

COSMIC Capstone Challenge (Track 3): Final Briefing, April-13-2026

# Mission for On-Orbit Service and Support (MOSS)

Students: Paytn Barnette, Paul Brich, Chanel Davis, Connor Hall, Brendan King, Bruce Noble, Parker Scribner, Lawrence Tolentino

Advisors: Dr. Siwei Fan, Dr. Matthew Haslam

Mentor: Rob Britts – Skyway Organization

**Department of Aerospace Engineering, Embry-Riddle Aeronautical University, Prescott**



**EMBRY-RIDDLE**  
Aeronautical University

100 YEARS | 1926-2026



# Meet the Team



**Paul Brich**  
Team Lead



**Connor Hall**  
Deputy Team Lead



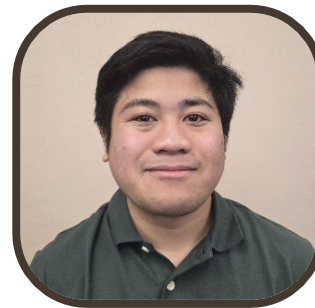
**Paytn Barnette**



**Chanel Davis**



**Bruce Noble**



**Lawrence Tolentino**



**Brendan King**



**Parker Scribner**

# Agenda

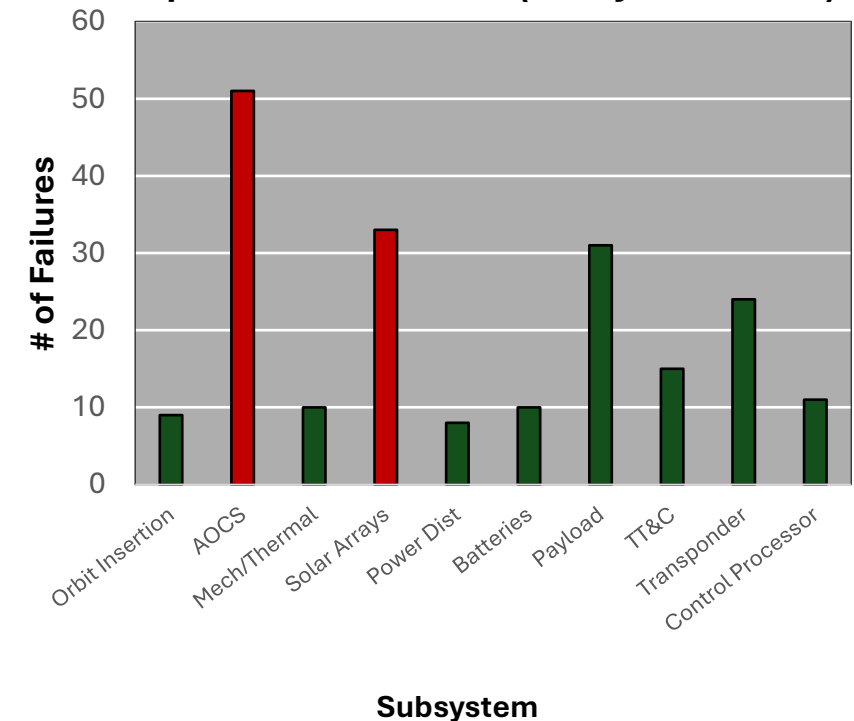
- Introduction
  - Background
  - Mission Overview
  - MOSS System Overview
- Core Orbit Refueling Kit (CORK)
- Solar Panel Augmentation Reflector Kit (SPARK)
- MOSS System
- Conclusion

# Background: Current Challenges

## 1.4 Advancing High Value Missions

- ❑ **\$2 Billion** worth of satellite damages were claimed in 2023 (Rainbow 2025)
  - Out of \$23 Billion worth of assets in space
- ❑ Leading failure causes are **lack of propellant** and **solar array degradation**
  - **Loral LS-1300** Bus has consistent solar array issues (Ellery et al. 2008; Selding 2013a)
    - With the ability to restore to nominal power, all components would be functional
  - **Yamal-402** had a lower-than-expected orbital insertion into GEO (Selding 2013b)
    - Required **4 years** worth of propellant to return to original orbit
    - Refueling would allow this satellite to return to nominal life expectancy

**Satellite Failures by Subsystem from Spacecraft Insurer 1 (Ellery et. al 2008)**



# Mission Overview

## 1.4 Advancing High Value Missions

- ESPAStar based servicing spacecraft
- Focused on aging GEO satellites
- Supports on-orbit life extension
- Addresses a gap in current servicing options
- Designed to service GOES-R
- Can service any satellite with some modifications



**ESPAStar-D**  
**Northrop Grumman [5]**



**GOES GEO Satellite with**  
**ESPAStar-D**

# MOSS Executive Summary

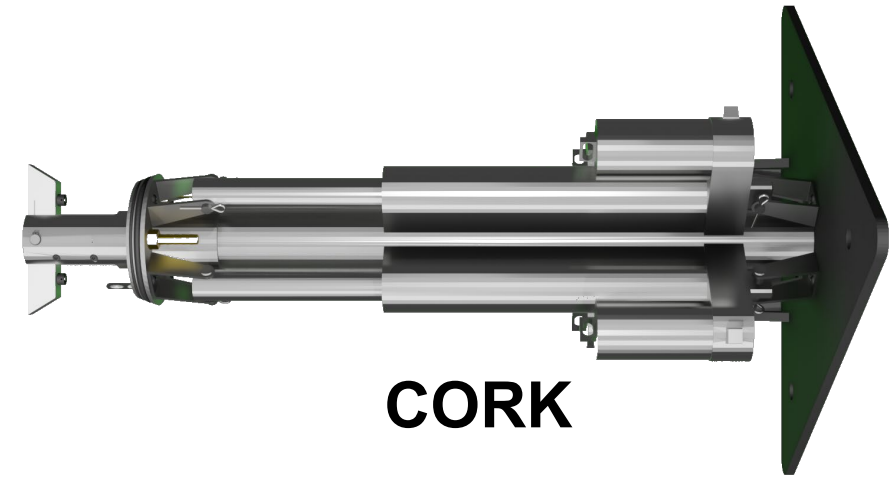
## 1.4 Advancing High Value Missions

The Problem: satellite failure due to

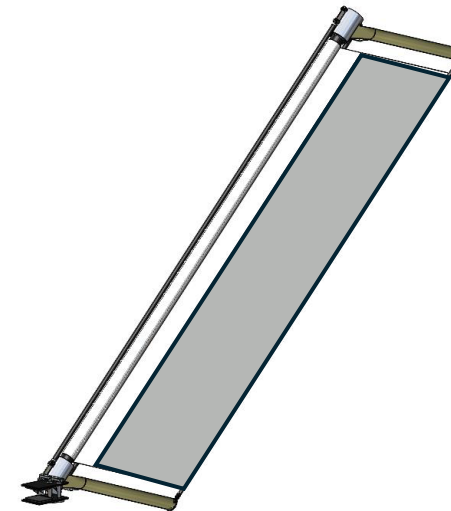
1. Lack of propellant
2. Solar array degradation

The Solutions

1. Refuel satellites on-orbit by backflowing propellant
2. Increase solar flux onto the panel to increase output power by adding a concentrator to the side of the panel



