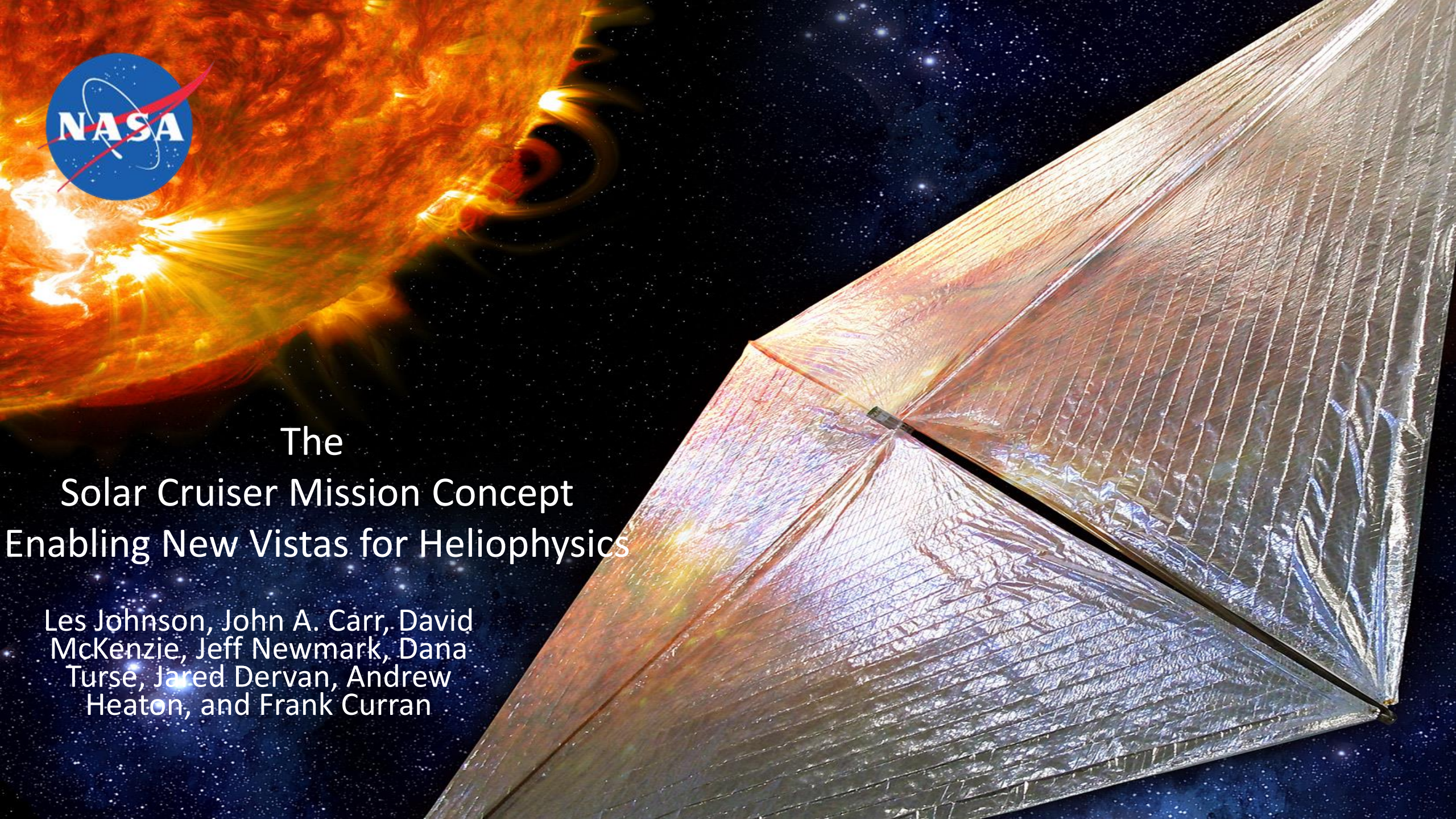
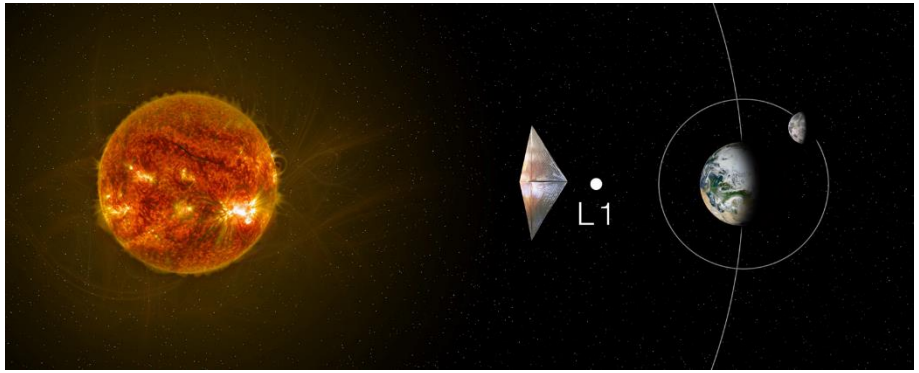


