Magnetospheric MultiScale Mission (MMS) Overview

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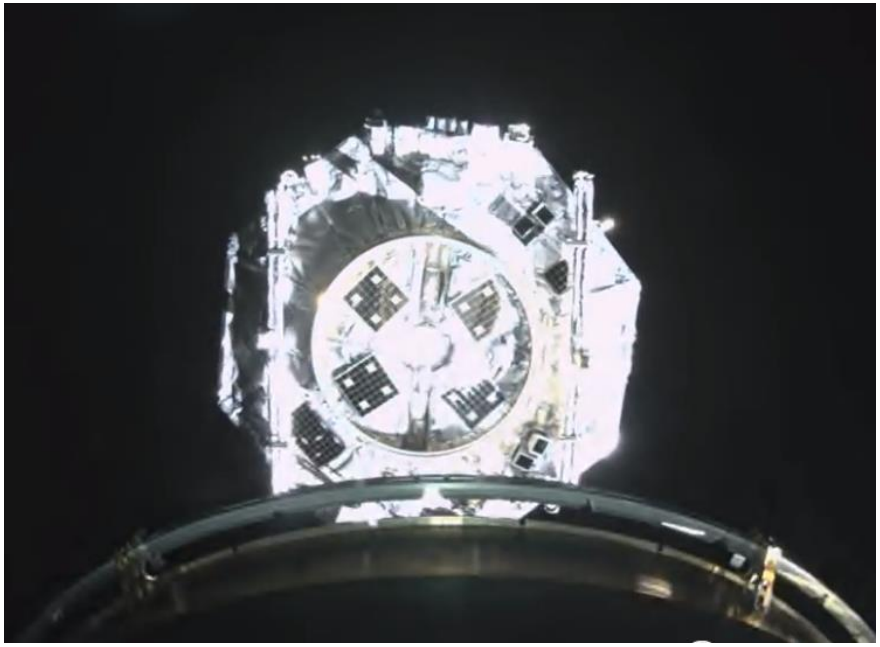
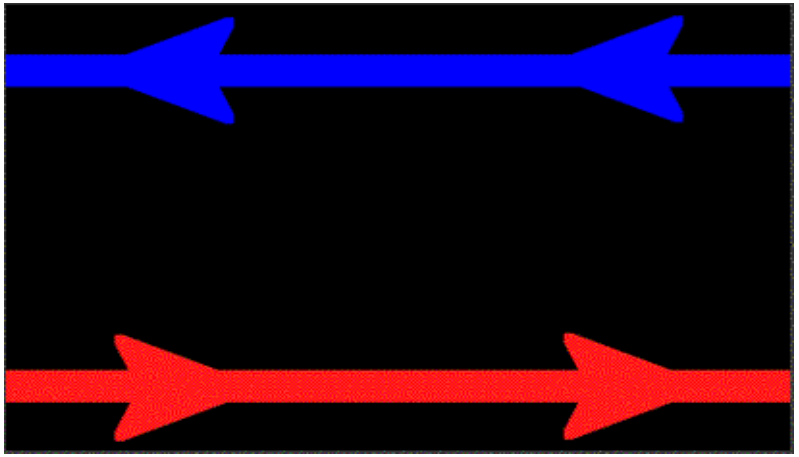
MMS Launch

- The MMS mission was launched on March 13, 2015 aboard an Atlas V rocket from Space Launch Complex 40, Cape Canaveral, Florida
- Each of the four observatories were successfully released at five minute intervals spinning at 3 rpm approximately 1.5 hours after launch



Science Goals

- Study magnetic reconnection in the Earth's magnetosphere
- Magnetic reconnection converts magnetic energy into kinetic energy
  - Oppositely directed parallel field lines are pinched
  - They join and snap apart like a breaking rubber band

