

Space News Update – October 2020

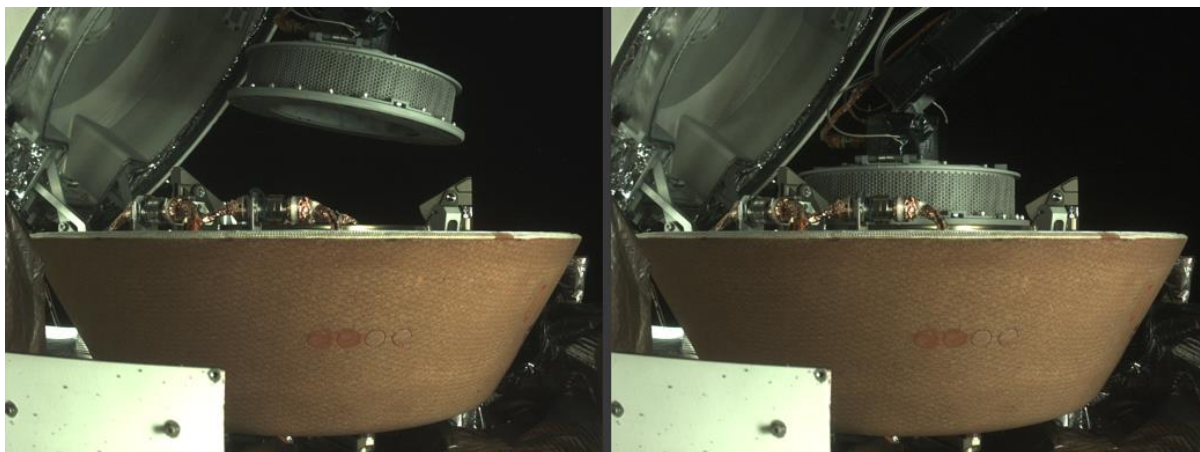
By Pat Williams

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Disclaimer - I claim no authorship for the printed material; except where noted (PW).

OSIRIS-REX IN THE MIDST OF SAMPLE STOWAGE



Credit: NASA/Goddard/University of Arizona/Lockheed Martin

Yesterday 27th October, NASA's OSIRIS-REx mission successfully placed the spacecraft's sample collector head into its Sample Return Capsule (SRC). The first image shows the collector head hovering over the SRC after the Touch-And-Go Sample Acquisition Mechanism (TAGSAM) arm moved it into the proper position for capture. The second image shows the collector head secured onto the capture ring in the SRC. Both images were captured by the StowCam camera. Today, after the head was seated into the SRC's capture ring, the spacecraft performed a "backout check," which commanded the TAGSAM arm to

back out of the capsule. This manoeuvre is designed to tug on the collector head and ensure that the latches, which keep the collector head in place, are well secured. Following the test, the mission team received telemetry confirming that the head is properly secured in the SRC. Before the sampler head can be sealed into the SRC, two mechanical parts on the TAGSAM arm must first be disconnected, these are the tube that carried the nitrogen gas to the TAGSAM head during sample collection and the TAGSAM arm itself. Over the next several hours, the mission team will command the spacecraft to cut the tube and separate the collector head from the TAGSAM arm. Once the team confirms these activities have executed as planned, they will command the spacecraft to seal the SRC. StowCam, a colour imager, is one of three cameras comprising TAGCAMS (the Touch-and-Go Camera System), which is part of OSIRIS-REx's guidance, navigation, and control system. TAGCAMS was designed, built and tested by Malin Space Science Systems; Lockheed Martin integrated TAGCAMS to the OSIRIS-REx spacecraft and operates TAGCAMS. (NASA Goddard) [OSIRIS-REx In the midst of sample stowage](#) (28 October 2020)

SPACEBIT SECURES A SECOND RIDE TO THE MOON



Credit: Spacebit

The United Kingdom is set to make its own giant leap soon, with a very small rover. A 2.2-lb., four-legged robot Asagumo built by Spacebit will launch aboard Astrobotic's Peregrine moon lander in July of 2021. The special feature of Asagumo rover is its tiny size, the basis of a rover is a single-unit CubeSat frame usually used in tiny satellites. Spacebit aims to launch a fleet of these little robots to explore the lunar subsurface and near subsurface, especially lava tubes that would be a good place for a future human settlement. [Spacebit secures a second ride to the Moon](#) (5 October 2020)