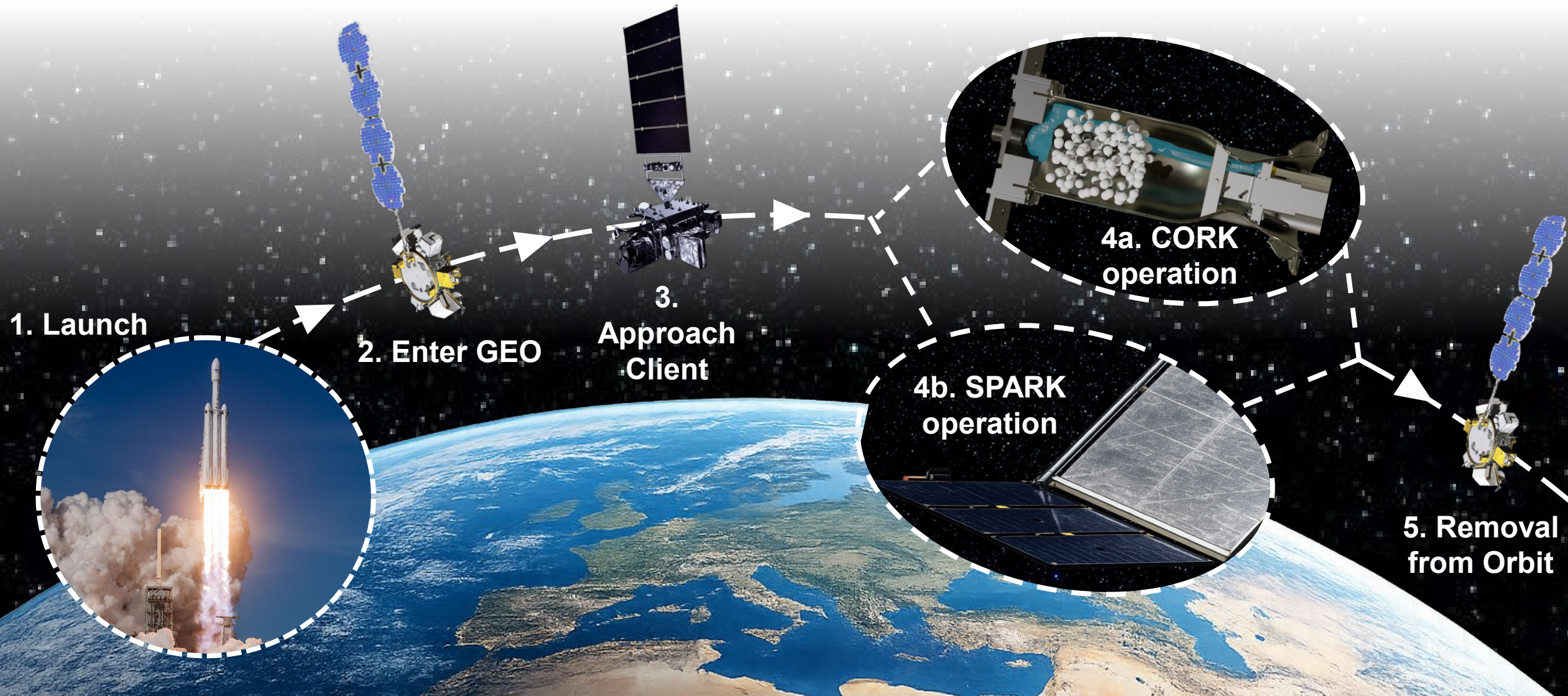
**CORK**



**SPARK**

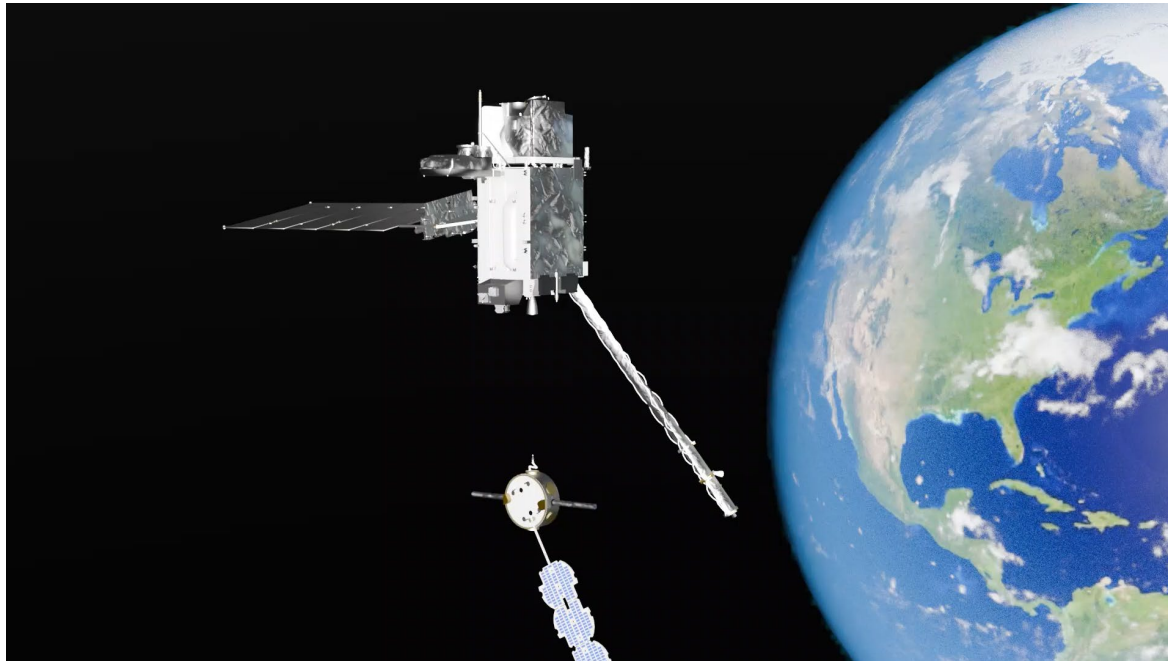
# MOSS Concept of Operations

## 2.2 Storyboard of Complete Operation

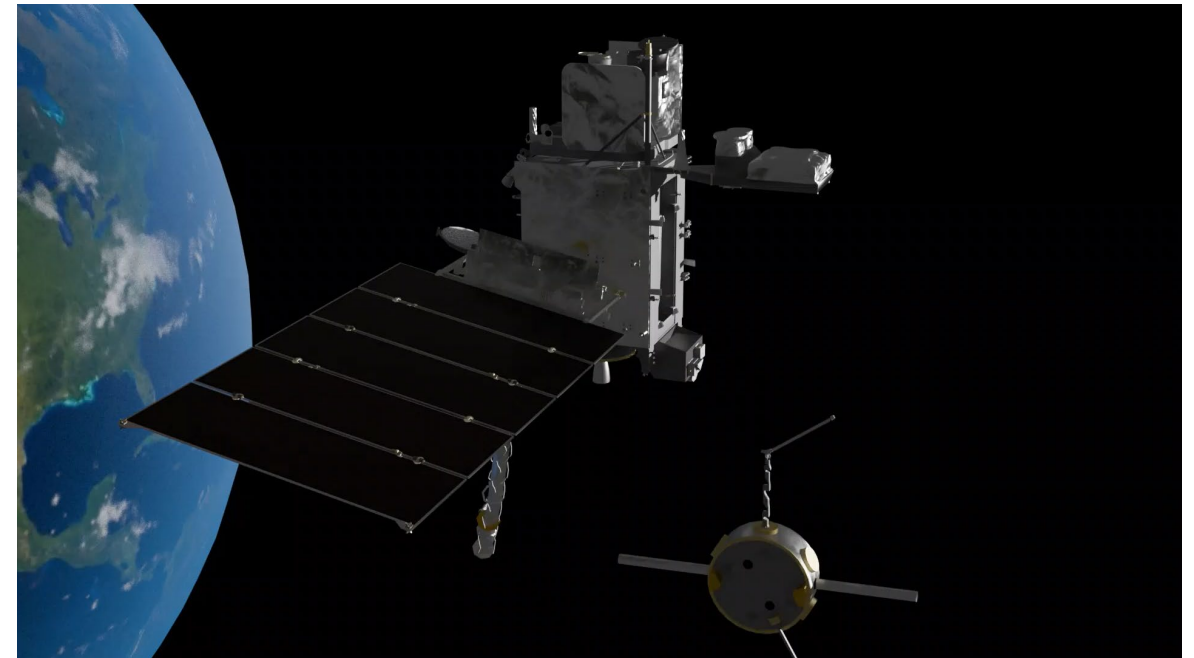


# CORK and SPARK Operations

*2.1 Animation, 2.2 Storyboard of Complete Operation*



Simulation of ESPASatellite Approach, Docking, and Refueling of GOES Satellite



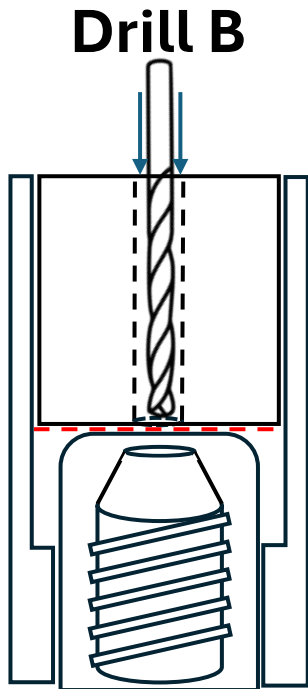
Simulation of ESPASatellite Approach and Attachment of Solar Concentrator on GOES Satellite

# Agenda

- Introduction
- Core Orbit Refueling Kit (CORK)
  - Design History
  - Impact
  - Requirements
  - Operation and Innovation
  - Risks and Mitigation
- Solar Panel Augmentation Reflector Kit (SPARK)
- MOSS System
- Conclusion

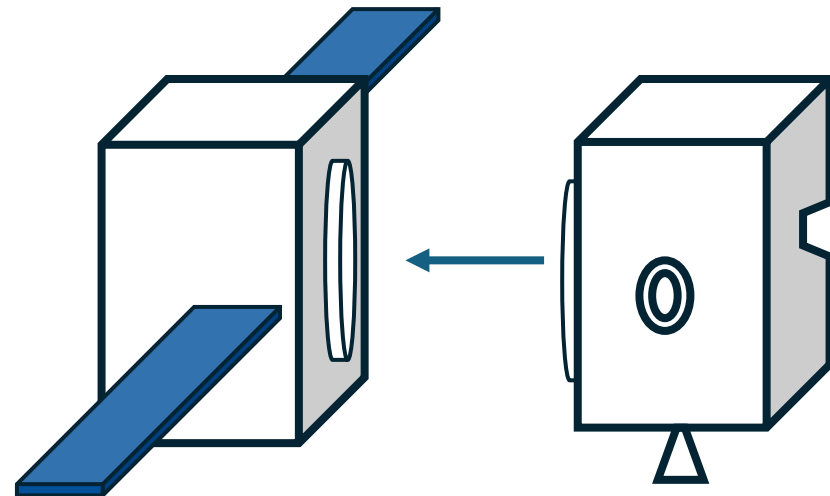
# Design History: Alternative Concepts

## 4.1 Innovative Concepts



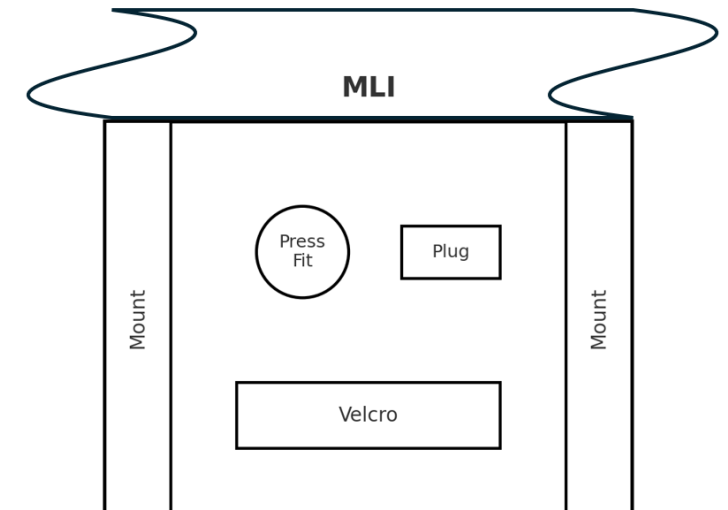
Drill to reach the original propellant port and install new port

### NG MEV 2.0 Northrop Grumman [6]



Attach a new attitude control system

### RAFTI 2.0 Orbit Fab [7]

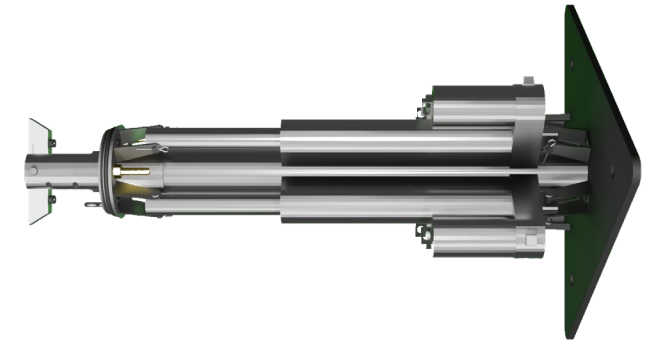


Design a refueling interface to install, **before satellite launches**

# Design History: Trade Studies

## 3.4 Trade Studies

Factors	Weight	Rafti 2.0	Mav 2.0	Cork	Drill B
Damage	20%	5	5	5	1
Complexity	15%	5	1	4	1
Manufacturability	30%	4	1	5	2
Mounting	10%	5	5	4	1
Adaptability	20%	1	3	3	5
Repeated use	5%	5	3	4	5
Total	100%	78%	54%	86%	46%



CORK

# Impact to Current and Future Missions

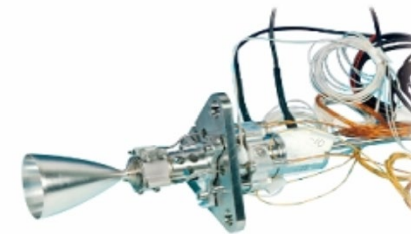
## 1.1 Impact

- Improve **current and existing** on-orbit spacecraft life span
  - Refuel bi-propellant and monopropellant
- Service any thruster
  - Scalable to any size nozzle
- Enable future in-space servicing operations
  - Satellites can be designed to use an extra thruster as their refueling port

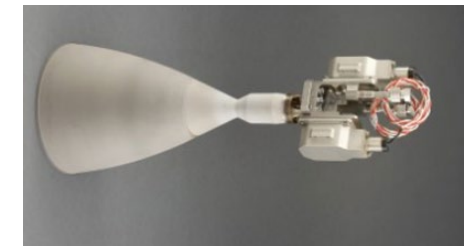
CORK is Designed to Improve Many GEO Missions



