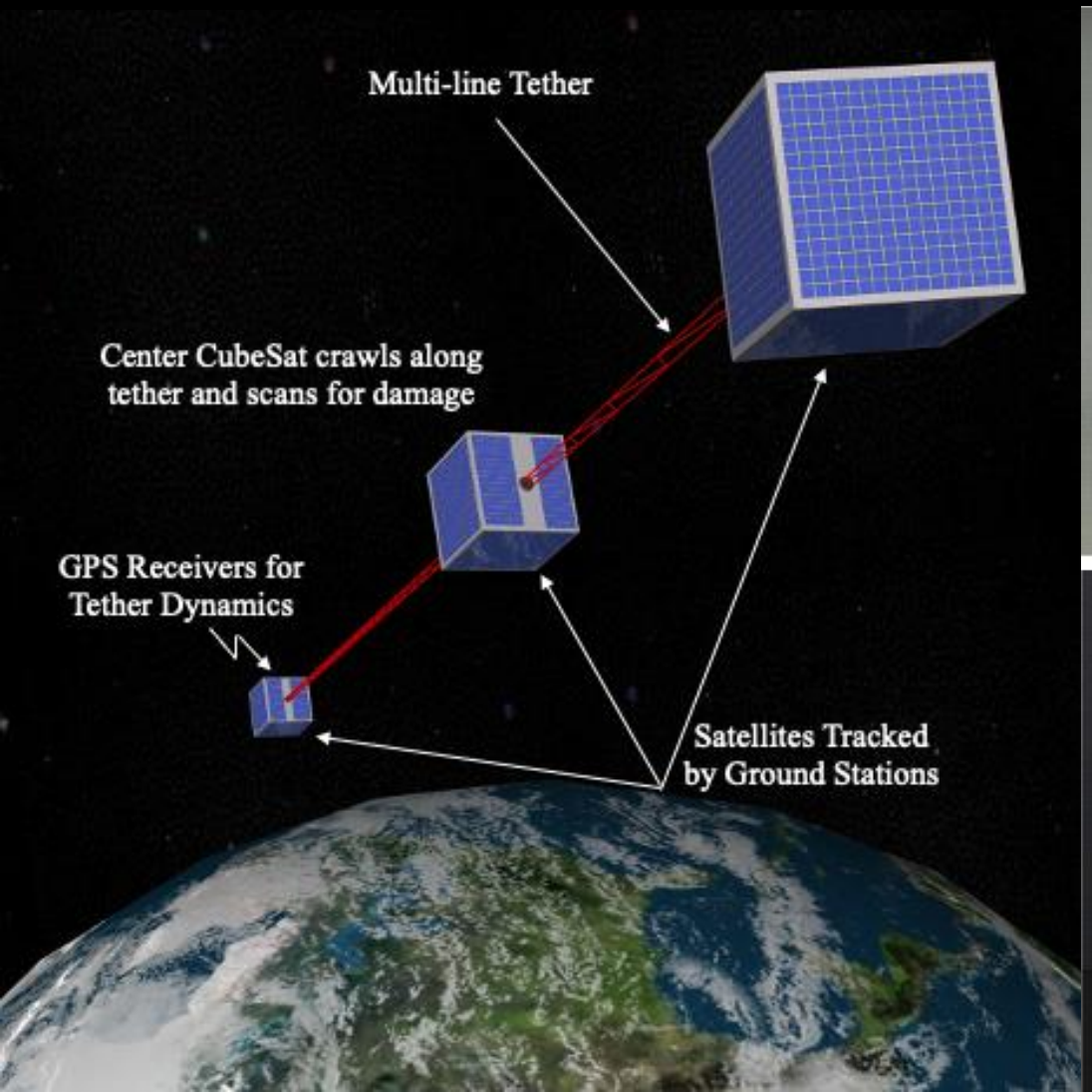
Slingshot to the Moon:
The Cislunar Tether Transport System