Spacebit's Asagumo four-legged walking rover is set to fly on that first CLPS mission (which NASA created to source commercial partners for delivering experiments and payloads to the moon along with over private cargo ahead of its Artemis crewed moon missions). For this second Nova-C lander launch, Spacebit is preparing a wheeled rover that will carry a small NASA scientific module. Both the wheeled and the walking rover are designed to help assess what kind of resources are available on the surface of the moon, with the aim of providing support for the Artemis program. This will provide Spacebit with multiple opportunities to assess the makeup of the regolith (the equivalent of soil for other planets), which is its primary goal with these missions. The different rover designs will also mean it can better assess which is more amenable to the task. The four-legged design is intended to make the walking rover better able to deal with uneven surfaces, allowing it to potentially explore lava flow tubes and other cave-like areas that could be suitable for natural shelter and future lunar habitat creation. (Spacebit)

[Spacebit secures a second ride to the Moon \(Darrel Etherington\)](#) Tech Crunch

NORTHROP GRUMMAN AND NASA COMPLETE ENVIRONMENTAL TESTING ON THE JAMES WEBB SPACE TELESCOPE



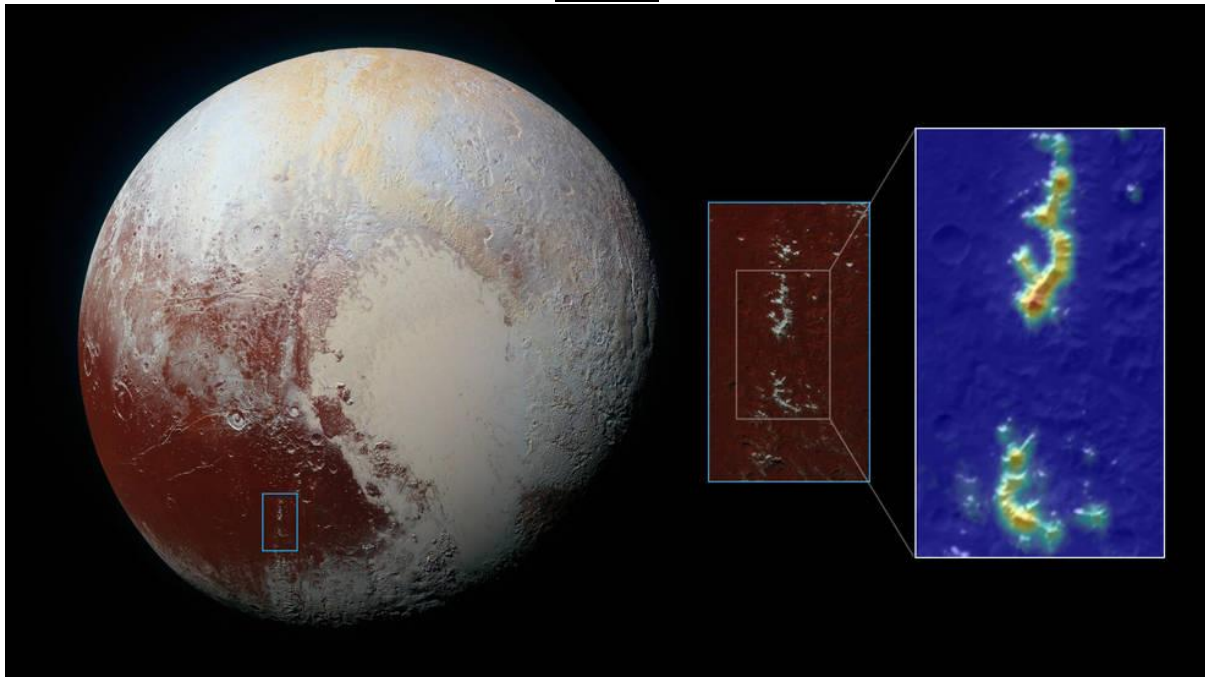
For the first time ever, testing teams at Northrop Grumman in Redondo Beach, California carefully lifted the fully assembled James Webb Space Telescope in order to prepare it for transport to nearby acoustic and sine-vibration testing facilities.

