CUBESAT TRADE-OFF:
THE ARGOMOON CASE

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ARGOTEC COMPANY OVERVIEW

Personnel

Workforce comprised of scientists and engineers with average age of 29
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Mission Overview

- **T₀**: deployment
  Closure of the separation switches: power to the system

- **Launch 2019**
  Launch on the new SLS NASA rocket during EM-1
  Mission along a Translunar trajectory

- **T₀ + 15 sec**
  ATITUDE reconstruction

- **T₀ + 1 min**
  ICPS Targeted: Tracking Mode

- **Pointing Cameras towards ICPS**

- **T₀ + 6 months**
  Natural decay into Earth atmosphere

- **6 different Moon Flybys**

- **T₀ + 8 hr**
  Burn to enter a Geocentric orbit to take pictures of Earth and the Moon and validate the on-board technology

- **T₀ + 5 min**
  PS operational:
  Relative dynamic maneuvers
  100m-500m proximity flight

- **T₀ + 2 min**
  SPA deployment

- **1st picture possible**
## CUBESAT TRADE-OFF: THE ARGOMOON CASE

### ArgoMoon Main Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Orbit:</strong></td>
<td>10,000-450,000 km</td>
</tr>
<tr>
<td><strong>Mass:</strong></td>
<td>14 kg</td>
</tr>
<tr>
<td><strong>Volume:</strong></td>
<td>366 mm x 239 mm x 116.2 mm (stowed)</td>
</tr>
<tr>
<td></td>
<td>911.5 mm x 366 mm x 239 mm (deployed)</td>
</tr>
<tr>
<td><strong>Generated Power:</strong></td>
<td>80 W</td>
</tr>
<tr>
<td><strong>Storage Memory:</strong></td>
<td>16 GB</td>
</tr>
<tr>
<td><strong>Downlink Band:</strong></td>
<td>X-band</td>
</tr>
<tr>
<td><strong>Downlink Data rate:</strong></td>
<td>256 kbps</td>
</tr>
<tr>
<td><strong>Lifetime:</strong></td>
<td>6 months (baseline)</td>
</tr>
<tr>
<td><strong>Propulsion:</strong></td>
<td>ADN (primary propulsion), Cold Gas (secondary propulsion)</td>
</tr>
<tr>
<td><strong>Payloads:</strong></td>
<td>40° field of view camera, 2.5° field of view camera, Rangefinder</td>
</tr>
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ArgoMoon SubSystems

- Payload1
- Payload2
- Radio
- Structures
- Attitude Determination & Control (ADCS)
- Propulsion (PS)
- Battery
- On-Board Computer
- EPS
- Structures
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ArgoMoon SubSystems

EPS Boards 0.6 U - 0.8 kg
- Voltage range: 15V÷50V
- Output power: up to 80W (3.3V, 5V, 12V Bus)
- LCL circuits to ensure SEL mitigation
- MPPT & Battery charging capability

OBC&DH 0.5U - 0.6 kg
- Dual-core SPARC V8 CPU
- 20 Mbit EEPROM with EDAC
- 16 GB NAND Flash (+1000 photos)
- Integrated FPGA

Designed by Argotec to allow:
- Scalability and Flexibility
- Military grade Reliability
- 20 Krad Rad-Hardness
- High Performance
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ArgoMoon SubSystems

**Payload optics 1.5 U – 1.2 kg**
- Narrow and wide Field of View Cameras
- High resolution from long and short distance
- Imaging up to 1+ Km and searching until 500 m

**Micro Engine 1 U – 1.8 kg**
- High performance main thruster – 190s -0.1 N
- Integrated cold Gas RCS system
- ADCS integrated commands

**Battery 0.7 U – 0.9 kg**
- 130 Wh power capacity
- High power density Space grade cells
- Double string fault tolerant design
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ArgoMoon SubSystems

**Range Finder 0.01 U – 0.01 kg**
- Miniaturized design
- COTS and reliable components
- Space qualified by Argotec

**Radio 0.5 U – 1.2 kg**
- JPL designed for Deep Space communication
- DSN ranging and communication compatible
- High link stability

**ADCS 0.5 U – 0.8 kg**
- High fidelity Sun Sensor
- 3 Reaction Wheel integrated design
- Software integrated with Engine and OBC
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ArgoMoon SubSystems

On Board Software

- Satellite subsystems management
- On-board time scheduling
- Memory management
- Operative modes
- Housekeeping
- TMTC
- FDIR
- Image recognition
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Conclusions

- Current Status: Ground Model TRB/ PFM Production
- High Performances
- Reliable and Robust Design
- Radiation Hardness
- Tracking and Navigation Algorithm
- 6U, 14 kg
- Compliant with ECSS and NASA Requirements
- From Concept to PFM delivery in 2 years
- Deep Space Platform for Science & Exploration