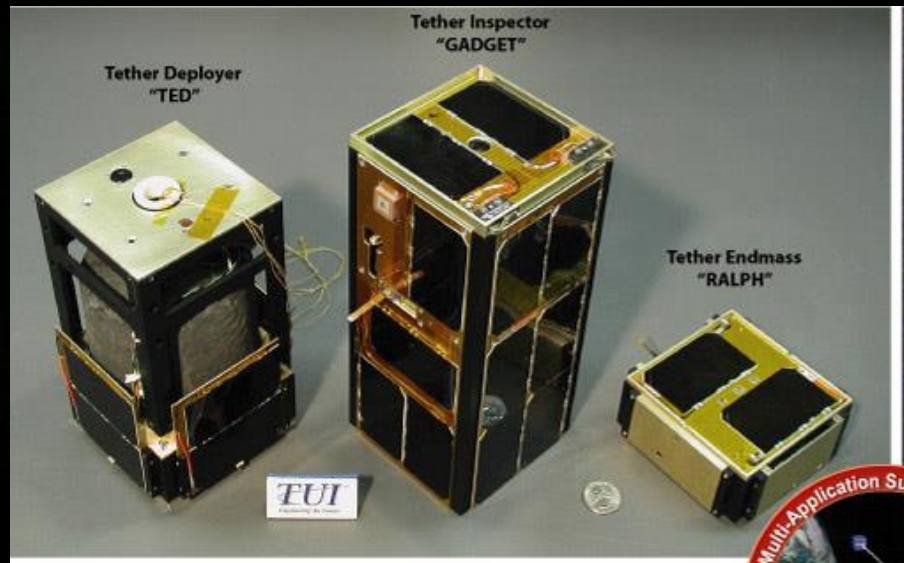


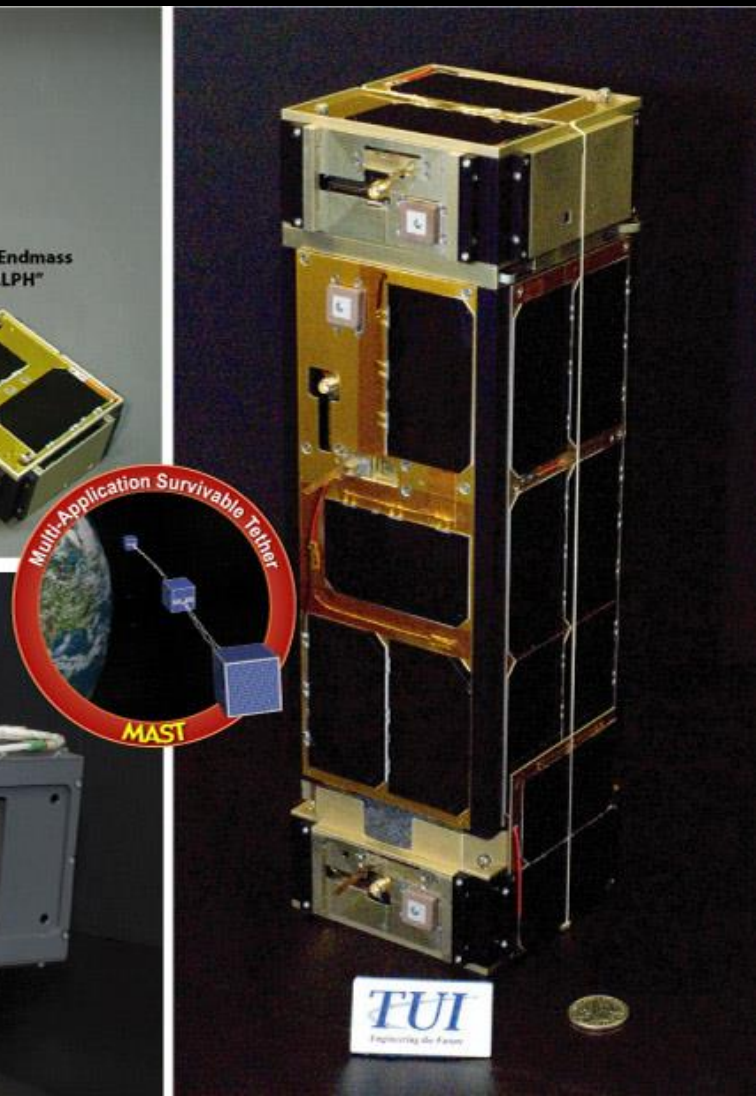
MXER Tether System Concept



Flight Mission on a Shoestring:
The MAST CubeSat Mission





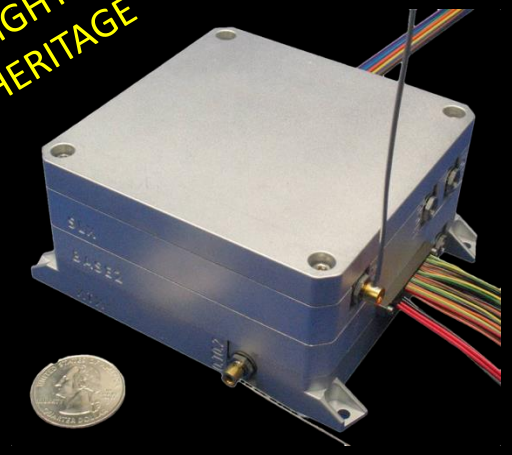


The CubeSat Revolution:
Radios, Thrusters, and Gimbals, Oh My

SWIFT SDR

- High-throughput data for SmallSats
- Frequency- and modulation-agility
- IP-based Inter-Satellite Adaptive Mesh Networking

FLIGHT HERITAGE



HYDROS®
$H_2O = \Delta V$

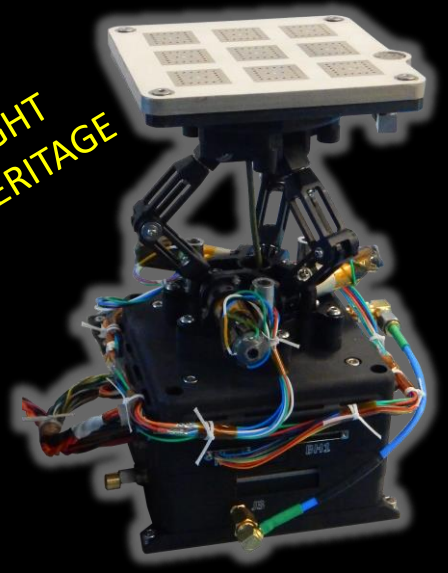
- Orbital agility for SmallSats
- Water propellant –> safe for personnel and primary payloads

