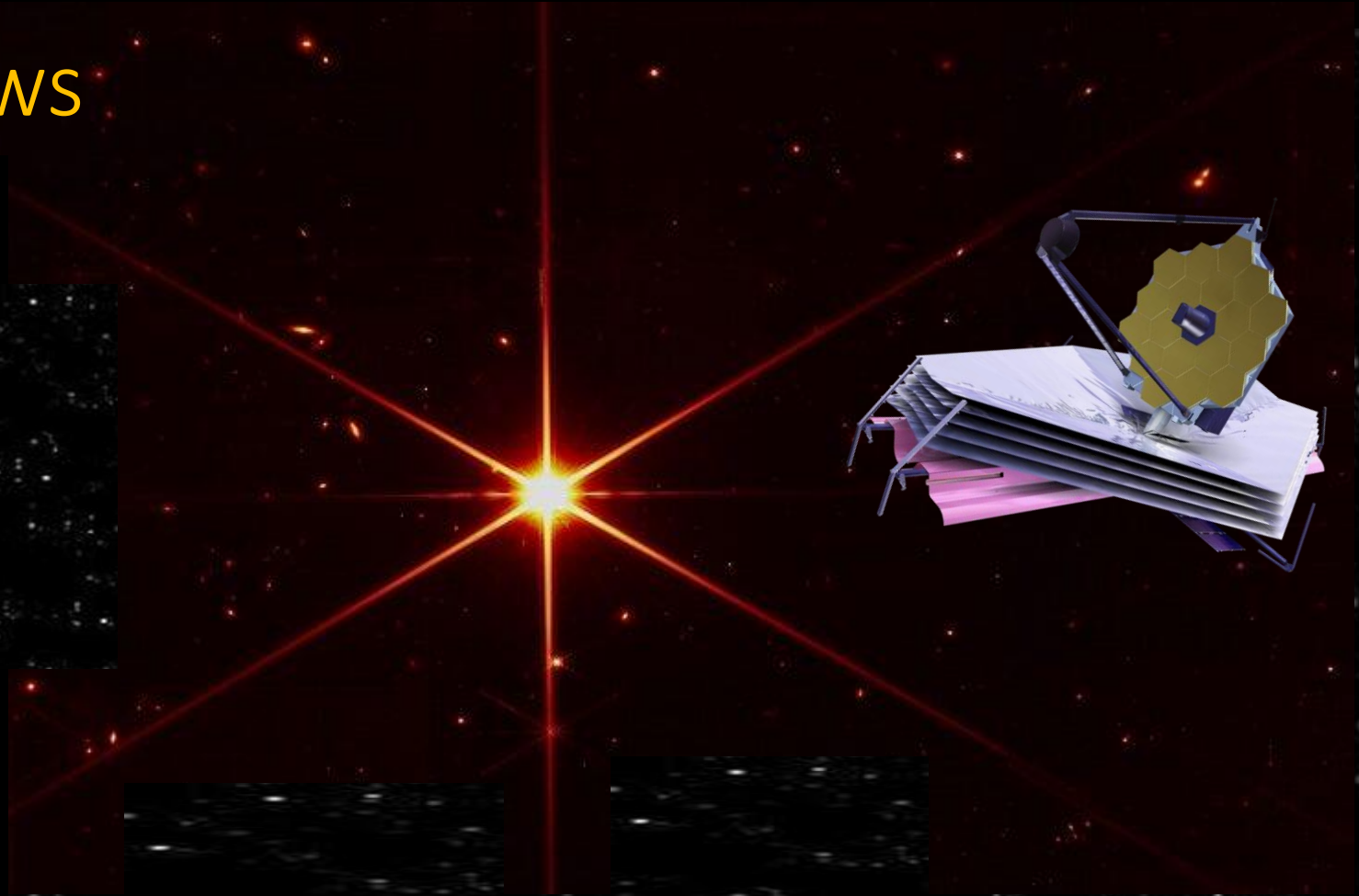


Monthly Space News

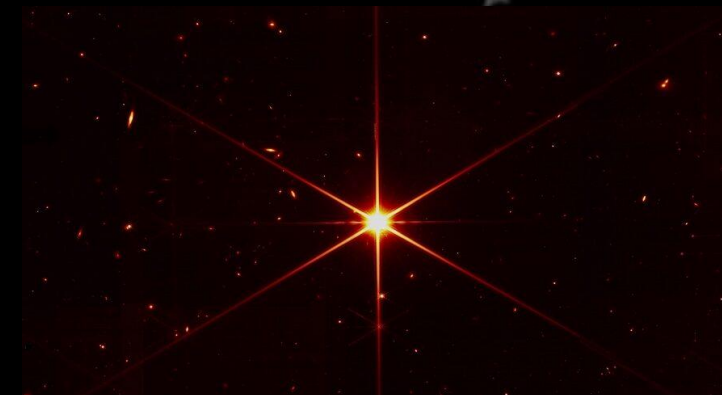