MONARC 22-12LT+HT  
Monopropellant Thruster  
*Moog Inc. [8]*



Monopropellant Thruster  
*IHI Aerospace [9]*



Bi-propellant Thruster  
*IHI Aerospace [10]*

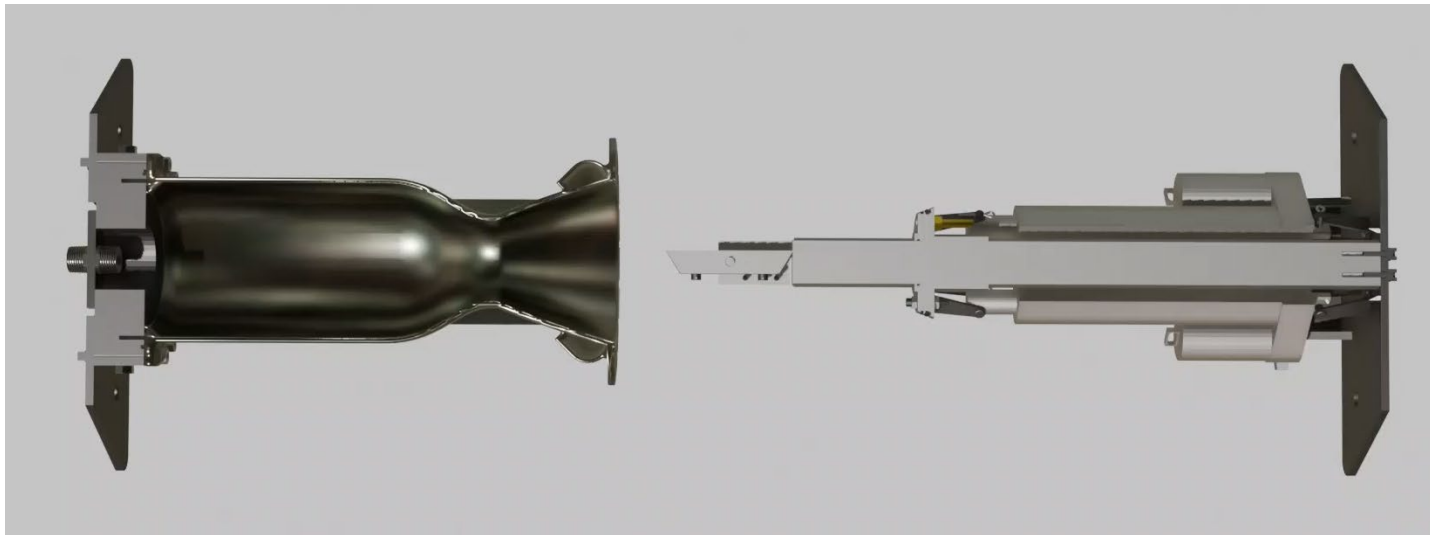
# CORK Requirements

## 3.1 Completion of Required Elements

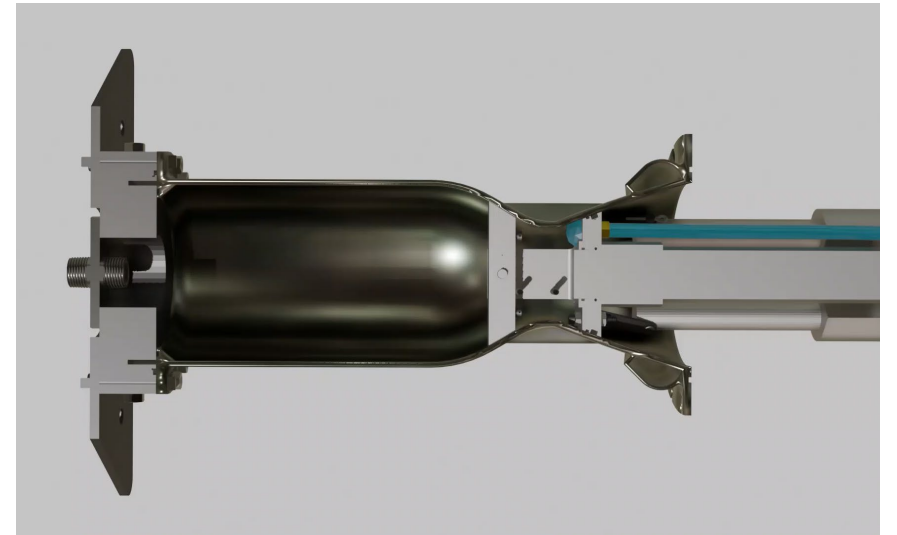
ID	Description	Met
R1.1	CORK shall <b>backflow propellant</b> through MONARC 22-12LT+HT thruster	Future Work
R1.2	CORK shall <b>not damage</b> GOES-R	Future Work
R1.3	CORK shall <b>terminate</b> the propellant transfer <b>autonomously</b>	Yes
R1.4	CORK shall <b>determine</b> when the <b>transfer has been completed</b>	Yes
R1.5	CORK shall <b>seal against the</b> MONARC 22-12LT+HT thruster	Future Work
R1.6	CORK shall <b>fit within stowage dimensions</b> of ESPASStar payload bay	Yes
R1.7	CORK shall be operational within ESPASStar's <b>power capabilities of 200W</b>	Yes
R1.8	CORK shall mass <b>less than 320kg</b>	Yes

# CORK Operation

## 2.1 Animation



CORK Docking and Sealing

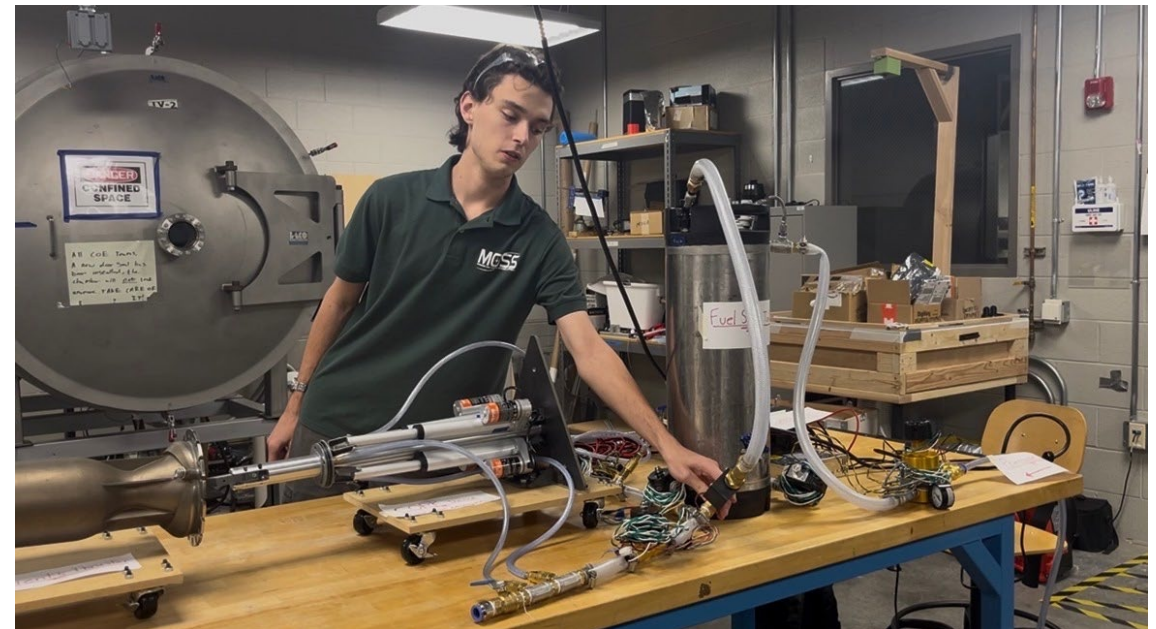


CORK Refueling

# CORK Prototype

## 6.0 Prototype

- Manufactured a prototype to fit a rocket engine for the Rocket Development Lab on campus
- Completed Testing
  - Sealing capability in fluid system
  - Flow rate speeds at varying pressure
- Future Testing
  - Nozzle sealing
  - Autonomous operations



CORK Testing Performed on April 8<sup>th</sup>

# CORK Innovation: Backflow

## 1.3 Innovation

Backflowing through the chamber is the innovation of this project:

- The process has never been demonstrated in space, proposed before, or executed in a similar fashion.
- Design is unique for this function

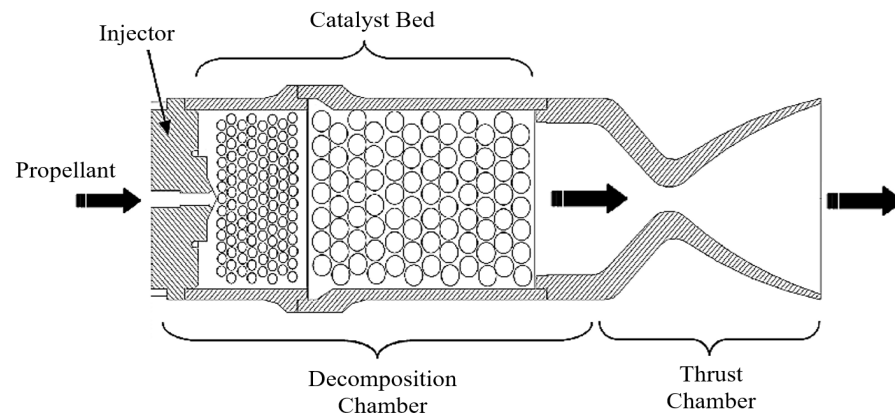
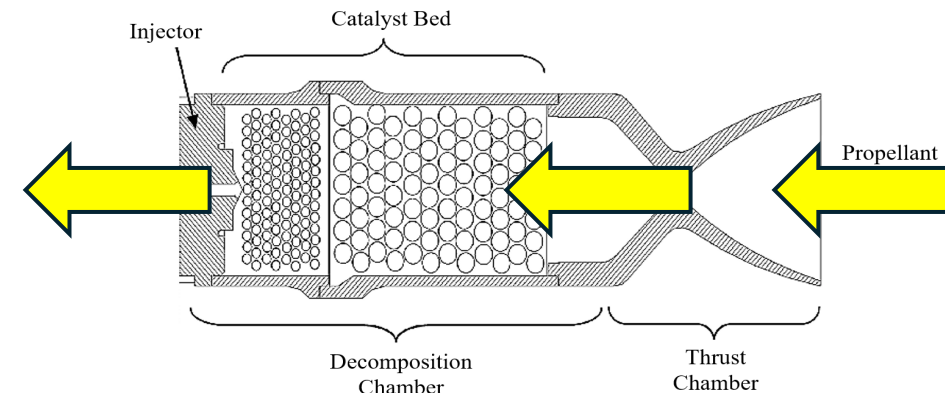


Image from the research paper  
*Han et. All, 2009*



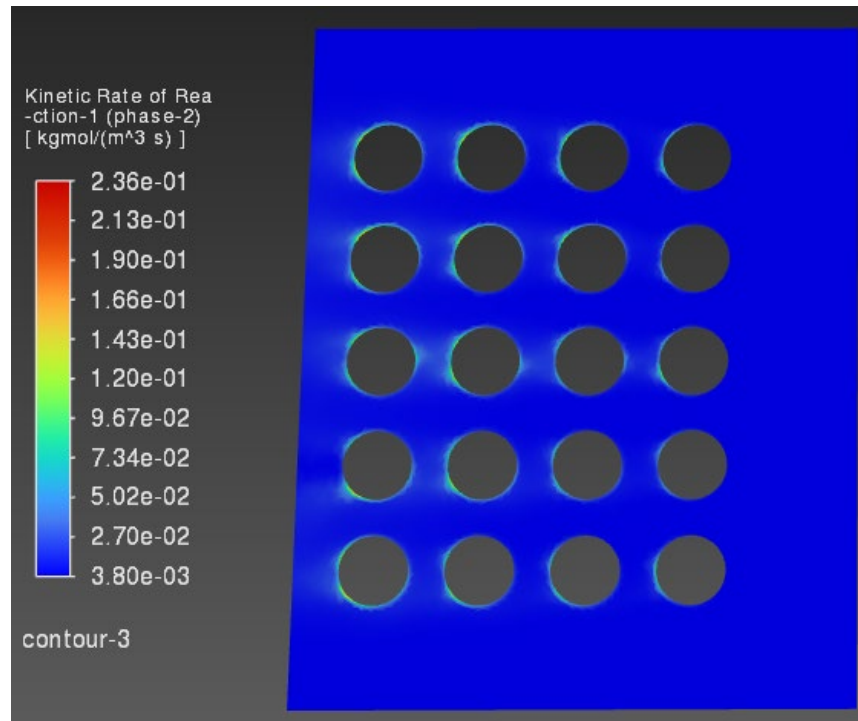
Modified image for CORK's proposed  
backflow method

