
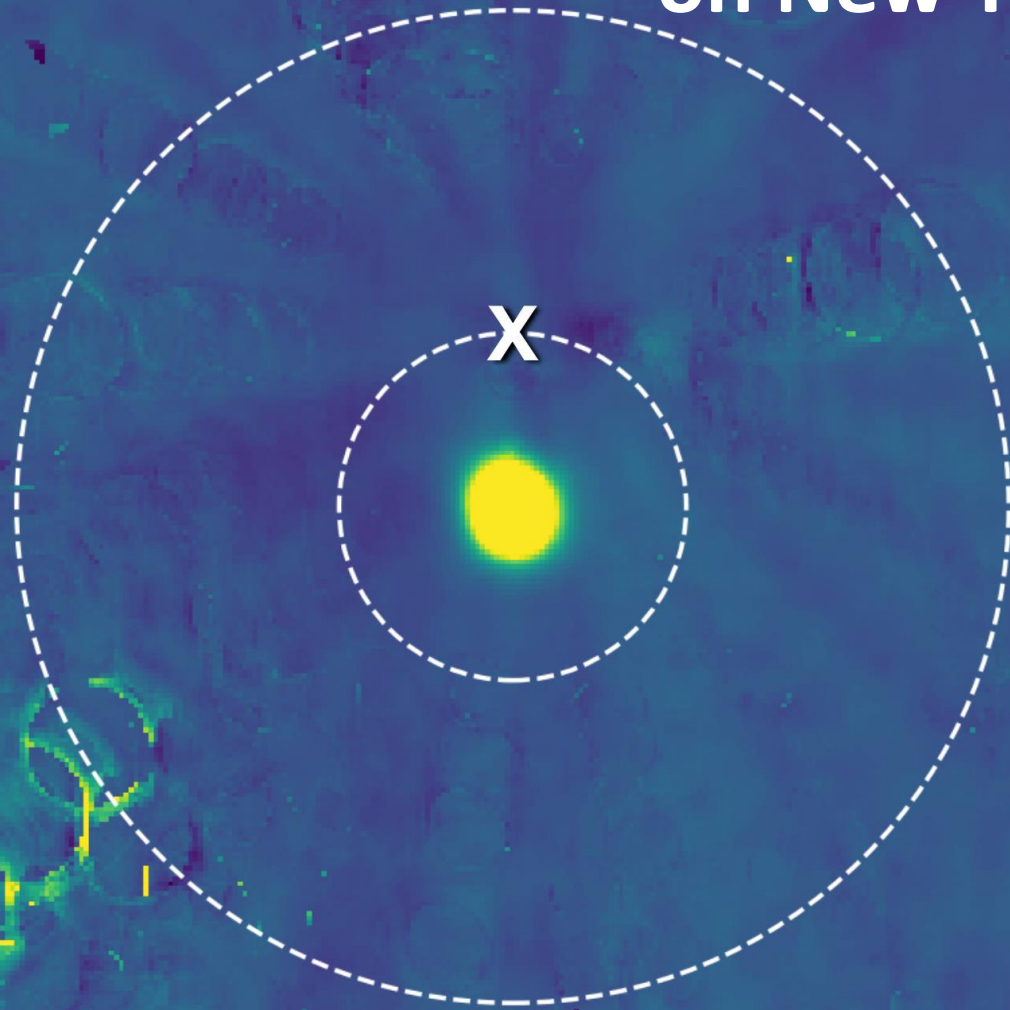


# The Aerospace Update

A detailed illustration of the New Horizons spacecraft, featuring a large white parabolic antenna and gold thermal blankets, as it flies past the dark, irregularly shaped dwarf planet Ultima Thule. The scene is set against a black background filled with distant stars. The spacecraft is positioned on the right side of the frame, moving towards the left, with Ultima Thule dominating the center and left. A smaller, similar object is visible in the lower-left quadrant.

