your window to space

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ISS Crew Enjoy Thanksgiving

The ISS crew enjoyed Thanksgiving dinner as they orbited the Earth at an altitude of 250 miles. Their turkey day dinner came after a full day of research and maintenance work, allowing them an off-duty day Friday 24 November to enjoy the view of the planet from their orbital laboratory. From the left in front: Paolo Nespoli of the European Space Agency and NASA astronaut Joe Acaba. From the left at the rear: Mark Vande Hei (NASA), Flight Engineer Alexander Misurkin of Roscosmos, Sergey Ryazanskiy of Roscosmos and Commander Randy Bresnik of NASA.

NASA (Via Twitter.com)
https://twitter.com/Space_Station

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space news roundup

National Space Council calls for human return to the Moon

With the space program's past as a backdrop, Vice President Mike Pence vowed on 5 October to reinvigorate the nation's future in space through policies developed by the National Space Council, including a renewed emphasis on human missions to the Moon.

Pence, chairing the first meeting of the Council since its reestablishment by an executive order in June, specifically instructed NASA to develop plans for human missions to the moon that will serve as a step toward later expeditions to Mars.

The Council accepted a recommendation by Pence that the U.S. "will lead in the return of humans to the moon for long-term exploration, followed by human missions to Mars and other destinations," he said. That recommendation will be incorporated into a decision memo to be submitted to the president.

"You've got a big job ahead of you," Pence said to NASA Acting Administrator Robert Lightfoot, representing the agency on the Council. "The Council is going to need the whole team at NASA to work with the Office of Management and Budget to provide the president with a recommended plan to fill that policy."

That request came after Pence, in opening remarks at the meeting held in the space gallery of the National Air and Space Museum's Udvar-Hazy Center here, put a human return to the moon on the path towards the long-term goal of humans to Mars.

"We will return American astronauts to the moon, not only to leave behind footprints and flags, but to build the foundation we need to send Americans to Mars and beyond," he said. "The moon will be a stepping-stone, a training ground, a venue to strengthen our commercial and international partnerships as we refocus America's space program toward human space exploration."

The idea of returning humans to at least the vicinity of the moon, if not the lunar surface, had the support of some executives who testified before the Council later in its two-and-a-half-hour meeting, including one who called for accelerated development of the Space Launch System and Orion spacecraft.

"Now, with a renewed sense of purpose and urgency, NASA and its industrial partners should be challenged to substantially accelerate the use, and to fully exploit the capabilities, of the SLS/Orion system," said Dave Thompson, president and chief executive of Orbital ATK.

"Backed by this administration's financial and moral support, U.S. astronauts can carry out several cislunar voyages during the next five years," he argued. NASA's current plans call for the first crewed SLS/ Orion mission to take place no sooner than 2021, and more likely 2022.

Gwynne Shotwell, president and chief operating officer of SpaceX, also offered support for development of a lunar facility of some kind. "Now is the time for swift and bold action. A permanent presence on the moon and American boots on the surface of Mars are not impossible, and they are not long-term goals," she said.

SpaceX's founder and chief executive, Elon Musk, mentioned a lunar base as one potential destination for the company's "BFR" reusable launch system under development when he spoke 29 September at the International Astronautical Congress in Adelaide, Australia. "It's 2017. I mean, we should have a lunar base by now," he said.

In a statement issued after the meeting, Lightfoot said that plan could include the Deep Space Gateway, a concept for a cislunar outpost that the agency unveiled earlier this year and has had discussions about with potential international partners, but which is not yet a formal NASA program.

"Based on a number of conversations I've had with the Council, we have highlighted a number of initiatives underway in this important area, including a study of an orbital gateway or outpost that could support a sustained cadence of robotic and human missions, as well as ensuing human missions to the lunar and Mars surfaces, and other destinations," he said in the statement.

"We've got to bring back a plan based on the new change in policy directive they talked about up front, about returning back to the moon and then moving on to Mars," Lightfoot told reporters after the meeting concluded.

Other Council Activities

The call for a revised human space exploration plan was just one of the action items to emerge from the meeting. Pence also called on the Secretaries of Commerce and Transportation, along with the OMB Director, to conduct a "full review of our regulatory framework for commercial space" to identify potential reforms to streamline operations.

Companies at the hearing made some recommendations. Shotwell noted that it "requires heroics" when the company wants to make even minor changes to existing launch licenses issued by the Federal Aviation Administration, such as changing a launch from one pad to another.

Bob Smith, the recently-appointed chief executive of Blue Origin, said that the development of reusable launchers threatened to create duplication of regulations between the U.S. Air Force and the FAA. “This is a good opportunity to go change that regulatory environment, because reusability will be the thing that actually changes the economics getting to space,” he said.

At the end of the meeting, National Security Adviser H.R. McMaster said that the National Security Council was developing a “space strategic framework” to support American “vital interests” in space. Much of that framework is classified, McMaster said, but some key unclassified elements include U.S. leadership in space, unfettered access to space, and support for international cooperation.

“What we will do with your approval,” he told Pence, “is we will now begin to flesh out this strategic framework. We will identify, and we will do this collaboratively with those who are here today and beyond, the specific tasks, the resources and the authorities required.” Pence said he supported such an effort for the next 45 days for later presentation to President Trump.

All three of those actions Pence instructed the Council to carry out fit into a theme of his speech that the United States had lost the lead in spaceflight. “America seems to have lost our edge in space,” he claimed, citing as evidence continued reliance on Russia for transporting astronauts to the International Space Station as well as the development of counterspace capabilities by China and Russia.

“We have resolved, with the leadership of President Donald Trump, to never again let America fall behind in the race for space,” he said. “America will lead again.”

However, industry witnesses were reticent to agree with Pence that the U.S. was no longer a leading space power. When Pence asked one panel if the U.S. had fallen behind, executives from Boeing and Lockheed Martin evaded giving a direct answer, emphasizing the importance of space and saying that the country can accelerate its space activities with more resources.

SpaceX’s Shotwell seemed to reject the premise entirely. “America is out-innovating the rest of the world in space launch,” she said, citing the increased number of commercial launches and development of reusable stages. “This is a market, commercial space launch, that the United States used to dominate in the ’90s. We lost it in the 2000s, and we are bringing that back to the United States, along with the thousands of jobs that follow it.”

Early praise

The 5 October meeting was the first for the National Space Council since the administration of President George H.W. Bush in the early 1990s. The Council, which at the time was not able to effectively align national space policy among government agencies, was disbanded in the Clinton administration and not revived until this year.

Representatives of space companies, both established and emerging, and industry organizations at the meeting supported this new effort to coordinate national space policy through the Council.

“We are encouraged by the dedication and interest demonstrated by the Council today,” said Eric Stallmer, president of the Commercial Spaceflight Federation, in a statement after the meeting. He added his organization, which includes many emerging space companies, looked forward to “collaborating with the Council to advance the administration’s space agenda.”

“We were encouraged by, and offer our full support for, the statements made by Vice President Pence today that U.S. leadership in space is a priority for this administration,” said Mary Lynne Dittmar, president and chief executive of the Coalition for Deep Space Exploration, another industry group, in a statement. Her group expects to be “working closely with the administration and with Congress to advance national leadership in human space exploration, science and commerce in deep space.”

