Europa Clipper Overview and Thermal Environment Challenges

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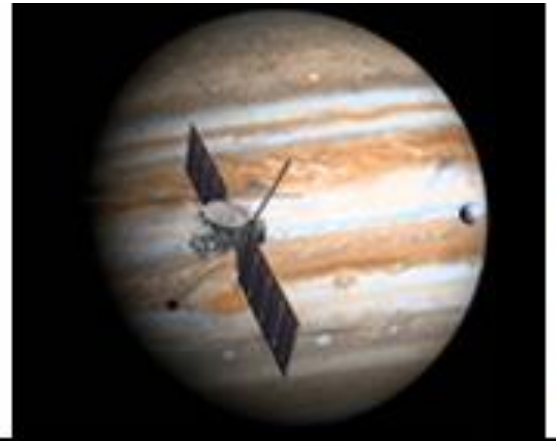
Mission Overview



Launch

Cruise:

0.69 A.U. Closest Approach

Jupiter Orbit Insertion

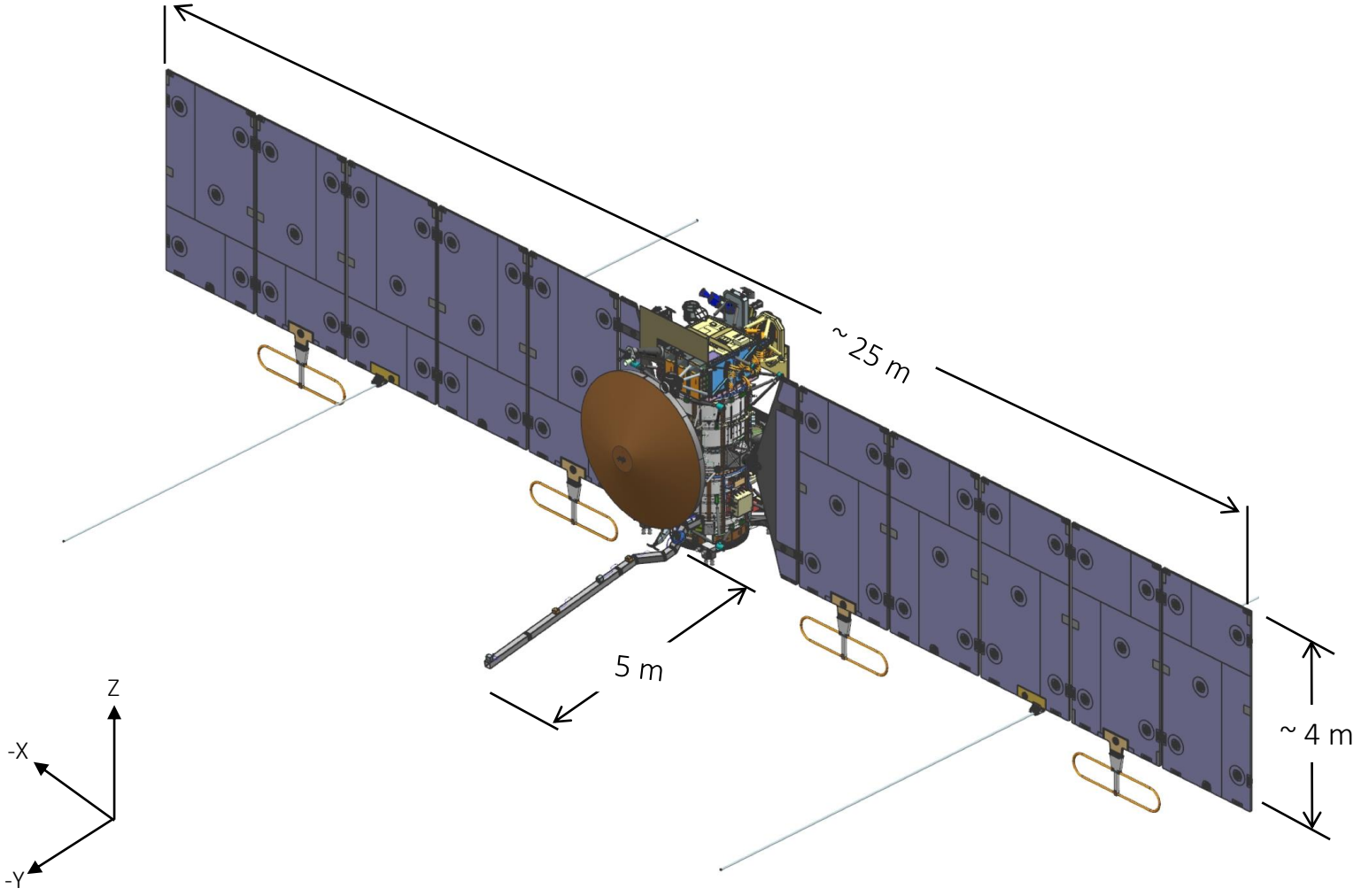
5.5 to 6.5 hour burn

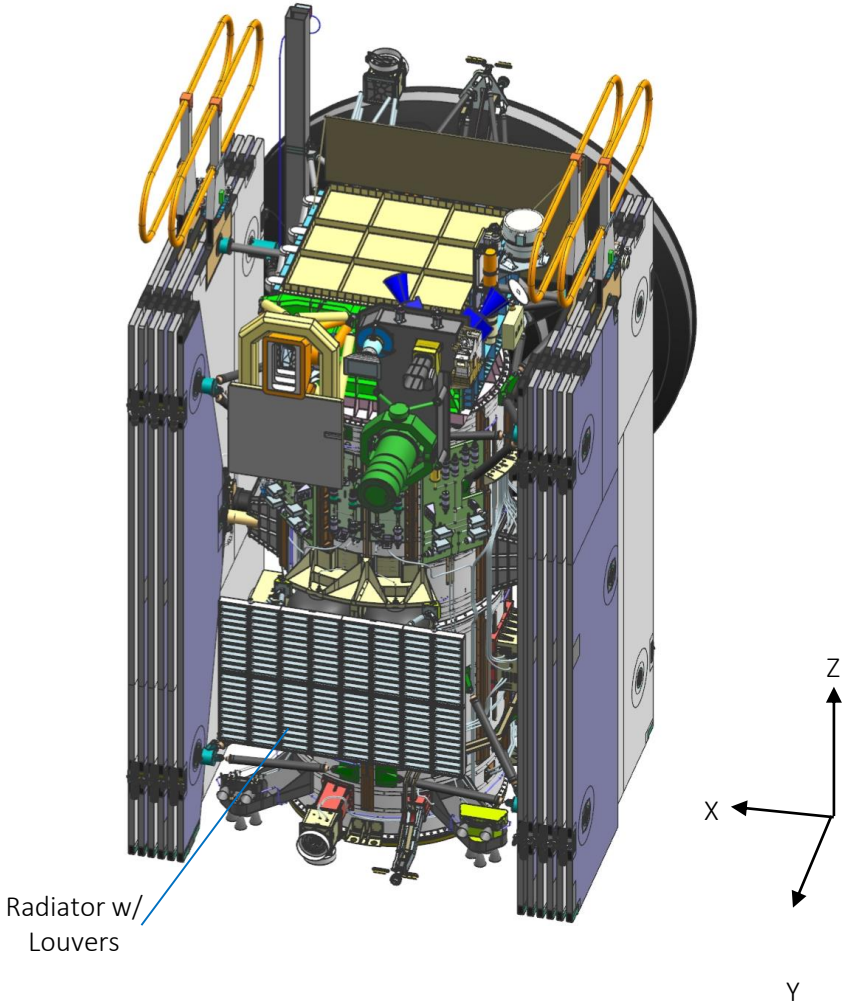
Jovian System Operations

Transition to Europa Science: 12 months
Prime Europa Flyby Campaign: 36 months
Multiple (40+) Flyby Encounters of Europa