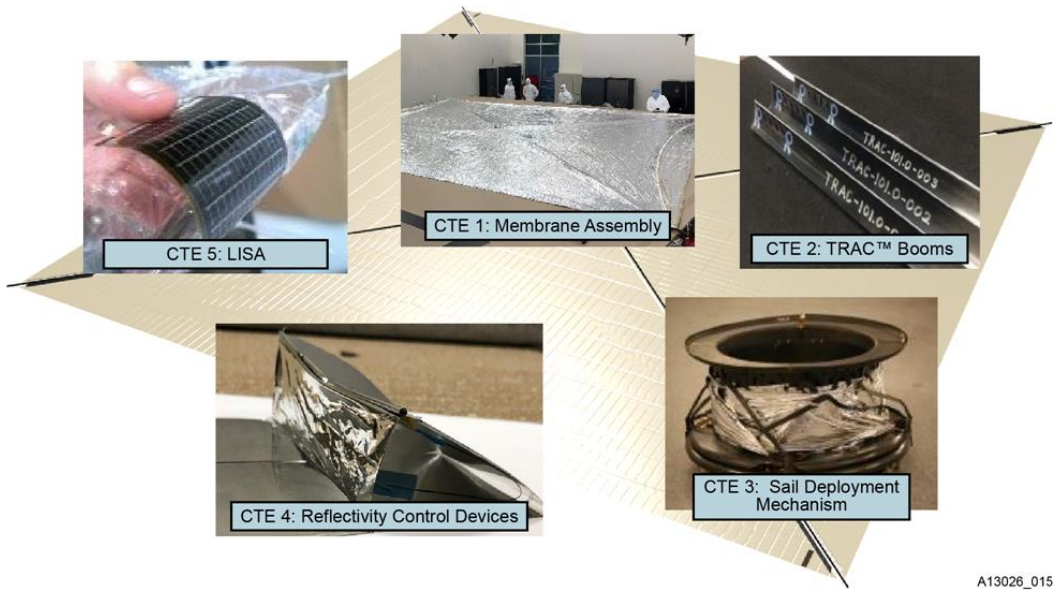
The Solar Cruiser Mission Concept Enabling New Vistas for Heliophysics

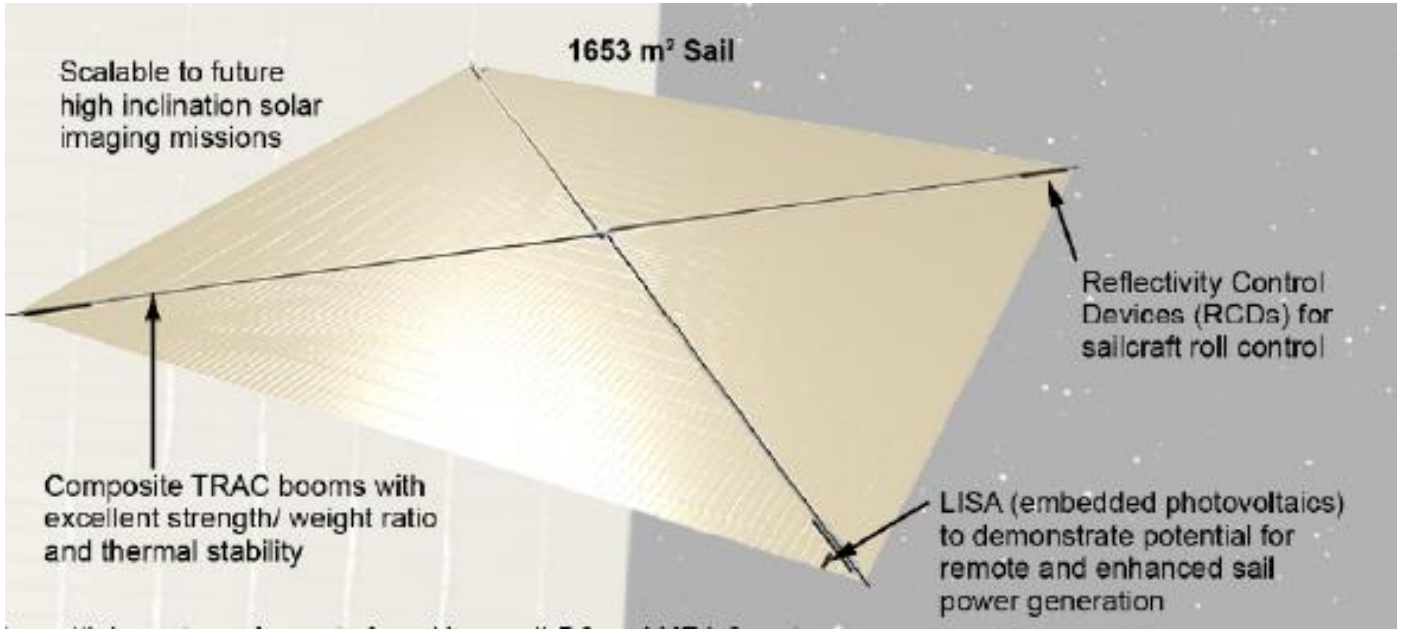
Les Johnson, John A. Carr, David McKenzie, Jeff Newmark, Dana Turse, Jared Dervan, Andrew Heaton, and Frank Curran

Solar Cruiser Mission Concept Overview



Solar Cruiser is proposed to launch as a secondary payload on the NASA IMAP mission in October, 2024. Using a solar sail, it then cruises past the Sun-Earth L-1 point, demonstrating the flight of a non-Keplerian trajectory, station keeping at an artificial equilibrium point (sub L-1), changes in heliocentric inclination, and other solar sail propulsion unique maneuvers.



