

Space News

February 6, 2021



Image: NASA

Greg Stanley



NASA Lunar news

- NASA delayed decision eliminating 1 of 3 groups competing for HLS (Human Landing System)
 - Part of the Artemis lunar program
 - Delayed until April 30th (2 month delay)
 - Previous Congress had already cut HLS funding
- Decision making in any organization gets delayed due to uncertainty about new management
 - Changes in mission or at least timing often occur
 - NASA adapts and re-packages
 - “Moon to Mars” approach for both Moon & Mars advocates
 - Repurposing of hardware programs (Gateway, SLS, etc.)
- NASA selected Firefly Aerospace to deliver 94 kg payload to the moon in 2023 for \$93.3 million
 - 6th CLPS award (Commercial Lunar Payload Services)
 - Previous awards: Astrobotic, Intuitive Machines, Masten Space Systems
 - Their lander has additional commercial 50 kg capacity

Mars news

- All 3 robotic missions to Mars launched in July will arrive in February
 - UAE: Hope (orbiter only), arriving February 9
 - China: Tianwen-1 (orbiter/lander/rover) orbit Feb 10, landing by May
 - US: Mars 2020 (landing system/Perseverance rover/Ingenuity helicopter) landing Feb 18



Image: NASA

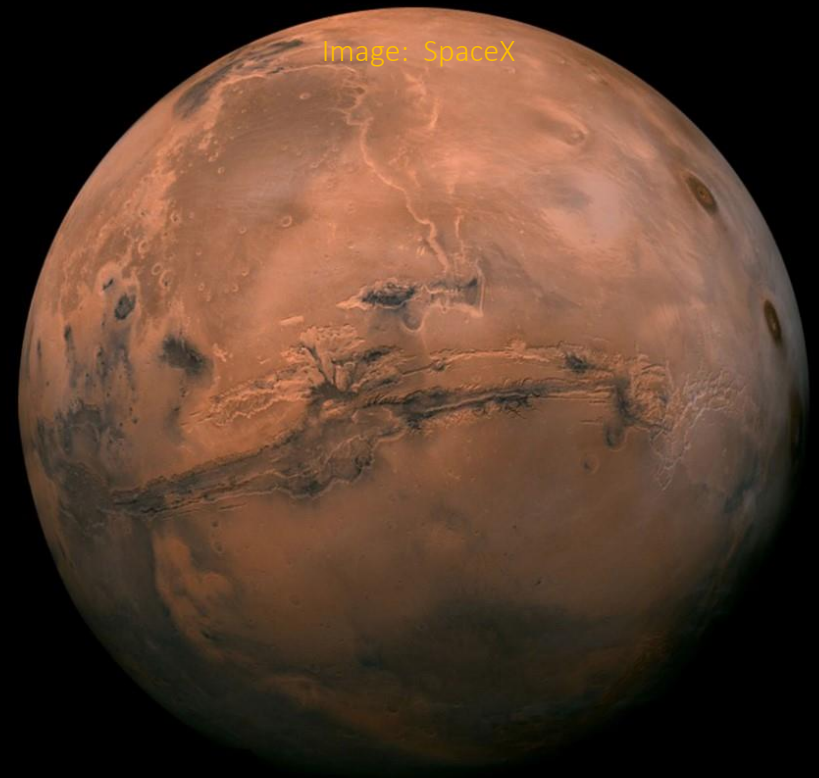


Image: SpaceX

Another small satellite launcher succeeds

- Virgin Orbit LauncherOne launched 10 cubesats
 - First test in May, 2019 had failed
- Hybrid launch: 2-stage rocket dropped from 747.
- 1 hour after 747 took off from Mojave Air & Space port, launched rocket

- Commercial launch service announced, but no schedule yet
- Competing with Rocket Lab, Astra, Firefly, ABL, Relativity Space

Satellites: it's a small small, small world (but crowded)

