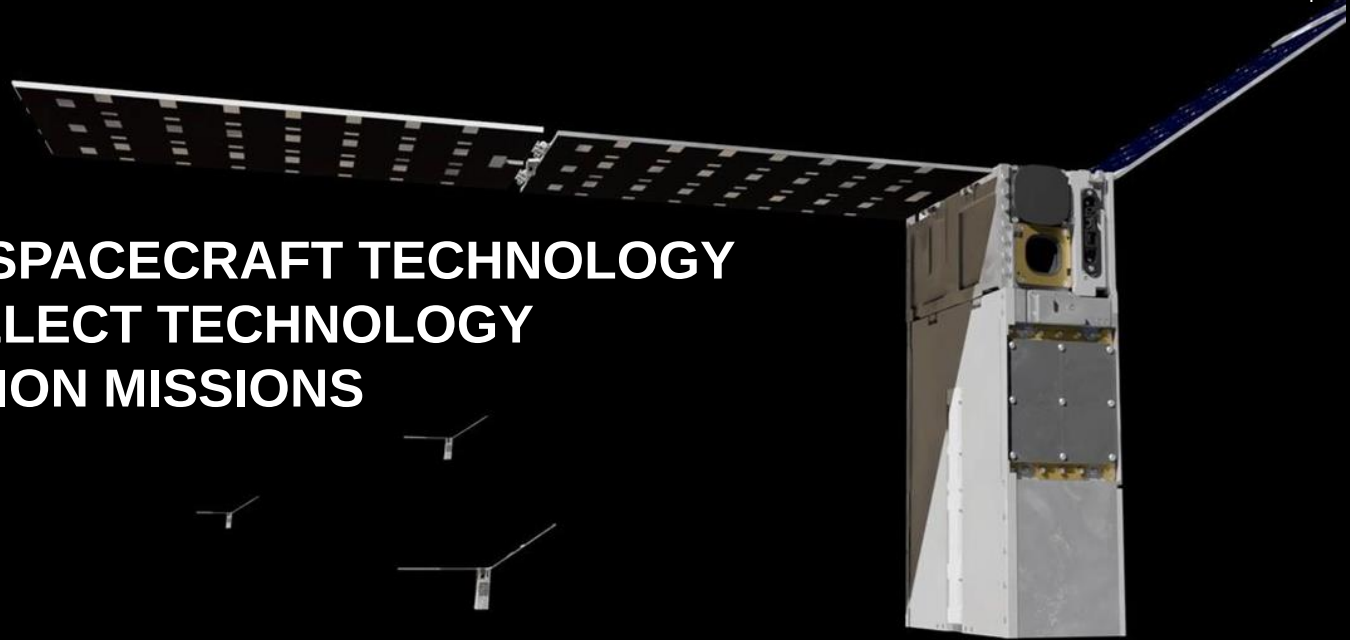




NASA SMALL SPACECRAFT TECHNOLOGY PROGRAM: SELECT TECHNOLOGY DEMONSTRATION MISSIONS

Roger C. Hunter
Program Manager, NASA Small Spacecraft Technology Program

Japanese Sasakawa Visit ♦ September 4, 2024



Small Spacecraft Technology Program

SPACE TECHNOLOGY MISSION DIRECTORATE

Expanding NASA's ability to execute unique missions through rapid development and demonstration of capabilities for small spacecraft applicable to exploration, science and the commercial space sector.

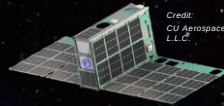
Starling
Technologies for Distributed
Small Spacecraft Missions



PTD-3
Pathfinder Technology Demonstrator-3
TeraByte InfraRed Delivery (TBIRD)