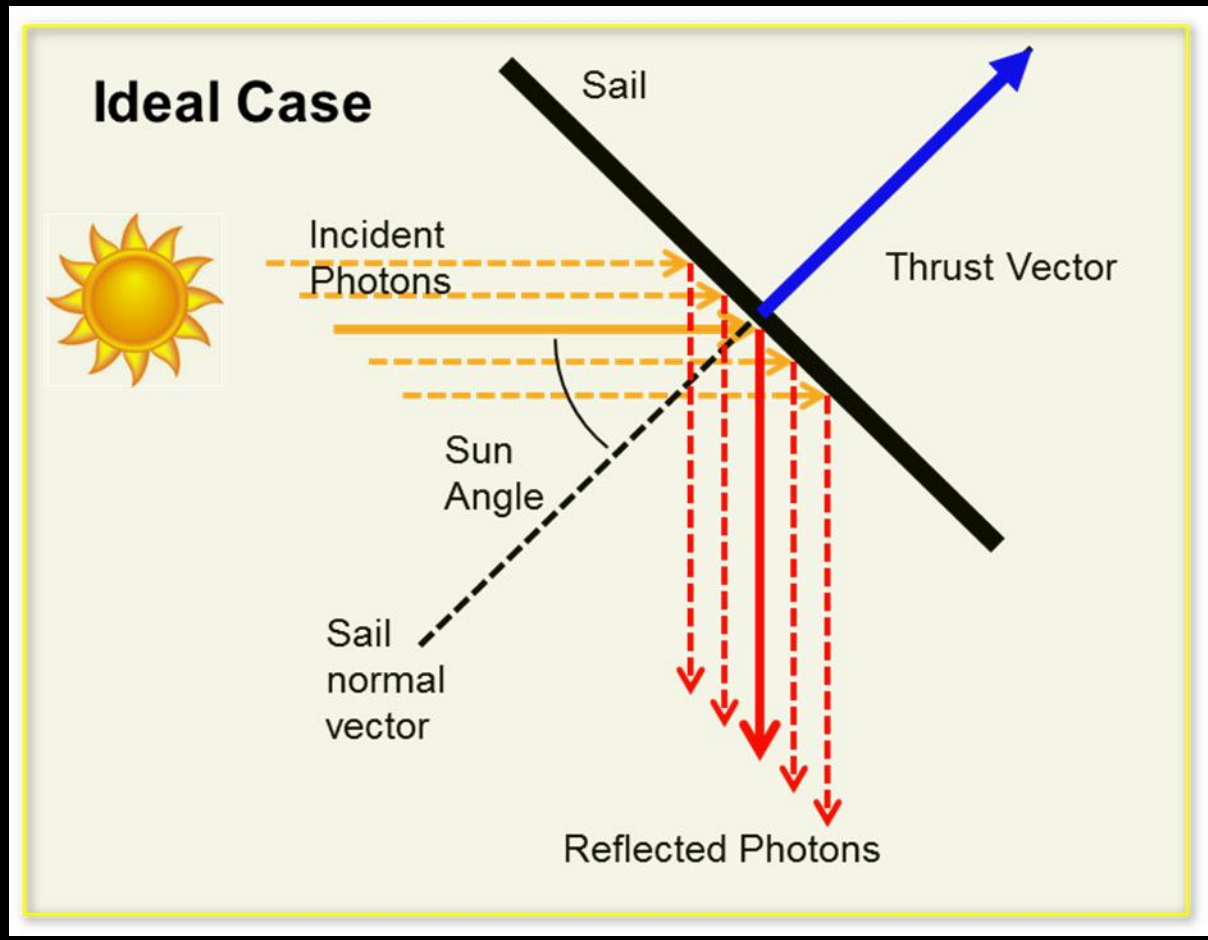


Key Feature: Solar Sail Propulsion System (SSPS)

Solar Sails Derive Propulsion By Reflecting Photons

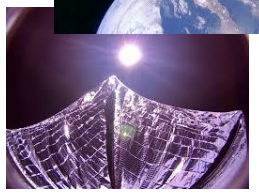
Solar sails use photon “pressure” or force on thin, lightweight, reflective sheets to produce thrust.

NASA Image



Solar Cruiser
Solar Sail Technology Investment Heritage

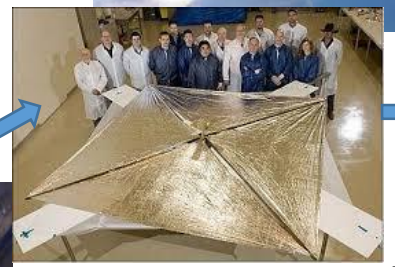
LightSail 2 (The Planetary Society)
32 m^2 sail
Successful flight in 2019

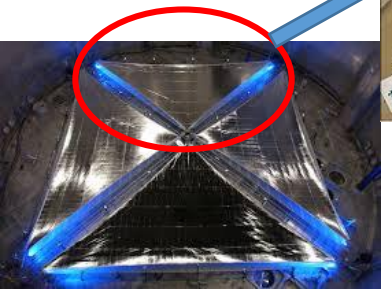


LightSail 1 (The Planetary Society)
32 m^2 sail (NanoSail heritage design)
Successful flight in 2015

