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The first flight of Orbital ATK's enhanced Cygnus spacecraft will carry more than 7,000 pounds of equipment and experiments to the International Space Station on a mission that marks the resumption of NASA's commercial resupply efforts. Standing inside the Payload Hazardous Servicing Facility at Kennedy Space Center in Florida, the 20.5-foot-tall, cylindrical Cygnus has been loaded for flight and will soon be bolted inside a protective fairing for its targeted launch date of December 3.

"This is an exciting time; the Cygnus launch will resume regular U.S.-based cargo missions to the station," said Randy Gordon, Launch Support Project manager for NASA.

The enhanced Cygnus can carry about 25 percent more mass than its predecessor and features upgraded Ultraflex solar arrays that unfurl like a fan into a circle and are lighter than the previous models. For NASA, the increased capacity brings the obvious benefit of taking more to the station at once, ranging from daily supplies of food and clothing for the station residents to new experiments so astronauts can continue to use the space-based laboratory to the benefit of all on the Earth.

Science payloads include a new life science facility that will support studies on cell cultures, bacteria, and other micro-organisms; a microsatellite deployer and the first microsatellite to be deployed from the space station; experiments that will study the behavior of gases and liquids and clarify the thermo-physical properties of molten steel; and evaluations of flame-resistant textiles.

In addition to the first flight of the enhanced version of the Cygnus, the launch marks the first use of the workhorse Atlas V rocket from United Launch Alliance (ULA) to lift a payload to the space station.
"Atlas V has put satellites in orbit reliably and we are thrilled to be partners both with ULA on the Atlas and with NASA for to fly Cygnus to deliver this important cargo to the space station," said Dan Tani, a former astronaut who is now Orbital ATK's vice president for Mission and Cargo Operations.

Cygnus will use autonomous systems and be guided by ground controllers to maneuver carefully near the space station until it is close enough for station astronaut Kjell Lindgren to grasp it with the station's robotic arm. Cygnus will then be moved into place and latched to the station for unloading. It will remain docked at the station for about three weeks.

Orbital ATK named the ship S.S. Deke Slayton II in tribute to the Mercury 7 astronaut who became a leader in commercial spaceflight.

"Aside from being a very famous astronaut, he was a crewmember on the first U.S.-Russian cooperative space mission, Apollo-Soyuz," Tani said. "After NASA he worked for one of the very first commercial space companies and they launched the very first commercial rocket so we give him a lot of credit for plowing that field for us and allowing companies like Orbital TK to come and succeed in commercial space."

The cargo includes numerous experiments across an array of specialties along with some student-devised projects. The laboratory facilities of the station have been vital in studying the effects on astronauts of long-duration spaceflight akin to the impacts crews might experience during future deep space missions and an eventual journey to Mars. Station commander Scott Kelly - who is more than 225 days into his yearlong residency in space - continues to take part in many of the experiments and observations so researchers can develop ways to counter effect conditions such as bone-loss that astronauts experience during long stays in weightless conditions.

Crew supplies including food, water and clothing also will be unpacked and stowed. The residents count on deliveries from an assortment of international cargo spacecraft to keep the station's pantry and closets full.

Station residents will load the empty spacecraft with equipment and unneeded items before it is released to burn up in the atmosphere.

Source: NASA
2. Discovery measures 'heartbeats' of distant galaxy's stars

In many ways stars are like living beings. They're born; they live; they die. And they even have a heartbeat. Using a novel technique, astronomers have detected thousands of stellar "pulses" in the galaxy Messier 87 (M87). Their measurements offer a new way of determining a galaxy's age.

We tend to think of stars as stable and unchanging. However, late in life stars like the Sun undergo a significant transformation. They become very bright and swell up to an enormous size, swallowing any planets that are within Earth's distance from the Sun. Near the end of their lifetime they begin to pulsate, increasing and decreasing their brightness by a large amount every few hundred days. In our own Milky Way galaxy many stars are known to be in this stage of life.