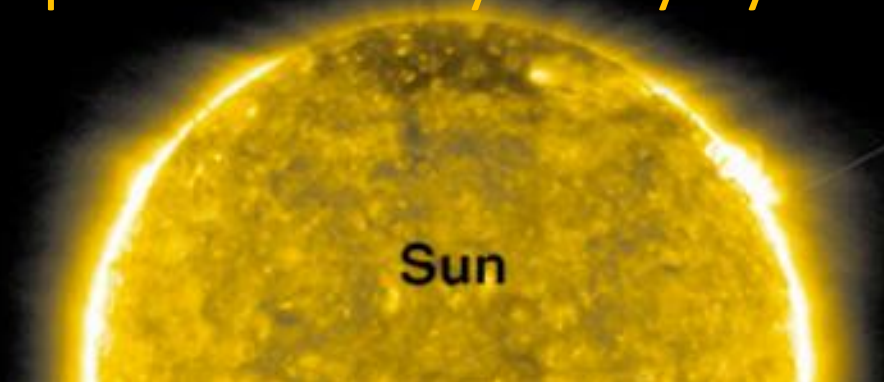
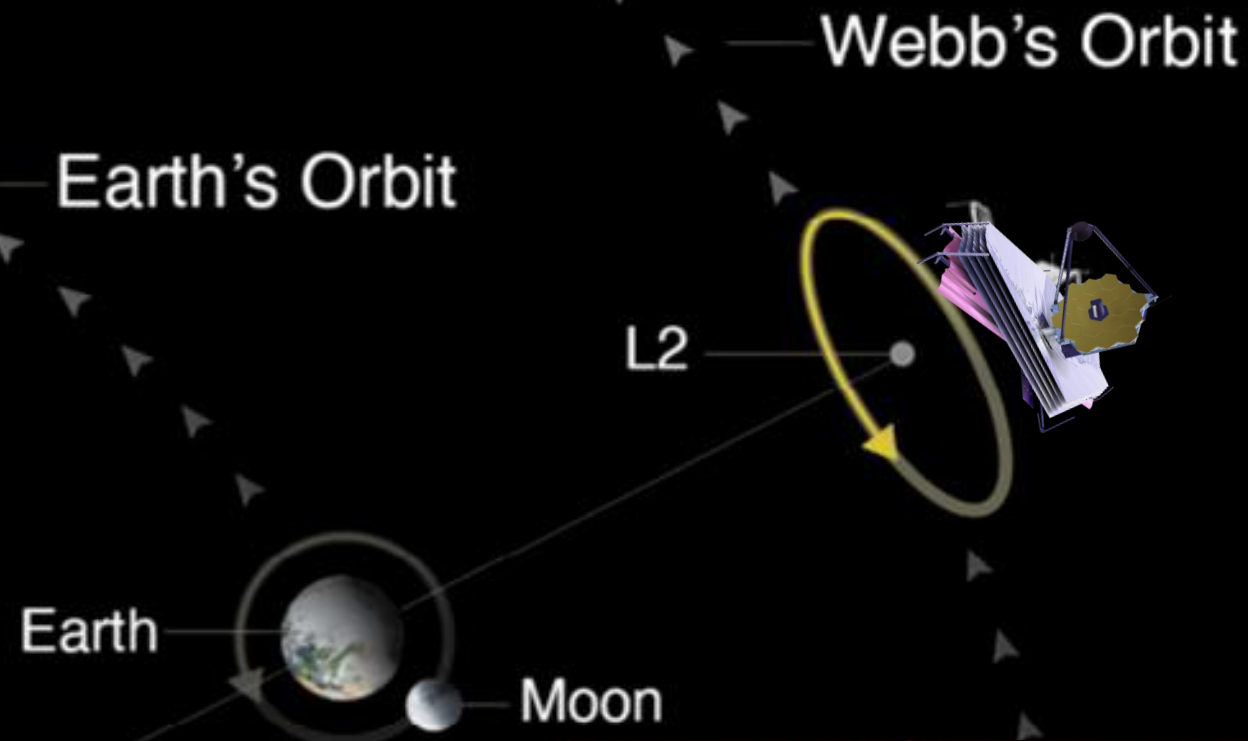
Greg Stanley