Another attendee of the meeting was former House Speaker Newt Gingrich, a long-time space advocate. “This communicates the degree to which the Trump administration really wants to make space a major focus,” he said of the meeting to reporters afterwards. He said he expected the Council to take action early, particularly on regulatory issues.

“I think he very seriously wants this to work,” Gingrich said of Pence’s role leading the Council. “He wants to be part of the team that gets America so deeply invested in space that you actually have an entirely new space ecosystem by the end of the administration’s second term.”

Others, though, took a wait-and-see approach about the Council’s effectiveness. “I’m optimistic that they’re going to try,” said John Logsdon, founding director and professor emeritus of the Space Policy Institute at George Washington University, after the meeting. “Words are the first step to action, but they’re not action.”

Spacenews.com
http://www.spacenews.com

Apollo 11 Moonwalker's Gold Lunar Module Lands at Auction

A solid gold model of NASA's Apollo lunar module is now up for auction, as one of the only two others in existence remains missing after a museum heist.

Astronaut Buzz Aldrin's gold scale model of the spacecraft that he and Neil Armstrong piloted to the first moon landing in July 1969 promptly exceeded its opening bid of $10,000 at RR Auction's space memorabilia sale on Thursday 9 November.

"Intricately reproducing the iconic lunar module in solid [18 karat] gold and presented to one of the first humans on the moon, this is a spectacular piece of the utmost rarity," said Bobby Livingston, executive vice president at RR Auction.

The French jeweller Cartier was commissioned to produce the three gold lunar modules by the newspaper "Le Figaro" for presentation to Apollo 11 crew of Armstrong, Aldrin and Michael Collins during the astronauts' post-mission visit to Paris in October 1969.

Space.com
www.space.com

XCOR Aerospace files for Bankruptcy

XCOR Aerospace, a company that for nearly 20 years had been working on rocket engines and a suborbital spaceplane, filed for bankruptcy Nov. 8 after it was unable to line up new investors.

The company filed paperwork with the U.S. Bankruptcy Court for the Eastern District of California, seeking bankruptcy under Chapter 7, which calls for liquidation of the company's assets. XCOR is headquartered in Midland, Texas, with facilities in Mojave, California. The filing was first reported by Parabolic Arc.

The company had, in recent weeks, been trying to line up investors or other partners that could keep the company alive. Michael Blum, a member of the board of directors of XCOR who took over as chief executive at the end of June, said in an Oct. 19 interview that the company had only a few weeks to reach an agreement or it would run out of money.

"By early November, either one of these deals pulls the trigger and saves XCOR, or we file for Chapter 7," he said at the time.

Blum, in a Nov. 9 email to investors and shareholders in the company obtained by *SpaceNews*, said time ran out on the company's efforts. "Today it is my sad duty to inform you that XCOR has failed," he wrote. "Our effort to find a financial future for XCOR has not succeeded."

Spacenews.com
http://www.spacenews.com

NASA Completes Review of First SLS, Orion Deep Space Exploration Mission

NASA is providing an update on the first integrated launch of the Space Launch System (SLS) rocket and Orion spacecraft after completing a comprehensive review of the launch schedule.

This uncrewed mission, known as Exploration Mission-1 (EM-1) is a critical flight test for the agency's human deep space exploration goals. EM-1 lays the foundation for the *first crewed flight of SLS and Orion*, as well as a regular cadence of missions thereafter near the Moon and beyond.

The review follows an earlier assessment where NASA evaluated the cost, risk and technical factors of adding crew to the mission, but ultimately *affirmed the original plan* to fly EM-1 uncrewed. NASA initiated this review as a result of the crew study and challenges related to building the core stage of the world's most powerful rocket for the first time, issues with manufacturing and supplying Orion's first European service module, and tornado damage at the agency's Michoud Assembly Facility in New Orleans.

The majority of work on NASA's new deep space exploration systems is on track. The agency is using lessons learned from first time builds to drive efficiencies into overall production and operations planning. To address schedule risks identified in the review, NASA established new production performance milestones for the SLS core stage to increase confidence for future hardware builds. NASA and its contractors are supporting ESA's (European Space Agency) efforts to optimize build plans for schedule flexibility if sub-contractor deliveries for the service module are late.

NASA's ability to meet its agency baseline commitments to EM-1 cost, which includes SLS and ground systems, currently remains within original targets. The costs for EM-1 up to a possible June 2020 launch date remain within the 15 percent limit for SLS and are slightly above for ground systems. NASA's cost commitment for Orion is through Exploration Mission-2. With NASA's multi-mission approach to deep space exploration, the agency has hardware in production for the first and second missions, and is gearing up for the third flight. When teams complete hardware for one flight, they're moving on to the next.

As part of the review, NASA now plans to accelerate a test of Orion's launch abort system ahead of EM-1, and is targeting April 2019. Known as Ascent-Abort 2, the test will validate the launch abort system's ability to get crew to safety if needed during ascent. Moving up the test date ahead of EM-1 will reduce risk for the first flight with crew, which remains on track for 2023.

NASA
http://www.nasa.gov

The Road to Orion's Launch

NASA's Orion spacecraft aims to send humans further into space than ever before, and ESA's European Service Module will provide the essentials for keeping the astronauts alive and on course.

A review of the programme by NASA to assess progress is now showing a launch date from December 2019 to June 2020.

The first Exploration Mission-1 will circle the Moon without astronauts to lay the foundation and prove the technology for a second mission with a crew.

In Bremen, Germany, integration of the service module is well under way, with work already starting on the second.

More than 11 km of cables are being laid and connected to send the megabytes of information from the solar panels, fuel systems, engines, and air and water supplies to the module's central computers.

Recently, the Orion's 24 orientation thrusters were installed, complementing the eight larger engines that will back up the main engine.

The module's complex design requires 1100 welds for the propulsion system alone, with only 173 left to complete.

Teams in Bremen at the Airbus integration room are on eight-hour shifts to keep work running 24 hours a day, aiming for a shipment of the completed module to the USA in the summer of 2018.

It will be flown to NASA's Kennedy Space Center in Florida, where it will be combined with the crew module before they are moved to NASA's Plum Brook station in Ohio for extensive tests to ensure they are ready for launch and the voyage into deep space.

The service module is based on technology from ESA's tried-and-tested Automated Transfer Vehicles that flew to the International Space Station on five missions. For Orion, the design is more complex with more systems but the technology behind it has been miniaturised to fit into the smaller Orion structure.

ESA's David Parker, Director of Human Spaceflight and Robotic Exploration, says: "The Orion spacecraft and service module is an inspiring international cooperation at the forefront of technology and humanity's drive for exploration. All the teams involved are justly proud to be part of such a complex and important project."

ESA
http://www.esa.int

First SLS Rocket Hardware Turned Over to Ground Systems at Kennedy Space Center

NASA recently marked another key milestone in preparation for human deep space exploration near the Moon. Officials with the Space Launch System (SLS) Spacecraft/Payload Integration and Evolution organization formally turned over processing of the rocket's interim cryogenic propulsion stage (ICPS) to the center's Ground Systems Development and Operations Program at NASA's Kennedy Space Center in Florida.

During a recent ceremony in the high bay of the spaceport's Space Station Processing Facility, Mike Bolger, manager, GSDO Program at Kennedy, noted the ICPS is the first piece of hardware being turned over to GSDO for processing in preparation for the first integrated flight of SLS and Orion, which is an uncrewed mission known as Exploration Mission -1.