No one had considered the effects of these stars on the light coming from more distant galaxies. In distant galaxies the light of each pulsating star is mixed in with the light of many more stars that are not varying in brightness.

"We realized that these stars are so bright and their pulsations so strong, that they are difficult to hide," said Charlie Conroy, an assistant professor at Harvard University and astronomer at the Harvard-Smithsonian Center for Astrophysics (CfA), who led the research. "We decided to see if the pulsations of these stars could be detected even if we couldn't separate their light from the sea of unchanging stars that are their neighbors."

The astronomers studied the elliptical galaxy M87, located 53 million light-years from Earth in the constellation Virgo. They examined a unique series of images taken with the Hubble Space Telescope over the course of three months in 2006. They quickly found what they were looking for.

"Amazingly, one in four pixels in the image changes with time," said Pieter van Dokkum, a professor and chair of the astronomy department at Yale University. "We tend to think of galaxies as steady beacons in the sky, but they are actually 'shimmering' due to all the giant, pulsating stars in them."

Analysis of the Hubble data showed that the average pixel varies on a timescale of approximately 270 days. The regular up and down changes in brightness are reminiscent of a heartbeat. "It's as if we're taking the pulse of the galaxy," said Conroy.

Their discovery offers a new way of measuring the age of a galaxy, because the strength and speed of a galaxy's heartbeat varies depending on its age. The team finds that M87 is about 10 billion years old, a number that agrees with previous estimates using different techniques.

The discovery of stellar heartbeats should not be specific to M87; every galaxy in the universe likely shows similar distinctive patterns. The next step is to take the pulse of other galaxies.

"Our models suggest that the pulsations will be stronger in younger galaxies, and that's something we'd love to test," said Jieun Choi, a graduate student at Harvard and a co-author of the study.

The galaxies will keep beating for a while longer. Said van Dokkum, "Cardiac arrest is not expected until a trillion years from now - that's a hundred times longer than the age of the universe."

Source: Eureka Alert
3. James Webb Space Telescope 'wings' successfully deployed

Recently inside the clean room at NASA's Goddard Space Flight Center in Greenbelt, Maryland, engineers successfully completed two deployments for the James Webb Space Telescope's "wings" or side portions of the backplane structure that fold up. The wings and telescope structure are essential because they make up the telescope's carbon fiber framework which will hold all 18 of the telescope's mirrors and the tower for the primary mirror.

“We deploy the wings one at a time. Each individual deployment can take up to 16 hours or more to complete," said Adam Carpenter, Mechanical Integration Engineer at Goddard, as he and other engineers prepared for the move. "It is a delicate operation requiring multiple groups to perform specific tasks."

Leading up to this test, engineers lined the telescope structure with cables. In space, these cables will enable the telescope to open up and will provide electrical signals to the active mirror segments. During the wing test, however, the engineers needed to make sure the cables did not block the deployment, and so the team arranged the cables carefully.

"The two wings of the telescope structure will eventually hold 6 of Webb's 18 primary mirror segment assemblies," said Carpenter said. "They are necessary so that the observatory can fold up in order to fit into the launch vehicle."

The James Webb Space telescope, once fully assembled, will be bigger than any rocket that can launch the telescope into space. So the engineering team designed the telescope to fold like origami to fit inside its Ariane 5 rocket. Once launched, Webb will be shipped out to its destination one million miles out in space.

Webb telescope's images will reveal the first galaxies forming approximately 13.5 billion years ago. The telescope will also see through interstellar dust clouds to capture stars and planets forming in our own galaxy. At the telescope's final destination in space, one million miles away from Earth, it will operate at incredibly cold temperatures of -387 degrees Fahrenheit, or 40 Kelvin. This is 260 degrees Fahrenheit colder than any place on the Earth's surface has ever been.