Apr. 9, 2022



James Webb Space Telescope (JWST) update

- NASA completed alignment of JWST mirrors
 - (Test picture at bottom right)
 - Images are focused as finely as laws of physics allow for that size telescope
 - Still commissioning 3 instruments
- Passive cooldown nearly complete
- Expect to be fully ready by June



Images credit:NASA

Space Launch System (SLS)

- Rolled out for “wet dress rehearsal” for Artemis 1
 - Liquid H₂, O₂
- Delayed SpaceX Ax-1 launch
 - Common utilities (e.g., N₂)
 - Adjacent launch pad
- Test unfinished: vent valve, fan, warm O₂ problems
 - Halted until after Ax-1 launch



Axiom Space Ax-1 Mission

- First all-commercial human flight to the ISS
 - Research and education, not just \$55M joyrides
 - Demonstrating future private space station access and work
- 10 day mission (8 on ISS) launched April 8
- Falcon 9 rocket/Dragon spacecraft
- Mission control from Axiom HQ in Houston, not NASA (an official payload operations site)

Ax-1 mission Falcon 9
at launch pad 39A
Credit: SpaceX



Image credit: Axiom Space



Axiom Space Mission Control Center MCC-A



Image credit: Axiom Space

ISS operations still normal despite Ukraine war

- International Space Station (ISS) – no significant change yet, just bluster
 - Russian launch of new crew on Mar. 18 was routine
 - Astronaut Mark Vande Hei returned via Russian craft as planned, Mar. 30
 - 355 days in space, set U.S. record



Soyuz crew ship return with Mark Vande Hei. Image credit: NASA



ISS, Nov., 2021. Image credit: NASA

OneWeb (satellite internet) update

March 25, 2021 Soyuz launch of 36 OneWeb internet satellites,
Vostochny Cosmodrome Credit: Arianespace

- OneWeb launched previous 428 satellites on Russian Soyuz rockets
- Cancelled remaining 6 Soyuz launches for 220 satellites
- Probably lost their 36 satellites in place for launch from Russia (?)
 - (18 days to produce new ones)

- Contracted at least some launches to SpaceX (details undisclosed)
 - Not willing to wait for new European rockets, and probably got cheaper pricing
 - May still try to hold European Space Agency (ESA) to contract, originally Soyuz-based