- A record 143 satellites launched in a single SpaceX Falcon 9: “Transporter-1”
 - All small “rideshare” satellites, except for 10 Starlink satellites
 - Polar orbit, 2nd one launched south from Cape Canaveral.
- Some contracted directly with SpaceX, others through aggregators like Nanoracks
 - Book on the SpaceX web site. \$1 million for 200 kg (440 lbs) to sun-synchronous orbit*
 - There will be more of these launches, every 4-6 months depending on demand
 - Threat to small-rocket competitors like Rocket Lab, who now emphasize quick results
 - “Taxi service” vs. “bus service”
- More concerns over crowding
- Stressed US military tracking of all the objects
- Shift to small satellites changes satellite reconnaissance (e.g., Blackjack program) and warfare planning



Organizing 143 satellites on Transporter-1

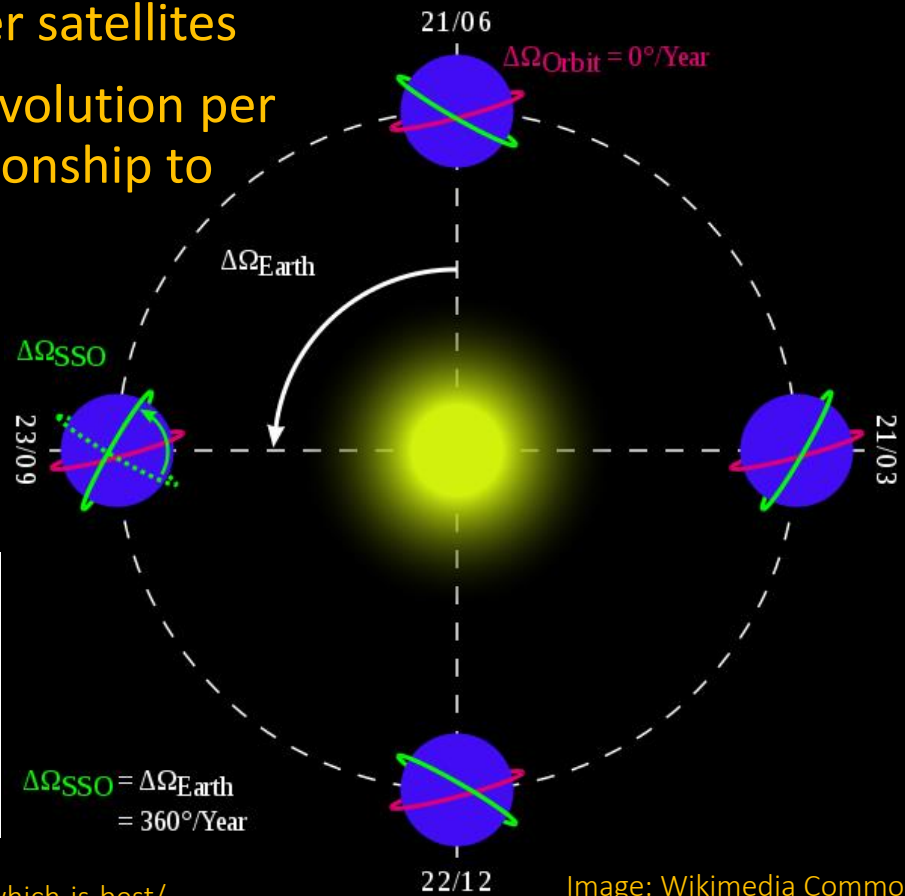
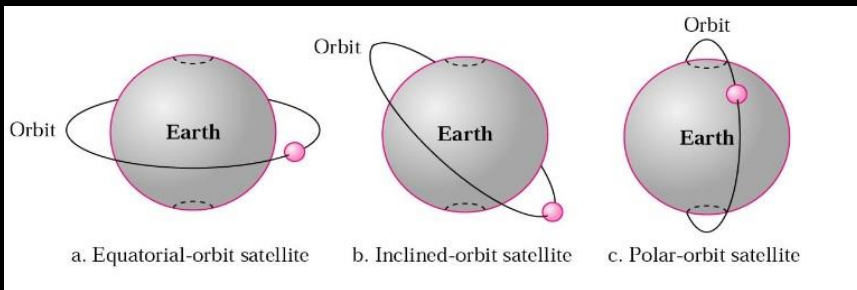
- Space tugs carry small satellites into different orbits so they can be rideshares among bigger payloads, separately managed
- Spaceflight's Sherpa space tug carried 13 satellites away, launched them over 2 hours
 - One pod included cremated remains of 104 people
- D-Orbit space tug carried 20 small satellites
- Space tugs challenge small rocket operators
 - Get better launch pricing with big rockets
 - But customers still get custom orbits