PTD-R
Pathfinder Technology
Demonstrator-R Monolithic
UV/SWIR/VIS Camera



DUPLEx
Dual Propulsion Experiment
(DUPLEx) CubeSat



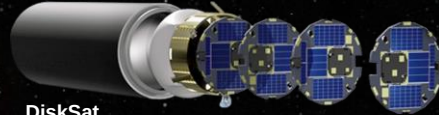
GPDM
Green Propulsion
Dual Mode



PY4
Four-CubeSat Swarm of
PyCubed-Based SpaceCRAFT



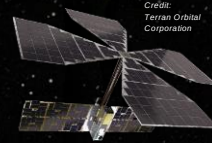
CLICK
CubeSat Laser
Infrared Crosslink



DiskSat
Two-Dimensional, High-Power,
High-Aperture, Maneuverable Spacecraft



R5
Rapid Technology Maturation



PTD-4
Pathfinder Technology Demonstrator-4
Lightweight Integrated Solar Array and
anTenna (LISA-T)



CAPSTONE
Cislunar Autonomous
Positioning System
Technology Operations
and Navigation Experiment



Courier
Solar Electric Propulsion Module

www.nasa.gov/smallspacecraft

www.nasa.gov



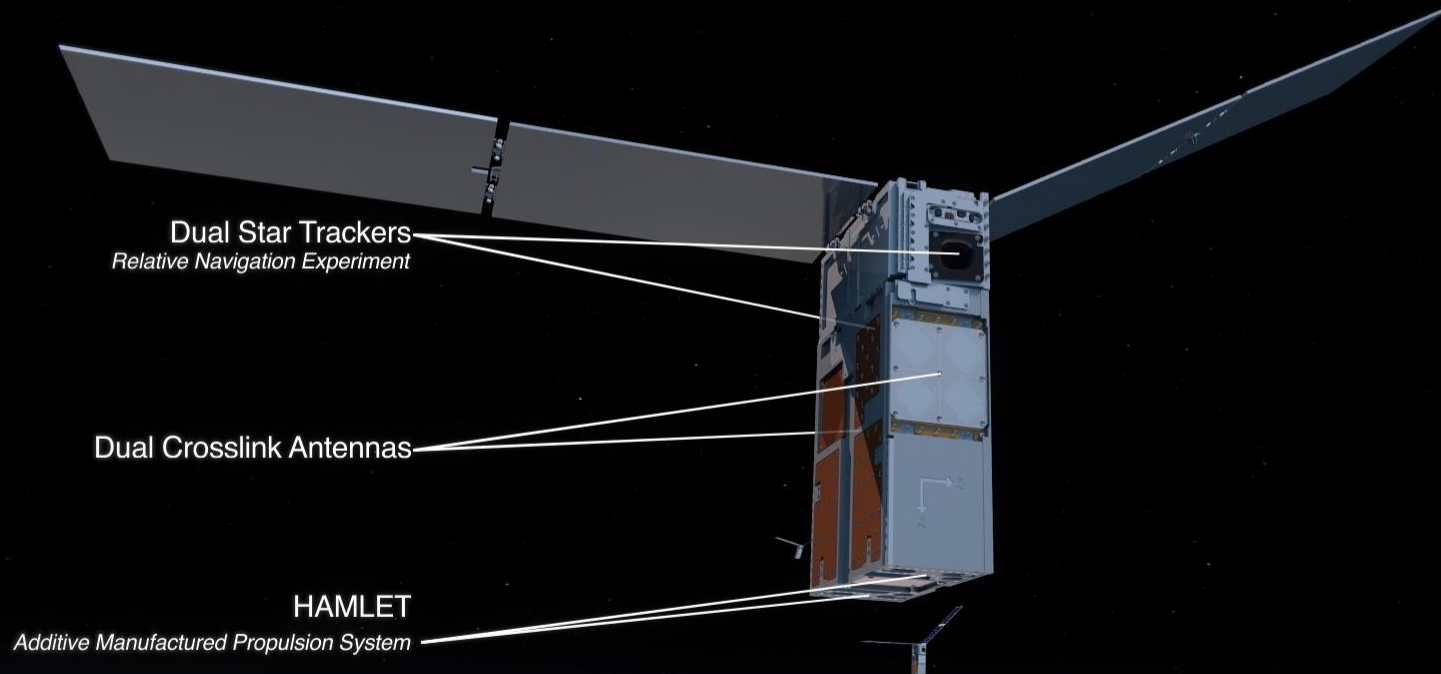
ACS3
Advanced Composite
Solar Sail System

Starling Technology Demonstration Mission - Overview



Starling Autonomous Swarm Technology Launched: July 17, 2023

Demonstrate swarm maneuver planning and execution, communications networking, relative navigation, and autonomous coordination between four 6U CubeSats.