Source: Phys Org
The Night Sky

Tuesday, November 17

• The typically weak Leonid meteor shower is likely to peak late tonight: from about midnight local time until dawn Wednesday morning. Good luck.

Wednesday, November 18

• The brightest star on the northeastern side of the November evening sky is Capella, magnitude zero. It’s below Perseus. Look well to its right (about three fists at arm's length) for the Pleiades, the size of your fingertip at arm's length. Below the Pleiades blinks orange Aldebaran.

Thursday, November 19

• Orion is now clearing your eastern horizon by about 8 p.m. (depending on how far east or west you live in your time zone). Aldebaran is high above Orion. Above Aldebaran are the Pleiades. Aldebaran and the Pleiades always serve as Orion's early announcers.

Friday, November 20

• Whenever Fomalhaut is "southing" (crossing the meridian due south, which it does around 7 p.m. this week), the first stars of Orion are just about to rise in the east, and the Pointers of the Big Dipper stand directly below Polaris (for skywatchers in the world's mid-northern latitudes).

• Before dawn tomorrow morning, look east for bright Jupiter and brighter Venus. Between them is little orange Mars. Look carefully; very close to Mars is the 4th-magnitude star Eta Virginis. The two may appear less than 0.1° apart depending on where you are.

Source: Sky & Telescope
ISS Sighting Opportunities (from Denver)

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Sighting information for other cities can be found at NASA's Satellite Sighting Information

NASA-TV Highlights
(all times Eastern Time Zone)

12 p.m., Tuesday, November 17 - ISS Expedition 45 In-Flight Interview with MSNBC’s “All In with Chris Hayes” and AOL.com with ISS Commander Scott Kelly of NASA and Flight Engineer Mikhail Kornienko of the Russian Federal Space Agency (all channels)

4 p.m., Tuesday, November 17 - “Our Violent Universe” the 2015 Goddard Space Flight Center Lecture at the Smithsonian Institution’s National Air and Space Museum (NTV-1 (Public), NTV-2 (Education))

1 p.m., Wednesday, November 18 - “STEM in 30” from the Smithsonian’s National Air and Space Museum – ISS 15 Years of Continuous Human Presence (NTV-1 (Public), NTV-2 (Education))

9:30 a.m., Thursday, November 19 - ISS Expedition 45 In-Flight Educational Event with TIME for Kids in New York (starts at 9:40 a.m.) (all channels)

6 a.m., Friday, November 20 - Live Satellite Media Interviews on the Carbon Cycle: New NASA View Shows Unprecedented Global Picture of Carbon Dioxide (NTV-3 (Media))

10 a.m., Friday, November 20 - Video File of the ISS Expedition 46-47 Crew Qualification Training at the Gagarin Cosmonaut Training Center in Star City, Russia (NTV-1 (Public), NTV-2 (Education))

1 p.m., Friday, November 20 - Live Satellite Media Interviews on the Carbon Cycle: New NASA View Shows Unprecedented Global Picture of Carbon Dioxide (NTV-3 (Media))

Watch NASA TV online by going to the NASA website. Return to Contents
Space Calendar