Amazon's Project Kuiper contracts for launches

- Amazon's internet satellite constellation will compete with Starlink and OneWeb
- Up to 83 launches, ALL on unfinished rockets
 - United Launch Alliance (ULA): 38 Vulcan launches (45 sats each)
 - Blue Origin: 12 New Glenn launches + option for 15 (61 sats each)
 - Arianespace: 18 Ariane 6 launches (35-40 satellites each)
 - No Russian Soyuz or lowest cost competitor SpaceX
- Largest commercial launch deal ever
 - Most of its 3,236 satellites in overall \$10B project
 - Worth at least several billion dollars (undisclosed)
 - Example low guess: \$70M/launch x 68 launches = \$4.76B
 - Not counting 9 Atlas 5 (ULA) launches already bought
 - Forcing most other medium+ lift business to SpaceX
 - (until new Rocket Lab and Relativity rockets fly)
- Time pressure: FCC license requires $\frac{1}{2}$ of satellites in orbit by 2026, rest by 2029



Image Credits: New Glenn – Blue Origin; Vulcan - ULA; Ariane 6 - ESA

Inflation hits SpaceX

- Launch prices going up
 - \$67M for Falcon 9, up from \$62M (8%)
 - \$97M for Falcon Heavy, up from \$90M (8%)
 - Smallsat rideshare: \$1.1M, up from \$1M (10%)
 - 200 kg to sun-synchronous orbit (\$5,500/kg)
- Starlink (internet service) prices
 - \$110/month, up from \$99/month (11%)
 - Terminal \$599, up from \$499 (20%)
 - Terminals are subsidized
 - Real cost may be \$1,300
- Compare to CPI, up 7.9% over last year



Falcon 9 launch. Credit: SpaceX

KSAT (Norway) building a lunar communications network

- Kongsberg Satellite Services (KSAT) increasing its network of antennas for lunar comms.
- Sites spread over longitudes to provide continuous coverage
- More large antennas (15m +)
- Customer example: Intuitive Machines
- A sign of momentum for lunar activities

A KSAT ground station in Svalbard, Norway, with 100 antennas. Credit: KSAT

Miscellany

- Blue Origin took 6 passengers on New Shepard (suborbital) launch Mar. 31
- SpaceX will now use only Raptor V2 engines for Starship testing
 - Simpler, cheaper to build, lighter, more powerful, faster to re-use, vs V1
 - Elon Musk said in February they were still having problems with melting them
 - Probably won't run at full throttle
 - Watch for green exhaust: vaporized copper

How many launches since the last meeting (Mar 12)?

Includes failed launches if they lift off the launch pad










Only includes launches attempting orbit or beyond



Rocket Lab's Electron launch from New Zealand, Apr. 2

Credit: Rocket Lab/ Joseph Baxter

Launches since last meeting (Mar. 12)

-  Mar 15 – Rocket 3.3 (Astra) – small payloads, including 16 Swarm SpaceBEEs
-  Mar 17 – Long March 4C – classified military reconnaissance satellite
-  Mar 18 – Soyuz – 3 Cosmonauts to International Space Station (ISS)
-  Mar 19 – Falcon 9 – 53 Starlink (internet) satellites (launched 2,335, 2086 working)
-  Mar 22 – Soyuz – Military communications satellite
-  Mar 29 – Long March 6A (new) – 2 satellites
-  Apr 01 – Falcon 9 – 40 mostly small satellites (“Transporter 4” rideshare mission)
-  Apr 02 – Electron – 2 BlackSky Earth observation satellites
-  Apr 08 – Falcon 9 – Axiom Ax-1, first fully private human mission to ISS

Discussion & questions?



Image: NASA

Featured speaker: Dr. Gary Johnson



- Retired aerospace engineer with wide experience
 - Aerospace, automotive, alternate fuels, certified auto mechanic, ...
 - Cactus-killing farm implements. HowToKillCactus.com
- Has patents on ramjet rocket motors, tool for controlling prickly pear cactus
- BS., M.S. Aerospace engineering, U. of Texas at Austin
- Ph.D., General Engineering, Kennedy-Western University

• TOPIC: Big Ship Propulsion
(as in taking passengers to Mars)