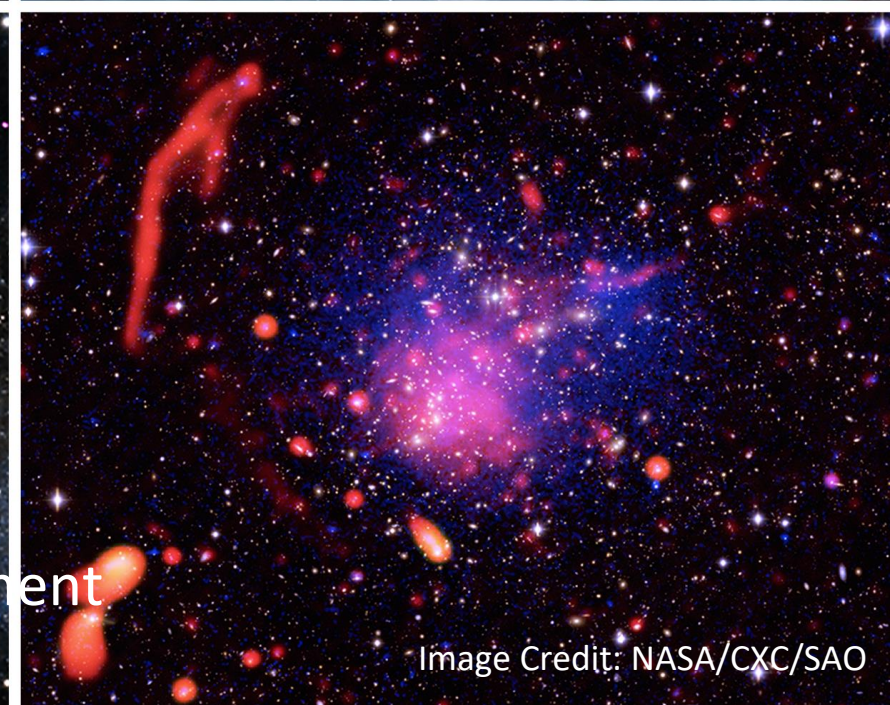
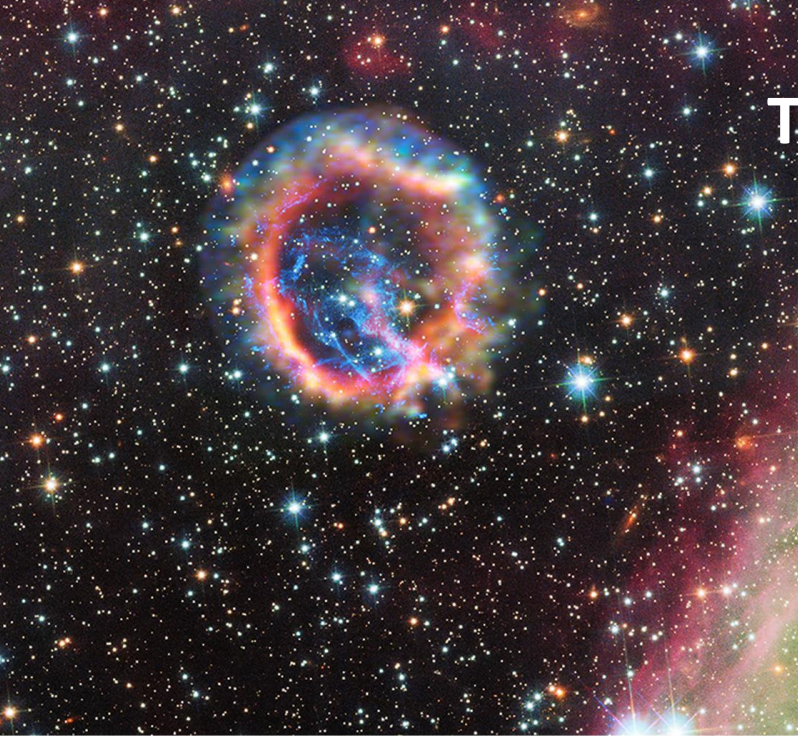