New Horizons New Year's Eve Flyby of Ultima Thule

# New Horizons Spacecraft Takes the Inside Course by Ultima Thule on New Year's Eve



With no apparent hazards in its way, NASA's New Horizons spacecraft has been given a "go" to stay on its optimal path to Ultima Thule as it speeds closer to a Jan. 1 flyby of the Kuiper Belt object a billion miles beyond Pluto – the farthest planetary flyby in history.

This image was made by combining hundreds of images taken between August and mid-December by New Horizons' Long Range Reconnaissance Imager (LORRI). It has been colored using deep blue for the darkest regions and yellow for the brightest. Ultima Thule is the bright yellow spot in the middle. The two possible flyby distances for New Horizons are indicated by the two concentric circles. The mission has decided to fly along the closer path, toward the target point marked by an X. Individual images contain many background stars, but by combining images taken at different distances from Ultima Thule, most of the stars can be identified and removed. However, some of them leave behind traces, which can be seen as faint circles radiating away from the target point.



# SpaceX Closes Out Year With Successful GPS Satellite Launch



T- 00:00:05

STAGE 2

COMING MAIN ENGINE CLOSING

RELEASED FALCON 9 AND WE HAVE  
BEGUN OUR FLIGHT TO GPS  
TRANSFER ORBIT

LAUNCH: GPS III SV01

A new era in GPS navigation launched Sunday, Dec. 23<sup>rd</sup>, when a SpaceX Falcon 9 rocket climbed into orbit with a Lockheed Martin-built satellite designed to beam higher-power positioning, navigation and timing signals around the world, providing military and civilian users with more accurate data that is more resistant to growing jamming threats. The 229-foot-tall Falcon 9 launcher lifted off from Cape Canaveral's Complex 40 launch pad at 8:51 a.m. EST (1351 GMT) Sunday after multiple delays over the last five days, including countdowns halted by SpaceX to investigate sensor trouble in the rocket's first stage and by poor weather at the Florida spaceport.

*Video Credit: SpaceX*

*Source: Stephen Clark @ SpaceFlightNow.com*

# USAF's Next-Gen GPS Satellites Will Be a Huge Upgrade...Eventually



The new features on the GPS 3-series satellites should make GPS more reliable and accurate for civilians, more secure against those who want to jam military users, and more cyber-secure for everyone. GPS III is also expected to have a 15-year lifespan, twice as long as the current GPS satellites. They include the addition of a fourth civilian L-band signal — known as L1C — designed to be interoperable with other global navigation satellite fleets. Europe's Galileo, China's Beidou, and Japan's QZSS navigation satellite networks provide a similar signal, allowing users to combine navigation fixes with satellites from different fleets, generating a more accurate position estimate. However, delays in creating the ground based receivers and infrastructure will delay will mean that military users will not be able to use the GPS III signals until at least 2020.

Source: Joe Pappalardo @ PopularMechanics.com

Image Credit: LOCKHEED MARTIN

# Military Communications Satellite Launched by Russian Proton Rocket



A Russian military communications satellite launched Friday, Dec. 21<sup>st</sup> from the Baikonur Cosmodrome in Kazakhstan, riding a Proton rocket and Breeze M upper stage into orbit on just the second Proton flight this year, the lowest annual flight rate for Russia's most powerful operational launcher since the 1960s. ISS Reshetnev says the Blagovest satellites provide high-speed internet, data communications, television and radio broadcasting, telephony and videoconferencing services. The satellite manufacturer issued press releases with details on the previous two Blagovest satellite launches, but released no statement marking Friday's mission.