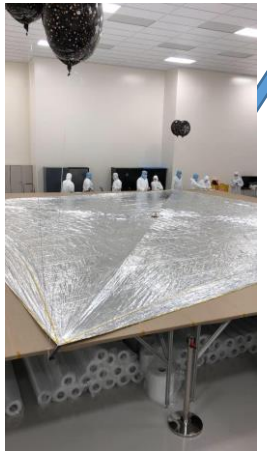
HEOMD Near-Earth
Asteroid Scout
86 m^2, Artemis 1 (2021)

MSFC NanoSail – D
10 m^2 sail Successful
flight 2010

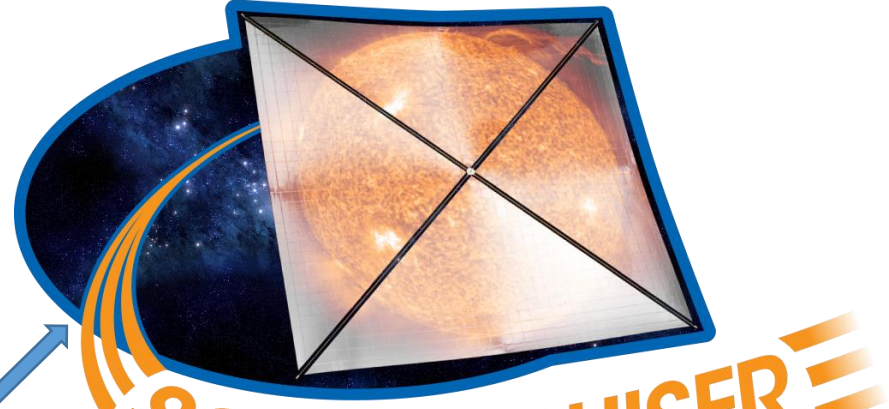


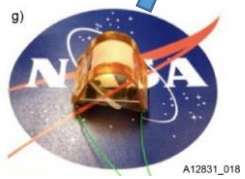


SMD In-Space Propulsion Technology Project
400 m^2 solar sail demonstrator
Deployed at Plumbrook Station (2000 – 2003)



HEOMD Near-Earth
Asteroid Scout
86 m^2 solar sail
Flight Unit
Deployment Test
(2014 - 2018)

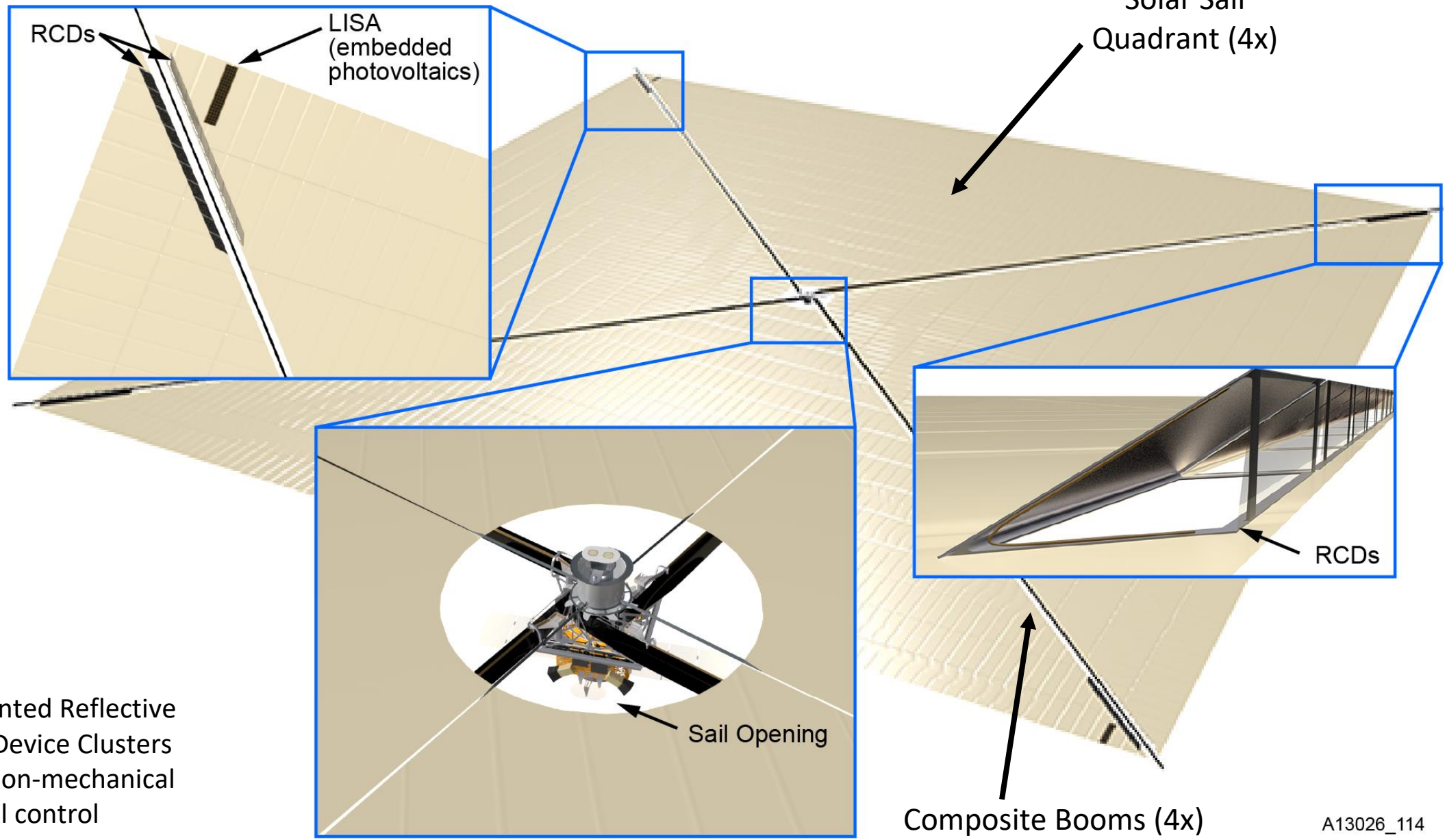




NASA STMD Investments in Solar Sail Technology

- Reflective Control Devices (RCDs)
- Composite booms
- Large area sail manufacturing