**CORK will demonstrate the first backflow solution.**

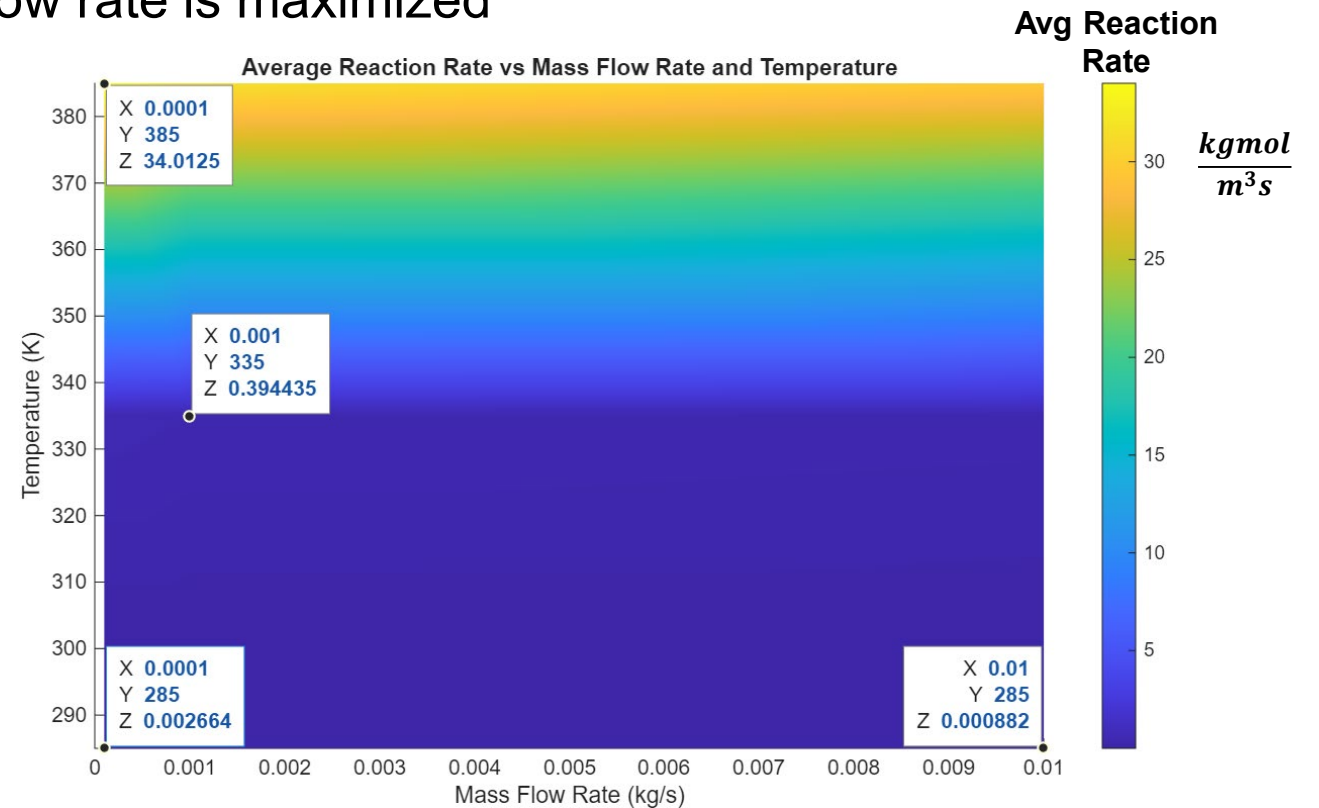
# CORK Innovation: Catalyst Degradation

## 1.3 Innovation

- Reaction rate of hydrazine decomposition is minimized when temperature is minimized and mass flow rate is maximized



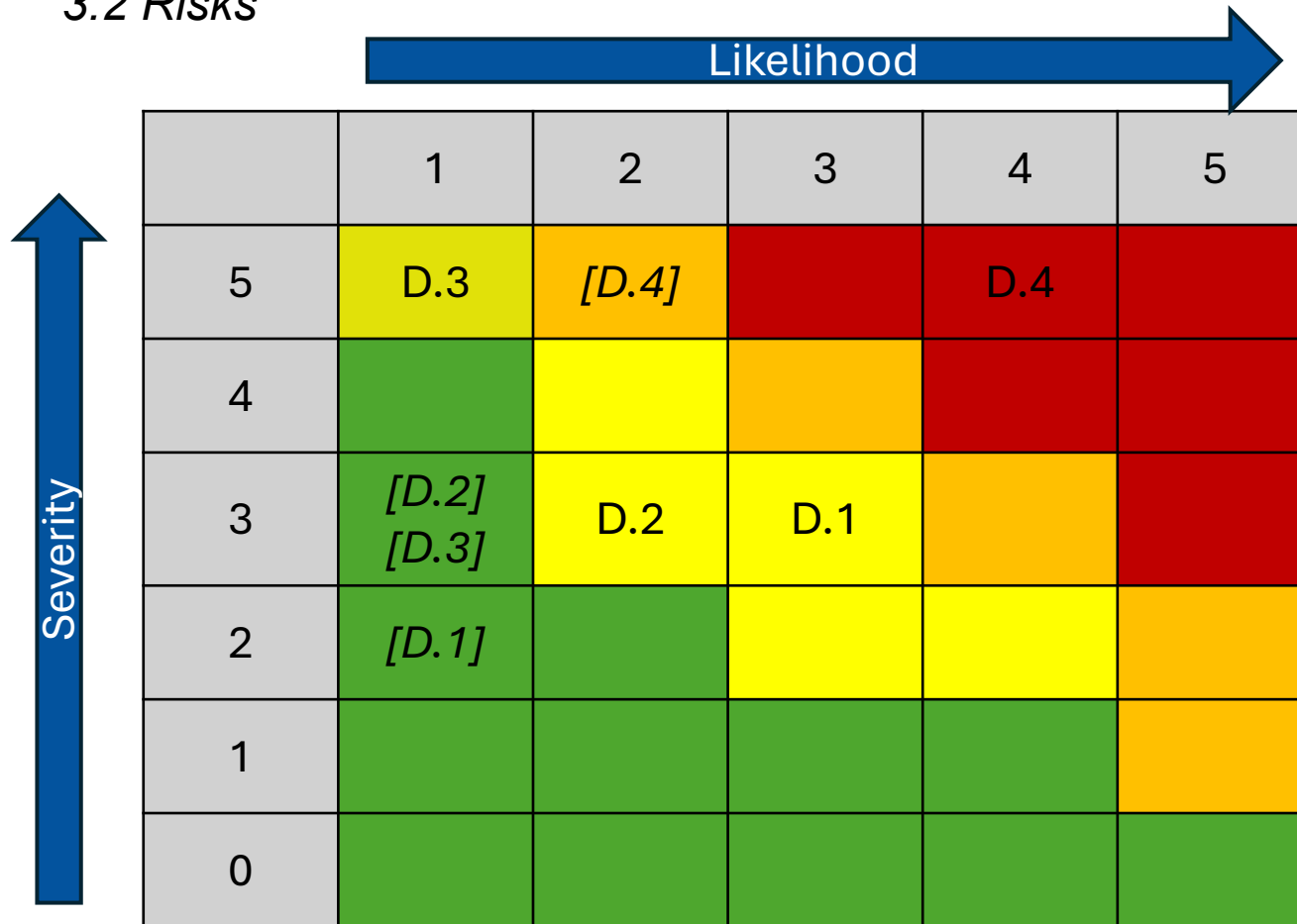
CFD Results for 300 K & 0.001 kg/s



Surface Plot of Reaction Rate based on CFD

# CORK Mitigated Primary Design Risks

## 3.2 Risks



X.X = Before Mitigation Measures  
[X.X] = After Mitigation Measures

ID	Hazard Description	Mitigation Measures
D.1	Pressure-holding components fail (Tank / Feed System)	Tubes and Tank <b>Thickness Required for pressure will be calculated.</b> <b>Relief Valves</b> will be designed into the fluid system.
D.2	Data Acquisition and Control Loses Power or Gets Disconnected while pressure is in system	Fluids System will be <b>designed to be in a safe state</b> when power is cutoff.
D.3	System damages client system mechanically	<b>Simulations of the loads applied</b> will be conducted to ensure the client system will not be damaged.
D.4	Catalyst Reaction causes over-pressurization and over-heating to damage client and CORK system	<b>CFD Simulations</b> of the Catalyst reaction shows it is <b>possible to omit reaction at high flow rate and reduced entry temperature of propellant.</b>

# CORK's Next Step Considerations

## 4.3 Biggest Challenges

### 1. Catalyst Reaction

- Flowing over a catalyst would allow servicing of the most common thruster type
- CFD Analysis done to prove feasibility but need further expert guidance

### 2. Sealing of Various Nozzle Shapes

- The scalability of the design allows for the mission to service multiple types of satellites but causes load variance
- Further structural analysis is needed to confirm strength in thrusters smaller than the MONARC 22-12LT+HT

### 3. Microgravity and Space Fluid Mechanics

- Pressure-driven systems would allow backflow due to no components to relief the downstream pressure
- Backflowing through components not designed for backflow need to be tested for leaks

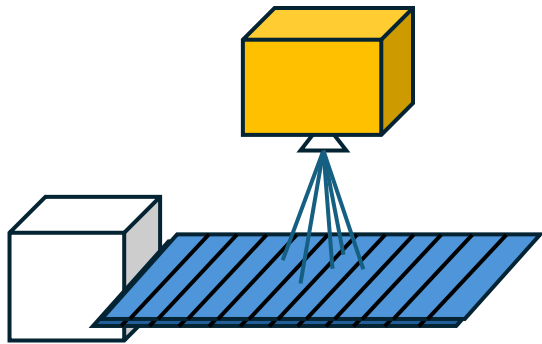
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# Design History: Alternative Concepts

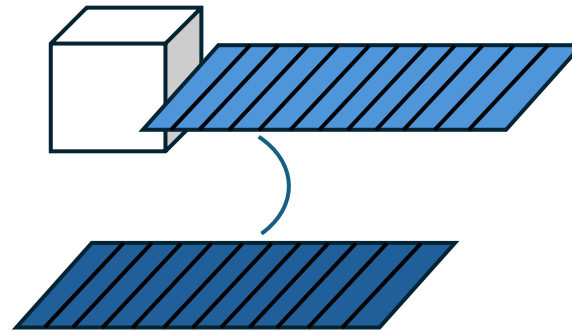
## 4.1 Innovative Concepts

### Spray-On



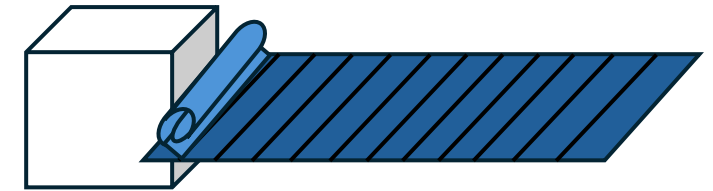
A layer of perovskites is sprayed on creating a new solar panel layer. Tested on ISS  
*Alanazi, 2023*

### Replace Solar Panel



Completely replace the solar panel. Has been performed on ISS  
*Spence, 2018*

### Roll Over



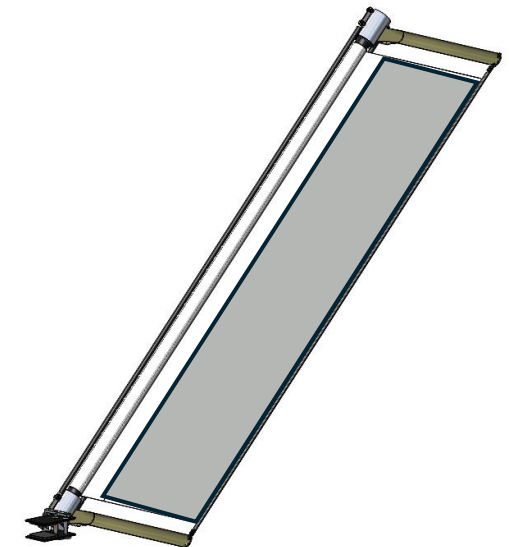
Roll over a new solar panel over the previous.  
Demonstrated on DART mission  
*Talbert, 2021*

# Design History: Mechanism Trade Studies

## 3.4 Trade Studies

### Replacement Methods

Factors	Weight	Scale	Roll Over	Concentrator	Replace	Spray On
Design Complexity	20%	5	4.00	5.00	2.00	2.00
Alters Moment of Inertia	15%	5	3.00	4.00	5.00	5.00
Installation Complexity	30%	5	3.00	4.00	1.00	3.00
Adaptability	30%	5	3.00	3.00	1.00	4.00
Ease of future servicing	5%	5	3.00	1.00	5.00	3.00
<b>Total</b>	<b>100%</b>		<b>64%</b>	<b>75%</b>	<b>40%</b>	<b>68%</b>