*Source: Stephen Clark @ SpaceFlightNow.com*



# Soyuz Launches Cluster of 28 Satellites

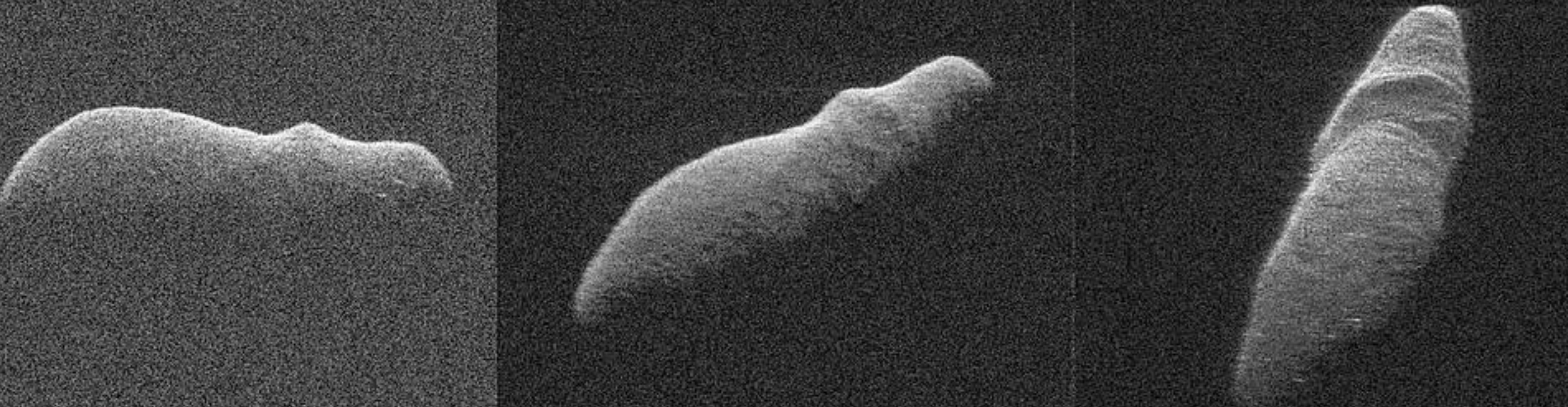
Russian Soyuz rocket lifted off from the Vostochny Cosmodrome in Russia's Far East on Thursday, Dec. 27<sup>th</sup> carrying 28 satellites, including a pair of Russian mapping satellites, secondary payloads from Germany, Japan, Spain, South Africa, and a dozen Earth-observing CubeSats and eight commercial weather payloads for Planet and Spire. The launch Thursday occurred at 11:07:18 a.m. local time at the Vostochny Cosmodrome, located in Russia's Amur region near the country's border with China. The Soyuz flight was the fourth launch from Vostochny since the new spaceport entered service in 2016, and the 17th space mission to lift off from a Russian-operated launch base this year.