Video Credit:
Stanford University



SV4 Tracker 2 View

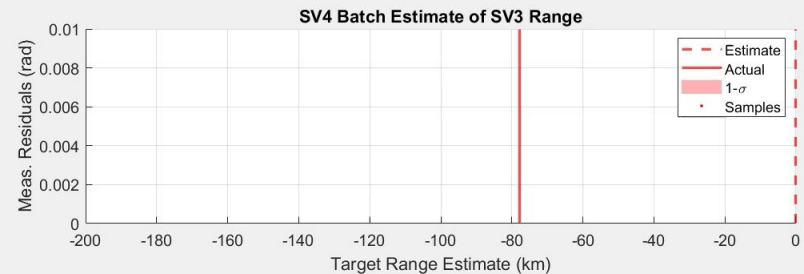
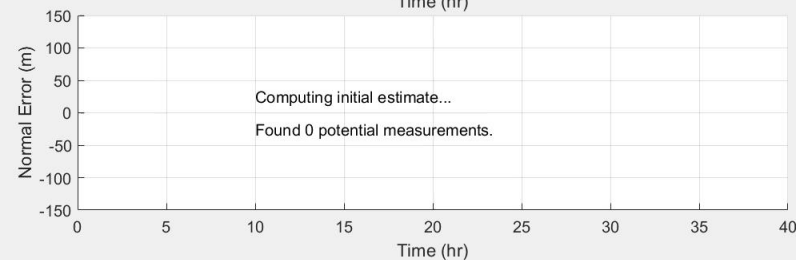
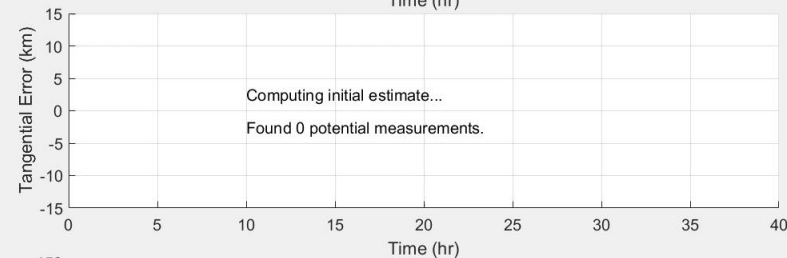
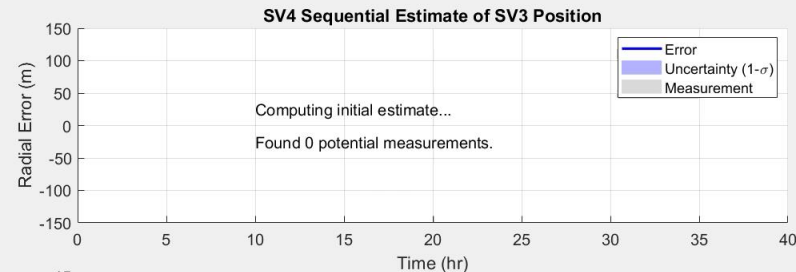
Time: 2024/02/11 01:33
Status: poor attitude sol.

Objects: 0
Swarm: 0
Stars: 0

Distance to SV2: 141.9 km
Distance to SV3: 78.4 km

- True Swarm Position
- Potential Target
- Tracked Target
- Known Star
- Unknown

○ SV2
○ SV3



Starling 1.5 Goals and Objectives



Goals

- Demonstrate a model of space traffic management (STM) between two cooperative swarms/constellations with onboard conjunction assessment (CA) and collision avoidance (COLA) capabilities.
- Develop autonomous maneuvering methods and tools that could be operationalized for NASA flight missions

Project Objectives

- Demonstrate onboard conjunction assessment (CA) for Starling's planned maneuvers
- Demonstrate continuous CA checking of passive and active/maneuvering objects
- Demonstrate a ground-based space situational awareness (SSA) / space traffic management (STM) hub that facilitates on-orbit autonomous CA/COLA
- Demonstrate collision avoidance (COLA) maneuver of Starling spacecraft in response to an onboard CA detection

6

Starling 1.5 launched as Starling 1.0. Starling 1.5 operations have commenced.