The ICPS arrived at Port Canaveral aboard the United Launch Alliance's (ULA's) Mariner barge earlier this year, and is the first integrated piece of flight hardware completed for NASA's SLS rocket. It was shipped from the ULA facility in Decatur, Alabama.

After arrival, the ICPS was transported to the ULA Horizontal Integration Facility near Space Launch Complex 37 at Cape Canaveral Air Force Station. There it was removed from its shipping container for initial inspections. Next, the ICPS was moved to the Delta Operations Center for further checkouts. It then was packed inside a canister and transferred to the Space Station Processing Facility.

The ICPS now will be processed and prepared for Exploration Mission-1, the first integrated flight of SLS and Orion. NASA is managing to December 2019 with four-to-six months schedule risk for launch. With the Orion attached, the ICPS sits atop the SLS rocket and uses liquid hydrogen and liquid oxygen propellants. The interim stage will provide Orion with the additional thrust needed to travel tens of thousands of miles beyond the Moon.

"Our human spaceflight mission at NASA is to push humans deeper out into the solar system," said Bill Hill, deputy associate administrator for Exploration Systems Development at NASA Headquarters in Washington. "We are going to take the Orion spacecraft, with the help of ICPS, farther into the solar system than any spacecraft built for humans has ever gone."

By Bob Granath
NASA's Kennedy Space Center, Florida
http://www.nasa.gov

Astronaut News

Rob Wood

ESA China Joint Training

I do love it when what I write in these pages becomes out of date or clearly wrong even before it goes to print. I would argue that the latest example is not really out of date or clearly wrong but just updated. In the last issue under 'Status of ESA's Astronaut Corps' I wrote, "There is also the rumoured joint mission with the Chinese, but that is certainly several years into the future (my guess is 2024)." To update these comments, the latest is that the rumoured joint mission with the Chinese is more than just rumour and my guess of 2024 might have been a little conservative.

In 2015, Chinese astronaut Ye Guangfu took part in ESA's CAVES 2015, a human spaceflight analogue mission exploring the Sa Grutta caves on the Mediterranean island of Sardinia. In August 2017, two ESA astronauts took part in sea survival training with Chinese astronauts in China. ESA noted shortly after the sea training was completed that "Both activities stem from the 2015 agreement to boost collaboration between ESA and the China Manned Space Agency, with the goal of flying European astronauts on the Chinese space station from 2022."

ESA astronauts Samantha Cristoforetti and Matthias Maurer joined their Chinese counterparts for sea survival training at a brand new centre in China's coastal city of Yantai. Part of the training took place on the open sea in the Bohai Strait. Water training had been part of China's normal astronaut preparations but the 2017 sessions were the first time they had taken place at sea.

Two ESA astronauts and seven Chinese astronauts formed three teams during the two weeks of training. Team one was Yang Liwei, China's first Chinese astronaut, Wang Yaping, the second Chinese female in space and Zhang Xiaoguang. Team two was Liu Boming, Ye Guangfu and Matthias Maurer. And team three was Liu Wang, Chen Dong and Samantha Cristoforetti.

Matthias Maurer said in an interview that three other teams of astronauts also did the training prior to their three groups, confirming that a total of 18 astronauts trained (16 Chinese and two ESA). I have not seen any confirmation of who the Chinese astronauts were taking part in the first three sessions other than Jing Haipeng, the first Chinese astronaut to fly three space missions.

Both Samantha Cristoforetti and Matthias Maurer have been learning Mandarin and have visited China previously. Cristoforetti had previously studied Chinese at university. Maurer had started learning the language in 2012 with Thomas Pesquet, a French ESA astronaut who has long been rumoured as the prime candidate for the first joint spaceflight with China.

In an interview published on the German Space Agency website in July 2017, Matthias Maurer was asked about his bucket list for favourite destinations to visit, a question that naturally Maurer related to spaceflight assignment, "A trip into space would be top of the list, obviously," he said. "But if I did get to choose, then it would be the Moon. I have been preparing relevant exploration scenarios for some years now at the EAC. Our planet's satellite has more than enough to offer. I know exactly what it takes to build a lunar base. The Moon will always be my favourite destination. The International Space Station and the Chinese Heavenly Palace would then come in second place." The Heavenly Palace is a translation of Tiangong which is the name of China's series of space stations.

He was asked about what attracts him to fly with China. He answered, "The language and the culture. I have been learning Chinese for several years now and find the cultural difference fascinating. It is a whole new level compared to Russia or North America. At the Astronaut Center [Cologne], I was responsible for coordinating cooperation with our Chinese counterpart. It was part of my future projects at ESA before I became an astronaut. So I know the foundations of collaboration as well as the local partners. With the Chinese, building long-term trust is imperative. It is a new way of working together, but fundamentally important nonetheless. I was able to lay a strong foundation for new cooperation – one that is just beginning."

Based upon the information currently available, and assuming that the joint flight with the Chinese will require two astronauts, one prime and one back-up, then two out of Samantha Cristoforetti, Matthias Maurer and Thomas Pesquet will be chosen. But, is there not still time for others to get involved? Watch this space (pun intended).

New Astronaut Selections Update: China

In the March/April 2017 edition of CapCom, I reported that on 18 November 2016 Huang Weifen, Deputy Chief of the Astronaut Centre of China within the China Manned Space Engineering Office, had said that China will start its third round of astronaut selection in 2017. This was announced at the post flight press conference in November 2016 held after the successful completion of the Shenzhou 11 mission to the Tiangong 2 space station. China's current astronauts are all former air force pilots but for the third selection, space engineers and technical staff in aerospace-related fields will be considered along with air force pilots.

It was not until June 2017 that further information began to appear in

English language sources. ChinaDaily.com reported that during an interview given on 16 May 2017 to China Youth Daily, Yang Liwei, China's first astronaut (Shenzhou 5 in 2003), said that there will be 10 to 12 candidates, including about two females. He noted that so far Chinese astronauts were required to be pilots but the new ones would include engineers. He added that China might choose new astronauts every four years depending on requirements. However, he said that for the first mission to the new space station, the crew of Shenzhou 12 will be made up of astronauts from the first two groups. China has selected astronauts in two batches, 14 in 1998 and seven in 2010.

On 25 July 2017, at the opening ceremony of a space photo exhibition which displayed nearly 100 photos taken by Chinese astronauts aboard various spacecraft, Yang Liwei repeated that China will select its latest group of astronauts during the course of this year and again said that the new group will include pilots and engineers and number 10 to 12 including two women.

Russia

On 14 March 2017, Roscosmos announced an open call for cosmonauts. They are looking for six to eight finalists to undertake cosmonaut candidate training. The closing date for applications was given as 14 July 2017. By early May 2017, there had been approximately 200 applications and this number grew to 300 by the initial closing date given. For the last cosmonaut selection, in 2012, a total of 304 applications were made.

However, on 14 July 2017, the Yuri Gagarin Cosmonaut Training Centre announced that applications received after that date would continue to be considered. No end date was given. "We are not in a hurry, said Sergey Krikalyov, a former cosmonaut who is now a manager within Russia's human spaceflight programme. "We are looking for professionals who are ready to conquer new space horizons." By mid-September 2017, applicants had reached the 400 mark.