*Source: Stephen Clark @ SpaceFlightNow.com*

*Photo Credit: GK Launch Services*



# Holiday Asteroid Imaged with NASA Radar

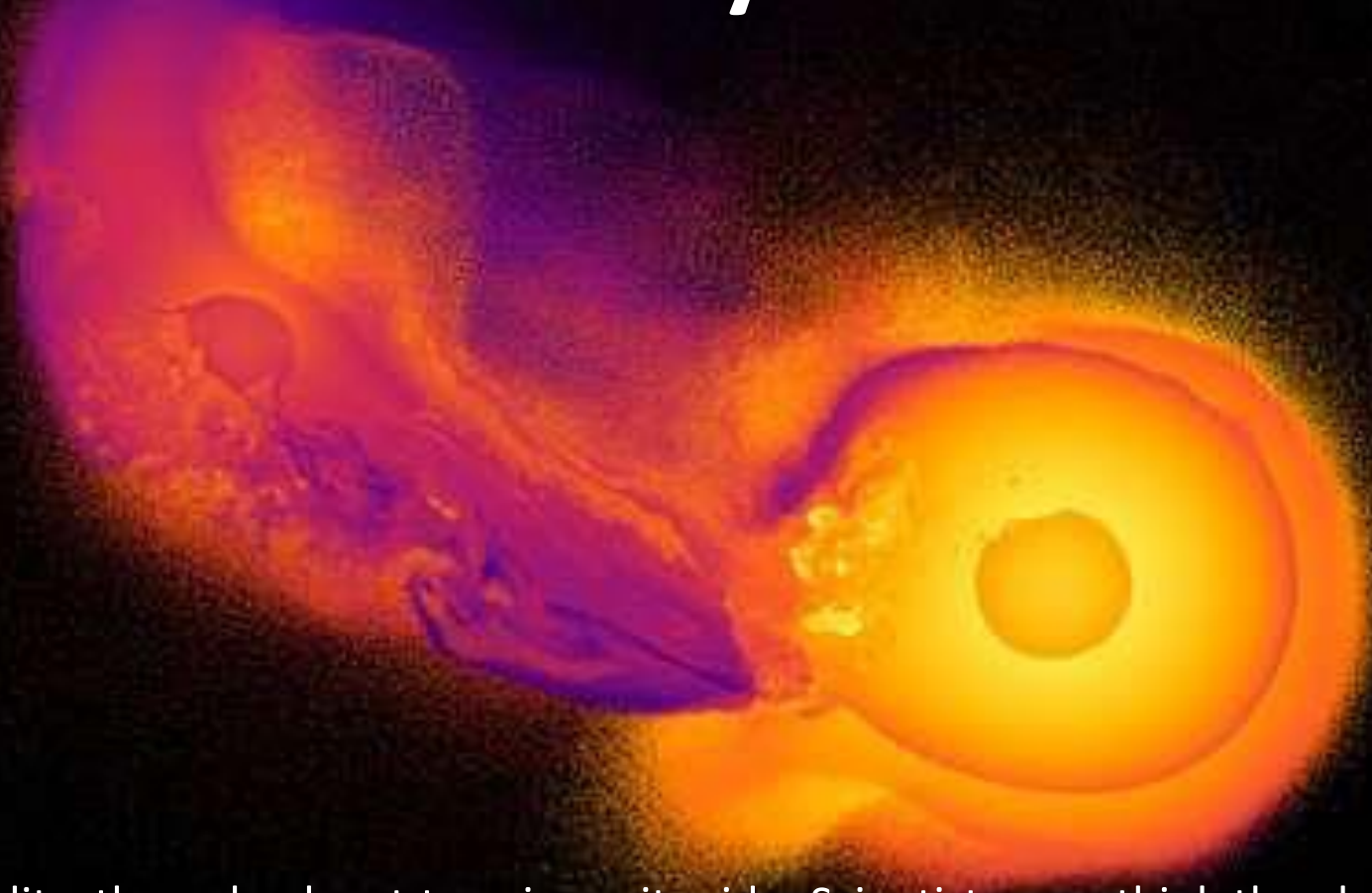


Asteroid 2003 SD220 was discovered on Sept. 29, 2003, by astronomers at the Lowell Observatory Near-Earth-Object Search (LONEOS) in Flagstaff, Arizona — an early Near-Earth Object (NEO) survey project supported by NASA that is no longer in operation. The asteroid flew safely past Earth on Saturday, Dec. 22, 2018, at a distance of about 1.8 million miles (2.9 million kilometers). This was the asteroid's closest approach in more than 400 years and the closest until 2070, when the asteroid will safely fly by slightly closer. These three radar images were obtained on Dec. 15-17, by coordinating observations with NASA's 230-foot (70-meter) antenna at the Goldstone Deep Space Communications Complex in California and the National Science Foundation's (NSF) 330-foot (100-meter) Green Bank Telescope in West Virginia.