Advanced Composite Solar Sail System (ACS3)

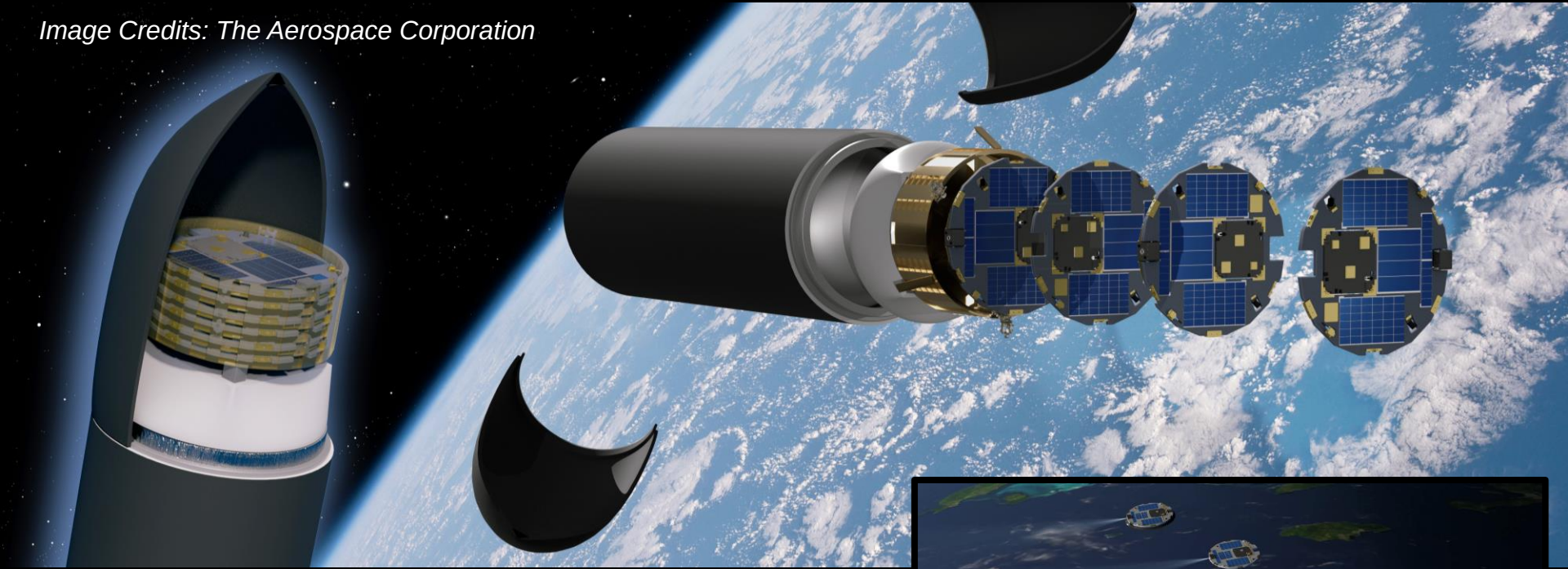
**Launched:
April 23, 2024**

Confirmed full deployment of the composite boom solar sail in low-Earth orbit. The unfurled solar sail measures approximately 84 m².