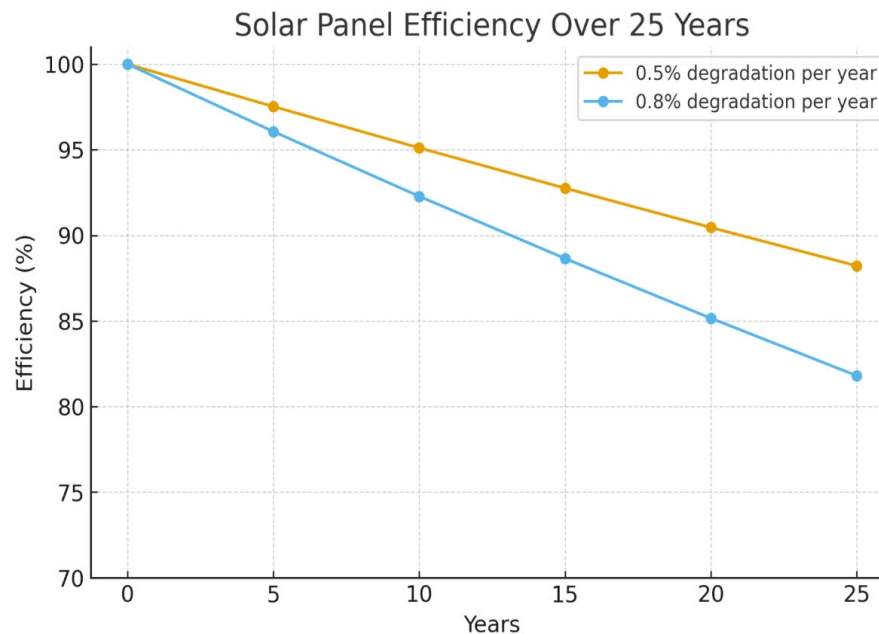


**SPARK**

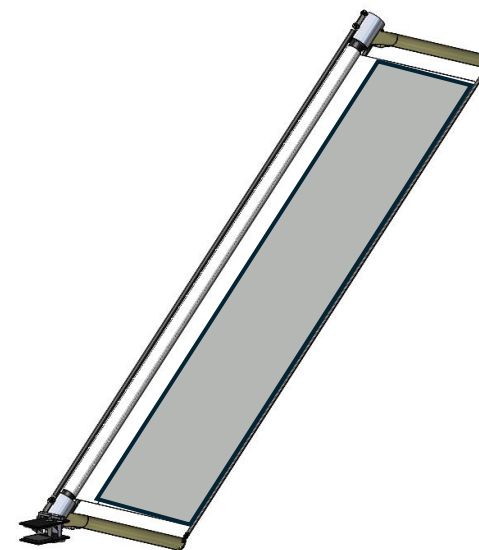
# Impact to Current and Future Missions

## 3.1 Impact

- Revitalize degraded solar panels by 10% of their original capability (from 90% to 100%)
- Compatible with **current & future GEO satellites**
- Designed to be easily modified to **service different sized solar panels**
- Improves performance **without the need for electrical connections**



Solar Panel Degradation Study  
Green World Energy. (n.d.)



SPARK

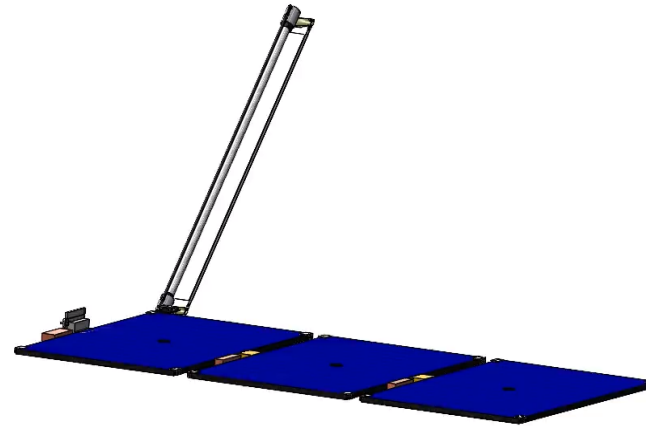
# SPARK Requirements

## 3.1 Completion of Required Elements

ID	Description	Met
R1.1	SPARK shall <b>reflect an additional 11% of light</b> from the sun onto the solar panels	Yes
R1.2	SPARK shall <b>increase station keeping burn time</b> within 5%	Future Work
R1.3	SPARK shall not break client solar arrays during maneuvers	Future Work
R1.4	SPARK shall mount to <b>not damage client solar cells</b>	Future Work
R1.5	SPARK shall <b>fit within stowage dimensions</b> of ESPA Star Payload bay	Yes
R1.6	SPARK shall be operational within ESPA stars Power <b>capabilities of 200W</b>	Yes
R1.7	SPARK shall mass <b>less than 320kg</b>	Yes

# SPARK Operation: Deployment

## 2.1 Animation



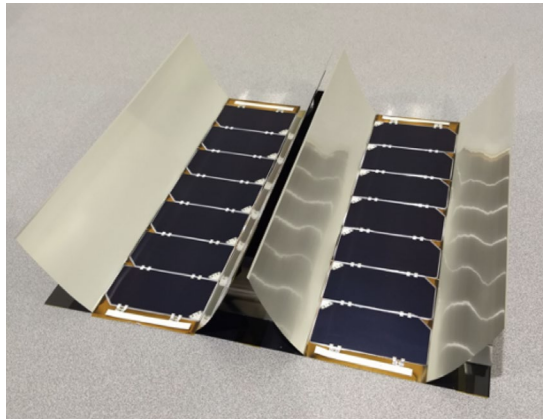
## SPARK Reflector Deployment

# SPARK Innovation

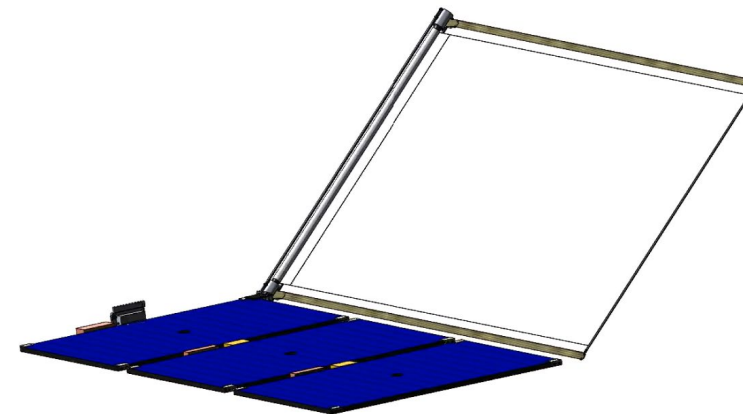
## 1.3 Innovation

Adding a reflector **post-launch** is the **core innovation** of this project:

- A similar concept was tested on DART mission through **Extreme Environment Solar Power (EERP)** (*small-scale demonstration*)
- **SPARK advances this concept** by enabling **deployment after GEO launch, without integration** into individual solar cells



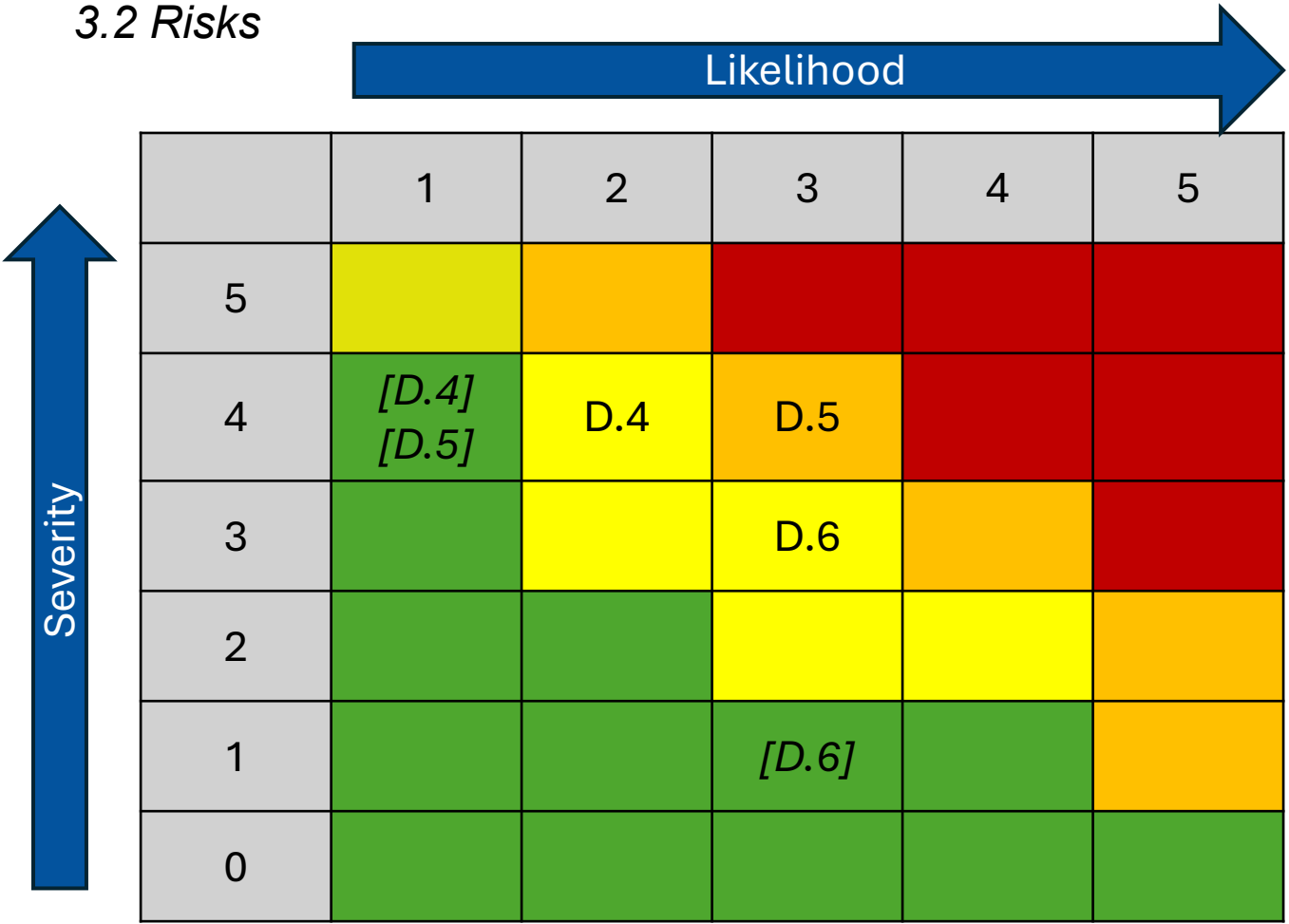
Extreme Environments Solar  
Power (EERP) Project on DART  
NASA, 2020



SPARK design

# SPARK Mitigated Primary Design Risks

## 3.2 Risks



X.X = Before Mitigation Measures  
[X.X] = After Mitigation Measures

ID	Hazard Description	Mitigation Measures
D.4	Panel Clamp Damaging Client	<b>Force exerted by SPARK can be calculated and controlled</b> by motor. <b>Surface area has been increased and pads applied</b> to distribute any unexpected forces .
D.5	Uneven deployment of deployment system causing structural damage	Both deployment system <b>relies on same motor driven system</b> to ensure even deployment.
D.6	Reflector Film Ripping/Tearing during due to manufacturing tolerances	Will <b>implement a carbon fiber cross-hatching protector</b> on the back of the reflective film.