*Credits: Image credit: NASA/JPL-Caltech/GSSR/NSF/GBO*



# A Big Space Crash Likely Made Uranus Lopsided



Uranus is a lopsided oddity, the only planet to spin on its side. Scientists now think they know how it got that way: It was pushed over by a rock at least twice as big as Earth. Detailed computer simulations show that an enormous rock crashed into the seventh planet from the sun, said Durham University astronomy researcher Jacob Kegerreis, who presented his analysis at a large earth and space science conference this month. Uranus is unique in the solar system. The massive planet tilts about 90 degrees on its side, as do its five largest moons. Its magnetic field is also lopsided and doesn't go out the poles like ours does, said NASA chief scientist Jim Green. It also is the only planet that doesn't have its interior heat escape from the core. It has rings like Saturn, albeit faint ones.



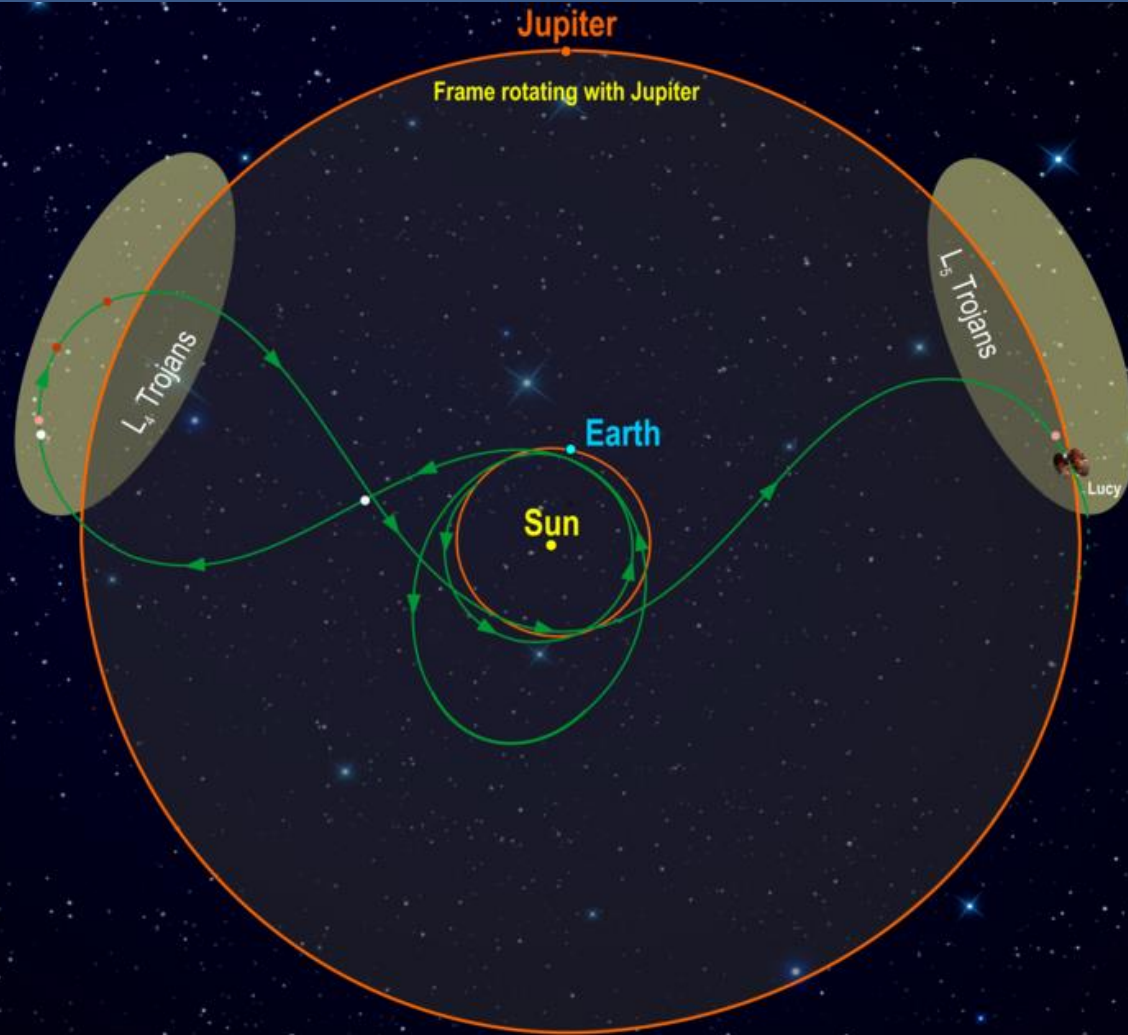
# Mars Express Gets Festive: A Winter Wonderland on Mars



