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CleanCube: a Zero Debris CubeSat Platform by ISISPACE

Clean Space Days 2026

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Consortium



Customer



Prime

Subcontractor

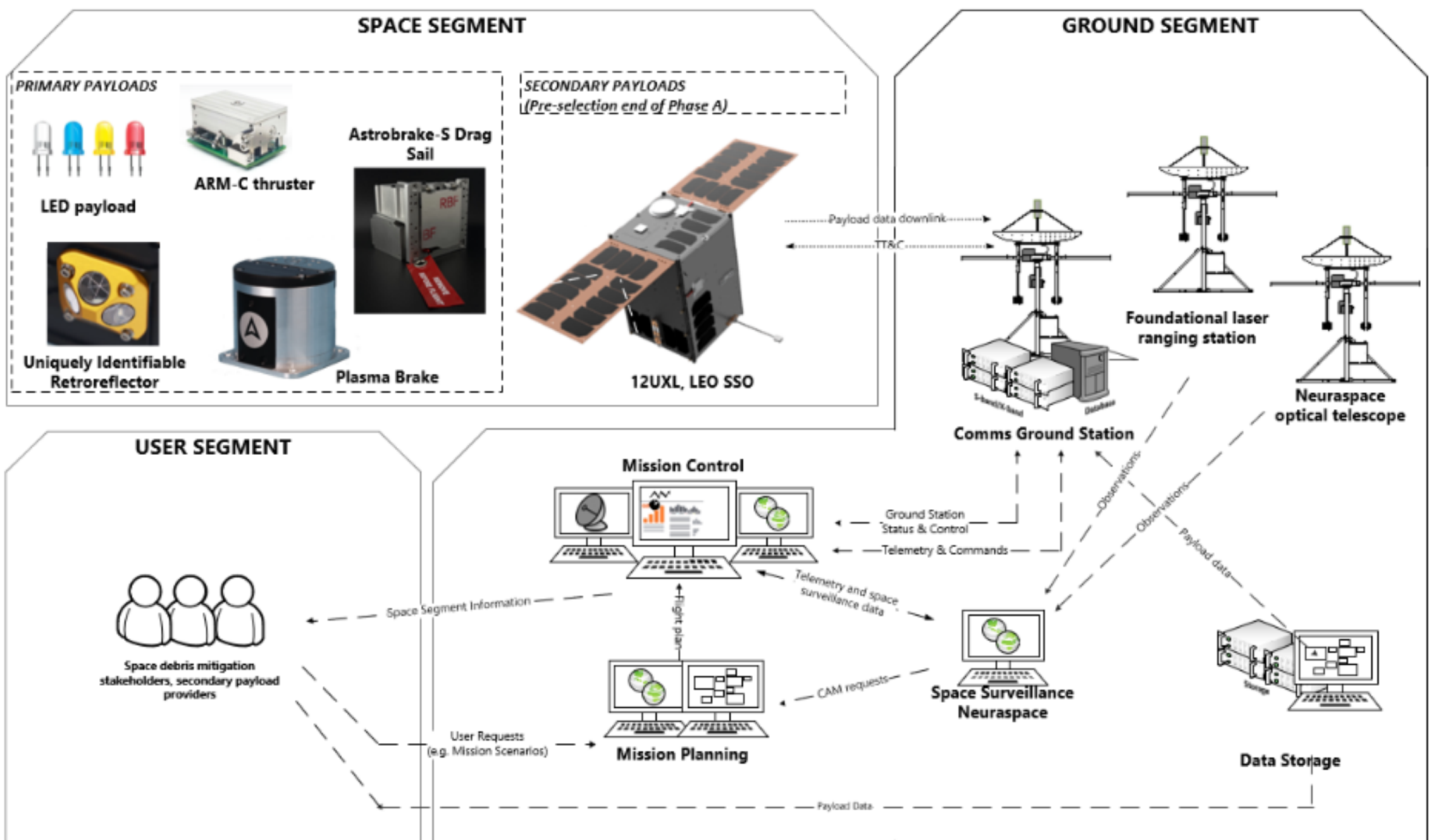


Key Suppliers



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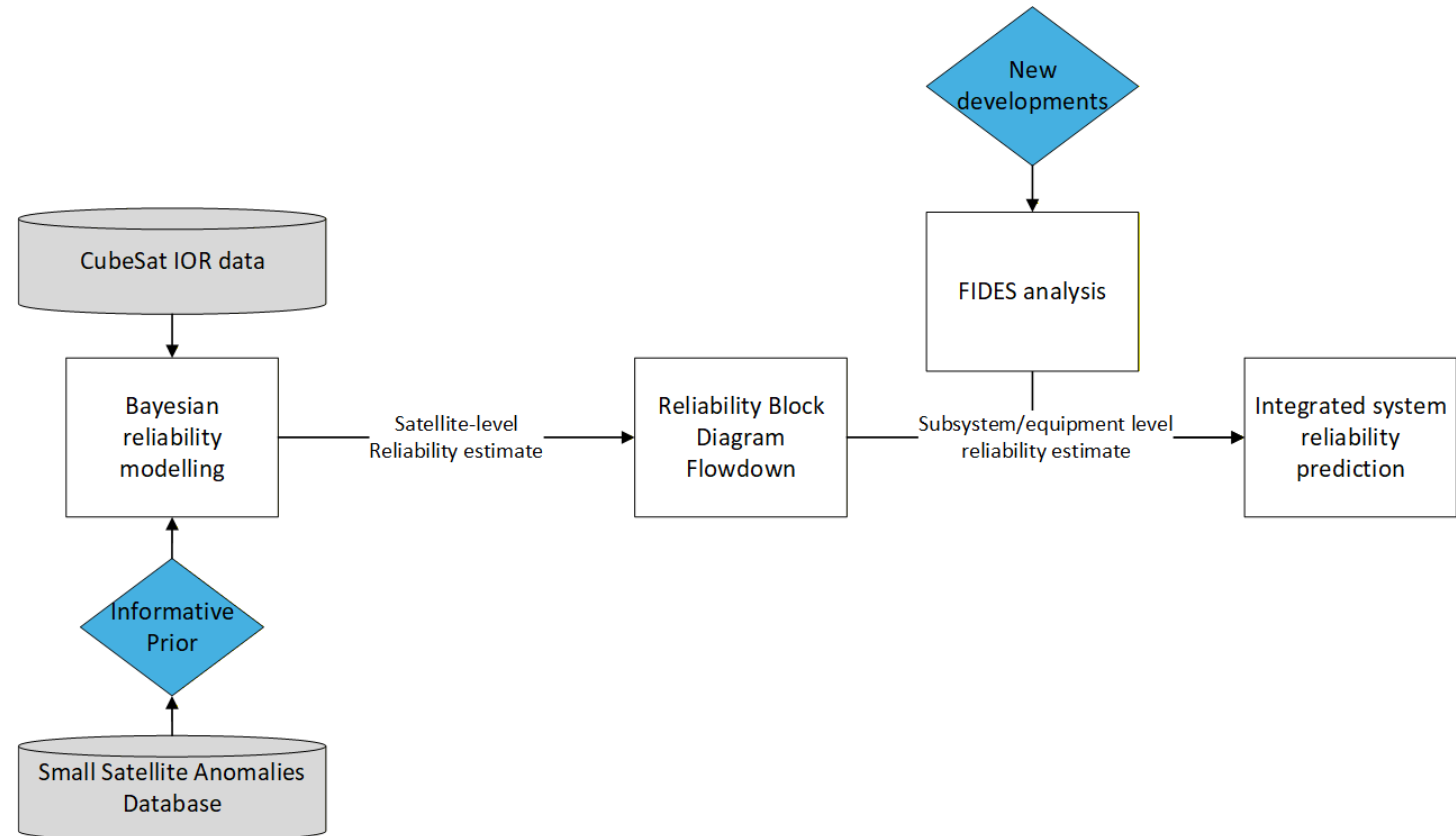


Objective: mission that is compliant to current and future foreseen Space Debris Mitigation requirements

Reliability

Objective: demonstrate high reliability figures for passivation, disposal and collision avoidance

- Reliability is calculated using heritage statistics + FIDES
- ISISPACE next generation fault tolerant avionics is used on CleanCube (Astrocore)

