

AUTOMATION IN SPACE OPERATION

AUTOMATION REVOLUTIONIZES SPACECRAFT OPERATIONS BY ENABLING:

Complex Maneuvers

Autonomous Communication

Scientific Experimentation

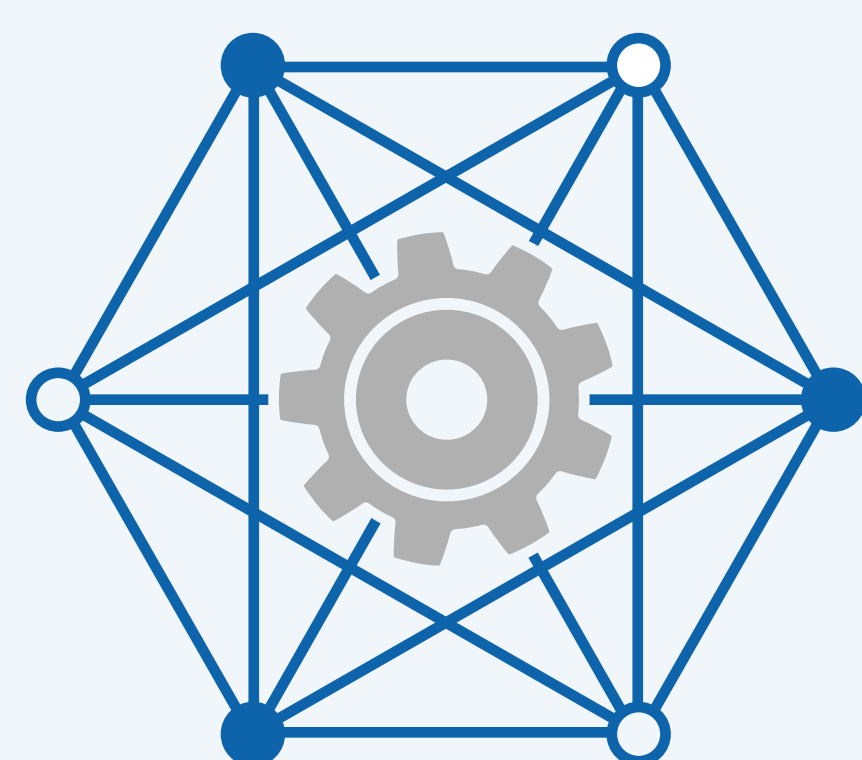
It forms the backbone of modern space missions, ensuring efficiency, reliability, and success.

KEY CONSIDERATIONS FOR AUTOMATION

Before implementing automation, address critical questions to align strategy with mission objectives:

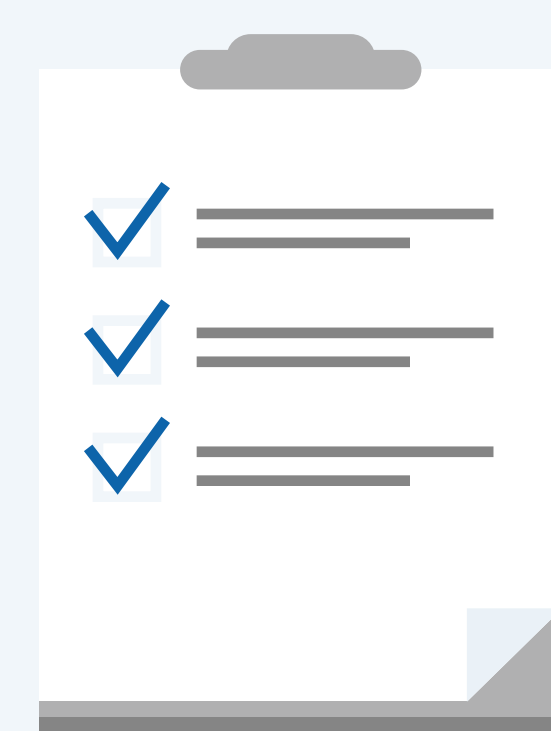
Mission Complexity

What unique challenges and needs must the system address?