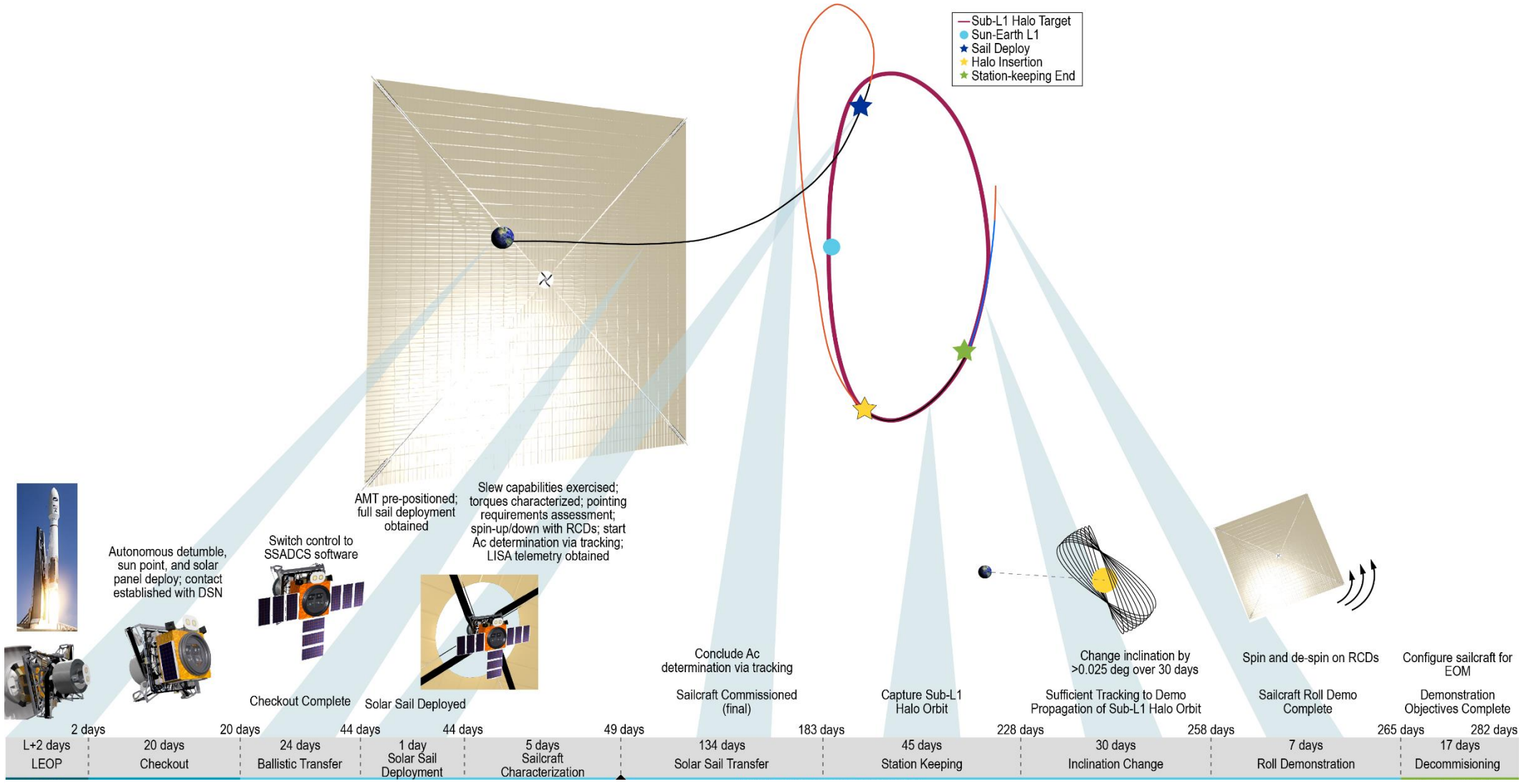
Key Solar Cruiser System Components



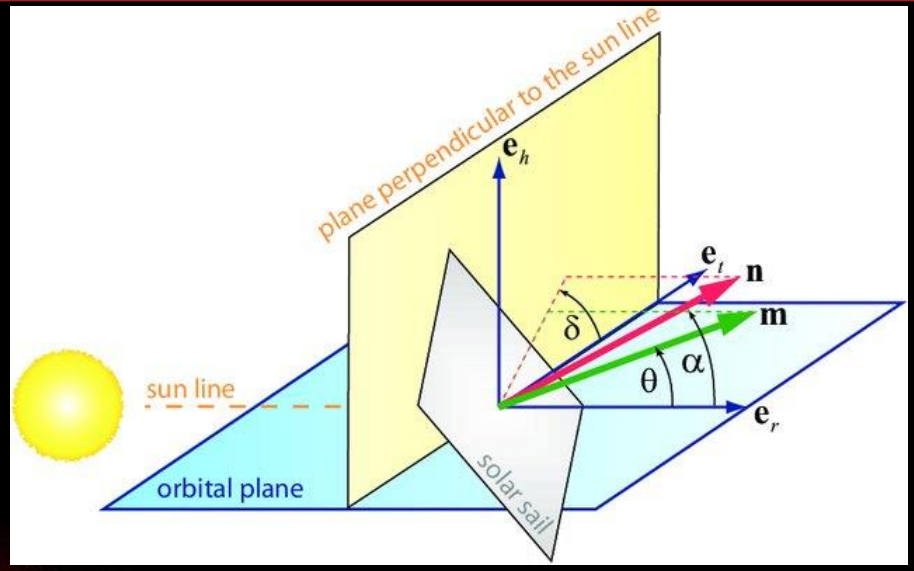
RCD = Tented Reflective Control Device Clusters (8x) for non-mechanical roll control