Republic of Cyprus Docks to the ISS

The Cyprus Space Exploration Organisation (CSEO) is the nearest thing to a space agency that the Republic of Cyprus has. Officially, Cyprus' space related matters come under the auspices of the Cypriot Ministry of Transport, Communications and Works. But, the CSEO is dedicated to space. It is a NGO or non-government organization but has links to a number of international space organizations and government space agencies such as the Committee on Space Research, the International Astronautical Federation, ASI (Italian Space Agency), ESA and NASA.

The CSEO is linking up with the ISS or more specifically ESA's Italian astronaut Paolo Nespoli during his 2017 mission to the space station. Prior to the start of Nespoli's flight, CSEO president George Danos discussed cooperation with him when he is in space. Danos has direct email contact with Nespoli during his flight and is hoping to arrange for local school pupils to communicate with the astronaut whilst he is in space. Already in September 2016, the CSEO organised an event for students where Nespoli talked about his previous experiences in space and answered questions on the ISS and experiments conducted in space. More than 1,000 students from various schools were able to hear Nespoli speak through Skype during some of his downtime in his preparations for his third spaceflight.

The CSEO was founded in 2012. Its aim is to promote scientific research and development in the field of space exploration, astronautics and astrophysics, and enhance and actively develop the local space industry, leading to the advancement of high tech industry and collaboration with other space-faring nations in scientific, space and planetary endeavours.

CSEO is in strategic partnership with many governmental organisations, ministries and bodies, the major universities of Cyprus, EU officials, research institutions, the private sector, the media and many others. CSEO collaborates worldwide with national space agencies, the international space private sector and industry, and many others. CSEO strengthens the local space community's presence and acts as a local centre of planning, harbouring, incubation, development, coordination and accumulation of relevant projects and research. CSEO is also actively involved in educational activities, to stimulate the younger generation into the field of science and space research.

Paolo Angelo Nespoli (Major, Italian Army, Ret.) was born on 6 April 1957 in Milan, Italy. He joined ESA in 1991. He was selected as an ESA astronaut in 1998. In August 1998 he joined NASA's 17th astronaut class for basic training.

His first spaceflight was as MS-4 for STS-120 Discovery (23 October – 7 November 2007), which delivered the 'Harmony' (Node 2) connecting module to the ISS. He served as the intra-vehicle crew member for the flights extra-vehicular activity (EVA or spacewalk) operations and had responsibility for a number of European backed activities in the fields of human physiology, biology and education.

He was a back-up flight engineer for Soyuz TMA-19/ISS-24/25, which was launched on 15 June 2010, before making his second spaceflight as a flight-engineer for Soyuz TMA-20/ISS-26/27 (15 December 2010 – 24 May 2011). His duties during the mission were wide ranging. On the experimental level he carried out work for the European, US, Japanese and Canadian space agencies. He participated in docking operations of ESA and Japanese cargo spacecraft.

He was a cavenaut on ESA's CAVES (Cooperative Adventure for Valuing and Exercising human behaviour and performance Skills) 2013 mission. He was a back-up flight engineer for Soyuz MS-03/ISS-50/51, which was launched on 17 November 2016.

He is again serving as a flight engineer for his third spaceflight, Soyuz MS-05/ISS-52/53 (launched 28 July 2017 – he is due to return to Earth on 14 December 2017). With his third spaceflight he took the record of ESA's oldest astronaut in space from Germany's Hans Schlegel who was 56 when he flew on STS-122 in 2008.

Astronaut Does His Bit to Save The Planet

One of the first things that NASA astronaut Chris Cassidy did after stepping down as Chief Astronaut in June 2017 was to cycle 1,000

kilometres (about 620 miles) across the Brazilian Amazon to raise awareness about climate change and record its effects. The ride was completed on 26 September 2017 and Cassidy was accompanied by Osvaldo Stella and Paulo Moutinho, two ecology scientists. "This is another way to be an explorer," said Cassidy, "just in a different part of the world." He told the viewers of WCSH-TV in his home state of Maine that, "Every action that we do affects the world."

The cyclists have been documenting their journey on social media channels under the handle 'TransAmazon25', which records some of the aims for the project with hopes it, "will open a window on the region and inspire people to preserve the forest and protect the rights of the people who call it home."

Osvaldo Stella, who did an even longer ride across the Amazon 25 years ago, has a doctorate in Ecology and Natural Resources and is with the non-profit Amazon Environmental Research Institute (IPAM) in Brazil who works with small-scale farmers and other landowners to preserve and restore forests. Paulo Moutinho also has a doctorate in Ecology and is a co -founder and senior scientist at IPAM and a Distinguished Policy Fellow at the Woods Hole Research Center in the USA.

Osvaldo Stella, thanks to his previous experience was able to observe first-hand the environmental and social changes that have occurred in the region over the past 25 years. "Gold mining, deforestation, and pastures covered many of the areas that were covered with forest 25 years ago," Stella told Mongabay (an environmental science and conservation news and information website). "During this period more than 340,000 km² of forests were cleared throughout the Amazon. Currently, the total deforested area in the Amazon is 700,000 km², an area equivalent to the entire state of Texas. The cities are larger but have not changed much in their overall appearance. One more sign that the current economic model generates much impact to the environment but little improvement in the quality of life of the people."

Chris Cassidy said that the project, "appealed to my adventurous spirit and scientific curiosity. I wanted to see from the ground this important ecosystem and what is happening there, after having already seen it from space." He noted that he hoped, "the documentary that we're making will reach a large audience. T25 is not a group of elite athletes doing something that regular people could never do. It's just three regular, middle-aged guys pushing their limits, and doing so in an important region of the planet. It should appeal to a broad range of people, including those interested in sports or adventure travel; regular people who perhaps don't currently give much thought to the Amazon, or the environmental challenges we face in general."

Cassidy continued by talking how he hoped his ride would aid his own outreach activities, "Additionally, when I speak to students and adults during future Astronaut appearances, I now have direct on-the-ground Amazon experience to go with the perspective I gained from my time living on the International Space Station. Just as the ISS is a spaceship sustaining the life of those living on board, Earth is a spaceship sustaining the life of all 7.5 billion of us. And Spaceship Earth is fragile. We need to take better care of it. Hopefully T25 will help more people realize this."

Christopher John 'Chris' Cassidy (Captain, USN) was born on 4 January 1970 in Salem, Massachusetts but considers York in Maine, to be his hometown. He has a master's degree from MIT and is former US Navy SEAL. He was selected as a mission specialist astronaut in 2004 (NASA Astronaut Group 19).

His first spaceflight was as MS-1 for STS-127 Endeavour (15- 31 July 2009), which delivered the Japanese-built Exposed Facility and Experiment Logistics Module Exposed Section to the ISS. With these, the crew were able to complete the construction of Kibo. Kibo is the Japan Aerospace Exploration Agency's ISS Experiment Module. He was MS-1 and conducted three spacewalks whilst the shuttle was docked to the station.

Next for Cassidy would be training for an ISS residency. As part of the preparations for this he was a back-up flight engineer for Soyuz TMA-06M/ISS33/34, which launched on 23 October 2012.