# SPARK's Next Step Considerations

## 4.3 Biggest Challenges

- 1. Incident angle efficiency losses** as satellite and earth orbits change solar incident angles off of reflector
  - Use TLE propagation and NASA SPICE data to model sun-spacecraft geometry
  - Optimize reflector angle relative to panel dimensions and sun vector
- 2. Reflector material issues**
  - Evaluate ionization effects and wavelength-dependent photon absorption losses
  - Improve beyond aluminized Mylar to better match GaAs absorption spectrum
- 3. Heat Degradation from increased sunlight** and Oxidation Losses
  - Study increased solar flux effects on GaAs degradation and outgassing contamination
  - Analyze thermal loading and long-term oxidation impacts on the reflector

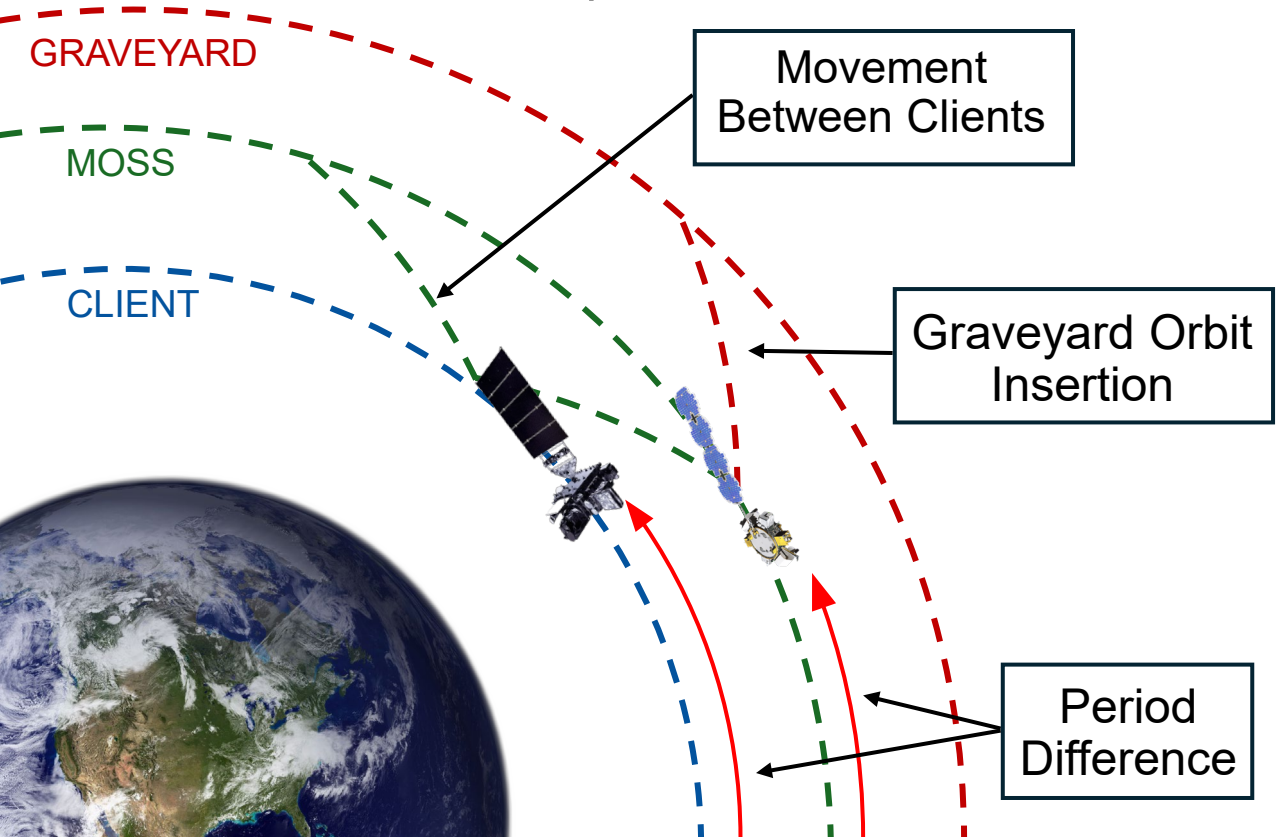
# Agenda

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- MOSS System**
  - Integration
  - Feasibility
  - Milestones
- Summary

# MOSS Integration: Mass & Propellant Budget

## 3.1 Completion of Required Elements

- Falcon Heavy payload Direct to GEO ~ 6000 kg SpaceX, [17]
  - Can Launch up to 4 MOSS missions to GEO



Use Case	Prop Mass
Movement between Clients	9 kg
Graveyard Orbit Insertion	8 kg
Left for Refueling	690 kg
Prop Capacity of GOES-P	1128 kg



System	Mass
ESPAStar-D (dry)	~ 450 kg
Propellant Capacity	~ 710 kg
CORK	< 100 kg
SPARK	< 80 kg
	<b>1340 kg</b>

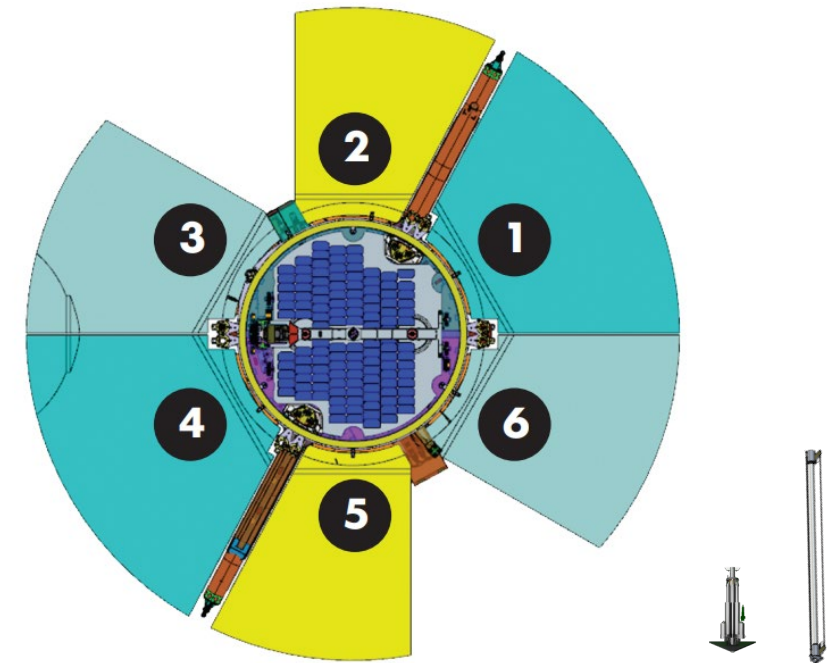
# MOSS Integration: Power & Volume Budget

## 3.1 Completion of Required Elements

- Uses two payload bays to maximize packing capability
  - ~ 0.55 m<sup>3</sup> per port
- CORK Volume = 0.00057 m<sup>3</sup>
- SPARK Volume = 0.0025 m<sup>3</sup>

### Power Consumption of MOSS

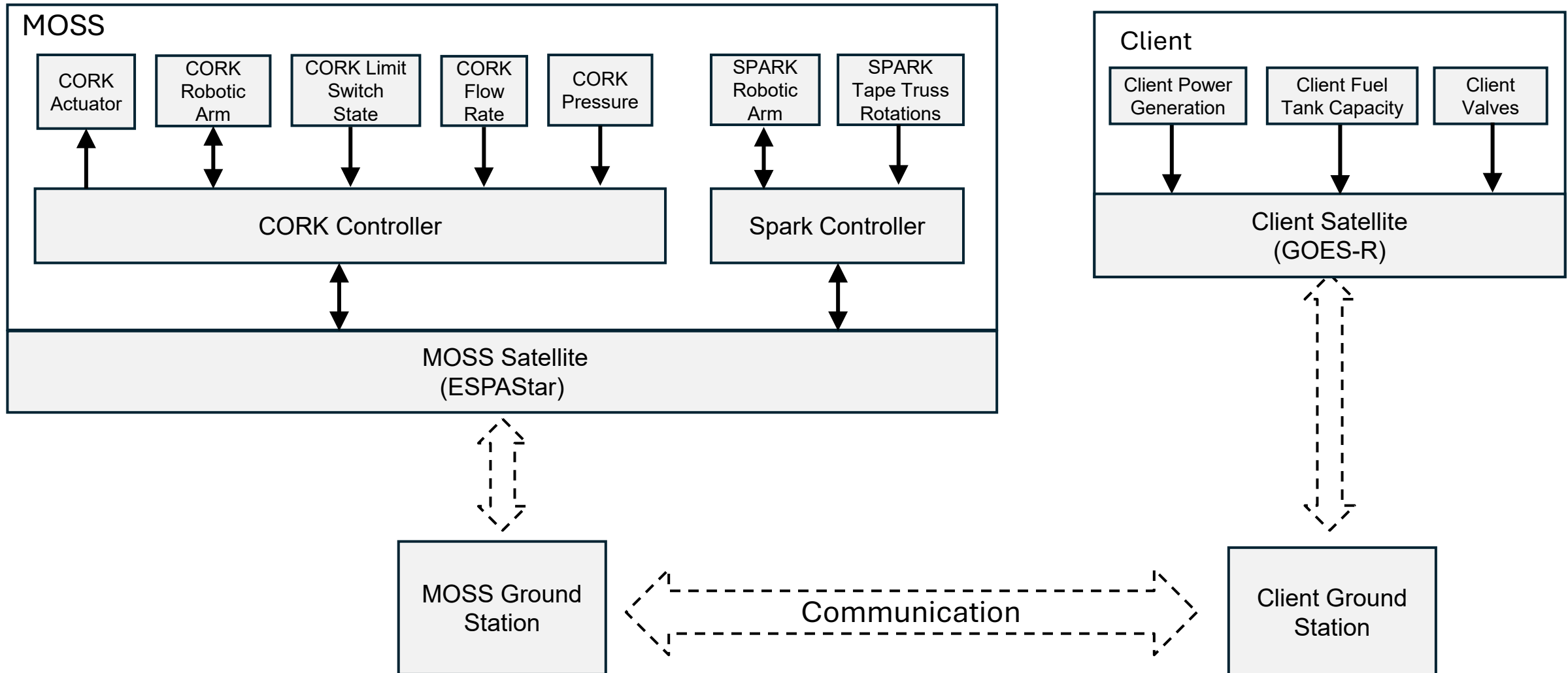
System	Max Power
CORK	< 500 W
SPARK	< 300 W
Available from ESPASStar	1200 W



ESPASStar Payload Area with CORK and SPARK to Scale.  
Northrop Grumman [5]

# MOSS Integration: Data Flow

## 3.3 Data Handling and Communications

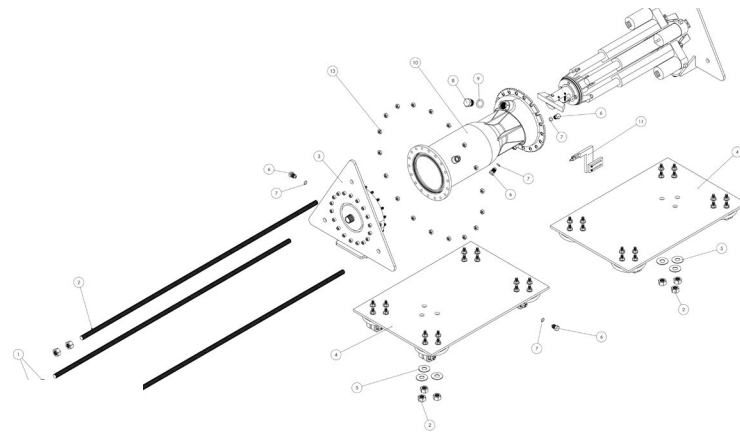


# MOSS Feasibility: Manufacturing

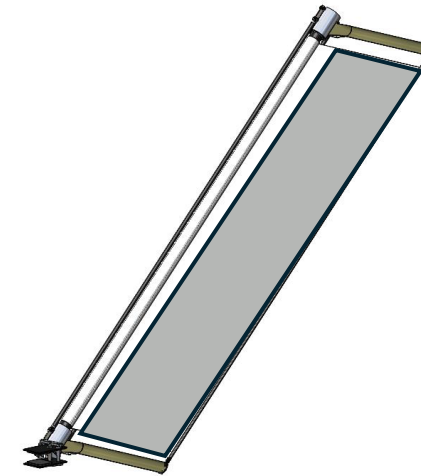
## 1.3 Feasibility of Proposed Mission

Item Number	Item Name	Part Number	Qty.
1	1/2-20 Nut	2732-104-11-00	15
2	1/2-20x36 Allthread	2732-104-04-02	3
3	Inector Emulator Subassembly	1010-104-32-02	1
4	Roller Cart Subassembly	1010-104-34-00	2
5	1/2 ID Washer	2784-104-02-00	6
6	-04 AN Fitting Plug	2164-104-03-01	4
7	-011 O Ring	2767-104-06-00	4
8	-08 AN Fitting Plug	2164-104-02-01	1
9	-209 O Ring	2767-104-07-00	1
10	Janus R Combustion Chamber	9999-104-01-00	1
11	Retraction Sensor Subassembly	1010-104-35-00	1
12	CORK Structure Subassembly	1010-104-36-03	1
13	1/4-20 Nut	2774-104-01-01	18

CORK Bill of Materials



CORK Prototype CAD Model



SPARK  
CAD Model



Space Truss by  
MMA Space [18]



Aluminized Film by  
Squid3 Space [19]

### Manufacturing and Testing Possible in 5 Years or Less

- Design takes acquisition of parts into consideration. All parts available
- Manufacturability ease was considered in our trade study decisions
- CAD models created for both CORK and SPARK to part level detail

# MOSS Feasibility: Technology Gap

## 4.2 Tech. Gap Assessment

1. **Experimental data on cooling the catalyst to slow reaction time (TRL 3)**
  - Operation is feasible, based on CFD analysis at low temperatures and high mass flow rate,
  - Test data is needed to verify simulations
2. **Specific Composite Layup Design for Tape Truss (TRL 6)**
  - Require a unique specific layup fabric orientation and radius for different lengths
3. **Clamp Mechanism to be Fabricated and Tested (TRL 6)**
  - Prototype needs to be tested to ensure minimal damage and proper connection

# MOSS Feasibility: Mission Cost

## 3.3 Feasibility of Proposed Mission

### Cost Savings Justify Mission Advancement

- ❑ Cost is \$245.15 Million - FY 2026
  - \$81.81 Million per Unit
  - \$150 Million Launch Cost for Falcon Heavy (CLRN, 2025)
  
- ❑ Used NASA's Advanced Mission Cost Model (NASA, 2015)
  - Parametric Cost Equation/Cost Estimating Relationship
  - Specification used from GOES-P includes:
    - I. Production
    - II. Integration
    - III. Launch costs.