FLIGHT HERITAGE

COBRA

- Precision pointing for optics, antennas, and sensors

FLIGHT HERITAGE

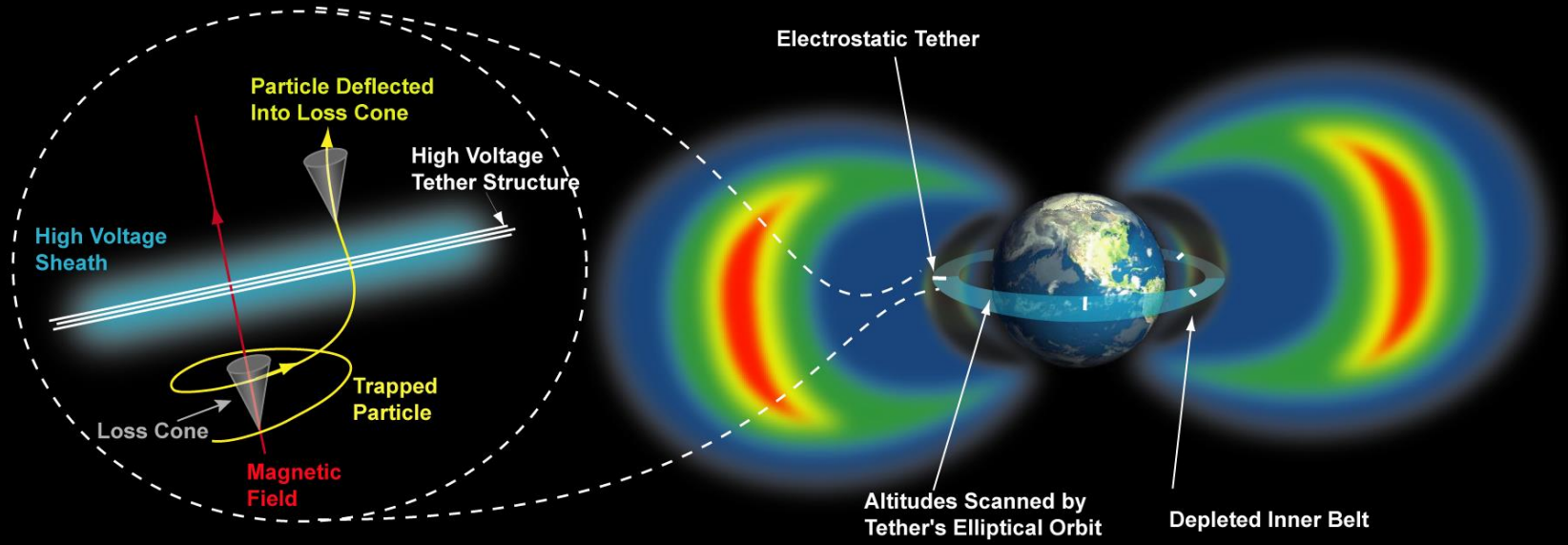


TERMINATOR TAPE®

- Affordable end-of-life deorbit for debris mitigation

FLIGHT HERITAGE

Remediating Space Radiation & Making the Tin-Hats Angry

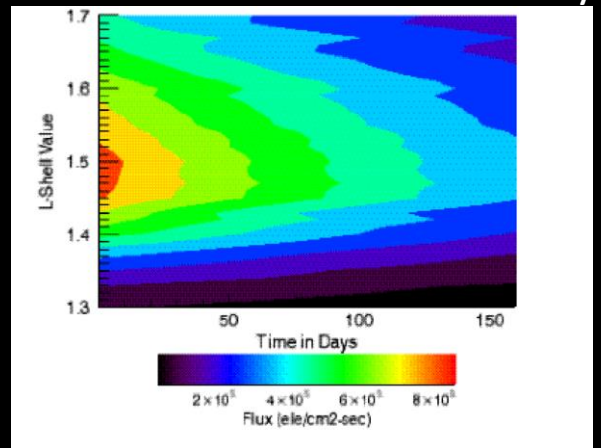


Mother of All Equations:

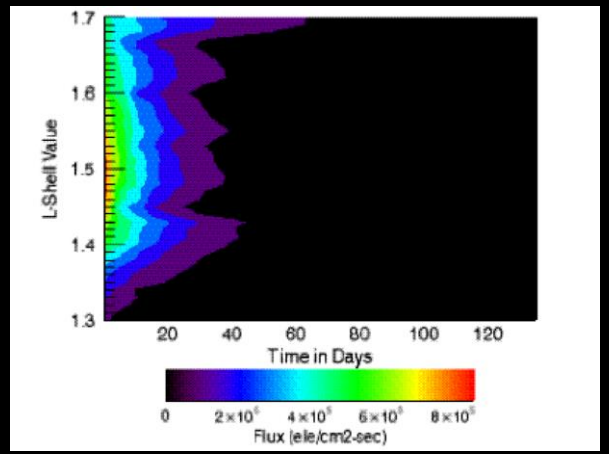
$$N_{sats} = C_1 \frac{1}{L}\left[\ln\left(\frac{\rho_{\text{sheath}}}{r_w}\right)\right]^2 \frac{1}{\rho_{\text{sheath}}^{3.65}}$$

- C_1: Constant defined by HAND scenario
- L: Tether Length
- r_w: Tether Wire Diameter
- ρ_{sheath}: Sheath Radius