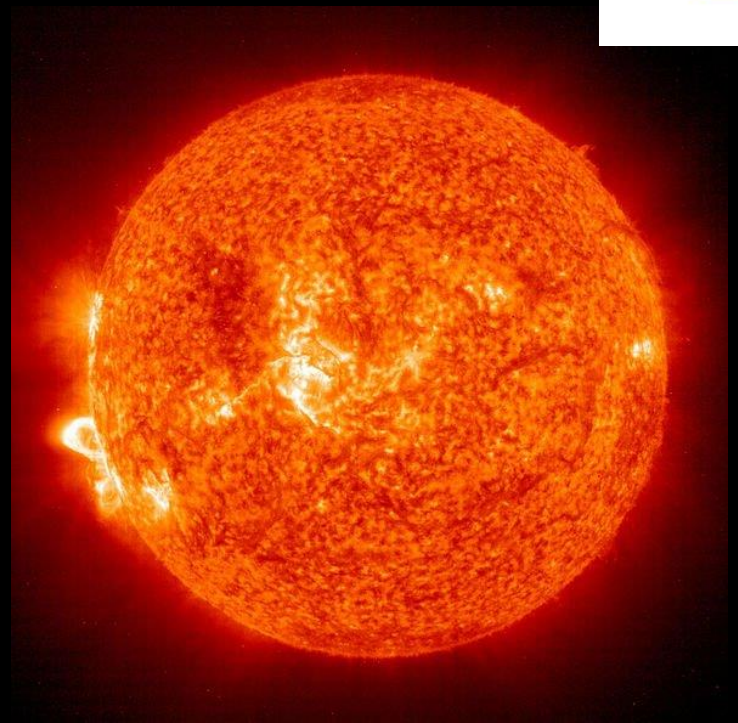
A13026_114

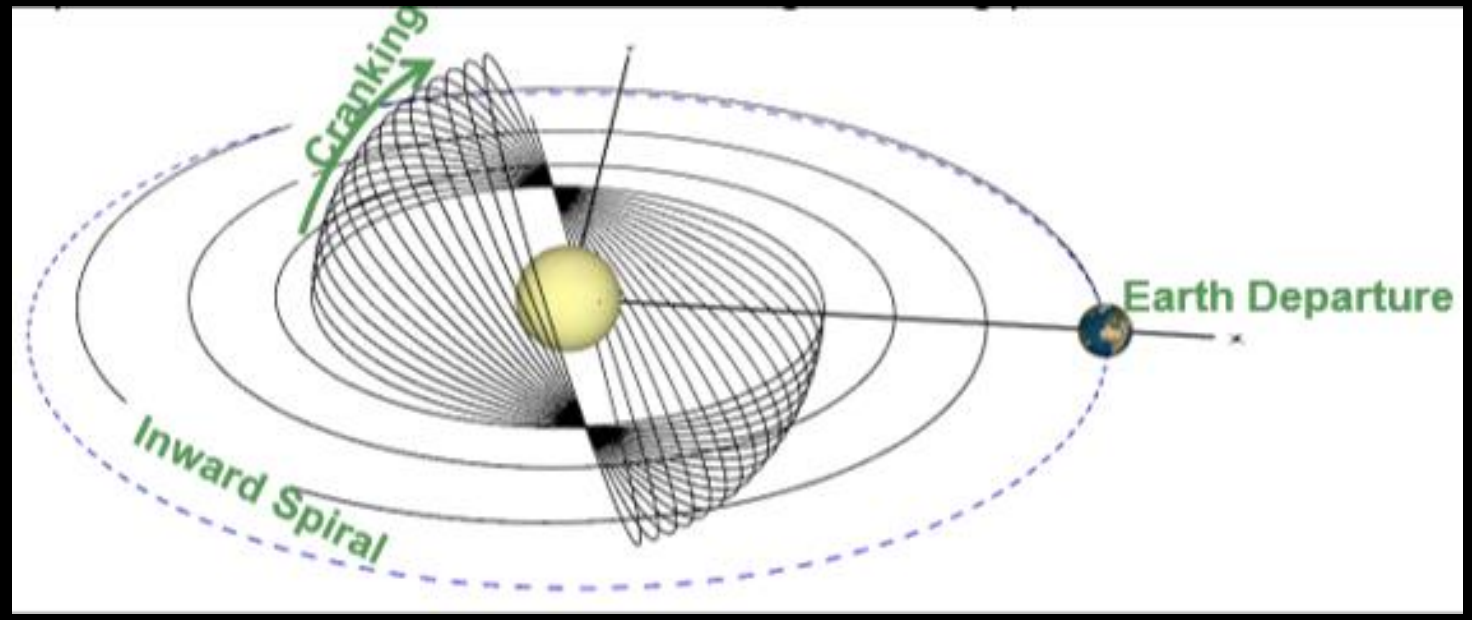
Solar Cruiser Mission Timeline



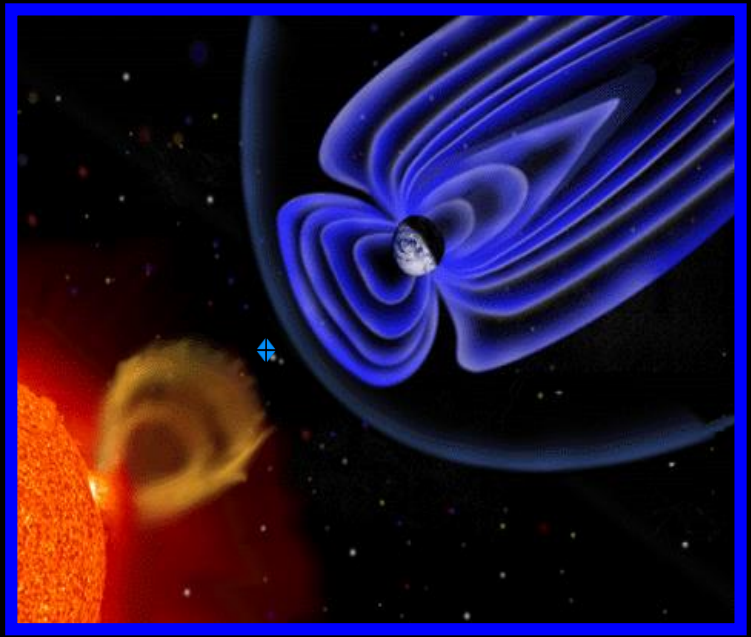
WHY SOLAR SAILS? High Inclination Solar Science