Photo Credit: NASA/Chris Gunn

The environmental testing demonstrated Webb's ability to withstand harsh environmental characteristics during its upcoming rocket launch and journey to reach its orbit at the second Sun-Earth Lagrange point (L2), approximately one million miles away from Earth. Webb's environmental testing consisted of a series of rigorous acoustic and sine-vibration tests spanning several weeks. Webb was first placed in Northrop Grumman's acoustic testing chamber where it underwent high frequency oscillating sound pressure levels above 140 decibels to simulate the effects of being launched on a rocket. The completion of the acoustic tests and analysis validated that Webb's hardware, science instruments, structure and electronics can successfully survive the planned rocket launch in a simulated environment. Following the completion of acoustic testing, Webb transitioned to a separate chamber where it underwent a series of sine-vibration tests on a shaker table to simulate vertical and horizontal accelerations in lower frequencies. The observatory was rigorously exposed to vibration levels on the shaker that are well above the flight environment, exciting its resonances to demonstrate its capability to withstand the flight environment with significant margins. (Northrop Grumman)

[Northrop Grumman and NASA complete environmental testing on the James Webb Space Telescope](#) (6 October 2020)

PLUTO'S ICE CAPS MADE OF METHANE, TURNS EARTH'S PROCESS UPSIDE DOWN



Pluto as seen from data taken by New Horizon's flyby in 2015 of the dwarf planet, with a close-up view of the Pigafetta Montes mountain range. The colorization on the right indicates the concentrations of methane ice, with the highest concentrations at higher elevations in red, decreasing downslope to the lowest concentrations in blue.

Credits: NASA/JHUAPL/SwRI and Ames Research Center/Daniel Rutter

The mountains discovered on Pluto during the New Horizons spacecraft's flyby of the dwarf planet in 2015 are covered by a blanket of methane ice, creating bright deposits strikingly like the snow-capped mountain chains found on Earth. New research conducted by an international team of scientists, including researchers at NASA's Ames Research Center in California's Silicon Valley, analyzed New Horizons data from Pluto's atmosphere and surface, using numerical simulations of Pluto's climate to reveal that these ice caps are created through an entirely different process than they are on Earth. On our planet, atmospheric temperatures decrease with altitude, mostly because of the cooling induced by the expansion of the air in upward motions. The cool atmosphere in turn cools temperatures at the surface. When a moist wind approaches a mountain on Earth, its water vapor cools and condenses, forming clouds and then the snow seen on mountain tops. But on Pluto, the opposite occurs. The dwarf planet's atmosphere actually gets warmer as altitude increases because the methane gas that's more concentrated higher up absorbs solar radiation. However, the atmosphere is too thin to impact the surface temperatures, which remain constant. And unlike Earth's upward winds, on Pluto, winds that travel down mountain slopes dominate. To understand how the same landscape could be produced with different materials and under different conditions, the researchers developed a 3D model of Pluto's climate in Paris, France, simulating the atmosphere and surface over time. They found that Pluto's atmosphere has more gaseous methane at its warmer, higher altitudes, allowing for that gas to saturate, condense, and then freeze directly on the mountain peaks without any clouds forming. At lower altitudes, there's no methane frost because there's less of this gaseous methane, making it impossible for condensation to occur. (NASA)

[Pluto's ice caps made of methane, turns Earth's process upside down](#) (13 October 2020)

FIRST SPACE CENSUS LAUNCHES TODAY 7th OCTOBER



A picture of United Kingdom under aurora taken by ESA astronaut Tim Peake during his six-month Principia on the International Space Station.