Image Credits: NASA

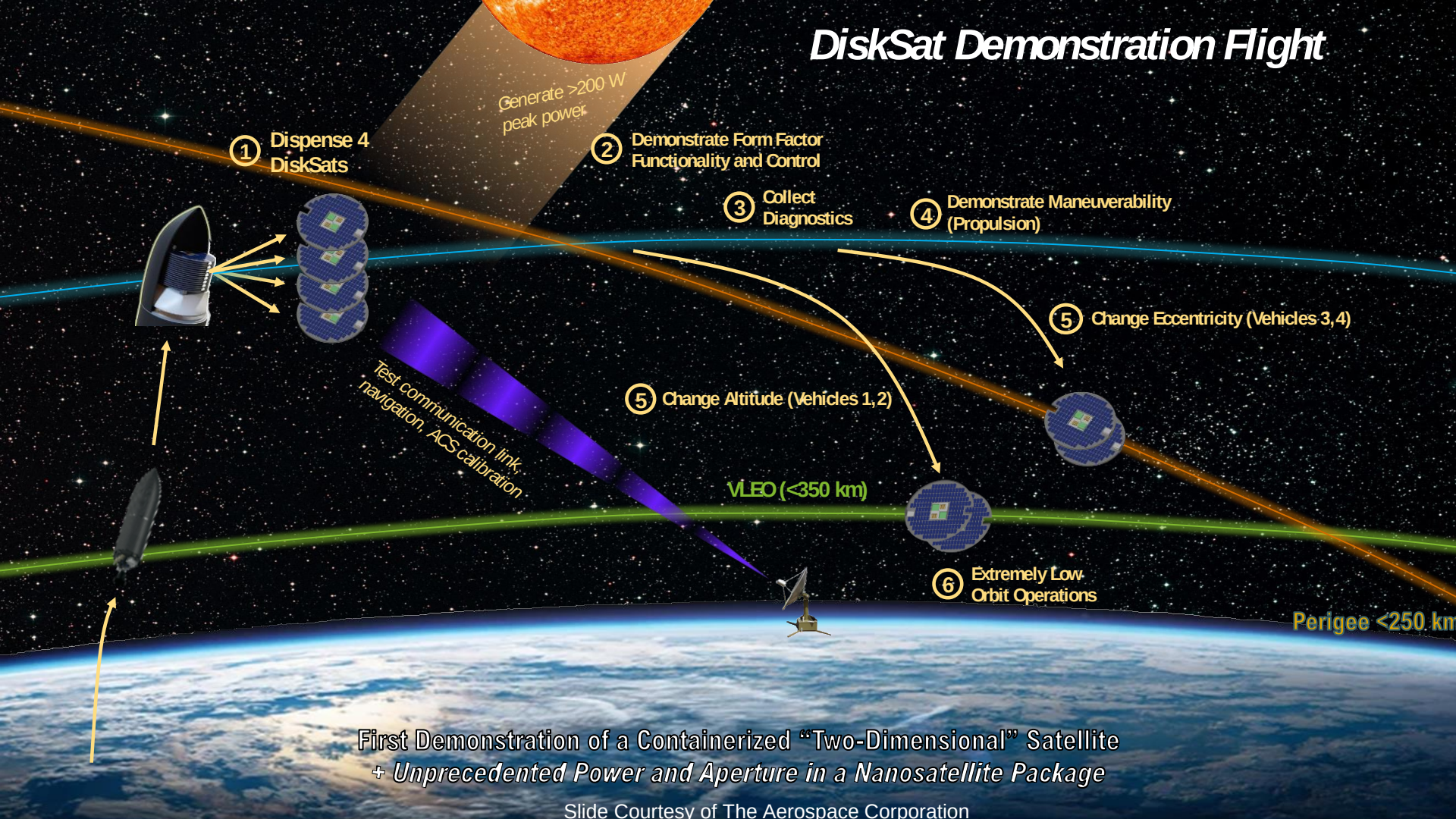
Image Credits: NASA



DiskSat DiskSats are high-power and high-aperture alternatives to CubeSats. They are launched in tight stacks but are deployed individually to ensure no recontact between satellites. This first DiskSat demonstration is anticipated to launch no earlier than April 2026.



DiskSat Demonstration Flight



First Demonstration of a Containerized “Two-Dimensional” Satellite
+ *Unprecedented Power and Aperture in a Nanosatellite Package*

Slide Courtesy of The Aerospace Corporation