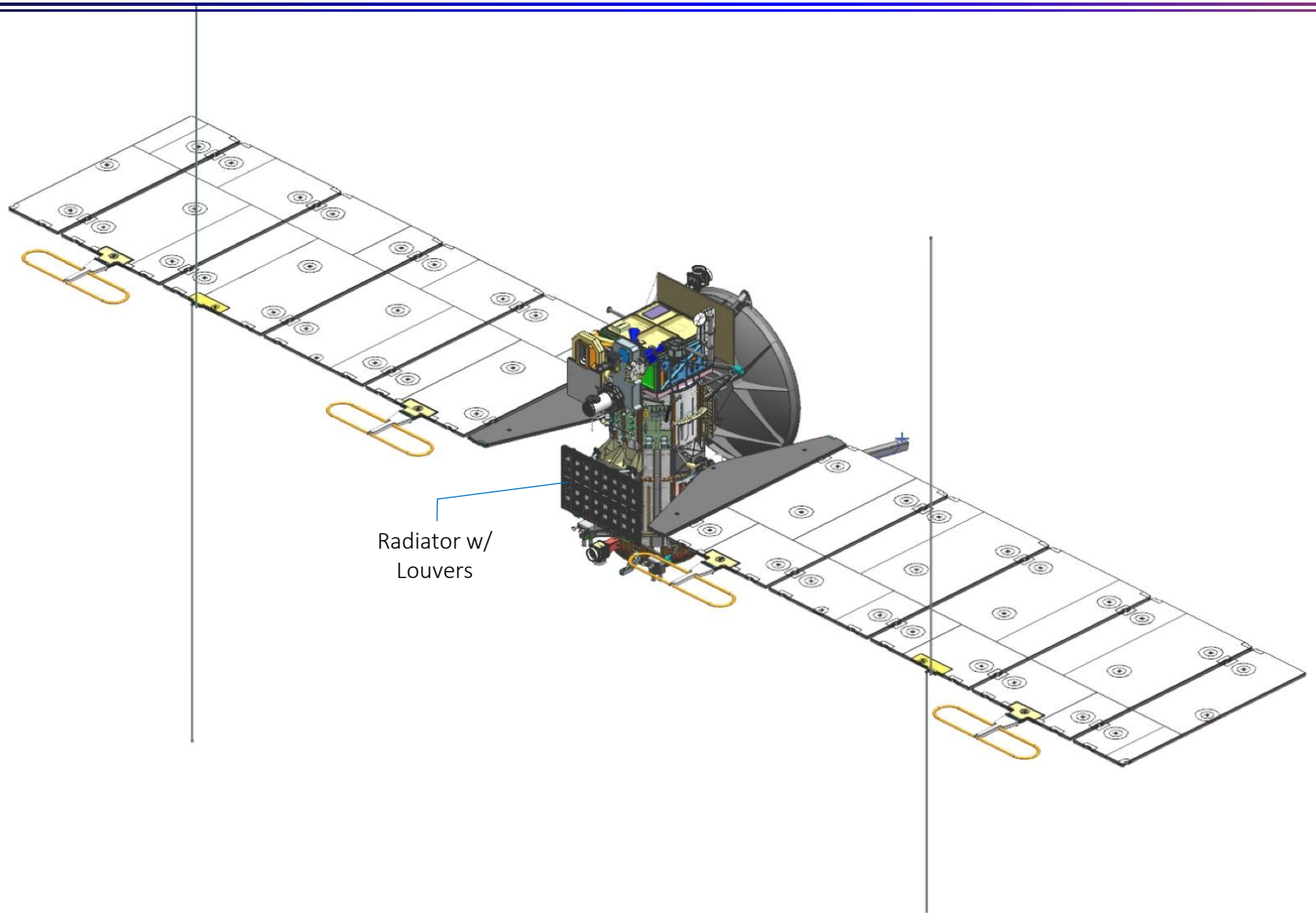
LAUNCH and CRUISE | **EUROPA SCIENCE**

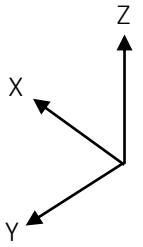
Solar Array Deployed and Stowed Configurations