First UK space census is launched, surveying the diversity of the UK space sector and collecting insights to inform future space policy. The 2020 Space Census will collect, for the first time, anonymous information from space sector professionals to build a comprehensive picture of the UK space job market; covering demographic characteristics from age and gender to race and sexuality. Once complete, the Space Growth Partnership, a network of government, industry and academia that informs national space policy and sector strategy, will use this intelligence to develop actions to improve equality, diversity and inclusion in the UK space sector. The UK space sector is aiming to create 30,000 new jobs in the coming decade and this ambition relies on it having a highly-skilled and diverse workforce, with jobs from satellite builders and rocket scientists to accountants and business development managers.

Nick Shave, Chair of UK space, said: “Understanding the make-up of our space sector is critical to us collectively developing a clear and transparent approach about how best to support those individuals and groups throughout their careers. We already recognise that the BAME community is underrepresented in the sector, but we are determined to address this, working in partnership with other key industry stakeholders. This census will provide us with a vital benchmark of our sector, giving us the impetus to ensure there are equal opportunities for everyone and measure the success of our efforts to improve diversity over the next few years.

The 2020 Space Census is carried out by the Space Skills Alliance and sponsored by the University of Leicester and will run until the end of the year. (UKSEA)

[First space census launches today](#) (7 October 2020)

LINKS TO OTHER SPACE NEWS PUBLISHED IN OCTOBER 2020

ASTEROIDS

[OSIRIS-REx spacecraft successfully touches asteroid](#) (20 October 2020)

NASA's Origins, Spectral Interpretation, Resource Identification, Security, Regolith Explorer (OSIRIS-REx) spacecraft unfurled its robotic arm and, in a first for the agency, briefly touched an asteroid to collect dust and pebbles from the surface for delivery to Earth in 2023. This well-preserved, ancient asteroid, known as Bennu, is currently more than 200 million miles (321 million kilometres) from Earth. Bennu offers scientists a window into the early solar system as it was first taking shape billions of years ago and flinging ingredients that could have helped seed life on Earth. If Tuesday's sample collection event, known as "Touch-And-Go" (TAG), provided enough of a sample, mission teams will command the spacecraft to begin stowing the precious primordial cargo to begin its journey back to Earth in March 2021. Otherwise, they will prepare for another attempt in January. (NASA)

[OSIRIS-REx spacecraft collects significant amount of asteroid](#) (23 October 2020)

Two days after touching down on asteroid Bennu, NASA's OSIRIS-REx mission team received on Thursday, Oct. 22, images that confirm the spacecraft has collected more than enough material to meet one of its main mission requirements, acquiring at least 2 ounces (60 grams) of the asteroid's surface material. The spacecraft captured images of the sample collector head as it moved through several different positions. In reviewing these images, the OSIRIS-REx team noticed both that the head appeared to be full of asteroid particles, and that some of these particles appeared to be escaping slowly from the sample collector, called the Touch-And-Go Sample Acquisition Mechanism (TAGSAM) head. They suspect bits of material are passing through small gaps where a mylar flap, the collector's "lid", is slightly wedged open by larger rocks. (NASA)

EARTH

[Millennium Space Systems to test space debris remediation technology](#) (30 October 2020)

Two Millennium Space Systems-built DRAGRACER small satellites are being prepared for a first-of-its kind, controlled flight experiment later this year to mature future deorbit tether systems for low Earth orbiting satellites. The DRAGRACER mission uses the scientific method to compare deorbit performance with two identical satellites: one in a naturally decaying orbit and one deploying a tether to expedite de-orbit. By flying this DRAGRACER experiment, Millennium plans to empirically compare the satellite hosting the 70-meter-long Terminator Tape provided by Tethers Unlimited to the control satellite, while calibrating predictive models with radar tracking data. "The LEO satellite community will be able to quantify the value of space tethers to help mitigate the ever-growing orbit debris problem, following the guidance from the Inter-Agency Space Debris Coordination (IADC) committee for satellites to re-enter the earth's atmosphere within 25 years of being decommissioned," founder and CEO, Millennium Space Systems. "This scientific method experiment will demonstrate Millennium's ability to field and fly a low-cost and straightforward orbital debris mitigation solution that doesn't require added mass, volume, cost and complexity of propulsion system to deorbit a satellite in low Earth orbit. This could also be used to augment LEO missions requiring higher accuracy re-entry impact points, whereby the tether would allow a course de-orbit to a VLEO point where a smaller and lighter propulsion system would