- Exolaunch , Nanoracks , Maverick Space Systems also aggregated customers
 - Their customer payloads were launched directly from Transporter-1
 - SpaceX sells slot to the aggregator, with their own carrier/launchers for 200 kg
 - Small customers deal with the aggregators, not SpaceX

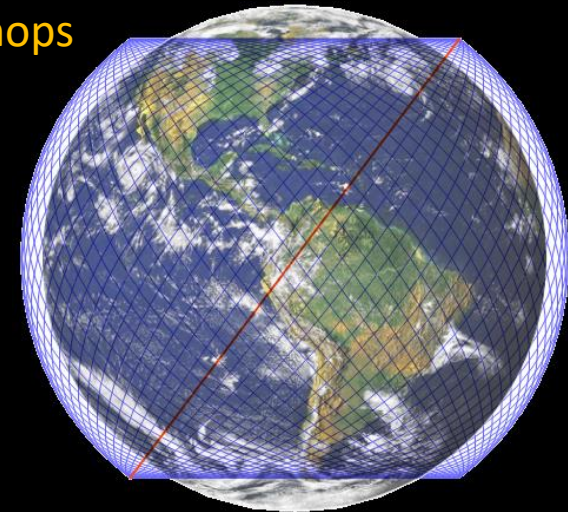
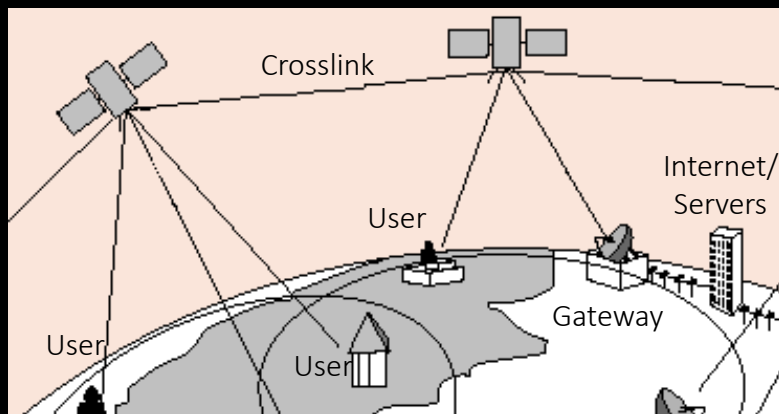
*What is a Sun-synchronous orbit?

- Nearly polar orbit
- Satellite passes over any given point of the planet's surface at the same local solar time.
 - Every time the satellite is overhead, surface illumination angle is the same
- Useful for imaging, spy, and weather satellites
- Precesses through one complete revolution per year, so it maintains the same relationship to the Sun



Starlink update: polar orbits and laser links

- As of Feb 4 launch, now have 1,022 satellites in orbit + 60 already deorbited
- 10,000 beta test users in northern US, Canada, UK, with 100/20 mbps
- “Transporter-1” launch put 10 Starlink satellites into polar orbit – a first
 - Previously, Starlink wasn’t even going to cover the poles.
 - Reasons: better Canada/Alaska coverage stated; military in polar regions?
- Introduced laser communications links between Starlink satellites
- Future Starlink satellites (2022+) will all have laser links
 - Links to adjacent satellites in same orbital plane or adjacent plane
 - Additional ground stations/gateways not needed in polar regions, oceans, hostile countries
 - Reduce latency (time delays) due to fewer ground station hops
 - Light speed in fiber only 2/3 speed in vacuum



