

# Monthly Space News

Greg Stanley

July 9, 2022



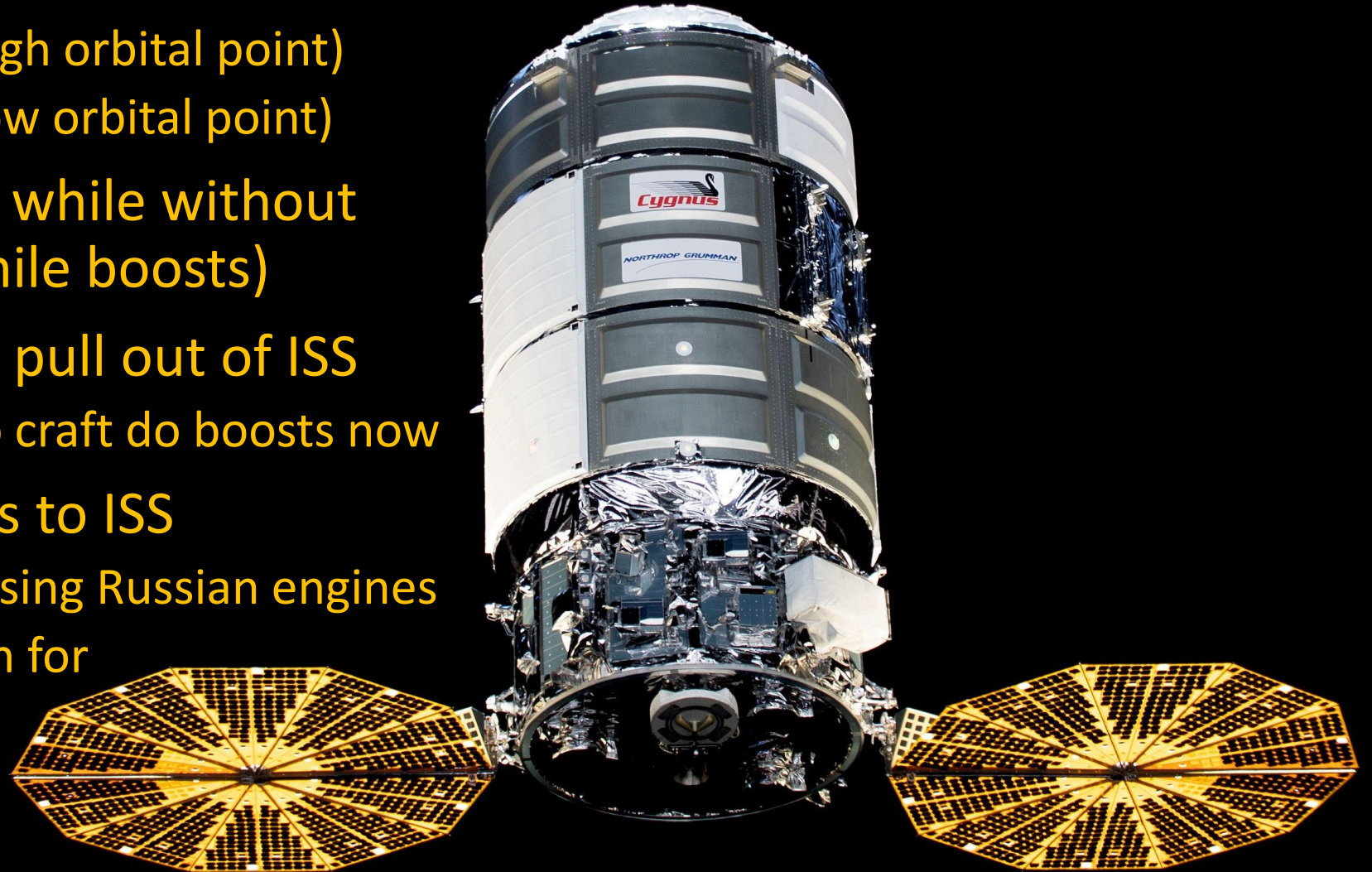
# FAA review will allow Starship launches, after minor steps

- Boca Chica launches to orbit OK'd, after 75 environmental mitigations
  - Initial 5 launches/year maximum
  - Limits on road closures
  - Notices on upcoming launches
  - Environmental monitoring
  - Remove debris from sensitive areas
- ... with some pettiness
  - Prepare a “historical context report” on the Mexican-American War and Civil War
  - Annual \$5,000 contribution to a state fishing program, Adopt-an-Ocelot, and a fund for birds of prey
  - Restore a historical marker
  - Educational tours for local students
  - Use Starlink for wildlife monitoring
  - Minimize lighting
- Elon Musk says Boca Chica will be an R&D center, not for routine launches
- Routine launches will be at Kennedy Space Center

SpaceX Boca Chica launch site  
Image credit: SpaceX

# Cygnus cargo craft lifted ISS (space station) orbit

- A Cygnus cargo spacecraft lifted ISS orbit
  - .1 mile lift at apogee (high orbital point)
  - .5 mile lift at perigee (low orbital point)
- Shows ISS can survive a while without Russian propulsion (1 mile boosts)
- Reduces risk if Russians pull out of ISS
  - Russian thrusters, cargo craft do boosts now
- Problem: getting Cygnus to ISS
  - 2 Antares rockets left, using Russian engines
  - Atlas rockets: all spoken for
  - Future: Vulcan rocket
- Future: Boeing Starliner could also boost ISS