Desired Outcomes

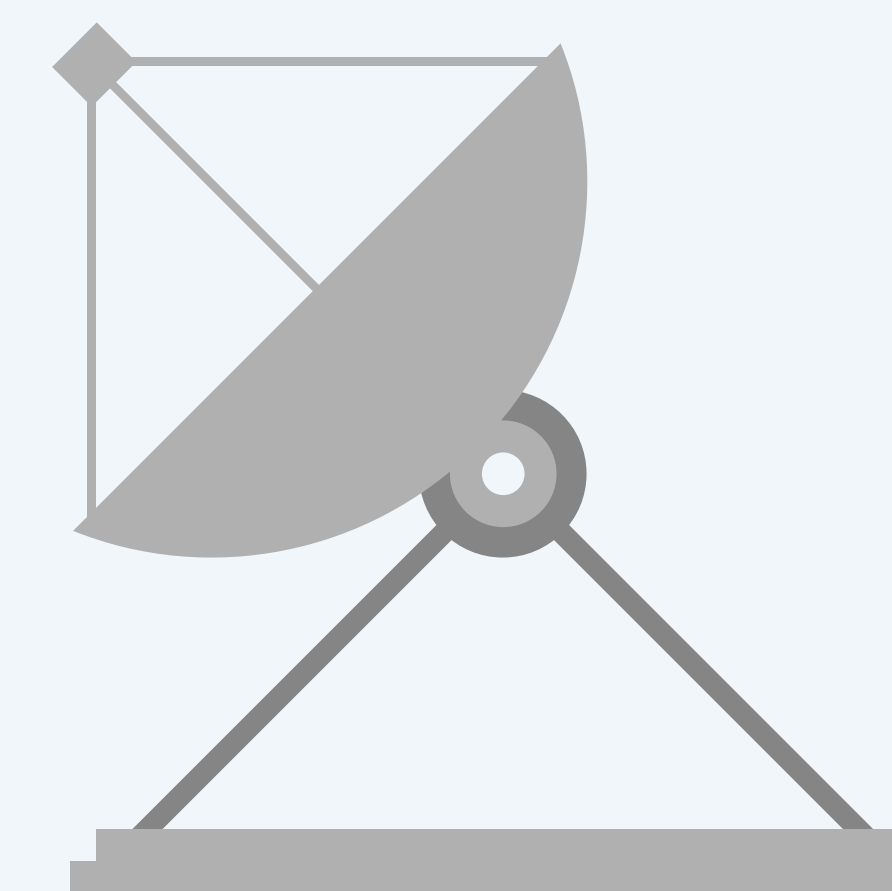
Efficiency, data quality, or safety – each goal shapes automation design.