then engage providing the higher accuracy end-game re-entry,” Dubyn said. The satellites are scheduled to ship in September to TriSept Corp, the mission launch service provider, for integration onto a Rocket Lab Electron launch vehicle. Once launched, the DRAGRACER mission begins when the two satellites, named ALCHEMY and AUGURY, eject from the rocket. After deployment, the DRAGRACER payload separates into two 6U Millennium RAPTOR satellites with identical stowed mass properties and drag coefficients. ALCHEMY will house the 70 meter tether while AUGURY will provide a baseline deorbit trajectory. (Millennium Space Systems)

[Start of the production of the Skylark constellation](#) (26 October 2020)

The ability to view, understand and map the physical location of natural and man-made objects in orbit around the Earth (currently there are more than 600 thousand objects in low Earth orbit with billions of dollars of space assets at risk from collisions) is now becoming a real concern for all private or governmental satellite owners and operators. Tracking resident space objects from space with optical sensors will enhance and complement existing systems. By observing from multiple perspectives in space, Skylark satellites will significantly improve tracking of objects, the number of detected debris and the ability to predict potential collisions. (Thales)

INTERNATIONAL SPACE STATION

[Northrop Grumman Successfully Launches 14th Cargo Delivery](#) (2 October 2020)

Northrop Grumman Corporation successfully launched the company’s Cygnus cargo resupply spacecraft, the S.S. Kalpana Chawla, to the International Space Station. After the nine minute ascent, the S.S. Kalpana Chawla, named for the first woman of Indian descent to fly in space, was deployed into orbit. Approximately two and a half hours later, the vehicle’s Ultra-flex solar arrays successfully deployed, and the spacecraft is currently operating nominally. Cygnus is scheduled to be grappled by the crew on the International Space Station on Oct. 5 at approximately 5:20 a.m. EDT. (Northrop Grumman)

[Felix & Paul Studios and TIME Studios partner with Nanoracks to deliver customized space camera to the International Space Station](#) (5 October 2020)

Felix & Paul Studios, the EMMY-award winning creator of immersive entertainment experiences, TIME Studios, TIME’s EMMY-award winning television and film division, and Nanoracks, the leading provider of commercial access to space, today announced the successful delivery of Felix & Paul Studios’ customized 3D, 360-degree, Space Camera to the International Space Station via the NG-14 Cygnus spacecraft, the S.S. Kalpana Chawla. The Space Camera will be used to capture the first-ever spacewalk filmed in cinematic virtual reality as the culmination of Space Explorers: The ISS Experience, produced by Felix & Paul Studios and TIME Studios. “An immersive series titled ‘The ISS Experience’ would not be complete without taking viewers along for the ultimate ride: a spacewalk outside the International Space Station side by side with two real astronauts,” said Félix Lajeunesse, co-founder of Felix & Paul Studios and Emmy-winning creative director of the Space Explorers series. “Our Space Camera, purpose-built to capture this historic event in fully-immersive 3D, brings us one step closer to our goal of taking billions of minds to space, and having them experience a spacewalk as if they were astronauts themselves.” Felix & Paul Studios’ state-of-the-art Space Camera, a Z-Cam V1 Pro camera consisting of nine 4K sensors allowing for a 3D, 360-degree image at 8K resolution has been specially hardened by Nanoracks to withstand the harsh conditions of low atmosphere orbit, including vacuum, solar ultraviolet (UV) radiation, charged particle (ionizing) radiation, plasma, surface