# First product manufactured in space sold

Image credit: Redwire



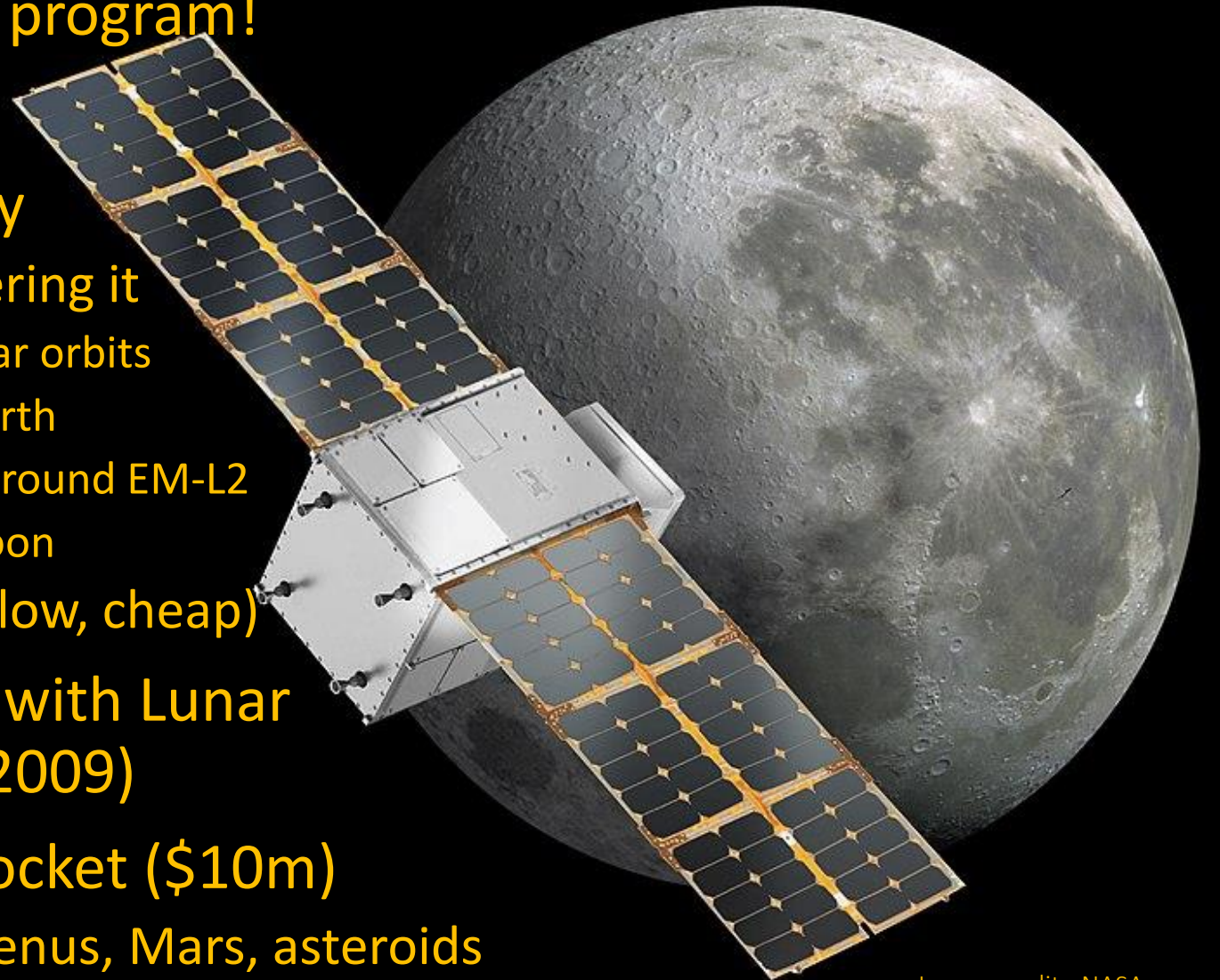
- Redwire sold 2g of space-manufactured optical crystal for \$4,000 (\$2m/kg)
  - KDP – potassium dihydrogen phosphate, used in high-energy lasers
  - Growing one large crystal
  - Made in Redwire's Industrial Crystallization Facility (ICF) on ISS
  - Optical crystals made on Earth have gravity-induced defects limiting laser power
  - Sold to Ohio State University Center for Electron Microscopy and Analysis (CEMAS)

# An update on Artemis/Moon to Mars

- CAPSTONE - First launch of the Artemis lunar program!
- Artemis delays leaked
- NASA Moon-to-Mars objectives workshop (after news)