For his second spaceflight, Soyuz TMA-08M/ISS-35/36 (28 March – 11 September 2013), he would serve as a flight engineer for both the Soyuz spacecraft and the space station. The Soyuz used a new 6-hour fast rendezvous flight profile to the ISS. It had been trialed on three unmanned Progress M resupply runs but this was its first use for a manned mission. He made three spacewalks but the third was terminated early when fellow spacewalker, Luca Parmitano, had water leaking into his helmet covering his face with water and putting him in extreme danger.

He was Chief of the Astronaut Office from July 2015 to June 2017. He is currently serving as an active astronaut in the Astronaut Office whilst awaiting a further flight assignment. He is not the only SEAL to be admitted into NASA's astronaut corps. Bill Shepherd joined the astronaut team in 1984. He made four spaceflights and was the first ISS commander. A third Navy SEAL, Jonny Kim, is currently in ascan training having been selected with the 2017 NASA astronaut class.

Another Long-Service Astronaut Retires

William McArthur became the sixth veteran astronaut to leave NASA in 2017. As reported in previous issues of CapCom. Michael Baker and Michael Fossum left on 7 January 2017, Charles Bolden on 20 January 2017, Anna Fisher on 28 April 2017 and Richard Mastracchio on 16 June 2017. On 18 July 2017, NASA announced that McArthur had left the agency on 24 June 2017 after almost three decades of service to the agency.

"We will greatly miss Bill's excellent leadership at NASA, and we've been the fortunate recipient of his many years of dedicated service to America's space agency," said Ellen Ochoa, Director of NASA's Johnson Space Center in Houston. "Bill and I were part of the same astronaut class in 1990. He brought the same enthusiasm he had for his flying career, along with his expertise as a crew member, to his recent positions as Director of our Safety and Mission Assurance Office and manager of the Space Shuttle Safety and Mission Assurance Office. I wish him all the best as he embarks on the next phase of his life."

William Surles 'Bill' McArthur (Colonel, US Army, Ret.) was born on 26 July 1952 in Laurinburg, North Carolina. He was an avid science fiction fan but did not harbour thoughts of an astronaut career. His ambitions were aimed at the US Army. In a similar way to the new Chief Astronaut Patrick Forrester (see previous issue of CapCom), McArthur was also inspired by Robert Stewart, the first army astronaut. McArthur read about his selection in 1978 and wondered if he could do the same thing.

His academic achievements include a Bachelor of Science degree in Applied Science and Engineering from the US Military Academy, in West Point, New York (1973), and a Master of Science degree in Aerospace Engineering from the Georgia Institute of Technology (1983).

He was commissioned into the US Army following graduation from West Point and served with the 82nd Airborne Division stationed at Fort Bragg, North Carolina, until he entered the US Army Aviation School in 1975. He was the top graduate of his flight class and was designated an Army aviator in June 1976. Operational flying service followed until he entered postgraduate school from where he was assigned to the Department of Mechanics at West Point as an assistant professor. In June 1987, he graduated from the US Naval Test Pilot School at Patuxent River and was designated an experimental test pilot.

In August 1987, he was posted to the Johnson Space Center as a space shuttle vehicle integration test engineer. His duties at NASA included serving as the engineering liaison for launch and landing operations of the Space Shuttle. He was actively involved in the integrated test of the flight control system for each orbiter for its return to flight and was a member of the Emergency Escape and Rescue Working Group.

He applied to join NASA's 1987 astronaut class (NASA Group 12) and was a semi-finalist having reached the interview and examination stage but was not one of the 15 finalists. He was selected as an astronaut in 1990 (NASA Group 13) and underwent 12 months of basic training, which qualified him for technical assignments for the Astronaut Office and assignment to a spaceflight. He did not have too long to wait for his first flight assignment. On 27 August 1992, NASA announced his assignment to STS-58. He went on to make four spaceflights and serve on two back-up crews.

He was MS-2 for STS-58 Columbia (18 October – 1 November 1993). As well as acting as the flight engineer for the mission, he also took part in many experiments in this the second dedicated Spacelab Life Sciences mission. Next up was STS-74 Atlantis (12-20 November 1995) on which he served as MS-3. The flight was NASA's second Space Shuttle mission to dock with the Russian Space Station Mir. He was part of the contingency EVA team for the flight (not needed). His final shuttle mission was STS-92 Discovery (11-24 October 2000), an ISS assembly mission. He had his second stint as MS-2 and was also part of the EVA team making two spacewalks. He was making his first visit to the ISS but it would not be his last.

From December 2000 to June 2001, he served as NASA Director of Operations in Russia where he oversaw training activities and personal requirements for astronauts in Zvyozdnyy Gorodok (Star City), Russia. On 23 March 2001, NASA announced his assignment as a flight engineer to ISS Expedition 8. He also retired from the US Army in 2001.

He was deep in the training flow for ISS-8 when on 1 February 2003 the Space Shuttle Columbia broke up on re-entry killing all seven crew members. One of the knock-on effects of this was a reduction of ISS crew size from three to two because of the loss of the shuttle supply capacity. On 25 July 2003 NASA released details of a new crew line-up for ISS-8 with McArthur dropping to the back-up crew. The mission launched on Soyuz TMA-3 on 18 October 2003.

Just over a month later, NASA's news release of 21 November 2003 named McArthur to the prime crew of ISS-9 with Russian cosmonaut Valery Tokarev due to start in April 2004. However, Russian medical doctors picked up a health issue which NASA called "a temporary medical issue related to McArthur's qualification for this long duration flight." They also noted that, "Because of medical privacy considerations, no information about McArthur's condition will be made public."

NASA announced on 12 January 2004 that Leroy Chiao would replace him. "This is a temporary medical issue for Bill," said the then Astronaut Office Chief Kent Rominger. "Because we are very cautious in our approach to crew health, we train backups for this kind of situation. We plan to assign Bill to another flight in the near future."

However, the story did not end there. On 6 February 2004, NASA said that Russia had proposed a new crew rota adding, "Following Chiao's assignment to fly with Tokarev, NASA and its partners continued to evaluate available crew resources for upcoming flights and decided it was optimal to keep teams together." McArthur re-joined Tokarev for the ISS-10 back-up crew. The mission launched on Soyuz TMA-5 on 14 October 2004. On 13 May 2005 NASA announced his appointment to ISS-12.

The flight took place as Soyuz TMA-7/ISS-12 (1 October 2005 – 8 April 2006). He served as the Soyuz flight engineer and ISS commander. He was also the ISS science officer. He made two spacewalks during his stay on the station. On the first, he and Tokarev used US EVA suits for what was classed a US spacewalk and on the second they used Russian EVA suits for a Russian spacewalk.

Throughout his career at NASA, he has held various assignments within the Astronaut Office, including working issues relating to the solid rocket booster, redesigned solid rocket motor and the advanced solid rocket motor. He has been Chief of the Astronaut Office Flight Support Branch and Chief of the Astronaut Office Space Station Branch. In March 2007, he translated to management astronaut status as Manager of the Space Shuttle Safety and Mission Assurance Office, then as Manager of the Space Shuttle Orbiter Project. Since 2011, he has been Director of the Safety and Mission Assurance Directorate.

Although several months have now elapsed since his retirement from NASA in June 2017, there is no indication on what his future plans are. His Linkedin entry shows only his last job at NASA ending in June 2017 and there is nothing from a google search.