charging and arcing, temperature extremes, thermal cycling, impacts from micrometeoroids and orbital debris (MMOD), and environment-induced contamination. The Space Camera can store approximately 15 hours of 3D, 360-degree footage with custom lenses made to withstand extreme light and heat to minimize flare when directly exposed to the Sun. The International Space Station travels at 17,100 miles per hour with 16 sunrises and sunsets per day and external temperatures ranging from -250° F to +250° F. Getting the camera to space was the culmination of five years of exceedingly hard work. Only 228 humans have ever conducted a spacewalk. It is one of the most thrilling yet perilous tasks an astronaut can undertake. Experience at TIME Studios and Emmy-winning producer of A Year in Space. “When I first reached out to pitch this idea to NASA in 2016, my goal was to spare viewers on Earth the perilous part while allowing them to enjoy the thrill by filming the first-ever spacewalk in Virtual Reality. Thanks to the efforts of hundreds of people around the world, working in collaboration with the brilliant Felix & Paul Studios, NASA, Nanoracks and the ISS National Lab, the VR experience that results will have made all of the work very much worth it.” Nanoracks’ expertise in EVA satellite deployment systems enabled them to design a hermetically sealed, radiation resistant aluminium shield enclosure for the Space Camera, built to last up to a minimum of 7 days in the environment of space. An active heating system as well as a passive cooling system were also integrated into the enclosure to manage the internal camera system’s temperature fluctuations. To capture the spacewalk featured in Episode 4 of The ISS Experience, the Space Camera will be mounted and powered via the Nanoracks’ Kaber MicroSatellite Deployer and manoeuvred around the outside of the International Space Station by Canadarm2, the Canadian robotic arm on the ISS. Canadarm2 will essentially function like a crane on a movie set, enabling the Space Camera to capture the spacewalk in fully-immersive virtual reality, bringing viewers alongside the astronauts as if they were part of the crew. (Nanoracks)

LAUNCH SERVICES

[All engines for Ariane 6 complete qualification tests](#) (15 October 2020)

All three engines developed to power Europe’s future Ariane 6 rocket have completed extensive tests; the P120C solid rocket motor for the boosters, the Vulcain 2.1 engine for the core stage and the Vinci for the upper stage. Ariane 6 in the four-booster version will stand 63m tall, will weigh 900 tonnes and have the lift-off power equivalent to 12 Airbus A380 engines roaring at take-off. (ESA)

MARS

[Thales Alenia Space selected by Airbus as partner to the Mars Sample Return Mission](#) (14 October 2020)

The Earth Return Orbiter spacecraft is composed by the Return Module and the Orbit Insertion Module. The Return Module (RM) hosts the NASA payload devoted to the capture of the Martian samples orbiting around Mars, of their containment and delivery to Earth. The Orbit Insertion Module (OIM) is an additional chemical propulsive stage, for inserting the spacecraft into Mars orbit. This module is crucial as he will allow to reduce the spacecraft velocity enabling the Martian gravity to capture ERO in a stable orbit. After the manoeuvre successfully completed, IOM will be separated from RM in order to save mass prior to the return to Earth. (Thales)

[Airbus to bring first Mars samples to Earth: ESA contract award](#) (14 October 2020)

Airbus has been selected by the European Space Agency (ESA) as prime contractor for the Mars Sample Return's Earth Return Orbiter (ERO) – the first ever spacecraft to bring samples back to Earth from Mars. Mars Sample Return (MSR) is a joint ESA-NASA campaign and the next step in the exploration of Mars. ERO and the Sample Fetch Rover (SFR) are the two main European elements of MSR, both are set to be designed and built by Airbus. A manipulating arm, referred to as the Sample Transfer Arm (STA), that will transfer the samples from the SFR to the Mars Ascent Vehicle (MAV), is the third European contribution to the MSR program. The value of the ERO contract is € 491 million. The five year mission will see the spacecraft head to Mars, act as a communication relay with the surface missions, perform a rendezvous with the orbiting samples and bring them safely back to Earth. Prior to launch from the Mars surface onboard the MAV, the Martian samples will be stored in sample tubes and collected by the SFR, for which Airbus has already commenced the study phase. (Airbus)

MOON

[Northrop Grumman to support NASA's Artemis missions with motors for Orion Spacecraft's Launch Abort System](#) (12 October 2020)

Northrop Grumman Corporation will continue supporting NASA's Artemis missions by providing six additional abort motors and attitude control motors (ACM) for the Orion human spaceflight capsule's Launch Abort System (LAS), under an agreement with Lockheed Martin, Orion's prime contractor. These motors will be used for six crewed Artemis missions III-VIII. The LAS is designed to carry the Orion spacecraft and its crew to safety if an anomaly occurs on the launch pad or during the SLS rocket's climb to orbit. The abort motor would provide thrust of about 400,000 pounds in less than two seconds to lift the crew away from the launch vehicle. In this event, the attitude control motor would steer the Orion crew capsule away from the launch vehicle and orient the capsule for parachute deployment once the crew module is clear of all hazards. (Northrop Grumman)