# NASA's CAPSTONE mission was launched

- Cislunar Autonomous Positioning System Technology Operations and Navigation Experiment
- First launch of the Artemis lunar program!
- 12-unit CubeSat lunar orbiter
- Will fly in orbit of future Gateway
  - Testing orbital model validity, entering it
    - Mass concentrations complicate lunar orbits
    - Continuous communications with Earth
    - 6.5 day Near Rectilinear Halo Orbit around EM-L2
    - 1,000 miles to 43,500 miles from Moon
  - 4 months to get to its final orbit (slow, cheap)
- Establishing a navigation system with Lunar Reconnaissance Orbiter (NASA, 2009)
- Launched from NZ on Electron rocket (\$10m)
  - Upgraded Photon space tug, for Venus, Mars, asteroids



# NASA Artemis/Moon to Mars schedule slip (leaked news)

- Eric Berger (Ars Technica) leaked NASA plan changes
  - Baseline plan not achievable on time or budget
  - Several alternatives depending on budgets and objectives
- Artemis 3 (human lunar landing) likely to slip beyond 2025
- Likely slower cadence of missions
- Earliest lunar surface habitat in 2034
- Mars? 2040s or 2050s
- Mostly still focusing on building a lunar space station (Gateway) rather than building up capabilities for sustainable presence on the Moon's surface
- NSS suggests changes to NASA plans & objectives

# Miscellany

- Is NASA administrator Bill Nelson finally “playing the China card”?
  - Bill Nelson: “*there is a new race to space*” with China
    - “*We must be very concerned that China is landing on the Moon and saying ‘It’s ours now and you stay out’*”
    - Urgency not yet apparent in Congress or in NASA objectives
  - Unhappy China pointed out that the U.S. “defined space as a war-fighting domain”
- (Local interest): Axiom Space leased former Fry’s store in Webster, TX with full-scale ISS mockup
  - Will support 400 employees working on Axiom space station
  - Separate from its long-term HQ construction at Ellington Airport (Houston Spaceport)



Image credit:  
NASA



Image credit: v16.imablog.net













# How many launches since the last meeting (June 11)?

*Includes failed launches if they lift off the launch pad  
Only includes launches attempting orbit or beyond*






Atlas 5 rocket for U.S. Space Force, 7/1/22  
Credit: United Launch Alliance

# Launches since last meeting (June 11) page 1

-  June 12 – Astra Rocket 3.3 – 2 of 6 small NASA hurricane research satellites (FAIL)
-  June 17 – Falcon 9 – 53 Starlink (internet service) satellites. Booster used 13 times!
-  June 18 – Falcon 9 – 4 ton remote sensing radar satellite (first of 3) for German military
-  June 19 – Falcon 9 – spare satellite for Globalstar data relay, 4 classified US payloads
-  June 21 – Nuri (Korea) – 5 small satellites, 358 pound test mockup of a primary payload
-  June 22 – Ariane 5 – 2 communications satellites for Malaysia and India
-  June 22 – Kuaizhou-1A – “space environment detection” research satellite
-  June 22 – Long March 2D – 3 military payloads
-  June 27 – Long March 4C – microwave remote sensing satellite
-  June 28 – Electron – NASA CAPSTONE 55 lb. craft to lunar orbit matching future Gateway
-  June 29 – Falcon 9 – communications satellite for SES of Luxembourg, for US TV & data
-  June 30 – PSLV (India) – 3 Earth observation satellites for Singapore, 6 experiments

# Launches since last meeting (June 11) page 2

-  July 1 – Atlas 5 – classified, including hypersonic missile warning test for U.S. Space Force
-  July 2 – LauncherOne (Virgin Orbit) – 7 small test satellites for U.S. military, NASA
-  July 7 – Falcon 9 – 53 Starlink (internet) satellites

---

  
(15 total)

# Discussion & questions?



Image: NASA

# NASA's Moon to Mars (M2M) objectives workshop

June 28-29, 2022, Houston

Greg Stanley

Flags and Footprints again?



National Aeronautics and  
Space Administration



MOON TO MARS OBJECTIVES WORKSHOP





National Aeronautics and  
Space Administration



# NASA's Moon to Mars (M2M) objectives workshop

MOON TO MARS OBJECTIVES WORKSHOP

- NASA workshop June 28-29, Houston
- Organizations invited based on responses to May survey on objectives
- NASA presentations + 30-minute meetings with each organization
- NSS sent a team of 4
- May have been the first meeting of this type



# Workshop attendees

- Companies

- Aerojet Rocketdyne, Lockheed Martin, Aerospace Corporation, Northrop Grumman, Astrobotic, SpaceX, Blue Origin, Relativity, Boeing, Lunar Resources Inc., Leidos (formerly called SAIC), Advanced Space, Sierra Nevada, Orbits Edge, Redwire, ICON, Oshkosh Corporation

- Universities

- John Hopkins University (Applied Physics Laboratory), U. of Arizona, Western Carolina University, Louisiana State University, Notre Dame, MIT

- Non-profits

- NSS, USRA/Lunar & Planetary Institute, TechFreedom, Explore Mars, Coalition for Deep Space, Earthlight Foundation

FOR SLIDES AND VIDEO ABOUT THIS WORKSHOP, SEE

<https://performity.com/Resources/Space/space.html>