Obituary Notes

Viktor Vasiliyevich Gorbatko 1934-2017

Viktor Gorbatko was a contemporary of Yuri Gagarin and Alexei Leonov having been one of the original 20 cosmonauts selected in 1960. He died on 17 May 2017. The cause of death was not given but the Russian news agency TASS reported that a source in the rocket and space industry said he had become unwell recently and spent two weeks in the P V Mandryka Central Military Clinical Hospital where he died in their intensive care unit.

He was born on 3 December 1934 in the village of Ventsy-Zarya in the district of Krasnodar Krai, Russia. In 1952, following graduation from secondary education, he was conscripted for his military service. He successfully applied for flight school and completed his initial training in 1953. In 1956 he qualified as a fighter pilot and served in that capacity in the Soviet air forces until his selection as a cosmonaut.

His spaceflight assignments came thick and fast but not all reached a successful conclusion. In 1964, he was assigned back-up commander for Voskhod 2 (flew 18-19 March 1965) but in January 1965 he was removed from training because of tonsillitis. Then, the medical doctors found anomalies in his electro-cardiogram readings. Fortunately, these returned to normal when his tonsils were removed and he was allowed to continue his space training for missions after Voskhod 2.

There were plans to fly further Voskhod missions after Voskhod 2 and Gorbatko trained for these flights. In April 1965, he was assigned to train as one of four male back-ups for an all-female crewed Voskhod 5 mission that would have also seen the first female spacewalk. In September 1965 the same four males were assigned for a further Voskhod EVA flight. The Voskhod Programme suffered delays due to technical and other issues and to all intent and purposes was cancelled in June 1966 without any further crewed missions taking place.

Gorbatko transferred to the Soyuz Programme and began training for the first Soyuz missions. In November 1966 he was named at a State Commission meeting as a back-up for Soyuz 2. Problems with unmanned Soyuz precursor missions led to several delays with the manned missions but eventually the launch of Soyuz 1 was set for 23 April 1967 with Soyuz 2 due to lift-off the following day.

The two spacecraft were due to dock and it was planned that two cosmonauts launched on Soyuz 2 would spacewalk from their spacecraft to Soyuz 1. They would then return to Earth in Soyuz 1. Gorbatko had trained as one of the back-up EVA cosmonauts. Several major failures on Soyuz 1 following launch on 23 April 1967 led to the cancellation of Soyuz 2 and sadly the Soyuz 1 cosmonaut, Vladimir Komarov died when the descent module smashed into the ground on 24 April 1967 following a failure of the parachute recovery system.

It was perhaps quite fortunate that Soyuz 2 did not fly as subsequent tests indicated the same inherent problem with the Soyuz 2 parachute system as on Soyuz 1. It was quite probable that if Soyuz 2 had flown it would have met the same fate on re-entry as Soyuz 1. The Soyuz spacecraft was clearly not ready for manned spaceflight but pressures to launch had been high. This was not dissimilar to the US Apollo programme where the Apollo spacecraft was being rushed for flight and three astronauts perished in a fire on the pad in January 1967.

There were delays for both nations' space programmes and it was October 1968 before the next manned flights took place, Apollo 7 and Soyuz 3. The Soyuz parachute recovery system had been redesigned and was now able to return cosmonauts safely to the Earth. In the meantime Gorbatko continued his training for an EVA flight and in January 1969 was the back-up research-engineer for the mission. Soyuz 4 (flew 14-17 January 1969) and Soyuz 5 (flew 15-18 January 1969) successfully completed the mission originally planned for Soyuz 1 and Soyuz 2.

Following the success of the Soyuz 4 and Soyuz 5 flights, plans were made to fly three Soyuz in space at the same time with welding, rendezvous and docking experiments. Soyuz 6 would carry out welding and rendezvous experiments and Soyuz 7 and Soyuz 8 would dock. In April 1969 Gorbatko began training as the prime research-engineer for Soyuz 7.

On consecutive days in October 1969, Soyuz 6 (flew 11-16 October 1969), Soyuz 7 (flew 12-17 October 1969) and Soyuz 8 (flew 13-18 October 1969) were launched into space. Gorbatko was aboard Soyuz 7 with his commander Anatoli Filipchenko and flight-engineer Vladislav Volkov. The overall mission of the three spacecraft was hardly an unqualified success. Soyuz 7 and Soyuz 8 failed to dock as planned due to a malfunctioning rendezvous system, and the welding experiments in Soyuz 6 went wrong and could have had disastrous consequences. Fortunately, all the cosmonauts returned to Earth safely.

The next Soviet mission would be a long-duration (for the time) solo-flight. Soyuz 9 (flew 1-19 June 1970) was the longest manned spaceflight to that time. The two cosmonauts flying, Andrian Nikolayev and Vitaliy Sevastyanov challenged Lieutenant General Nikolay Kamanin, a senior Soviet military figure who was in charge of Russia's cosmonauts (as a young pilot Kamanin was also one of the first recipients of the award 'Hero of the Soviet Union', the State's highest bravery award, for a rescue mission in Arctic waters in 1934) and Gorbatko, who was one of the CapComs for the mission, to a chess match for the tenth day of the mission which was earmarked as a day of rest for the flying cosmonauts. After four communication periods and three orbits all parties agreed to draw. This was the first ever chess game between Earth and space, after which Gorbatko became an honorary member of the Soviet Central Chess Club.

In 1971, he was assigned to the Almaz programme. This was a military space station project and in order to disguise the nature of the missions the space stations were named publically as Salyut space stations. Three were flown, Salyut 2, Salyut 3 and Salyut 5. Salyut 2 failed shortly after reaching orbit when an unknown accident left the station disabled and de-pressurized but the other two stations received manned missions. Gorbatko was involved in ground testing for Salyut 3 and then in 1974 he was assigned as commander of the third crew for the third Almaz station, Salyut 5.

He was on the second back-up crew for Soyuz 21/Salyut 5 (flew 6 July -24 August 1976) and then the first back-up crew for Soyuz 23 (flew 14 -16 October 1976). The first mission manned Salyut 5 but guidance

problems caused the second's docking to be cancelled. He was then commander for Soyuz 24/Salyut 5 (flew 7-25 February 1977), which flew a successful mission to Salyut 5.

In 1977, he was assigned to the Intercosmos Programme. The Intercosmos Programme originally started as unmanned international satellite research missions but in 1976 the Soviets opened it up for manned flights involving other communist countries. He served as back-up commander for Soyuz 31/Salyut 6/Soyuz 29 (flew 26 August – 3 September 1978). This was the third manned Intercosmos flight and dedicated to Germany.

In September 1979, he was assigned as the commander for the Vietnamese Intercosmos mission, which became the sixth manned Intercosmos flight. His third and final spaceflight took place as Soyuz 37/Salyut 6/Soyuz 36 (23-31 July 1980). He launched in Soyuz 37 but returned in Soyuz 36 in order to leave the fresher spacecraft for the use of the Salyut resident crew. The Soyuz systems degrade with the passage of time due to the effects of spaceflight and this swapping of spacecraft allowed resident crews to fly longer missions. With this spaceflight he was the last of the first group of Soviet cosmonauts to spend time in space.

Other manned spaceflight programmes he was associated with include the Soviet lunar landing programme, although the amount of training he did on actual lunar hardware is unclear. He may also have conducted some training on the TKS (Transportniy Korabl Snabzheniya) spacecraft that was a rival of Soyuz but never flew as a manned transport.