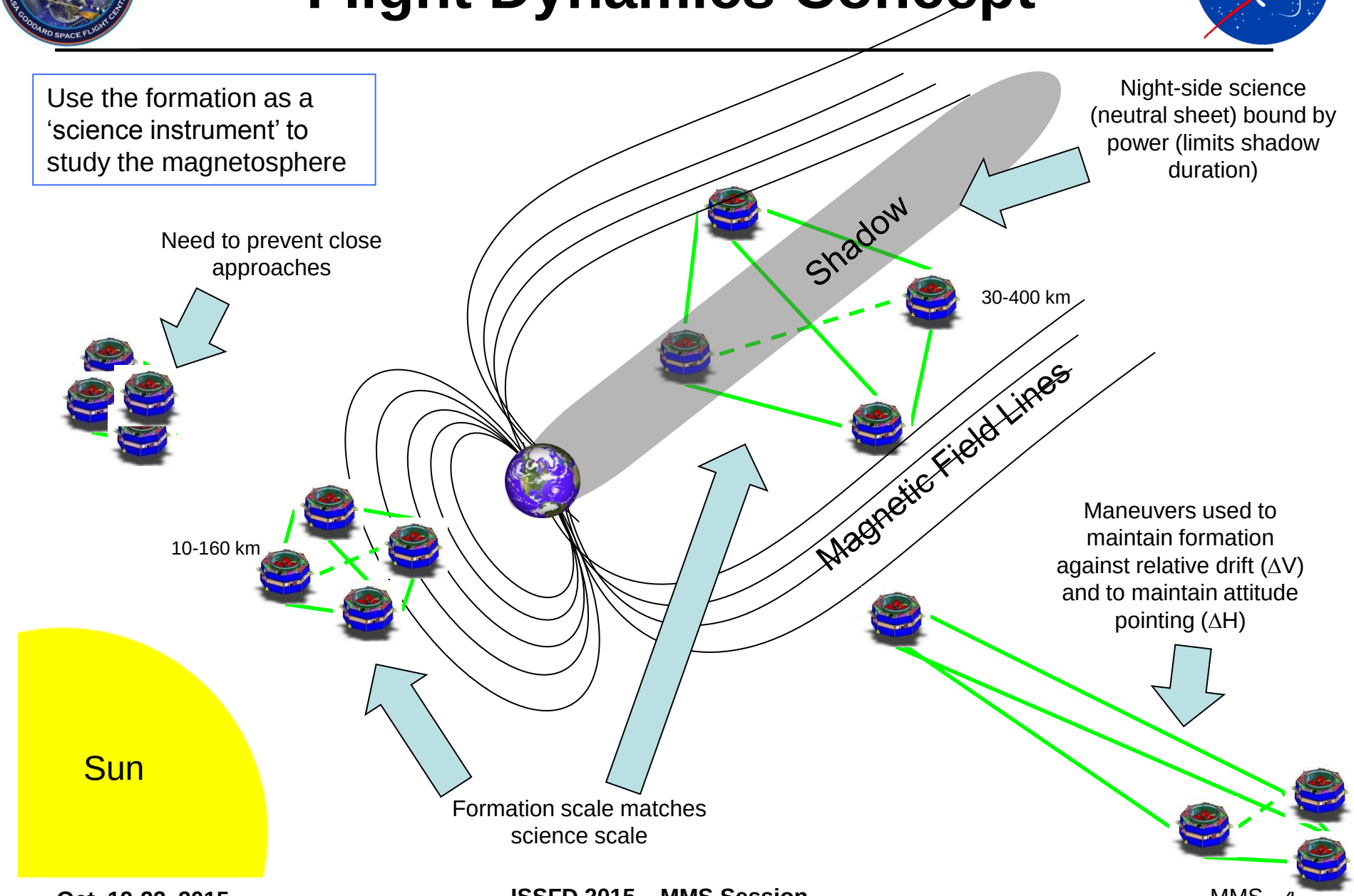


Credit: European Space Agency

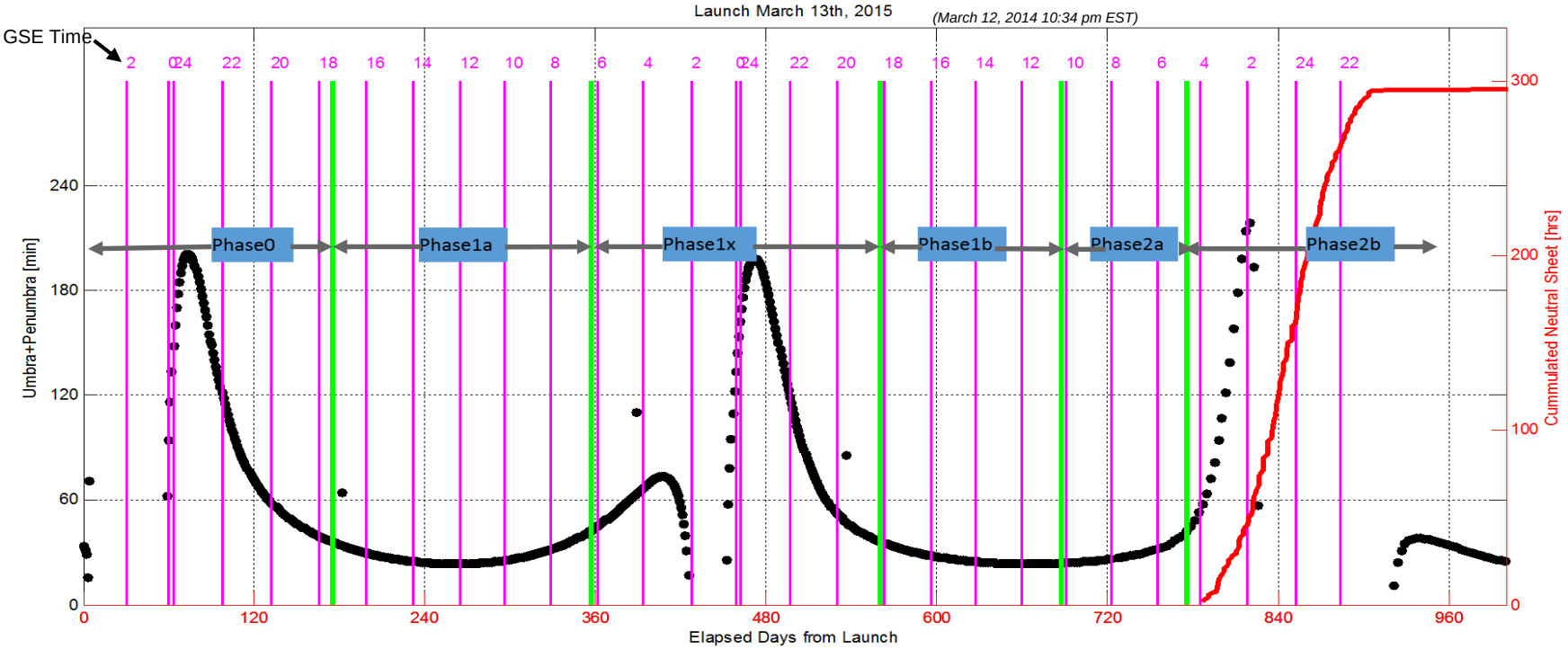
- Benefit: understanding of how the Earth lives with the Sun (e.g. Class X Flash 0156 GMT Tuesday, Feb. 15, 2011)
  - Power grid problems
  - Communications disruption
  - Aurora formation