# The Aerospace Update



## Chandra's Cosmic Holiday Assortment

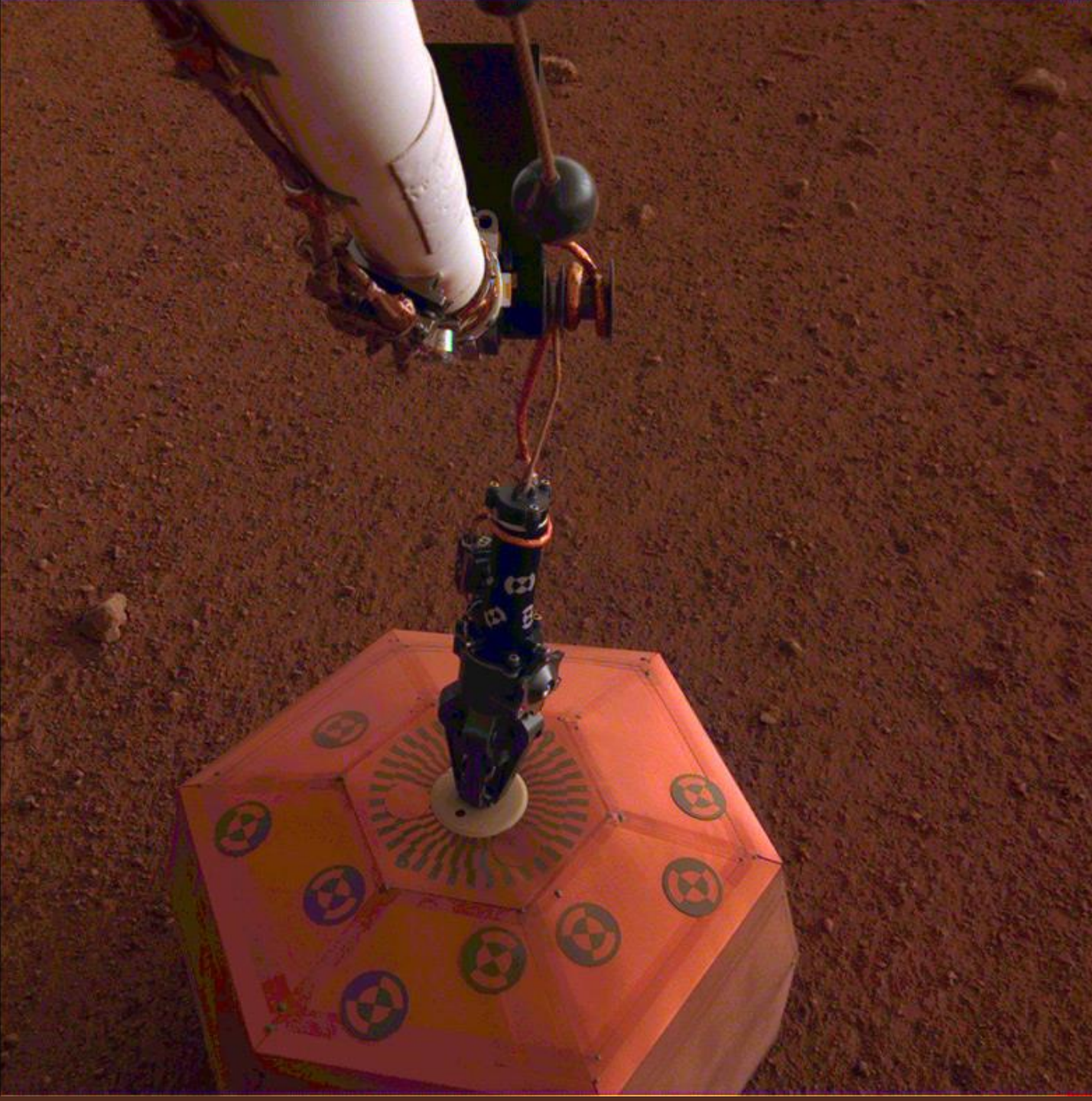
Dec. 20, 2018

Image Credit: NASA/CXC/SAO


# InSight Places First Instrument on Mars

NASA's InSight lander placed its seismometer on Mars on Dec. 19, 2018. This was the first time a seismometer had ever been placed onto the surface of another planet. To deploy the seismometer (also known as the Seismic Experiment for Interior Structure, or SEIS) and the heat probe (also known as the Heat Flow and Physical Properties Probe, or HP3), engineers first had to verify the robotic arm that picks up and places InSight's instruments onto the Martian surface was working properly. Engineers tested the commands for the lander, making sure a model in the test bed at JPL deployed the instruments exactly as intended. Scientists also had to analyze images of the Martian terrain around the lander to figure out the best places to deploy the instruments. On Tuesday, Dec. 18, InSight engineers sent up the commands to the spacecraft. On Wednesday, Dec. 19, the seismometer was gently placed onto the ground directly in front of the lander, about as far away as the arm can reach - 5.367 feet, or 1.636 meters, away).