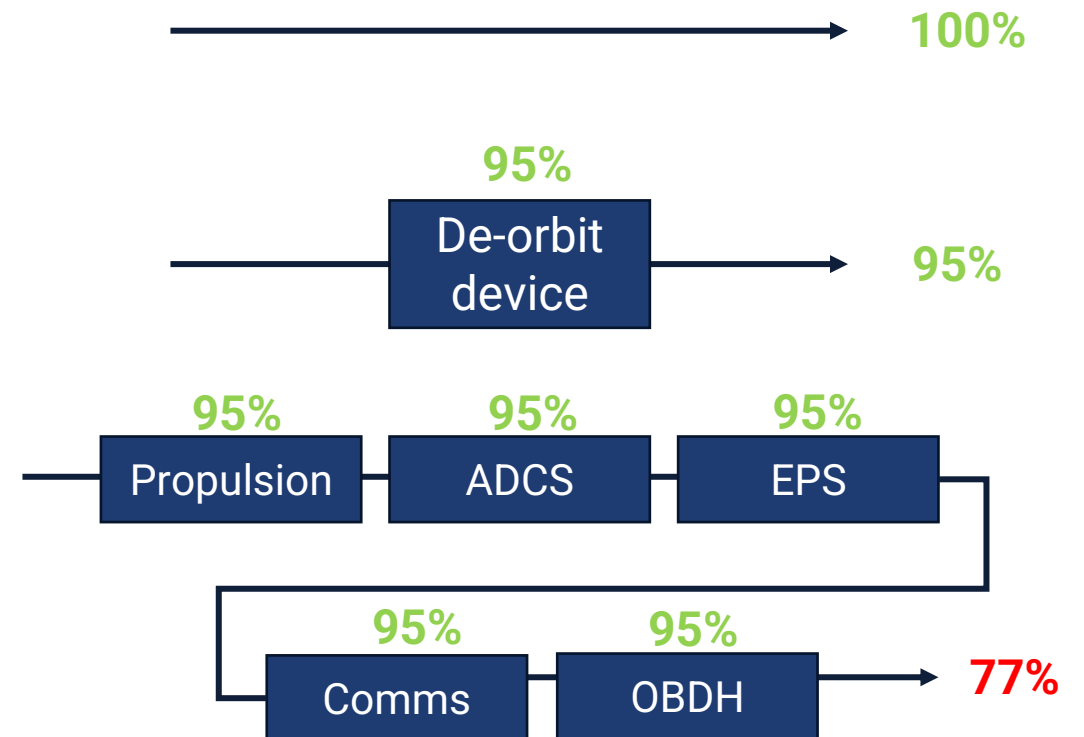


End-of-Life disposal

Objective: de-orbit within 5 years after the end-of-life with 90% probability of success, on the road to >95%

Three main options are considered:

1. **Launching lower:** no need for reliability calculations
2. **Stand-alone de-orbit device:** solely dependent on reliability of the de-orbit device
3. **Propulsion:** dependent on reliability of nearly entire platform



End-of-Life disposal

Objective: de-orbit within 5 years after the end-of-life with 90% reliability, on the road to >95%

For CleanCube, two stand-alone de-orbit devices are used

1. Astrobrake-S drag device from Gama
2. Plasma tether from Aurora

Key characteristics:

- Both devices can be deployed upon command or after a timer runs out
- Both devices independently target to meet the de-orbit reliability requirement (> 95%)

Alternative attractive option (not baselined for CleanCube): Launching lower

- Best solution if the altitude is not critical for mission design (launch up to ~520 km, depending on the satellite design)
- Propulsion can be used to extend the lifetime, without impacting compliancy to debris mitigation requirements → mission risk

Space situational awareness

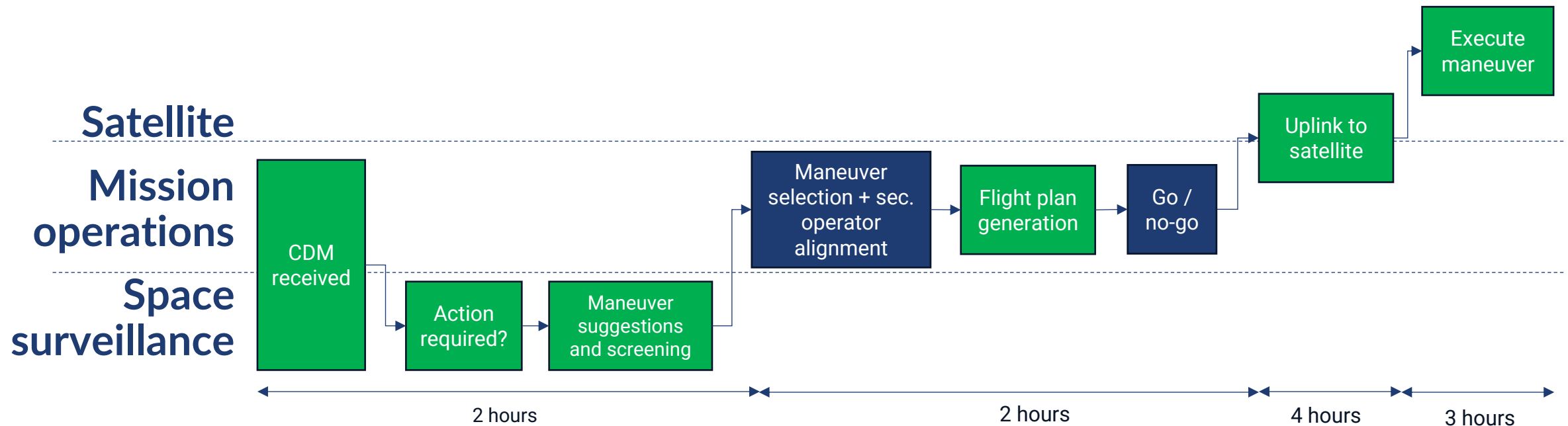
Objective: unique identification 1 day after launch (sufficiently good for collision avoidance purposes)