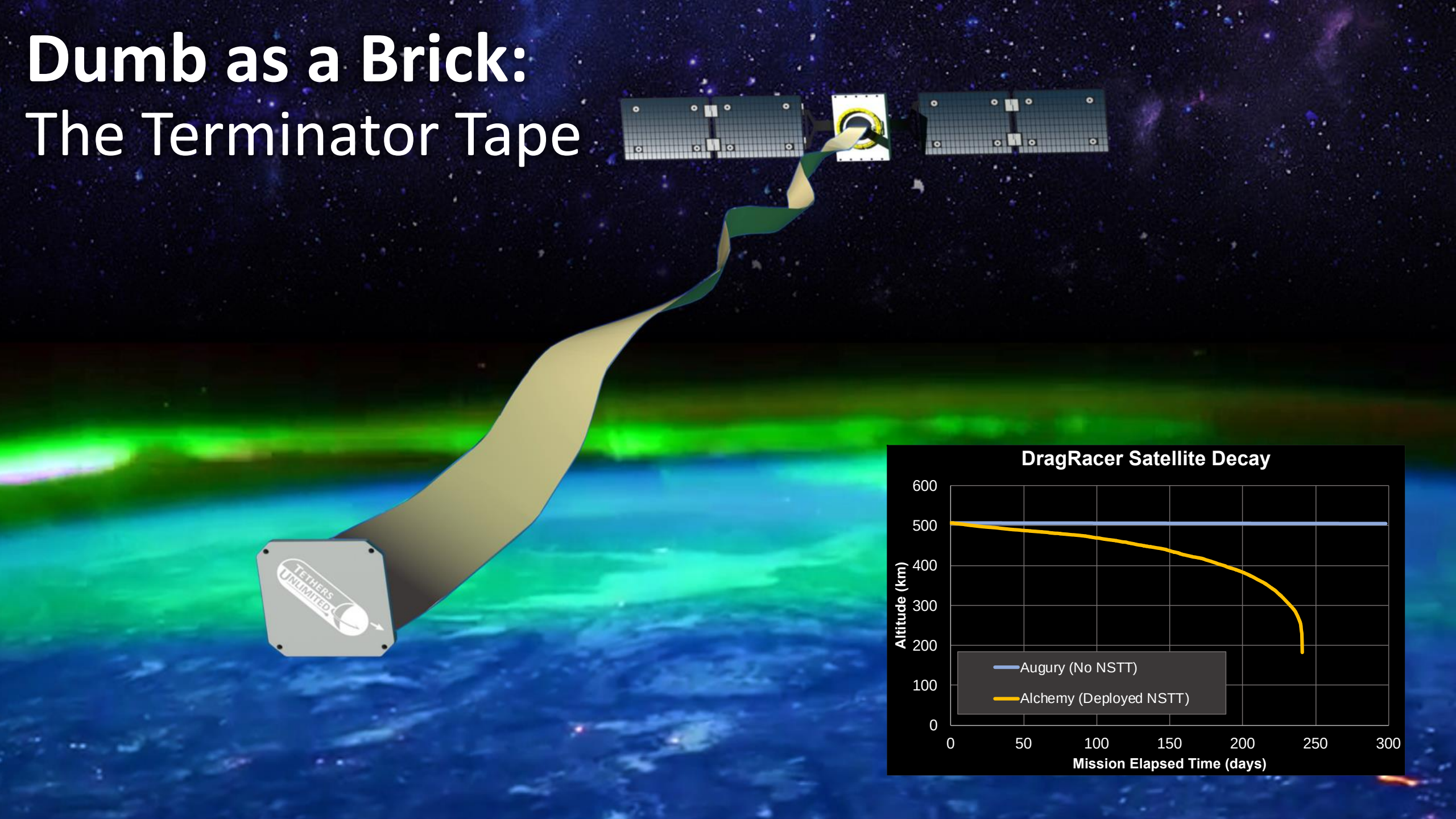
No Remediation
Natural Sources & Losses Only



With Remediation
Natural Sources & Losses



Dumb as a Brick:
The Terminator Tape



Valley of Death, Part II:
Going from Prototype to Production

AS9100 & ISO9001 Certified

Produce **up to 36 radios a month** at TUI alone

Rapidly Scaling to meet customer demand

100% On-time delivery (10 mo rolling ave.)