He remained part of the cosmonaut detachment until 28 August 1982 when he left to become chief of a faculty at the Zhukovsky Air Force Engineering Academy. In 1992, he retired from active duty in the military with the rank of Major-General. He was widowed in 1997 but later remarried. He is survived by his second wife and two daughters from his first marriage.

Irene Leverton 1927-2017

At the dawn of the space race Human Spaceflight was very much a male dominated endeavour. Apart from the politically motivated flight of the Soviet Union's Valentina Tereshkova in 1963 no female astronauts were launched until the 1980's. However, in the early 1960's, a number of women took the same rigorous physical and psychological tests at the same Lovelace Clinic in Albuquerque, New Mexico, that the first US astronauts, the all-male Mercury 7, had endured during their selection process in the late 1950's.

A total of 13 women passed the tests. Many years later they would become known as the Mercury 13. Unfortunately, the politics and views of the day were such that they had little chance of persuading the US Government or NASA to fly them in space and history then left them behind before they became news again at the time of Eileen Collins flight as pilot of STS-63 in 1995.

One of those who underwent the Lovelace tests was Irene Leverton. At the time she had more than 9,000 flight hours. A figure that was higher than any member of the male Mercury 7 astronauts. John Glenn with a little over 5,000 hours was the nearest and he was more than a thousand hours ahead of any other Mercury 7 astronaut. It should be pointed out that the Mercury 7's flying hours included a lot more in higher-performance aircraft.

Irene Helen Leverton was born 3 March 1927 in Chicago, Illinois to James and Frieda (Gerhardt) Leverton. In an interview given in 2014 she said she could not remember a time when she did not want to fly. She did not want dolls as toys but airplanes.

In 1944 she joined the Women Airforce Service Pilots (WASP) organisation. Despite its name it was not a military unit but a civil service group. However the job of the female pilots was to fly military planes in non-combat roles to free up their male counterparts for front-line service. They flew most types of military aircraft from aircraft factories to hand over points to the military e.g. ports of embarkation and training bases. They flew supply missions and towed targets for live anti-aircraft artillery practice. She first soloed in a Piper J-3 Cub but WASP was disbanded at the end of 1944 so she had to look to other means for getting into the air.

She took up employment at an airport and earned enough money to fly for an hour once a week. She found work crop dusting, flying in a number of states including Illinois, Arkansas, Tennessee, Mississippi and Michigan. Over the years she built up many hours in the air on scheduled commuter flights, ferrying aircraft, as a corporate pilot, racing aircraft, flying for a multi-engine air ambulance service and as a rated flight instructor for students wanting to become commercial instrument and multi-engine pilots.

By the late 1950's spaceflight was very much in the news with the Soviet Union and the United States both planning manned spaceflight projects. At first there was no consideration that women could take part. The idea that led to the Lovelace tests funnily enough came from a senior male medical doctor in the United States Air Force (USAF) in 1959. Brigadier-General Donald Flickinger called his idea the Girl Astronaut Program.

Flickinger had the support of Dr Randolph Lovelace II of the clinic. They did not automatically accept the mainstream thinking that women were physically unable to stand the rigours of spaceflight. They wanted proper scientific evidence to study. They were also well aware that every pound saved was important for getting payloads into orbit especially as US rockets only had limited capacity at the time and it was without question that generally women weighed less than men. This had significant implications for launch weight.

Initial support from the USAF was withdrawn but with private sponsorship Dr Lovelace and the Lovelace Clinic with the tacit support of Flickinger continued the research, and this led to the tests which 13 aviatrix passed. Amongst the successful candidates was Leverton. She had been invited to take part in 1961 and took the tests in April 1961. There was never any support from NASA for flying female astronauts at this time but there was some political backing and this led to a Congressional Hearing in July 1962. It did not go well for the female candidates. In October 1962 the House Committee on Science and Astronautics annual report confirmed NASA's astronaut selection

process was correct but that at some time in the future NASA should look into using female astronauts. Whatever, slim hopes the women had of becoming astronauts during the early days of human spaceflight had ended.
Leverton continued flying and by the time she stopped in 2010 she had accumulated 25,768 flight hours as pilot-in-command. She flew over 50 types of multi-engine and single-engine aircraft. She died on 23 July 2017 at an assisted living facility in Arizona, after an extended illness.

UK Astronaut Sightings

Brief details on UK astronaut sightings follow. For full details see Collect Space and their sightings section - **http:// www.collectspace.com/sightings/sightings-unitedkingdom.html** This is kept updated by many in the space community and is always more up to date than any printed material.

Scott Kelly will be in London, Oxford and Bath on consecutive evenings 23-25 November 2017 with lectures and book signings for his book 'Endurance: A Year in Space, A Lifetime of Discovery'

In December 2017, **Tim Peake** will be on a book signing tour for his new book 'Ask an Astronaut'. Manchester (8 December), Guildford (9 December) and London (10 December).

Chris Hadfield is on tour in the UK during February 2018 under the general title 'An Evening with Chris Hadfield': Southampton (12 February), Manchester (13 February), Belfast (15 February) and Glasgow (16 February).

Rick Mastracchio: 23-24 March 2018 with Space Lectures events in Pontefract.

NB: If anyone wants to know more about these or other sightings and they do not have access to Collect Space on the Internet please contact me either through the Midlands Spaceflight Society or by email at - RobandJill@blueyonder.co.uk - I often find out about visits at too short notice to put in CapCom. But, a word of warning. It is always best to check in advance of travelling that an event is taking place as planned. I travelled all the way to London a number of years ago to meet a cosmonaut only to discover he had cancelled because of work commitments. I had not phoned before travelling. I have no involvement in the organisation of the above astronaut events and therefore no liability is accepted for any changes that occur.

Bits & Pieces

1/ National Geographic have a special magazine issue out, 'Astronauts: Past, Present, Future'. A coffee table publication that is pretty to look at but based upon a quick glance does seem rather short of detail and I was very disappointed by it. Locally, I have seen copies for sale at Sainsbury's Shirley branch in Solihull, and two branches of WHSmith, Union Street, Birmingham and Birmingham New Street Station.

2/ Lego's 'Women of NASA' is one of Amazon's current best-selling toy sets. It includes 4 minifigures: Nancy Grace Roman (astronomer who was one of the first female executives at NASA and was instrumental in getting the Hubble Space Telescope Programme started), Margaret Hamilton (who led the Software Engineering Division of the Massachusetts Institute of Technology Instrumentation Laboratory that developed the on-board flight software for the Apollo spacecraft), and two astronauts, Sally Ride (the first female astronaut in 1983) and Mae Jemison (the first female African American astronaut in 1992).

COMMENTS & UPCOMING IN THE NEXT ISSUE OF ASTRONAUT NEWS

All dates for lift-off and landing are given in GMT for this issue of CapCom.

Sad news out of America with the loss of Skylab and Space Shuttle astronaut Paul Weitz who died on 23 October 2017 and Gemini and Apollo astronaut Richard Gordon on 6 November 2017..

Japanese astronaut Soichi Noguchi has been assigned to a third spaceflight and we will have details on the retirements of two more veteran NASA astronauts, Nancy Currie-Gregg and Steven Smith, and who are 'The Turtles'.