THREE CRITICAL LEVELS OF AUTOMATION

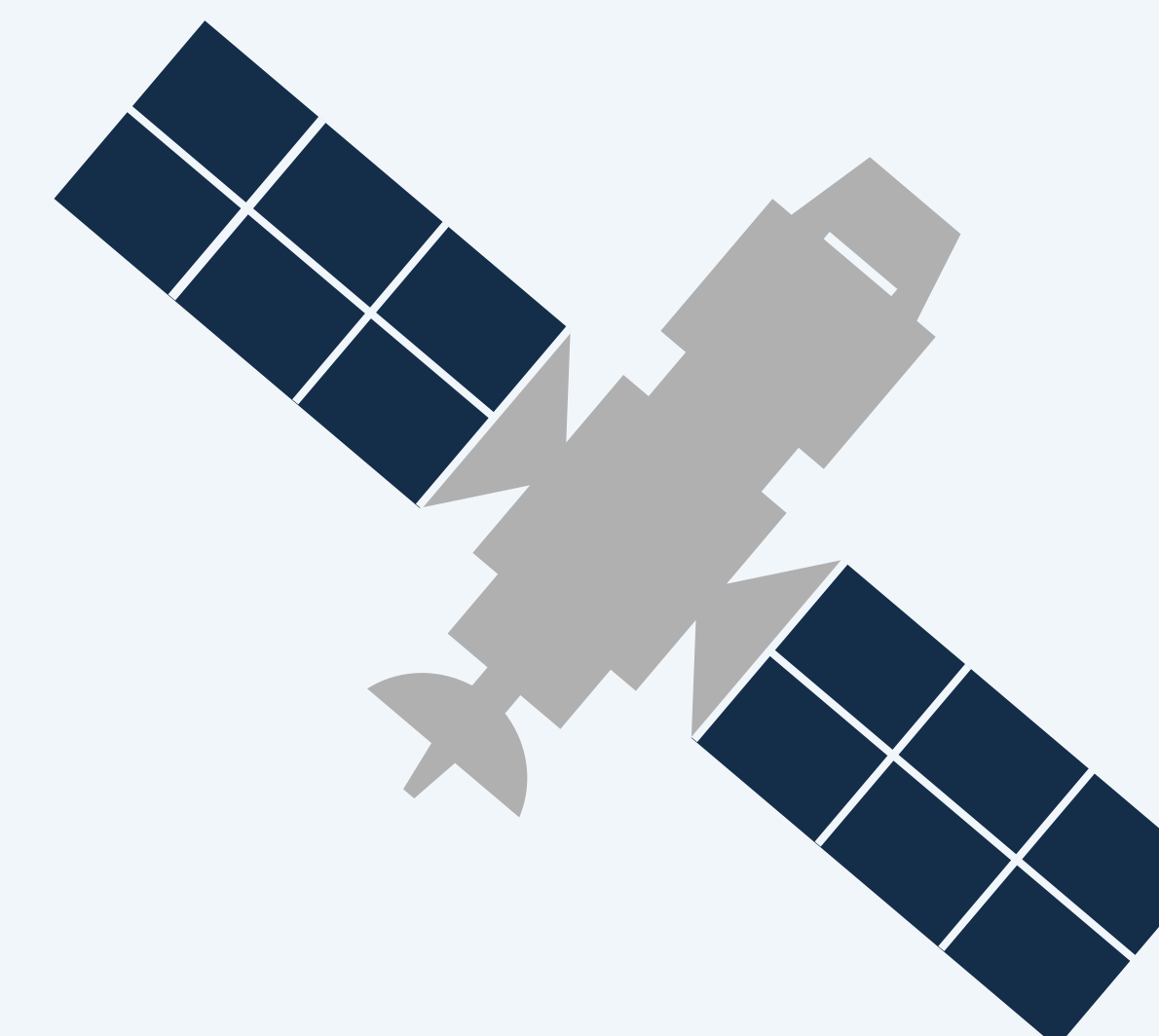
Ground-Based Systems

- Mission control handles trajectory calculations, data analysis, and command sequencing.
- Ensures smooth operations and adaptability to mission needs.