### MOSS Cost Calculations

Parameter	Value
$\alpha$	5.65E-04
$\beta$	0.5941
$\Xi$	0.6604
$\delta$	80.599
$\varepsilon$	3.8085E-55
$\phi$	-0.3553
$\gamma$	1.5691

Advanced Mission Cost Model Equation:

$$C = \alpha Q^\beta M^\Xi \delta^S \varepsilon^{\frac{1}{(IOC-1900)}} B^\phi \gamma^D$$

	Value	Justification
Quantity $Q$	1	Accounting for ESPAstar, CORK, and SPARK to be one unit
Mass $M$ (lbs.)	2948	Mass of all systems combined
Specification $S$	1.9993	Specification anchored from GOES-P mission
Initial Operational Capability $IOC$	2031	Estimated operations start in 2031
Block $B$	1	New design to be tested
Difficulty $D$	-1.75	GEO missions are well practiced, and MOSS has reduced difficulty due to less complicated instruments

$C = \$81.81$  Million (FY 2026) One Module

$C = \$245.15$  Million (FY 2026) One Module w/Launch Cost

# MOSS Feasibility: Mission Cost Comparison

## 3.3 Feasibility of Proposed Mission

### Cost Savings Justify Mission Advancement

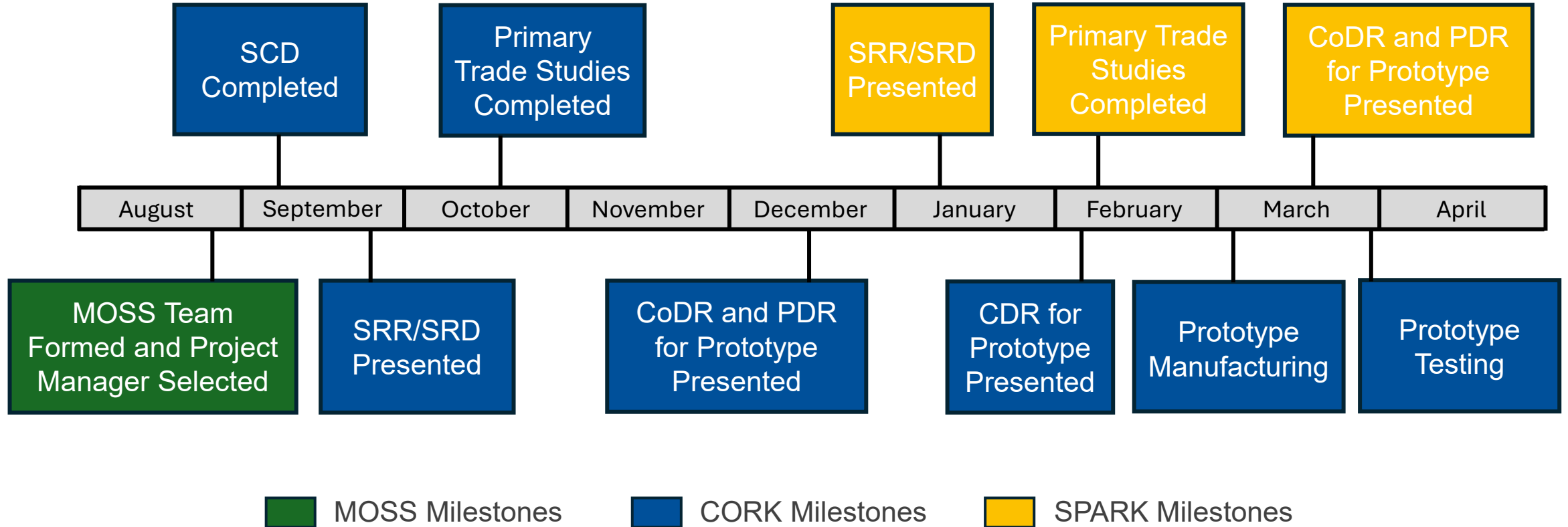
☐ Main Cost Savers:

- Cost of GOES-P was \$190.9 million in 1999 for production, integration, and launch costs. Forecast International [22], (Boeing 601,2009)
- Significantly reduced mass (3238 kg vs 1340kg)
- Reduced Difficulty, less complex instruments (GOES-P Imager [23], Sounder, X-Ray Imager vs CORK + SPARK components)

Financial Year	GOES Replacement (\$Millions)	CORK + SPARK Solution (\$Millions)
FY 1999	\$190.9	
FY 2026	\$373.63	\$245.15
	Total Saved (FY 2026)	\$128.48

# Major Milestones

## 2.4 Program Management Milestones



# Final Summary

## 1.4 Advancing High-Value Missions

- ❑ MOSS Servicing will include:
  - On-Orbit Refueling Kit (CORK) – Rank 5
  - Solar Panel Augmentation Kit (SPARK) – Rank 10
- ❑ CORK will:
  - Backflow propellant through satellite thruster to refuel
  - Service any GEO satellites with hydrazine thruster
  - Servicing design has never been done before
- ❑ SPARK will:
  - Add reflector to increase solar flux on degrading satellites
  - Service any GEO satellite
  - Similar design has been proposed but never fully designed and implemented

# Future Work (MOSS's Path to PDR)

## 2.3 Path to Preliminary Design Review (PDR)

- ❑ Finalize client and platform-specialized design inputs
- ❑ CORK
  - Complete catalyst analysis
  - Perform space environment & Dynamics simulations
- ❑ SPARK
  - Develop and test deployment mechanisms (clamp & rollout)
  - Design compact stowage system
  - Mature composite tape truss manufacturing
  - Refine critical material properties (foil reflectivity)
- ❑ Deliver full-scope Preliminary Design Review (PDR)

# MOSS Paper

## 5.2 Paper

### C3 Final Showcase Report

Paytn Barnette, Paul Brich, Chanel Davis, Connor Hall, Brendan King,

Bruce Noble, Parker Scribner, and Lawrence Tolentino

*Embry-Riddle Aeronautical University, Prescott, AZ, USA*

The Mission for Orbital Servicing and Support (MOSS) is a satellite servicing architecture developed to extend the operational lifetime and capability of geostationary orbit (GEO) spacecrafts. MOSS integrates two servicing payloads, the Core Orbital Refueling Kit (CORK) and the Solar Panel Augmentation Reflector Kit (SPARK), to address the primary drivers of satellite end-of-life: propellant depletion and power degradation. CORK enables on-orbit refueling by backflowing propellant through existing engine nozzles without requiring pre-installed servicing interfaces. SPARK increases solar panel performance by redirecting additional sunlight onto degraded arrays. The system operates as a hosted payload on the ESPASStar platform and performs autonomous docking, fluid transfer, and deployable power augmentation. System architecture, concept of operations, and subsystem-level analyses demonstrate feasibility through structural validation, fluid-system design, and autonomous-control implementation. Cost analysis indicates that MOSS provides significant savings compared to full satellite replacement by targeting only depleted subsystems. This work presents a scalable, non-invasive approach to sustain high-value GEO assets and reduce the economic burden of satellite replacement.

Abstract Length	Paper Length	Number of References
115	20	12

- Detailed report on various components of the MOSS design
- Planned participation in AIAA SciTech 2027

# Acknowledgements

- Dr. Siwei Fan, Dr. Matthew Haslam
- Rob Britts – Skyway Organization
- Embry-Riddle Aeronautical University and the College of Engineering
- COSMIC C3 Organizers
- Jacob Rome
- Trey Quiller and MMA Design

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COSMIC Capstone Challenge (Track 3): Final Briefing, April-13-2026

# Mission for On-Orbit Service and Support (MOSS)

Students: Paytn Barnette, Paul Brich, Chanel Davis, Connor Hall,  
Brendan King, Parker Scribner, Lawrence Tolentino

Advisors: Dr. Siwei Fan, Dr. Matthew Haslam

Mentor: Rob Britts – Skyway Organization

**Department of Aerospace Engineering, Embry-Riddle Aeronautical University, Prescott**



**EMBRY-RIDDLE**  
Aeronautical University

100 YEARS | 1926-2026

# Appendix

# Sensors and Hardware Needed for RPOD Operations

- Rendezvous Proximity Operations
  - Northrop MEV (Mission Extension Vehicle) VSS (Visual Sensor Suite)
    - 6 Cameras at various focal lengths
  - RVS 3000-X (LiDAR sensor suite)
    - Designed for non-cooperative and cooperative satellite docking
    - Extensive heritage
  - Sierra Space External Spacecraft LED lighting



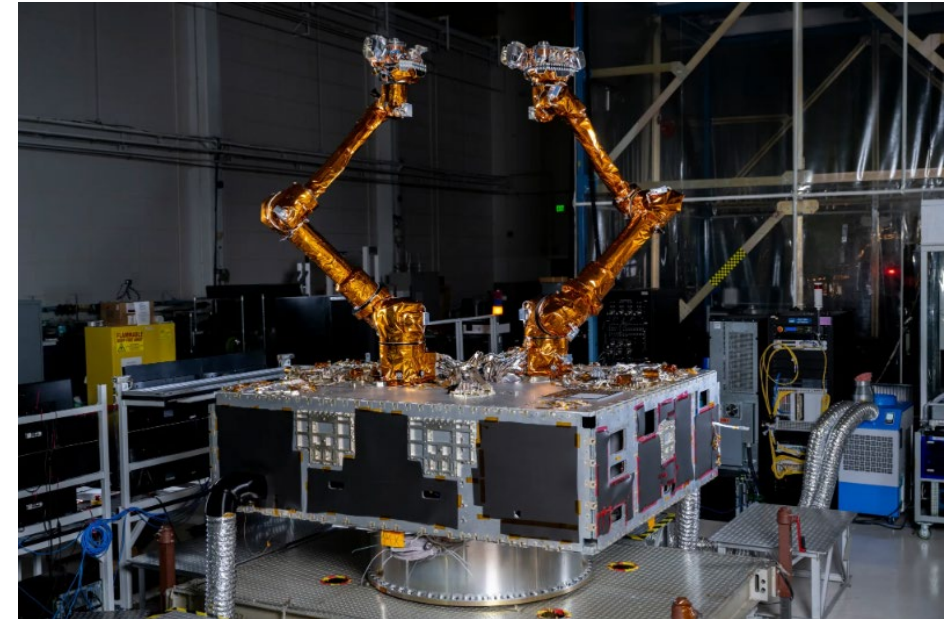
VSS



RVS 3000

# Necessary Robotic Fidelity

- DARPA Robotic Servicing of Geosynchronous Satellites (RSGS)
  - 2 robotic arms
    - 1 dedicated to CORK
    - 1 dedicated to SPARK
  - TRL Level 6
  - Robotic arms are modular
  - Ease of integration