This image shows what appears to be a large patch of fresh, untrodden snow---a dream for any lover of the holiday season. However, it's a little too distant for a last-minute getaway. This feature, known as the Korolev crater, is found on Mars, and is shown here in beautiful details as seen by Mars Express. Korolev crater is 82 kilometers across and found in the northern lowlands of Mars, just south of a large patch of dune filled terrain that encircles part of the planet's northern polar cap. It's an especially well preserved example of a martian crater and is filled not by snow but ice, with its center hosting a mound of water ice some 1.8 kilometers thick all year around.

*Source & Image Credits: ESA.int*

# Navigating NASA's First Mission to the Trojan Asteroids



In 2021, the feat of navigation that is the Lucy mission will launch. To steer Lucy towards its targets doesn't simply involve programming a map into a spacecraft and giving it gas money – it will fly by six asteroid targets, each in different orbits, over the course of 12 years. Lucy's destination is among Jupiter's Trojan asteroids, clusters of rocky bodies almost as old as the Sun itself, and visiting these asteroids may help unlock the secrets of the early solar system. Lucy will encounter a Main Belt asteroid in 2025, where it will conduct a practice run of its instruments before encountering the first four Trojan targets from 2027-2028. In 2033, Lucy will end its mission with a study of a binary system of two Trojans orbiting each other.



# Musk Teases New Details About Redesigned Next-Generation Launch System

In a tweet early Dec. 24, Musk posted a photo of two parts of that initial test article, a conical section next to a cylindrical unit with landing legs. “Stainless Steel Starship,” he wrote. The recent series of tweets from Musk also confirmed a change in materials from carbon composites to stainless steel which will be used to build the vehicle. A stainless steel surface of the vehicle, he added, would require “much less” thermal protection but also would not be painted. “Skin will get too hot for paint,” he tweeted. “Stainless mirror finish. Maximum reflectivity.”

*Source: Jeff Foust @ SpaceNews.com*





# Dragon Shows Off its New Integrated Solar Arrays



This photo contains some interesting details. Notably, the standalone photo of Dragon and its “trunk” is shown in its on-orbit configuration. Unlike most spacecraft that deploys solar arrays, the solar arrays are built into the trunk itself. “The Cargo Dragon’s deployable solar arrays have been eliminated to reduce the number of mechanisms on the vehicle and further increase reliability.” SpaceX’s then-director of crew operations, Garrett Reisman, explained before Congress.

Source: Eric Berger @ arstechnica.com

Photo Credit: SpaceX



# Textron Readies Hybrid Aerosonde Kit Ahead of At-Sea Testing



**Textron Systems is preparing to take the production-ready hybrid quad version of its Aerosonde fixed-wing unmanned aerial vehicle to sea in support of the U.S. Southern Seas/UNITAS exercise in 2019. The VTOL kit adds a quad-rotor lift system to the Aerosonde, removing the need for the regular catapult launcher. Textron anticipates that this added capability will become the backbone of shipborne operations in the future. The company has now completed development of the VTOL kit for Aerosonde and is continuing to test-fly it at its Blackstone, Virginia facility, but is planning on taking it for maritime testing on a boat at Wallops Island in the near future, ahead of trialling it in front of potential customers during the next U.S. Navy's Southern Seas deployment. The Aerosonde was developed by Insitu, and is now manufactured by Aerosonde Ltd, which is a strategic business of Textron.**



1968 Apollo 8  
Frank Borman  
Jim Lovell  
Bill Anders