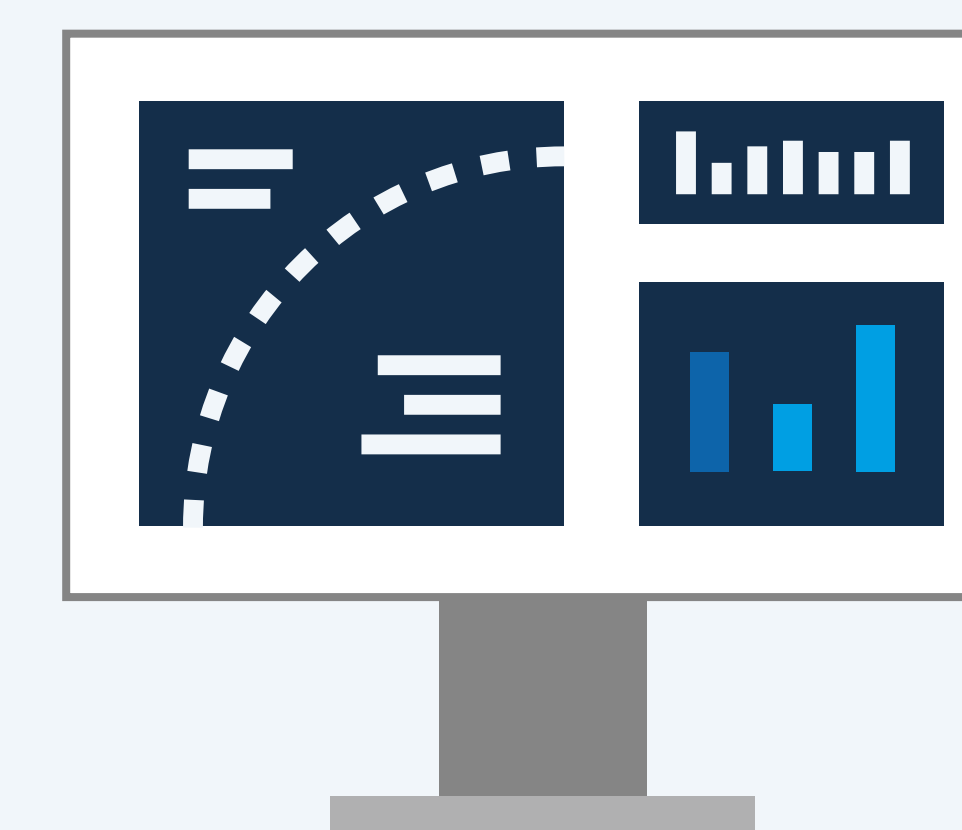
Onboard Automation

- Manages navigation, system health, and scientific data processing autonomously.
- Operates critical systems like solar panels and antennas.



Complementary Interaction

- Ground and spacecraft systems work together.
- Ground recalibrates onboard systems; spacecraft provide real-time updates.



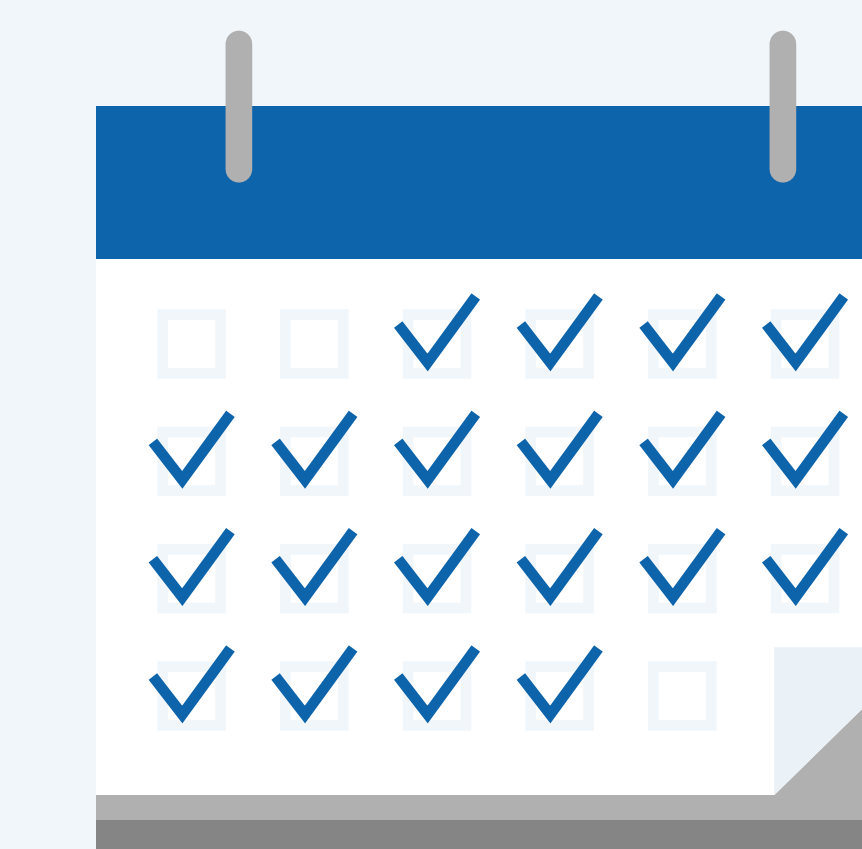
COMPLEXITY IN AUTOMATION

Enhancing Efficiency & Reliability

Automation supports tasks from routine to complex, reducing risks and enabling long-duration missions.

Daily Workflow Automation

- Routine tasks like solar panel orientation and system checks are automated to save time and reduce errors.
- *Example:* Automated solar panel positioning ensures optimal energy capture.



Complex Scenarios

- Advanced systems diagnose issues but often require human intervention for root cause analysis.
- *Example:* Anomaly detection in power grids.