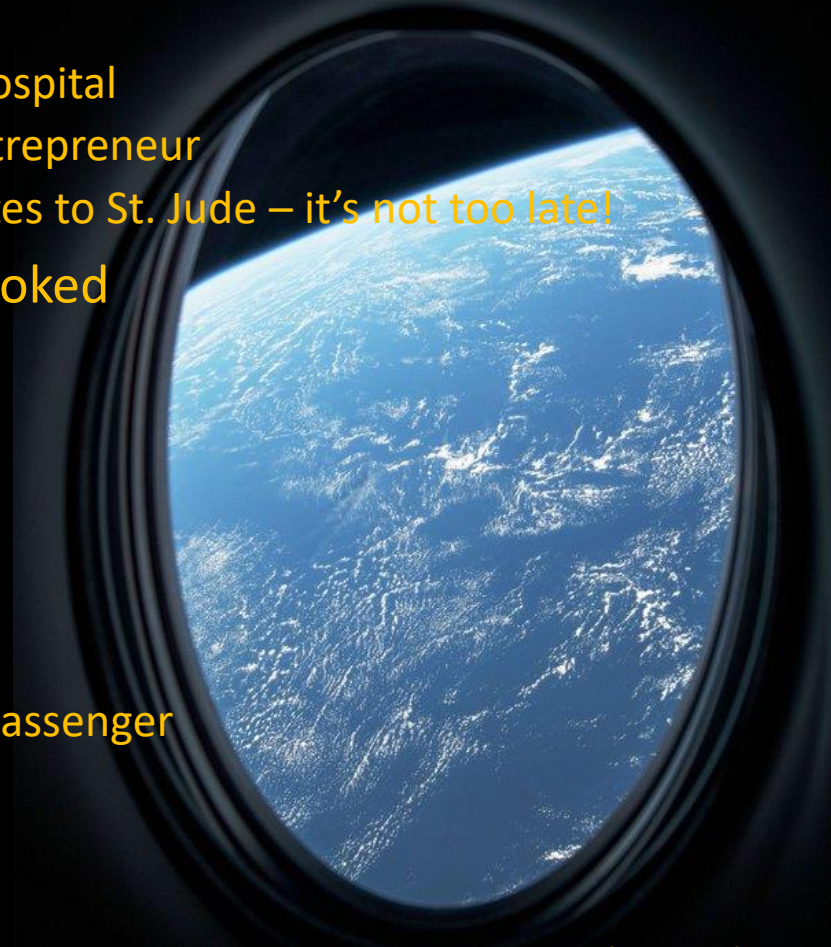
Oil rigs to become offshore Starship launch pads

- SpaceX bought 2 offshore deepwater oil rigs
 - 240 ft x 255 ft
 - Compares with existing 300 ft x 170 ft drone ships
 - 1.4 acres of main decks
 - Living quarters for 150 people
- Were headed to scrapyard, cost \$3.5 million
 - Original cost: \$330 - \$515 million in 2008 !
- Will convert to floating spaceport for Starship
 - Noise, sonic booms, congestion