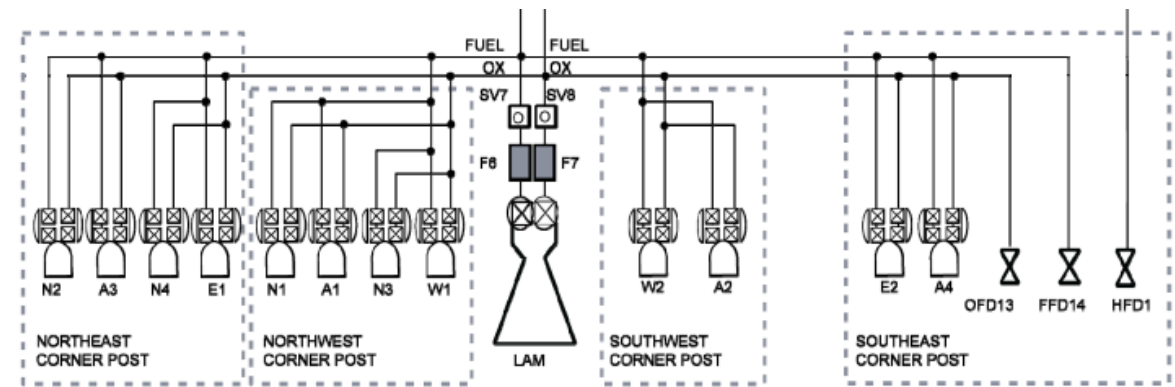
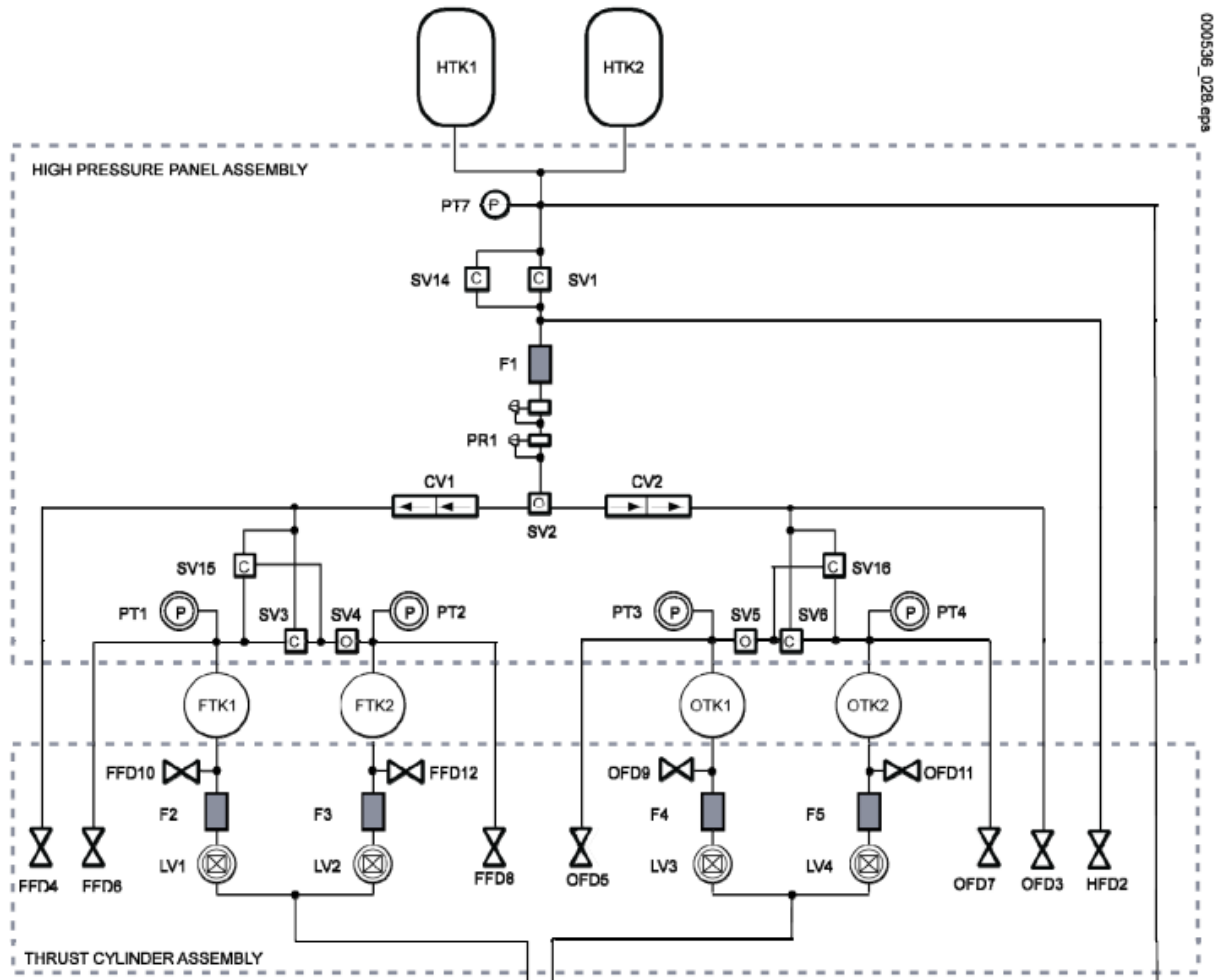


DARPA RSGS

# CFD Model Details

Grid Resolution	Numerical Methods
Number of Nodes: 186174	Energy Model
Number of Cells: 58838	Species Transport Model
Convergence Criteria	Multiphase (Eulerian) Model
Residuals below 10e-3	Heat of Surface Reactions
Boundary Conditions	Scalable Transport Model
Mass Flow Inlet	Wall Surface Reactions
Wall (Thruster Wall and Pellets)	Pressure-based Solver
Pressure Outlet	Production Limiter

# Plumbing and Instrument Diagram of GOES-P



**LEGEND**

- FILL AND DRAIN VALVE
- DUAL SEAT SOLENOID VALVE
- 2 LBF THRUSTER
- NORMALLY CLOSED SQUIB VALVE
- FILTER
- LOW PRESSURE TRANSDUCER
- NORMALLY OPEN SQUIB VALVE
- CHECK VALVE
- HIGH PRESSURE TRANSDUCER
- SINGLE SEAT SOLENOID VALVE
- DUAL SERIES REDUNDANT REGULATOR

**Figure 12-1. GOES-NOP Propulsion Subsystem**

# Additional Research/Analysis in Paper

## 5.2 Paper

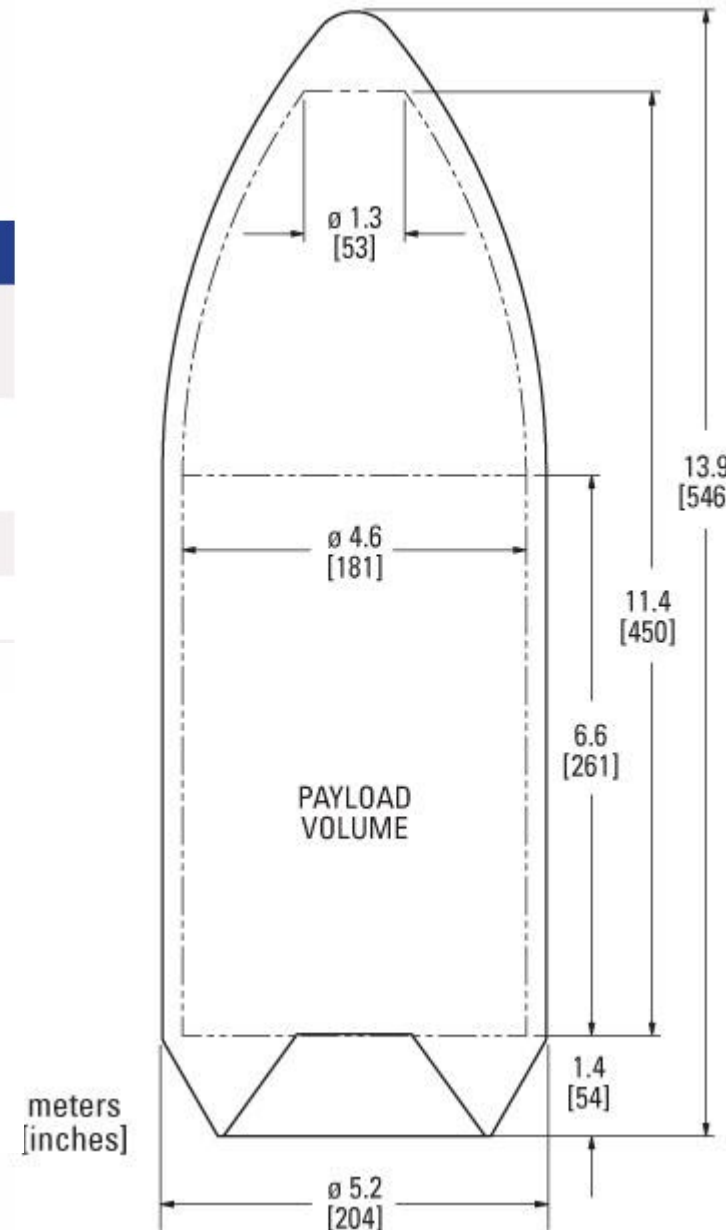
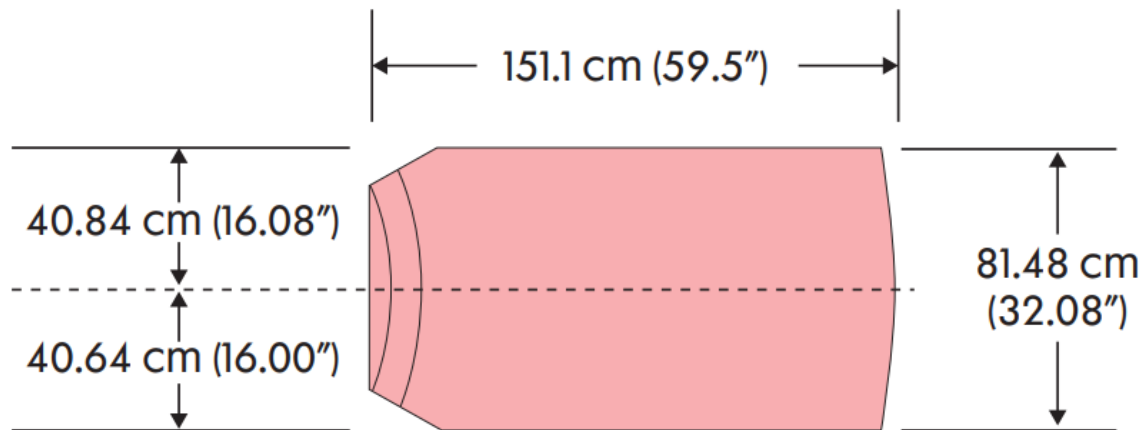
Our paper contains more in-depth information for topics such as:

- CORK subsystem requirements
- Details and analytical work on CORK prototype
  - Finite Element Analysis
  - Computational Fluid Dynamics
- Details on SPARK subsystem requirements

# Falcon Heavy Payload

## SPECIFICATIONS

<b>ORBIT</b>	Optimized for GEO, adaptable for LEO and MEO missions
<b>TARGETED MISSION DURATION</b>	One to three years, single string
<b>DRY MASS (NO P/LS)</b>	430-470 kg, (orbit dependent)
<b>DIMENSIONS (NO P/LS)</b>	157.5 cm dia x 61 cm ht. (62" dia. x 24" ht.)



# MOSS Feasibility: Mission Cost

## 3.3 Feasibility of Proposed Mission

### Cost Savings Justify Mission Advancement

- ❑ Cost is \$245.15 Million - FY 2026
  - \$81.81 Million per Unit
  - \$150 Million Launch Cost for Falcon Heavy (CLRN 2025)
  
- ❑ Used NASA's Advanced Mission Cost Model (NASA 2015)
  - Parametric Cost Equation/Cost Estimating Relationship
  - Specification used from GOES-P includes:
    - I. Production
    - II. Integration
    - III. Launch costs.

Advanced Mission Cost Model Equation:

$$C = \alpha Q^\beta M^\epsilon \delta^s \epsilon^{\frac{1}{(IOC-1900)}} B \phi \gamma^D$$



# SPARK Challenges

## 2.2 Storyboard