*Source & Image Credits: NASA/JPL-Caltech*



# Soyuz Crew Returns to Earth After Six Months in Space

A photograph showing NASA astronaut Serena Auñón-Chancellor being assisted out of the Soyuz MS-09 spacecraft. She is wearing a white and blue spacesuit and is seated on a metal platform. Several ground crew members in blue winter uniforms are helping her. The scene is set in a snowy, remote area. In the background, a group of people, some in blue uniforms and others in civilian winter clothing, are watching the event. A red and white striped caution tape is visible on the snow.

NASA astronaut Serena Auñón-Chancellor is helped out of the Soyuz MS-09 spacecraft just minutes after she, ESA astronaut Alexander Gerst and Roscosmos cosmonaut Sergey Prokopyev landed Dec. 20th in a remote area near the town of Zhezkazgan, Kazakhstan. The astronauts returned to Earth in the same Soyuz crew capsule that brought them to the ISS in June — and the same spacecraft that sprang a mysterious air leak almost halfway into the crew's mission. Thankfully, the leaking Soyuz posed no threat to the passengers on their way home. The hole was located in the spacecraft's orbital module, which separates from the crew capsule and burns up in Earth's atmosphere before landing.

# Rocket Lab Launches Cubesats for NASA



A Rocket Lab Electron rocket successfully launched a group of cubesats Dec. 16 on a mission funded by NASA as the company looks ahead to more frequent launches in the next year. The rocket placed a kick stage containing the 13 satellites into orbit nine minutes after launch. About 40 minutes later, the kick stage ignited for a 90-second burn, after which the satellites were placed into 500-kilometer circular orbits at an inclination of 85 degrees. NASA purchased the launch for its CubeSat Launch Initiative program, which provides launches for cubesats developed by academic institutions and NASA centers. This particular flight, known as Educational Launch of Nanosatellites (ELaNa) 19, features three satellites built by NASA centers, six by universities and one by a charter school in Idaho.

*Video Credit: Rocket Lab*

*Source: Jeff Foust @ SpaceNews.com*

# India Closes Out Year With Launch of Upgraded GSLV



An upgraded Geosynchronous Satellite Launch Vehicle carrying more fuel and standing taller than earlier GSLV variants took off Wednesday from an Indian spaceport and delivered a new communications satellite into Geo-Sync orbit for the Indian Air Force. The GSAT 7A satellite will serve the Indian Air Force by connecting ground radar stations, airbases and airborne command and control aircraft. GSAT 7A will also support Indian Air Force drone operations, helping convert the military's remotely-piloted aircraft from ground control to satellite control networks.

*Video Credit: ISRO*

*Source: Stephen Clark @ SpaceFlightNow.com*

# Arianespace, In Final Mission of 2018, Launches French Spy Satellite



European launch provider Arianespace completed its final launch of the year Dec. 19<sup>th</sup>, sending the French spy satellite CSO-1 into orbit on a Soyuz ST-A rocket. The year-end mission was the 20th Soyuz rocket to launch from the Guiana Space Center since Arianespace began offering a Europeanized version of the Russian workhorse rocket. CSO-1 is the first of three Composante Spatiale Optique (Optical Space Component) satellites the French government intends to launch over the next few years. The high-resolution optical and infrared satellite is the first in a trio that replaces France's Helios-2A and -2B surveillance satellites. Germany, Sweden and Belgium will, through partnership with France, also have access to CSO imagery.