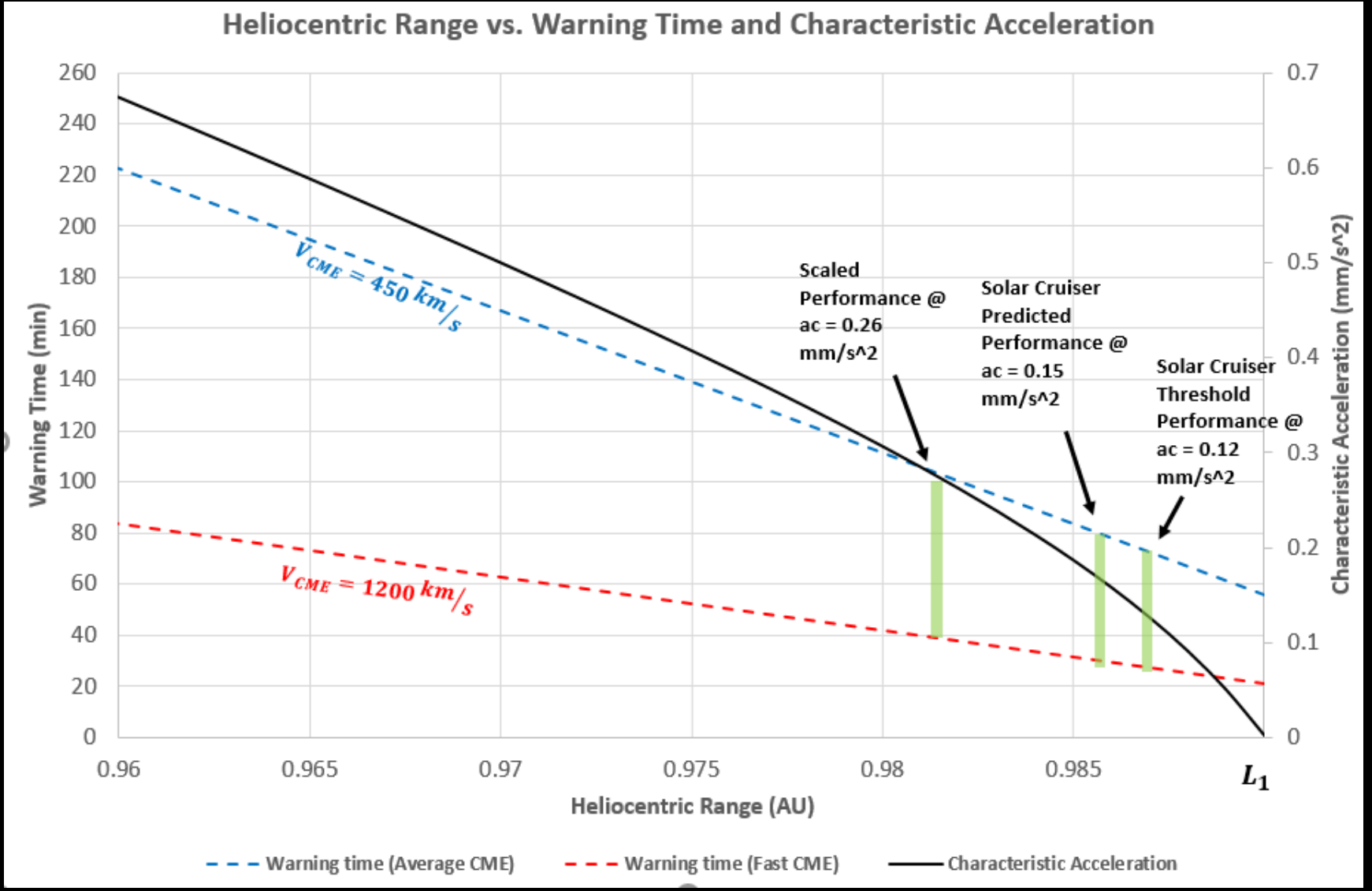




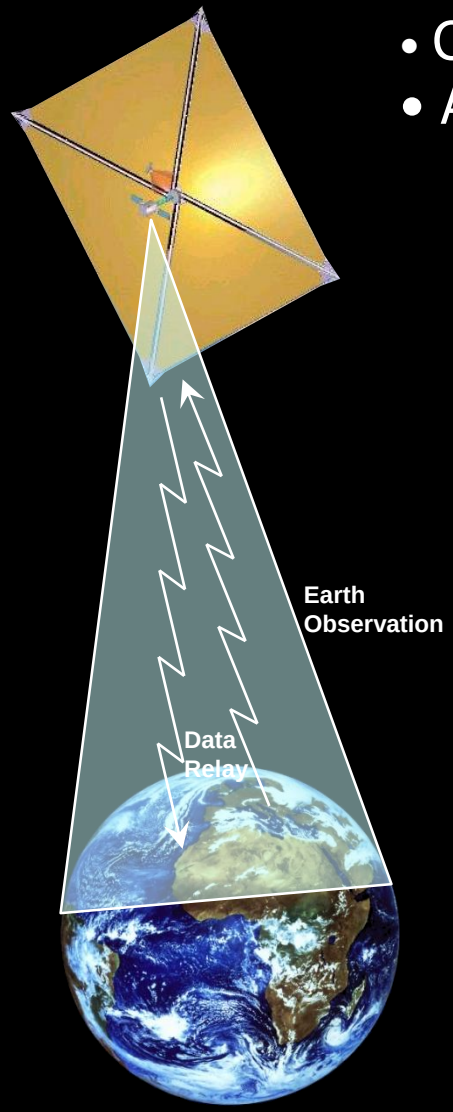
WHY SOLAR SAILS? Solar Storm Warning



A sailcraft with 0.26 mm/s^2 Ac (Scaled Solar Cruiser Performance) station-keeping sub-L1 can increase the warning times for both “typical” and “fast” CME’s (from 55 min, to 100 min. and 20 min. to 35 min., respectively.)