- **Nov 17** - Michael A’Hearn’s 75th Birthday (1940)
- **Nov 17** - John Plaskett’s 150th Birthday (1865)
- **Nov 18** - Comet 230P/LINEAR Perihelion (1.485 AU)
- **Nov 18** - Apollo Asteroid 2015 VC106 Near-Earth Flyby (0.018 AU)
- **Nov 18** - Apollo Asteroid 2015 VV2 Near-Earth Flyby (0.044 AU)
- **Nov 18** - Amor Asteroid 2015 VB2 Near-Earth Flyby (0.059 AU)
- **Nov 18** - Asteroid 5231 Verne Closest Approach To Earth (1.258 AU)
- **Nov 18** - Asteroid 2801 Huygens Closest Approach To Earth (1.604 AU)
- **Nov 18** - Kuiper Belt Object 90377 Sedna At Opposition (84.850 AU)
- **Nov 19** - Comet P/2011 A2 (Scotti) At Opposition (1.411 AU)
- **Nov 19** - Comet C/2015 A2 (PANSTARRS) Closest Approach To Earth (4.337 AU)
- **Nov 19** - Comet C/2015 T2 (PANSTARRS) At Opposition (6.813 AU)
- **Nov 19** - Asteroid 951 Gaspra Occults TYC 1864-01617-1 (11.6 Magnitude Star)
- **Nov 19** - Amor Asteroid 2015 TO178 Near-Earth Flyby (0.091 AU)
- **Nov 19** - Apollo Asteroid 4581 Ascepius Closest Approach To Earth (0.326 AU)
- **Nov 19** - Asteroid 784 Pickeringia Closest Approach To Earth (2.836 AU)
- **Nov 19** - Comet C/2015 GX (PANSTARRS) Closest Approach To Earth (1.462 AU)
- **Nov 20** - *Hayabusa*, Asteroid 25143 Itokawa Sample Collection

Source: [JPL Space Calendar](https://solarsystem.nasa.gov/calendars/)
Flowers could be blooming on the International Space Station after the New Year.

This morning, NASA astronaut Kjell Lindgren activated the Veggie plant growth system and its rooting “pillows” containing Zinnia seeds on the space station.

It is the first time that a flowering crop experiment will be grown on the orbiting laboratory. Growing Zinnias in orbit will help provide precursory information about other flowering plants that could be grown in space.

“Growing a flowering crop is more challenging than growing a vegetative crop such as lettuce,” said Gioia Massa, NASA Kennedy Space Center payload scientist for Veggie. “Lighting and other environmental parameters are more critical.”

Lindgren will turn on the red, blue and green LED lights, activate the water and nutrient system to Veggie, and monitor the plant growth. The Zinnias will grow for 60 days, which is twice as long as the first and second crop of Outredgeous red romaine lettuce that grew on the space station.

During the growth cycle, the LED lights will be on for 10 hours and off for 14 hours in order to stimulate the plants to flower.

“Growing the Zinnia plants will help advance our knowledge of how plants flower in the Veggie growth system, and will enable fruiting plants like tomatoes to be grown and eaten in space using Veggie as the in-orbit garden,” said Trent Smith, Veggie program manager at Kennedy.

Researchers also hope to gather good data regarding long-duration seed stow and germination, whether pollen could be an issue, and the impacts on crew morale. Growing tomato plants on the space station is planned for 2017.

The Veggie system was developed by Orbital Technologies Corp. (ORBITEC) in Madison, Wisconsin, and tested at Kennedy before flight. Veggie, along with two sets of pillows containing romaine seeds and one set of zinnias, was delivered to the station by SpaceX on the third cargo resupply mission in April 2014.

Source: NASA
A Brighter Moon

Although Dione (near) and Enceladus (far) are composed of nearly the same materials, Enceladus has a considerably higher reflectivity than Dione. As a result, it appears brighter against the dark night sky.

The surface of Enceladus (313 miles or 504 kilometers across) endures a constant rain of ice grains from its south polar jets. As a result, its surface is more like fresh, bright, snow than Dione’s (698 miles or 1123 kilometers across) older, weathered surface. As clean, fresh surfaces are left exposed in space, they slowly gather dust and radiation damage and darken in a process known as “space weathering.”

This view looks toward the leading hemisphere of Enceladus. North on Enceladus is up and rotated 1 degree to the right. The image was taken in visible light with the Cassini spacecraft narrow-angle camera on Sept. 8, 2015.

The view was acquired at a distance of approximately 52,000 miles (83,000 kilometers) from Dione. Image scale is 1,600 feet (500 meters) per pixel. The distance from Enceladus was 228,000 miles (364,000 kilometers) for an image scale of 1.4 miles (2.2 kilometers) per pixel. Credit: NASA/JPL-Caltech/Space Science Institute

Source: NASA