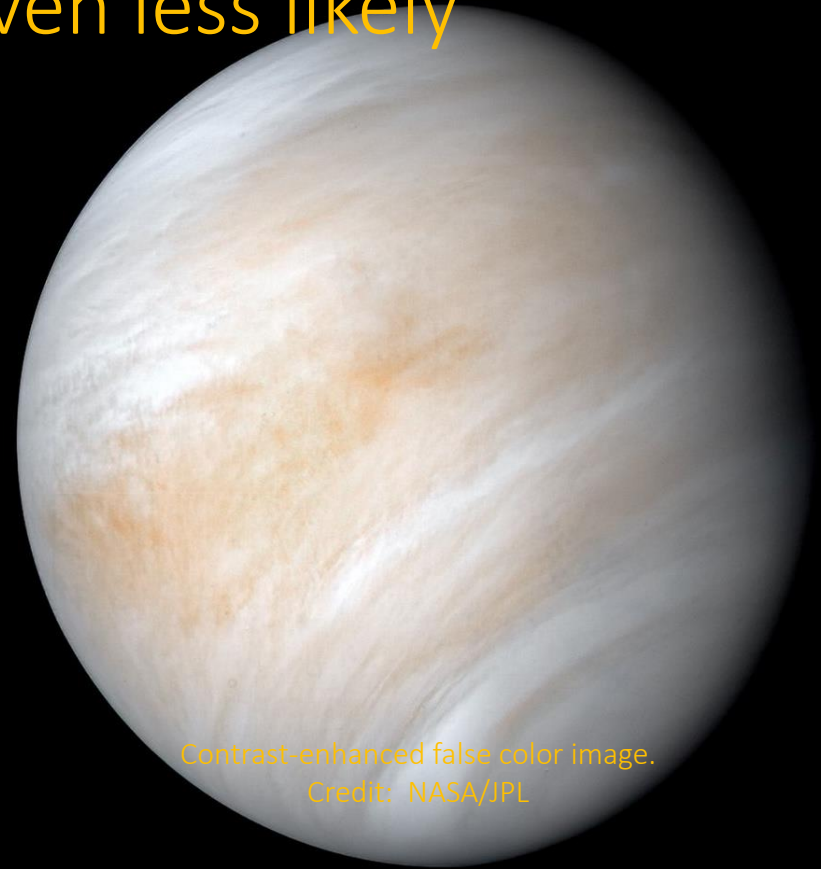
Space tourism taking off soon ... but still expensive

- First all-civilian space mission announced by SpaceX
 - Falcon 9 / Crew Dragon , possibly as early as Oct, 2021
 - Orbit for 2-4 days (not going to ISS)
 - Fundraiser for St. Jude's Children's Research Hospital
 - Led and paid for by Jared Isaacman, a tech entrepreneur
 - One seat still available to someone who donates to St. Jude – it's not too late!
- More private Crew Dragon missions are booked
 - Axiom Space: 4-man crew to ISS, a first
 - 4 months of training
 - About 8 days aboard ISS
 - As early as January, 2022
 - Space Adventures
- Costs
 - SpaceX probably charging about \$50 million/passenger
 - NASA charges for ISS:
 - \$35,000 /night/passenger
 - \$17,500/hour for astronaut time onboard ISS
- Blue Origin flew New Shepard 4 reusable rocket & capsule to 106 km (66 m)

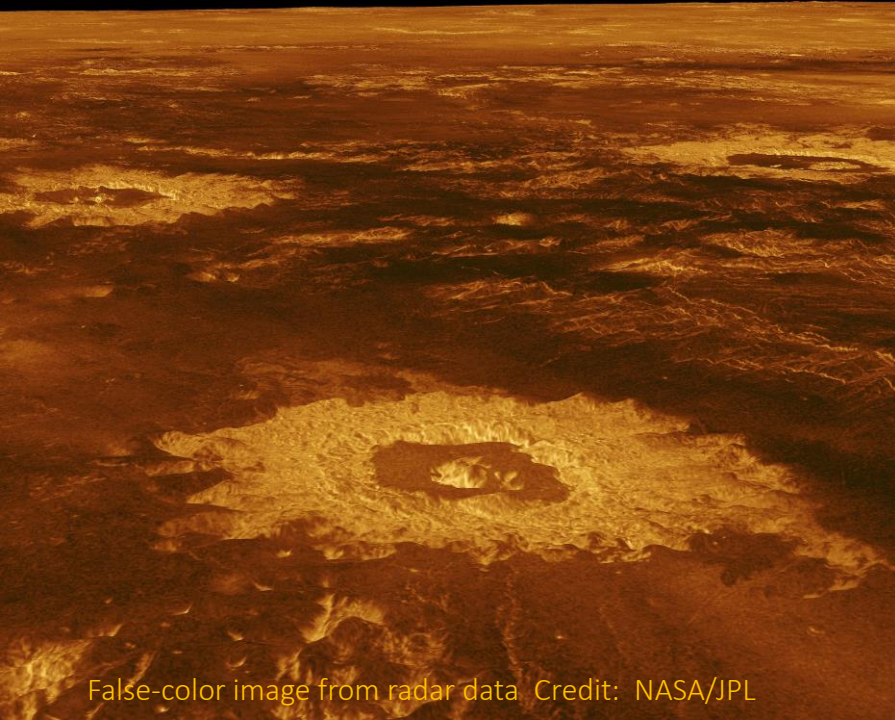


Update: Venus life looking even less likely

- Sept. 2020: Astronomers thought they found phosphine, which might be a product of life, in Venus clouds > 30 miles up (where it's cool)
- Doubts arose soon after that
- Jan. 28, 2021: New study preprint, discussed in Nature, concludes it was SO₂