*Video Credit: Arianespace*

*Source: Caleb Henry @SpaceNews.com*

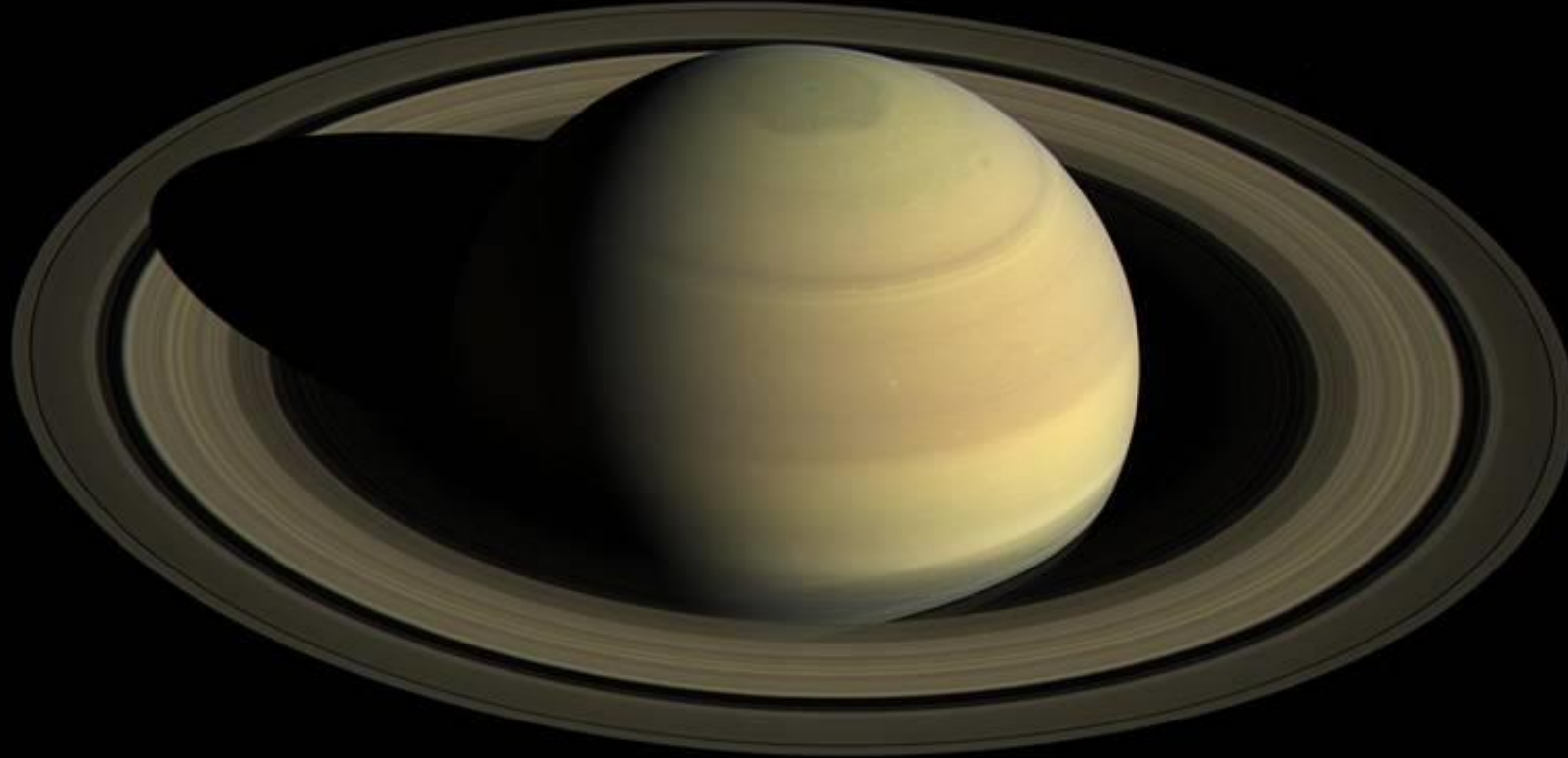
# Video of Virgin Galactic's VSS Unity's Flight to Space



As reported last week, Virgin Galactic launched a test flight for its six-seater passenger spacecraft, which reached space for the first time in the company's history on Thursday, Dec 13<sup>th</sup>. We now have video of various portions of that flight.

*Video Credit: Virgin Galactic*

# NASA Research Reveals Saturn is Losing Its Rings at “Worst-Case-Scenario” Rate




New NASA research confirms that Saturn is losing its iconic rings at the maximum rate estimated from Voyager 1 & 2 observations made decades ago. The rings are being pulled into Saturn by gravity as a dusty rain of ice particles under the influence of Saturn's magnetic field. "We estimate that this 'ring rain' drains an amount of water products that could fill an Olympic-sized swimming pool from Saturn's rings in half an hour," said James O'Donoghue of NASA's Goddard Space Flight Center in Greenbelt, Maryland. "From this alone, the entire ring system will be gone in 300 million years, but add to this the Cassini-spacecraft measured ring-material detected falling into Saturn's equator, and the rings have less than 100 million years to live. This is relatively short, compared to Saturn's age of over 4 billion years."

*Credits: NASA/JPL-Caltech/Space Science Institute*



# NASA Solar Spacecraft Snaps First Image Inside Sun's Atmosphere



Over 12 days in October and November, the Parker Solar Probe sped through the corona---the ultra-hot cosmic oven of atmosphere that surrounds the sun---and snapped this absolute pearler of an image. This is practically the first image from inside the sun...the image was captured by Parker's WISPR (Wide-field Imager for Solar Probe) when the probe was a mere 16.9 million miles from the sun---inside its corona. It clearly shows two distinct jets of solar material, known as coronal streamers, emanating from the left of the image. The bright spot in the distance is Mercury, while the black spots are artifacts of background connection.