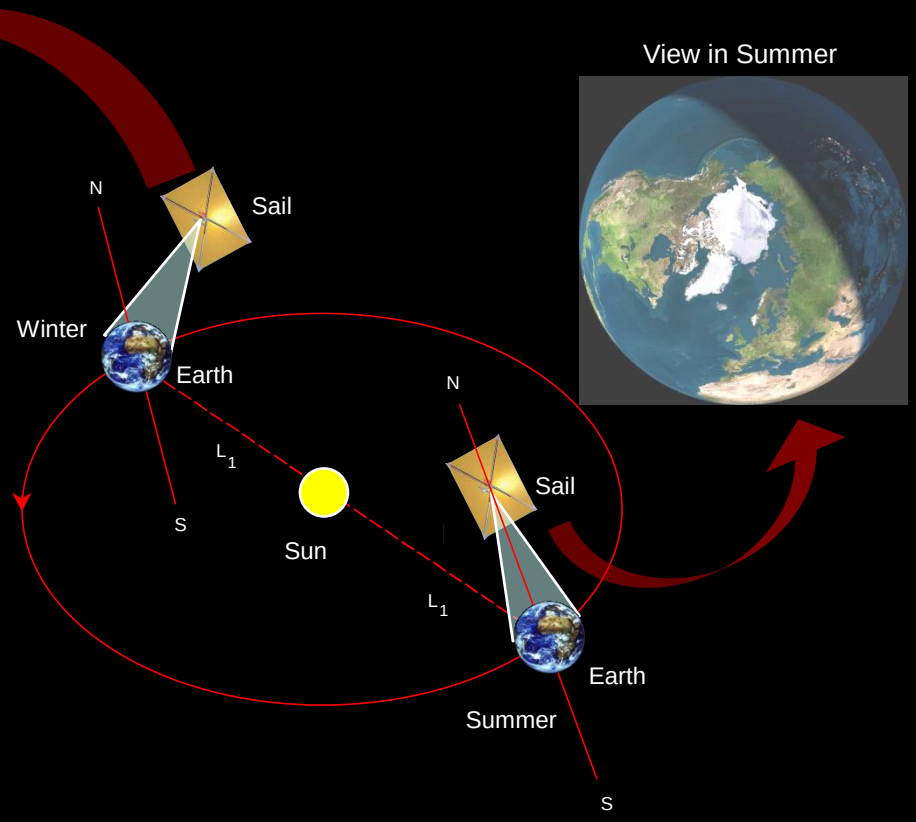


WHY SOLAR SAILS? Earth Pole Sitters



- Continual coverage of the polar regions
- Altitudes ranging from 0.75 million km to 3.5 million km, depending on sail performance and inclination chosen

View in Winter



View in Summer


NASA