Flight System Flyby Configuration

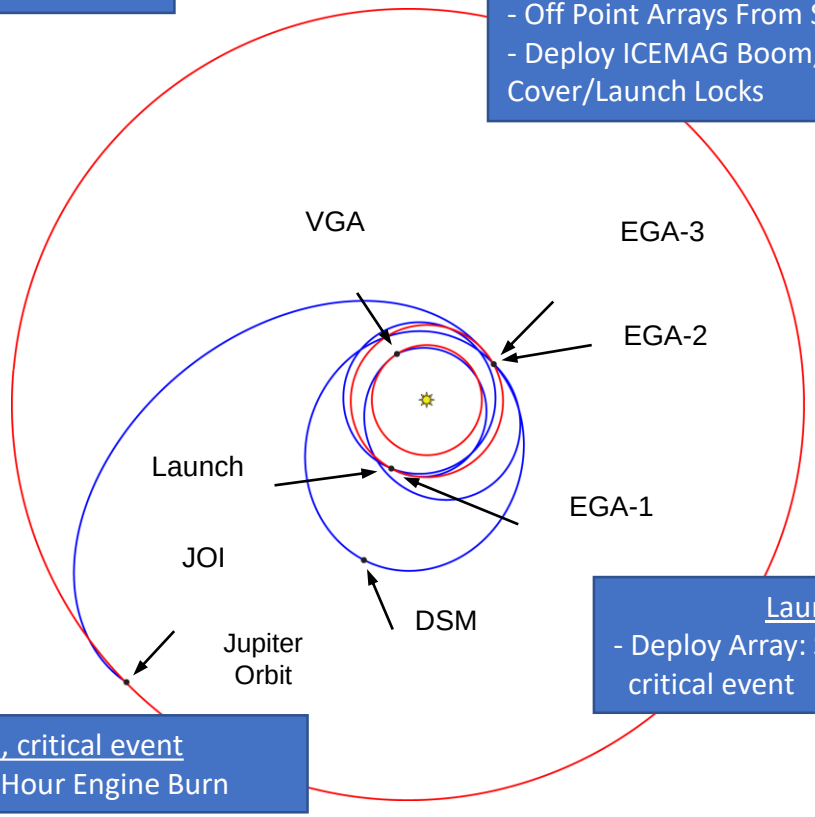




Operating Modes During Mission Timeline

Outer Cruise
- Instrument Calibrations
- TCMs, RCS Control
- Sun Point Arrays

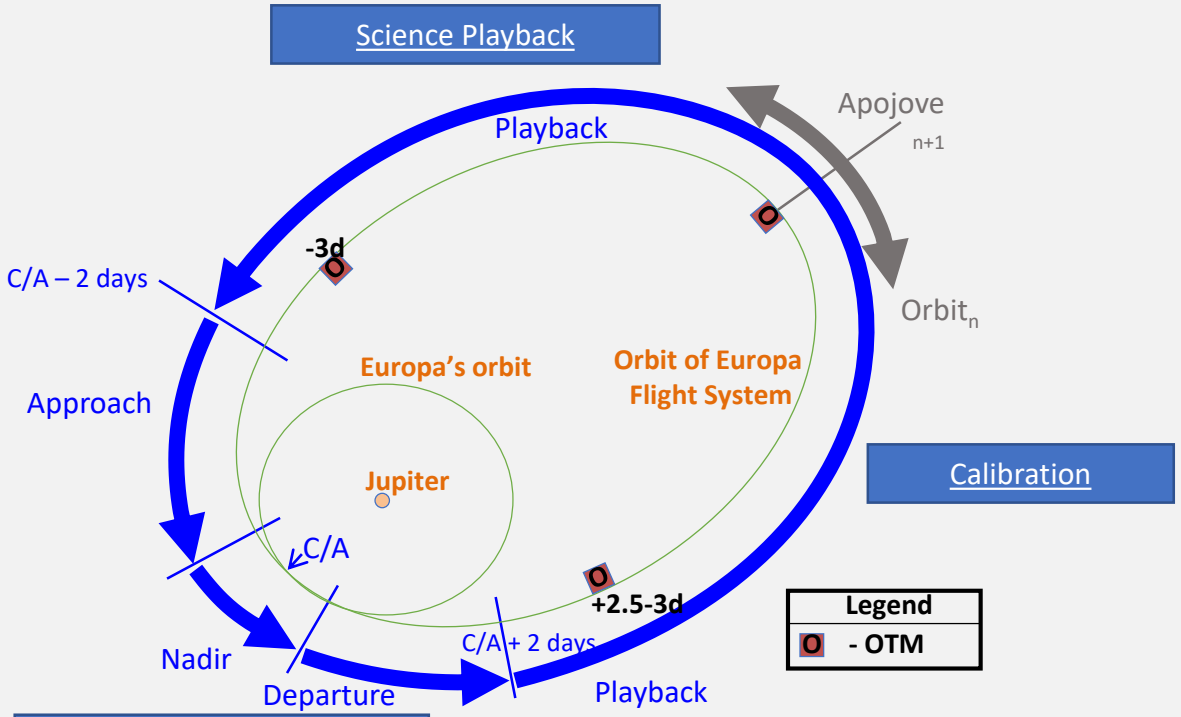
Inner Cruise (Option)
- Sun Point HGA
- Thermally Limited Off Sun Activities
- Off Point Arrays From Sun
- Deploy ICEMAG Boom, Instrument Cover/Launch Locks