- **‘CubeSat confusion’** → it may take weeks to identify satellites on a rideshare launch
- **Meaning of identification:** it is known which satellite in the ‘cloud’ is ours → requires matching on-board GNSS data with on-ground observations
- Three solutions will be demonstrated (*in addition to downlinking GNSS data*):
 1. Optical telescopes observations combined with Doppler shift assessment during first RF passes
 2. Uniquely identifiable retroreflector (from Foundational Space)
 3. LED payload on the satellite
- All three solutions have their pro’s and con’s, demonstration of all three allows for performance comparisons

Collision avoidance

Objective: act upon CDM within 12 hours + CAM capability 2 days after launch + 90% reliability of collision avoidance maneuvers

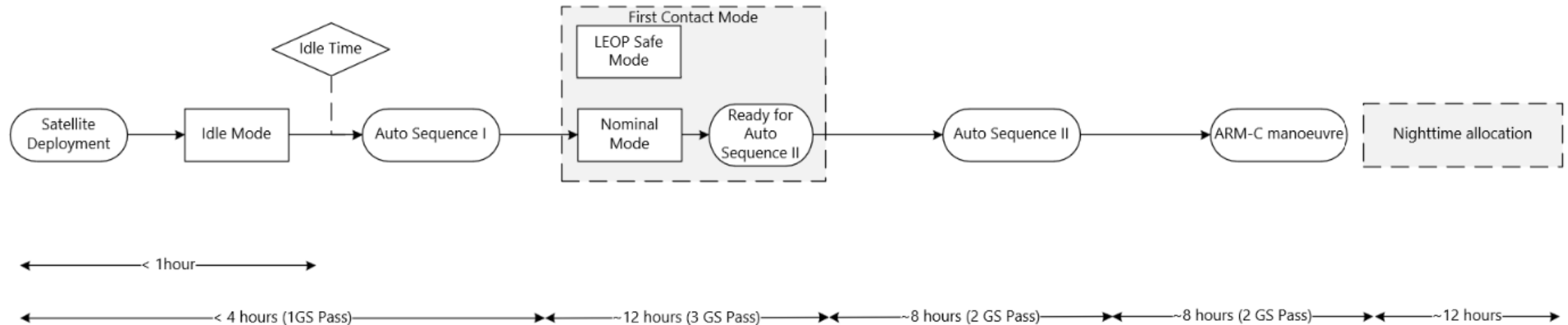
12-hour timeline: demonstration of incremental automation



Collision avoidance

Objective: act upon CDM within 12 hours + CAM capability 2 days after launch + 90% reliability of collision avoidance maneuvers

- **LEOP response time:**



- **Reliability**

- Challenge to proof towards the end of the mission, even with fault tolerant systems
- It is a good step in the direction to perform reliable disposal by propulsion

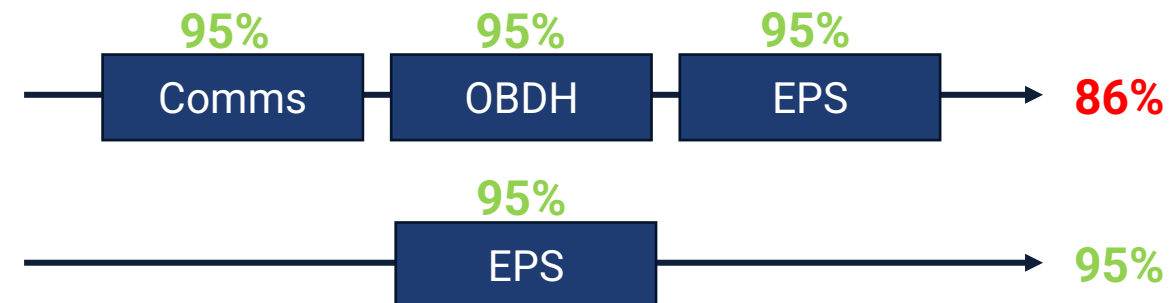
Passivation

Objective: Probability of successful passivation >90% through permanent and irreversible depletion and prevention of future loading

Dependent on third party hardware providers for propulsion systems and reaction wheels. Power system is made in-house.

- **Proposed strategy:**

- Autonomous passivation is being considered to achieve the required reliability
- Due to reliability impact, low break-up risk will continue to be shown as back-up option, i.e. proof of inherently safe system



Conclusion

Multiple attractive solutions have been found for:

- Reliability analyses
- LEOP identification
- Collision avoidance timeline starting 2 days post-launch
- Reliable end-of-life deorbit
- System resilience and monitoring
- Dark and quiet skies

Biggest challenges remaining:

- Reliable collision avoidance capability
- Reliable passivation

→ Innovations driven by debris mitigation requirements will improve small satellites design in general