*Source: Jackson Ryan @ cnet.com*

*Image Credit: NASA/Naval Research Laboratory/Parker Solar Probe*

# Brilliant Fireball in California Leaves Twisted Trail Over San Francisco



A brilliant fireball lit up the sky over the San Francisco Bay Area shortly after sunset Wednesday (Dec. 19), leaving an odd, wind-twisted trail in its violent wake. The meteor, which was visible across a wide swath of California, blazed up around 5:30 p.m. local time first appearing as a bright-white point of light. As it streaked through the air on its high-speed death dive, the space rock sprouted a tail composed of tiny pieces of its own disintegrating body.

*Source & Photo Credit: Mike Wall @ Space.com*

# Boeing Delivers Its 1st 737 Jet From Completion Center in China



The first 737 MAX airliner was delivered from Boeing's new Zhoushan factory in a ceremony to Air China on Saturday. This comes amid the 90-day truce in the U.S. and China's trade war. The 100-acre completion site is the first of its kind for Boeing and is part of the U.S. aerospace company's plan to deepen its connection to what will soon be the biggest aviation market in the world. The factory is a joint venture between the company and China's Commercial Aircraft Corporation (COMAC).

Source: VERONICA NETO @ Fortune.com

Photo Credit: Boeing



# Apollo 8: 50 Years Ago, Christmas at the Moon

Christmas Eve, 1968. As one of the most turbulent, tragic years in American history drew to a close, millions around the world were watching and listening as the Apollo 8 astronauts - Frank Borman, Jim Lovell and Bill Anders - became the first humans to orbit another world. As their command module floated above the lunar surface, the astronauts beamed back images of the moon and Earth and took turns reading from the book of Genesis, closing with a wish for everyone "on the good Earth."

The Apollo 8 flight marked the first time humans left Earth orbit, the first time humans traveled to and orbited the moon, and the first manned flight of the Saturn 5. When it was feared that the Soviet Union was about to launch a manned mission to the Moon, NASA made the decision to change the Apollo 8 mission from a low earth orbit to test the Lunar Excursion Module to a trip to the Moon. Four months later, history was made!

# Earthrise



"We came all this way to explore the Moon, and the most important thing is that we discovered the Earth."

Bill Anders, Apollo 8 Astronaut

*Image Credit: NASA/Bill Anders*

# In The News



**Dream Chaser Cleared to Begin Full-Scale Production.** Sierra Nevada Corporation (SNC) has won NASA approval to begin full-scale production of its Dream Chaser cargo spacecraft scheduled to make its first flight in about two years. The company announced Dec. 18 that it completed a milestone in its Commercial Resupply Services (CRS) 2 contract called Integrated Review 4. With that milestone, the company is cleared to move ahead into assembly of the Dream Chaser vehicle that will deliver cargo to the station. *(Jeff Foust @ SpaceNews.com)*



**SpaceX And Blue Origin Scrub Rocket Launches, Dashing Hopes Of A 4-Launch Day.** Weather and other delays marred what had been anticipated as a banner day for space launches Tuesday, Dec. 18<sup>th</sup>, as both SpaceX and Blue Origin were forced to postpone launches that had been scheduled to take place within minutes of each other. Both companies say they will look at moving their launches to Wednesday morning. *(Bill Chappell @ NPR.org)*



**Boeing Delivers the 787th 787 Dreamliner Aircraft.** On Dec. 13<sup>th</sup>, Boeing delivered the 787th 787 Dreamliner to come off the production line, marking a special milestone for the airplane family and the twin-aisle jet in history. The airplane was delivered to AerCap, the world's largest lessor and 787 customer. Sporting a special logo commemorating that production milestone, the airplane will be leased and operated by China Southern, which continues to expand its long-haul fleet of 787 Dreamliner's, including ten 787-8s and eight 787-9s. *(Boeing.mediaroom.com)*



**Boeing, Embraer Agree To Terms on Commercial JV, Propose Second JV for KC-390.** Boeing and Embraer have approved the terms of a strategic partnership that will give Boeing an 80 percent stake in Embraer's commercial aircraft and services operations through a joint venture, the companies announced through a joint press release today. Boeing said it will pay \$4.2 billion, up from \$3.8 billion, for the ownership stake in the JV, which still requires approval by the Brazilian government. Embraer and Boeing also said they have agreed to terms of another JV to promote and develop new markets for Embraer's KC-390, a multi-mission, medium-lift airplane. Terms of that JV call for 51 percent ownership by Embraer and 49 percent by Boeing. *(Jerry Siebenmark @ AINonline.com)*