Launch
- Deploy Array: Sun Point, critical event

JOI, critical event
- 5.5 – 6.5 Hour Engine Burn

Encounter Period 10-14 Days

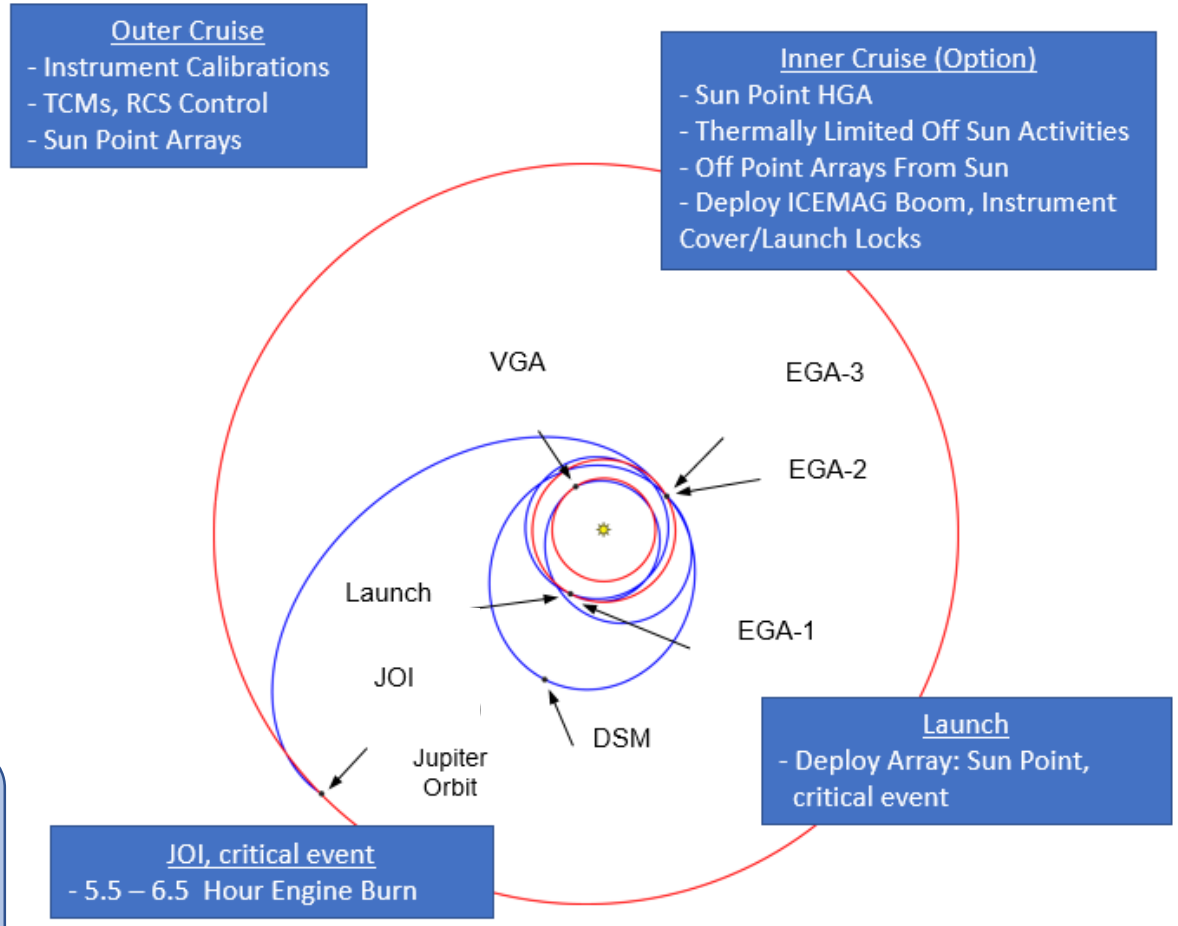


Europa Flyby
- Nadir Point
- Closest approach 25km to 2500 km

Europa Clipper Thermal Environment Challenges

- Thermal analysis estimates of mission phases
  - Inner Cruise Defined by relatively shallow cycle depth but high absolute temperatures
    - Maximum predicted temperature on radiator (+50°C)
    - Minimum temperature predicted on louver (~9°C)
    - Louver will actuate open and remain open
  - Outer Cruise Maximum predicted temperature on Louver (+10°C)
    - Minimum temperature predicted on louver(~-94°C)
    - Louver should remain closed
  - Jupiter orbit Largest cycle depth (ΔT=115°C)
    - Characterized by low absolute temperatures
    - Maximum predicted temperature on louver (+19°C)
    - Minimum predicted temperature on louver (~-94°C)

- Bottom Line:
  - Louvers are required to operate over a much wider range (+50°C → -95°C) than heritage louvers, requiring a new design to meet the demanding environment of this mission



Backup