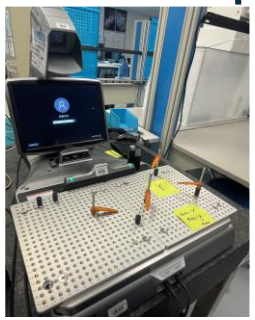
96% Customer Satisfaction

25,000 sq ft facility

Vacuum Chambers

Thermal Testing

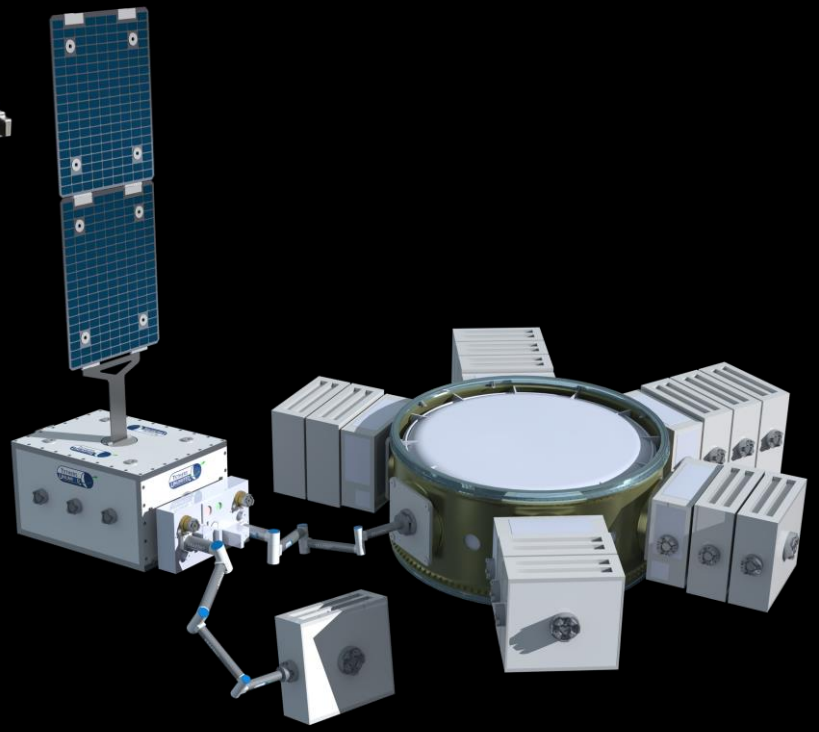
Vibe Testing



Building Our Future in Space

GAUNTLET

Cost-Effective Robotics Payload

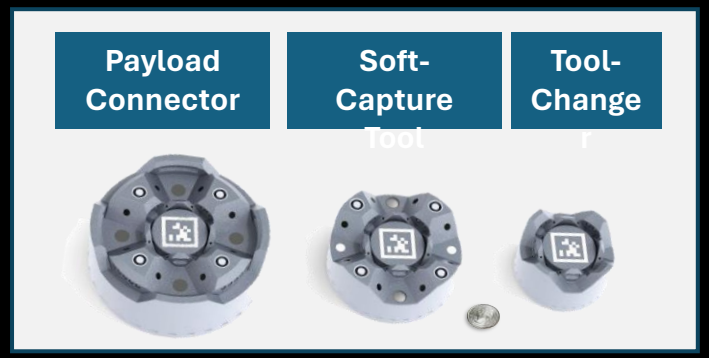


MakerSat

In-Space Composite Structure Manufacturing

AXON™ Connectors

In-Space Assembly and Servicing



Refabricator

In-Space Recycling & 3D Printing

Resistance is Futile:
Acquisition & Assimilation

Lessons Learned the Hard Way

- Space Tethers are Hard
- How you learn from failures determines whether you succeed in the long run
- Market Timing is Critical to Product Success
- In taking a product from prototype to flight production, the last 5% is 95% of the effort & cost