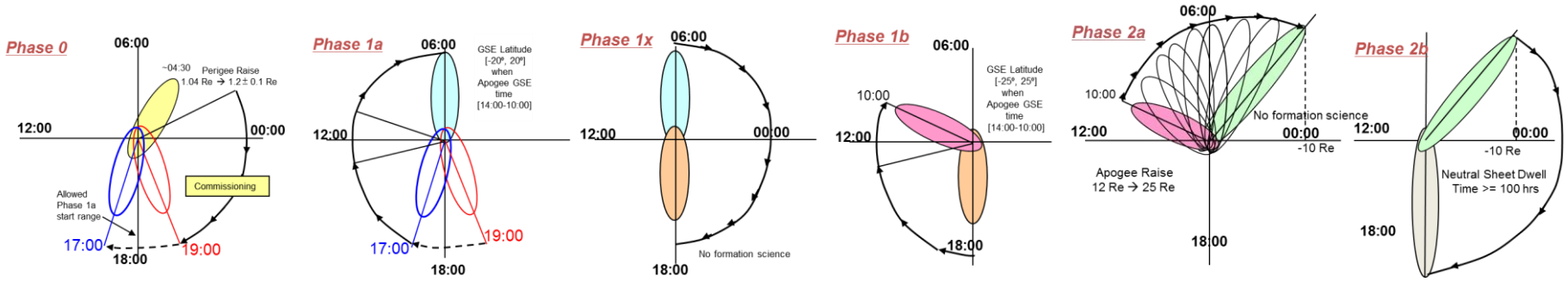
Flight Dynamics Concept

Use the formation as a ‘science instrument’ to study the magnetosphere



MMS Flight Summary

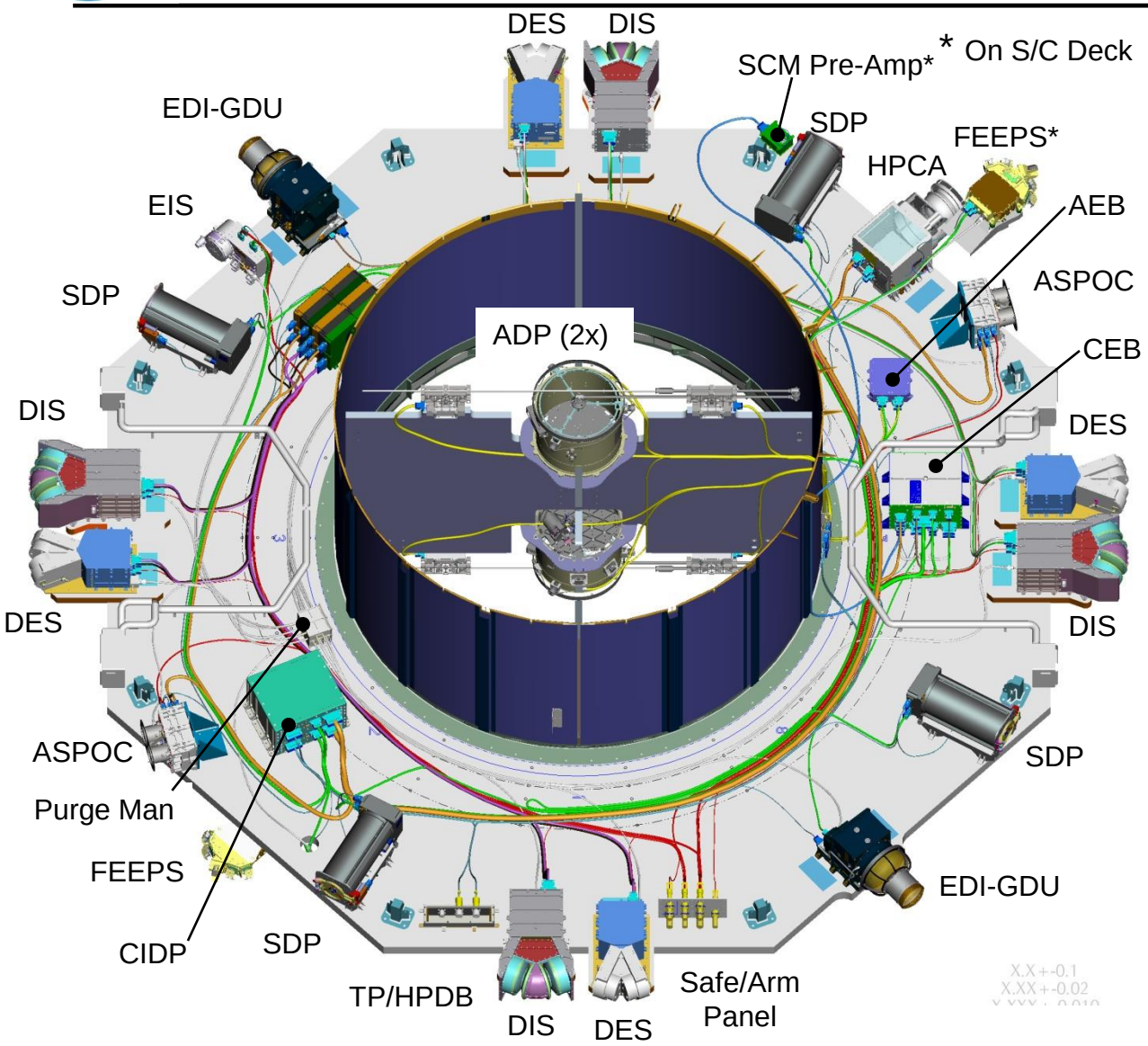




Multiple opportunities for joint observations with THEMIS and Van Allen Probes

MMS Instrument Suite Components

(view looking from the bottom of the IS Deck)