[New Shepard successfully completes mission with NASA precision lunar landing technology onboard](#) (13 October 2020)

Blue Origin successfully completed the 13th New Shepard mission to space and back, and the 7th consecutive flight for this particular vehicle, a record. There were 12 payloads onboard including the Deorbit, Descent, and Landing Sensor Demonstration under the NASA Tipping Point partnership. The lunar landing sensor demo was the first payload to be mounted on the exterior of a New Shepard booster and tested technology designed to achieve high accuracy landing. This will enable long-term lunar exploration, as well as future Mars missions. (Blue Origin)

[Thales Alenia Space on its way to reach the Moon](#) (14 October 2020)

I-HAB (International - Habitat), a pressurized module that will provide crew living quarters, plus docking points to supply interfaces and resources to vehicles in transit. Drawing on Thales Alenia Space's long-standing expertise in the development of pressurized modules for the ISS, along with new technologies and processes, I-HAB will mark the transition from the ISS to a new generation of space infrastructures for deep space exploration. It will meet evolving requirements and performances for lighter structures and optimized micrometeorites protection system, evolved docking systems and hatches, enhanced functional and avionic

architectures, more efficient thermal control system with deployable radiators to ensure full autonomous capability of heat rejection, innovative conditioning systems. The I-HAB will experience for the first time long exposure in the deep space environment, offering the opportunity to test and prove potential design solutions for protection against cosmic radiations. Being unmanned for most of its time on orbit, it will also require dedicated solutions for the robotic operations, either on board or externally. One of the key evolving step with respect to the ISS will be focused on designing, with the support of virtual reality technique, more comfortable internal accommodations, with exploitation of modular and reconfigurable solutions to optimize room and comfort for the crew. The module will be provided by Europe with contributions from the other space Agencies like environmental and life support system from JAXA, avionics and software parts from NASA and robotic components from CSA; the integration of all these elements in I-HAB will leverage on the large experience already acquired by Thales Alenia Space during the ISS Nodes 2 and 3 activities already developed in cooperation. I-HAB is slated for launch in 2026. (Thales)

[Airbus selected for ESA's Moon lander study](#) (14 October 2020)

Airbus has been selected by the European Space Agency (ESA) as one of the two primes for the definition phase of the European Large Logistic Lander (EL3). In this study (phase A/B1), Airbus will develop the concept of a large multi-role logistic lander able to transport up to 1.7 tons of cargo to any location on the lunar surface. EL3 flights are set to begin in the late 2020s, with a cadence of missions over the following decade and more. (Airbus)

[NASA selects Intuitive Machines to deliver lunar ice drill in 2022](#) (16 October 2020)

NASA has selected Intuitive Machines to deliver the Polar Resources Ice Mining Experiment (PRIME-1) drill, combined with a mass spectrometer, to the Moon by December 2022. PRIME-1 will drill into the lunar surface, harvest and bring ice to the Moon's surface and use a mass spectrometer to measure how much is lost to sublimation as it turns from solid into vapor in a vacuum. The data from the PRIME-1 mission will help scientists understand how VIPER can search for water at the Moon's pole, and how much water may be available to use as NASA plans to establish a sustainable human presence on the Moon by the end of the decade. (Intuitive Machines)

[Nokia selected by NASA to build first ever cellular network on the Moon](#) (19 October 2020)

Nokia selected by NASA to build first ever cellular network on the Moon. LTE/4G technology promises to revolutionize lunar surface communications by delivering reliable, high data rates while containing power, size and cost. Communications will be a crucial component for NASA's Artemis program, which will establish a sustainable presence on the Moon by the end of the decade. (NASA)

SATURN AND MOONS

[Impact craters reveal details of Titan's dynamic surface weathering](#) (29 October 2020)