Contrast-enhanced false color image.
Credit: NASA/JPL



False-color image from radar data. Credit: NASA/JPL

- Problems: mistakes in data processing
- Phosphine still can't be ruled out: "there's enough wiggle room there."

How many launches since the last meeting (Jan 9)?

*This includes failed launches only if they lift off the launch pad
and only includes launches that attempt going into orbit*

The Starship SN9 test didn't count because it was sub-orbital (10 km/6.2 miles)
(The crash at the end due to failure of a second engine to restart didn't disqualify it)

"Again, we've just got to work on that landing a little bit"
(John Insprucker, SpaceX principal integration engineer)



<https://twitter.com/LabPadre/status/1356718480045834240>

Launches since last meeting (Jan 9, 2020)



Jan 17 – LauncherOne (Virgin) – 10 cubesats



Jan 19 – Long March 3B – communications satellite for mobile services



Jan 20 – Electron (Rocket Lab) – a small communications satellite



Jan 20 – Falcon 9 – 17th batch of 60 comm. satellites for Starlink



Jan 24 – Falcon 9 – Transporter-1 : 143 small satellites



Jan 29 – Long March 4C – 3 military spy satellites



Feb 01 – Hyperbola-1 (Chinese “private” firm iSpace, like SpaceX) FAIL



Feb 04 – Falcon 9 – 60 Starlink (internet service) satellites

Discussion & questions?

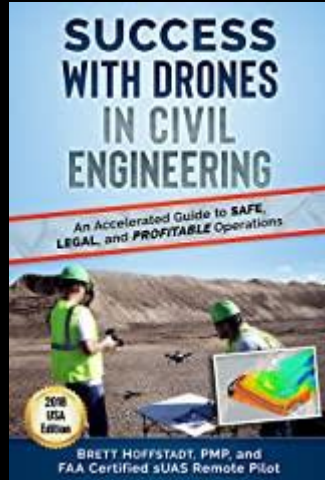


Featured Speaker: Brett Hoffstadt

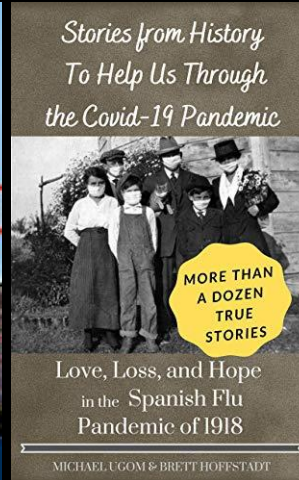
- Topic: Creating a better space exploration future through children's books



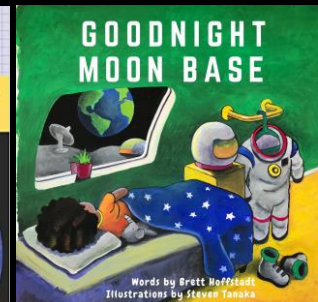
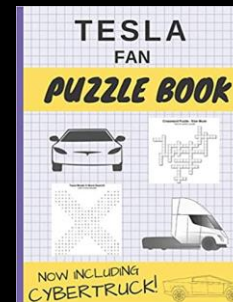
2014



2018



2020



- Book author, now focusing on preschool and grade school children
- BS Aeronautical Engineering at Purdue (1993), MS Aerospace Engineering at Penn State (1997)
- 20 years of aerospace experience at McDonnell Douglas, SAIC, Boeing, Siemens, Kratos Unmanned Aerial Systems, ...
- Staff writer at Commercial UAV News