Acknowledgements and sources:

Astronaut.ru; CapCom (previous issues); Chinadaily.com; Collect Space; The Cosmonaut Detachment ©2003 AIS Publications; Cyprus Space Exploration Organisation; The Cyprus Mail; Dcourier.com (online Arizona news site); ESA; The First Soviet Cosmonaut Team ©2009 by Colin Burgess and Rex Hall; Gbtimes.com; German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt or DLR - German Space Agency); Google; Landscapes.org: Linkedin; Mercury13.com; The Mercury 13 ©2003 by Martha Ackermann; Mongabay.com; The Moscow Times; NASA and its various centres; NASASpaceflight.com; Novosti Kosmonavtika; Researchgate.net; The Rocket Men ©2001 by Rex Hall and David J Shayler; RussianSpaceWeb.com; Russia's Cosmonauts Inside the Yuri Gagarin Training Center ©2005 by Rex D Hall, David J Shayler and Bert Vis; Smithsonian National Air and Space Museum; Soviet Cosmonaut Detachment ©1998 AIS Publications; The Soviet Space Race With Apollo ©2000 by Asif A Siddiqi; Soyuz: A Universal Spacecraft ©2003 by Rex D Hall and David J Shayler; Spacefacts; The spacereview.com; Sputnik and the Soviet Space Challenge ©2000 by Asif A Siddiqi; TASS (Russian News Agency); Uk.businessinsider.com; WCSH-TV; Wikipedia; Yuri Gagarin Cosmonaut Training Centre; Zenit (magazine publication of Astro Info Service).

Cassini Image Mosaic: A Farewell to Saturn

In a fitting farewell to the planet that had been its home for over 13 years, the Cassini spacecraft took one last, lingering look at Saturn and its splendid rings during the final leg of its journey and snapped a series of images that has been assembled into a new mosaic.

Cassini's wide-angle camera acquired 42 red, green and blue images, covering the planet and its main rings from one end to the other, on 13 September 2017. Imaging scientists stitched these frames together to make a natural colour view.

There is much to remember and celebrate in marking the end of the mission. Cassini's exploration of Saturn and its environs was deep, comprehensive and historic.

"Cassini's scientific bounty has been truly spectacular -- a vast array of new results leading to new insights and surprises, from the tiniest of ring particles to the opening of new landscapes on Titan and Enceladus, to the deep interior of Saturn itself," said Robert West, Cassini's deputy imaging team leader at NASA's Jet Propulsion Laboratory in Pasadena, California.

The Cassini imaging team had been planning this special farewell view of Saturn for years. For some, when the end finally came, it was a difficult goodbye.

"It was all too easy to get used to receiving new images from the Saturn system on a daily basis, seeing new sights, watching things change," said Elizabeth Turtle, an imaging team associate at the Johns Hopkins University Applied Physics Laboratory, Laurel, Maryland. "It was hard to say goodbye, but how lucky we were to be able to see it all through Cassini's eyes!"

For others, Cassini's farewell to Saturn is reminiscent of another parting from long ago.

"For 37 years, Voyager 1's last view of Saturn has been, for me, one of the most evocative images ever taken in the exploration of the solar system," said Carolyn Porco, former Voyager imaging team member and Cassini's imaging team leader at the Space Science Institute in Boulder, Colorado. "In a similar vein, this 'Farewell to Saturn' will forevermore serve as a reminder of the dramatic conclusion to that wondrous time humankind spent in intimate study of our Sun's most iconic planetary system."

Launched in 1997, the Cassini spacecraft orbited Saturn from 2004 to 2017. The mission made numerous dramatic discoveries, including the surprising geologic activity on Saturn's moon Enceladus and liquid methane seas on Saturn's largest moon, Titan. Cassini ended its journey with a dramatic plunge into Saturn's atmosphere on Sept. 15, 2017, returning unique science data until it lost contact with Earth.

The Cassini-Huygens mission is a cooperative project of NASA, ESA (European Space Agency) and the Italian Space Agency. NASA's Jet Propulsion Laboratory, a division of Caltech in Pasadena, manages the mission for NASA's Science Mission Directorate, Washington. The Cassini orbiter and its two onboard cameras were designed, developed and assembled at JPL. The imaging team consists of scientists from the U.S., England, France, and Germany. The imaging operations center and team leader are based at the Space Science Institute in Boulder, Colorado.

NASA
https://www.nasa.gov/cassini
https://saturn.jpl.nasa.gov

Kingdom Of Saudi Arabia And Virgin Announce Partnership On Spaceflight, Satellite Launch And Space Centric Entertainment Industry

PIF announce intention to invest $1 billion into Virgin Galactic, The Spaceship Company, and Virgin Orbit

The Public Investment Fund (PIF) of Saudi Arabia and Virgin Group (Virgin), have signed a non-binding Memorandum of Understanding (MoU) for a partnership under which PIF intends to invest approximately $1 billion into Virgin Galactic, The Spaceship Company and Virgin Orbit, with an option for $480 million of future additional investment in space services.

The intention to invest was agreed by HRH Prince Mohammad bin Salman Al-Saud, Crown Prince of Saudi Arabia, Deputy Prime Minister, Chairman of the Council of Economic and Development Affairs and of the PIF, and Sir Richard Branson, Founder of Virgin Group. The strategic guidance for the partnership was provided by the Kingdom of Saudi Arabia's Ministry of Economy and Planning.

PIF and Virgin partnership creates a strong platform to enhance the role of innovative technology within the Kingdom's blueprint for a modern, diversified economy, which is a central part of Vision 2030.

The intended investment will, subject to regulatory approval, result in PIF taking a significant stake in Virgin Galactic, The Spaceship Company and Virgin Orbit, alongside Virgin Group and Abu Dhabi's Aabar Investments. This will support the companies' human spaceflight plans and accelerate Virgin Orbit's manufacturing and operational capabilities. It will also aid the development of next generation low cost small satellite launch systems and commercial supersonic point-to-point travel capabilities; and includes the possibility to develop a space centric entertainment industry in the Kingdom of Saudi Arabia.

Virgin Galactic
http://www.virgingalactic.com

Gadgets for Mars

A mini-rover, tools once used on the Moon and lasers for 3D mapping are in the backpack of the explorers of tomorrow. The terrain will be hazardous and it will be dark in volcanic caves, but this equipment could one day help to scout other planets.

The alien-like landscapes of Lanzarote, Canary Islands, Spain, are almost surreal but this volcanic island is helping to bring future space missions to reality.

In November 2017, an expedition with a dozen of experiments mobilised 50 people and four space agencies during five days in five different locations.

This pioneering exercise is Pangaea-X, an extension of ESA's Pangaea geology training. European astronauts, scientists and engineers work side by side to prepare for human and robotic operations away from Earth.

For full story visit ESA:
http://www.esa.int/Our_Activities/Human_Spaceflight/Caves/Gadgets_for_Mars

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Contributions to CapCom

The Editor welcomes contributions for CapCom. Articles on any aspect of space exploration are considered. Articles in Word format or text files should be sent by email to

capcom.editor@midspace.org.uk.

The Society is not responsible for individual opinions expressed in articles, reviews or reports of any kind. Such opinions are solely those of the author. Material published in CapCom does not necessarily reflect the views of the Society. Any comments directly concerning the magazine should be addressed to the Editor via the email address above.

Copy Deadline

All contributions intended for the **January—February 2018** issue should be emailed to the editor by

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