Scientists have used data from NASA's Cassini mission to delve into the impact craters on the surface of Titan, revealing more detail than ever before about how the craters evolve and how weather drives changes on the surface of Saturn's mammoth moon. Like Earth, Titan has a thick atmosphere that acts as a protective shield from meteoroids; meanwhile, erosion and

other geologic processes efficiently erase craters made by meteoroids that do reach the surface. The result is far fewer impacts and craters than on other moons. Even so, because impacts stir up what lies beneath and expose it, Titan's impact craters reveal a lot. The new examination showed that they can be split into two categories: those in the fields of dunes around Titan's equator and those in the vast plains at midlatitudes (between the equatorial zone and the poles). Their location and their makeup are connected: The craters among the dunes at the equator consist completely of organic material, while craters in the midlatitude plains are a mix of organic materials, water ice, and a small amount of methane-like ice. From there, scientists took the connections a step further and found that craters actually evolve differently, depending on where they lie on Titan. Some of the new results reinforce what scientists knew about the craters, that the mixture of organic material and water ice is created by the heat of impact, and those surfaces are then washed by methane rain. But while researchers found that cleaning process happening in the midlatitude plains, they discovered that it's not happening in the equatorial region; instead, those impact areas are quickly covered by a thin layer of sand sediment. That means Titan's atmosphere and weather aren't just shaping the surface of Titan; they're also driving a physical process that affects which materials remain exposed at the surface, the authors found. (JPL)

SPACE

[Tupperware Brands awarded U.S. patent for PONDS, a NASA-tested product used to grow vegetables in space](#) (15 October 2020)

Tupperware Brands Corp. said that it has been awarded a U.S. patent for PONDS (Passive Orbital Nutrient Delivery System), a unique device designed to grow vegetables in low earth orbit with minimal maintenance. PONDS is a NASA-tested product used to grow vegetables in space. It is a low gravity, non-powered, agricultural device designed to grow vegetables on the International Space Station. The device was developed by Tupperware in partnership with Techshot, an in-space research and manufacturing company. The patented design focuses on watering plants in the absence of gravity. Tupperware said it took inspiration from the natural way plants absorb water through capillary action. (Tupperware Brands)

TECHNOLOGY

[Final hot firing proves P120C booster for Ariane 6](#) (8 October 2020)

Advanced features make this new motor a pivotal achievement of European industry. It is an example of innovative thinking and optimisation that allows Europe to equip two very different launch vehicles with the same solid rocket motor. Depending on the configuration, two or four P120C boosters will be strapped onto the sides of the future Ariane 6 heavy-lift rocket, the P120C will also serve as the first stage of the smaller Vega-C launch vehicle. This huge P120C motor was filled with 142 tonnes of solid propellant inside its 13.5 m long and 3.4 m diameter casing and was moved from the integration building to the dedicated stand used for testing solid propulsion stages. After ignition it burned for 130 seconds, delivering a maximum thrust of about 4500 kN simulating lift-off and the first phase of flight. No anomalies were seen and, according to initial recorded data, the performance met expectations. A full analysis of these test results and inspection of all components will confirm readiness of this motor for the debut launch of Ariane 6 (ESA)

[Two SwRI experiments fly aboard Blue Origin's New Shepard suborbital rocket](#)

(13 October 2020)

Two Southwest Research Institute (SwRI) experiments were aboard Blue Origin's New Shepard suborbital rocket, which launched from Van Horn, Texas. The Box of Rocks Experiment II (BORE II) tested a new technology for magnetically attaching to and sampling asteroids. The second experiment evaluated a tapered liquid acquisition device (LAD) designed to safely deliver liquid propellant to a rocket engine from fuel tanks. (SwRI)

[Refueling mission completes second set of robotic tool operations in space](#) (23 October 2020)

Robotic Refueling Mission 3 (RRM3) has successfully completed its second set of robotic tool operations on the International Space Station, demonstrating key techniques for transferring cryogenic fluids, used as coolants, propellants, or for life support systems in orbit. These technologies have applications for extending spacecraft life and facilitating exploration to the Moon and Mars. (NASA Goddard)

Pat Williams October 2020