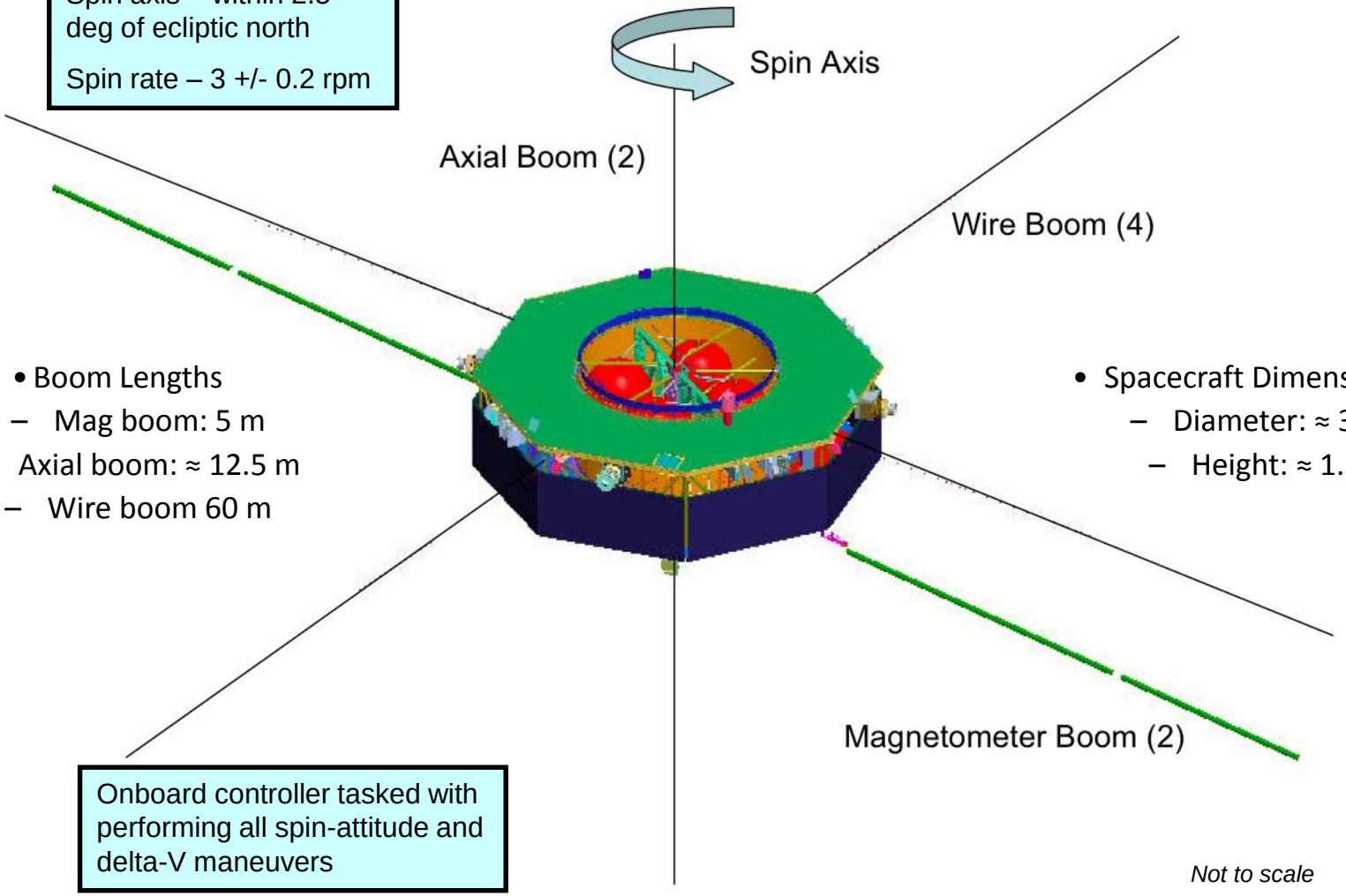


ADP - Axial Double Probe
AFG - Analog Flux Gate Magnetometer (mounted on boom)
ASPOC - Active Spacecraft Potential Control
CEB - Central Electronics Box (Fields)
CIDP - Central Instrument Data Processor
DES - Dual Electron Spectrometer
DFG - Digital Flux Gate Magnetometer (mounted on boom)
DIS - Dual Ion Spectrometer
EDI/GDU - Electron Drift Instrument/ Gun Detector Unit
EIS - Energetic Ion Spectrometer
FEEPS - Fly's Eye Energetic Particle Sensors
HPCA - Hot Plasma Composition Analyzer
IDPU - Instrument Data Processing Unit (FPI)
SCM - Search-Coil Magnetometer (mounted on boom)
SDP - Spin-Plane Double Probe
TP/HPDB – Test Panel Heater Power Distribution Box

Spacecraft Fully Deployed

Spin axis – within 2.5 deg of ecliptic north

Spin rate – 3 +/- 0.2 rpm



- Boom Lengths
  - Mag boom: 5 m
  - Axial boom: ≈ 12.5 m
  - Wire boom 60 m

- Spacecraft Dimensions
  - Diameter: ≈ 3.4 m
  - Height: ≈ 1.2 m

Onboard controller tasked with performing all spin-attitude and delta-V maneuvers

Not to scale

Spacecraft GN&C Block Diagram