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Deep Space Habitat is NASA's Next Step on its Journey to Mars . . .

Concept image of Lockheed Martin's refurbished multi-purpose logistics module prototype

Credits: Lockheed Martin

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space news roundup

NASA Selects Six Companies to Develop Prototypes, Concepts for Deep Space Habitats

NASA has selected six U.S. companies to help advance the Journey to Mars by developing ground prototypes and concepts for deep space habitats.

Through the public-private partnerships enabled by the Next Space Technologies for Exploration Partnerships-2 (NextSTEP-2) Broad Agency Announcement, Appendix A, NASA and industry partners will expand commercial development of space in low-Earth orbit while also improving deep space exploration capabilities to support more extensive human spaceflight missions.

The selected companies are:

* Bigelow Aerospace of Las Vegas

* Boeing of Pasadena, Texas

* Lockheed Martin of Denver

* Orbital ATK of Dulles, Virginia

* Sierra Nevada Corporation's Space Systems of Louisville, Colorado

* NanoRacks of Webster, Texas

Habitation systems provide a safe place for humans to live as we move beyond Earth on our Journey to Mars.

"NASA is on an ambitious expansion of human spaceflight, including the Journey to Mars, and we're utilizing the innovation, skill and knowledge of both the government and private sectors," said Jason Crusan, director of NASA's Advanced Exploration Systems. "The next human exploration capabilities needed beyond the Space Launch System (SLS) rocket and Orion capsule are deep space, long duration habitation and in-space propulsion. We are now adding focus and specifics on the deep space habitats where humans will live and work independently for months or years at a time, without cargo supply deliveries from Earth."

The six partners will have up to approximately 24 months to develop ground prototypes and/or conduct concept studies for deep space habitats. The contract award amounts are dependent on contract negotiations, and NASA has estimated the combined total of all the awards, covering work in 2016 and 2017, will be approximately $65 million, with additional efforts and funding continuing into 2018. Selected partners are required to contribute at least 30 percent of the cost of the overall proposed effort.

The ground prototypes will be used for three primary purposes: supporting integrated systems testing, human factors and operations testing, and to help define overall system functionality. These are important activities as they help define the design standards, common interfaces, and requirements while reducing risks for the final flight systems that will come after this phase.

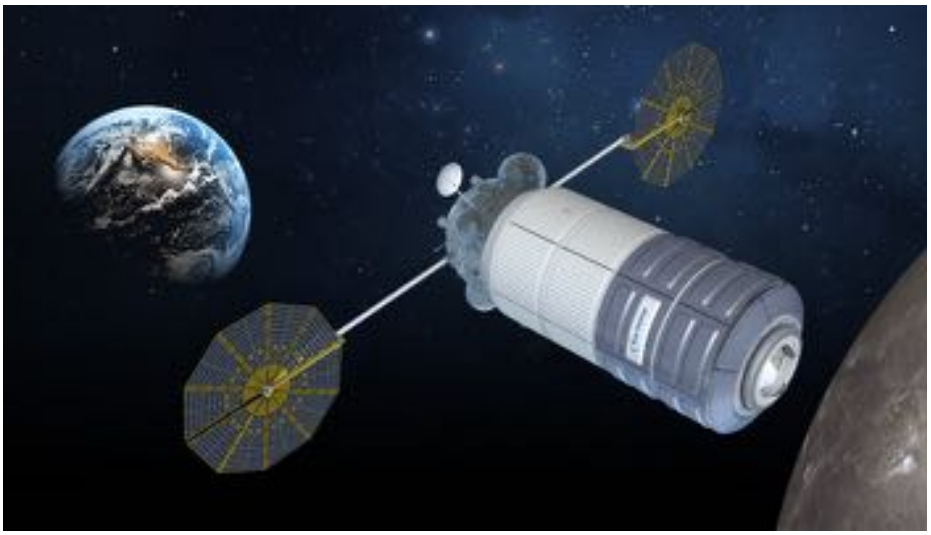
NASA made the first NextSTEP selections in 2015, which include deep space habitation concept studies that also advance low-Earth orbit commercial capabilities. Four companies were selected under that solicitation: Bigelow Aerospace LLC, Boeing, Lockheed Martin and Orbital ATK.

This round of NextSTEP selections are part of a phased approach that will catalyze commercial investment in low-Earth orbit and lead to an operational deep space habitation capability for missions in the area of space near the moon, which will serve as the proving ground for Mars during the 2020s. These missions will demonstrate human, robotic and spacecraft operations in a true deep space environment that's still relatively close to Earth and validate technologies for the longer journey to Mars.

The activities of these NextSTEP awards will inform the acquisition and deployment approach for the next phase of flight systems for deep space including important aspects, such as standards and interfaces, module configurations, and options for deployment using SLS and Orion and commercial vehicles. In addition to U.S. industry, NASA is in discussions on collaborative opportunities with our international partners to enable fully operational deep space habitation capability.

NextSTEP is managed by the Advanced Exploration Systems Division (AES) in NASA's Human Exploration and Operations Mission Directorate. AES is pioneering innovative approaches and public-private partnerships to rapidly develop prototype systems, advance key capabilities, and validate operational concepts for future human missions beyond Earth orbit.

NASA
http://www.nasa.gov/nextstep



Concept image of Orbital ATK's cislunar habitat based, based on the design of the Cygnus spacecraft.

Credits: Orbital ATK

Crew Access Arm Installed for Starliner Missions

The Crew Access Arm for a new generation of spacecraft was lifted into place the morning of 15 August at Space Launch Complex-41 where workers are modifying the launch pad to give astronauts access to Boeing's CST-100 Starliner on launch day.

The 50-foot-long, 90,000-pound arm will form a bridge between the newly built Crew Access Tower and the hatch of the spacecraft. Astronauts will walk across the arm to climb inside the Starliner for flight. Poised to begin a mission, the Starliner will sit on top of a United Launch Alliance Atlas V rocket.

The arm also holds the so-called "White Room", an enclosed area big enough for astronauts to make final adjustments to their suits before climbing aboard the spacecraft.

The addition of the arm is the latest in a rapid string of accomplishments for NASA's Commercial Crew Program and its partners. Working independently on separate contracts with NASA's program, Boeing and SpaceX are developing spacecraft and launch systems to take astronauts to the International Space Station. The additional launch capability will allow the resident crew of the station to grow by one, effectively doubling the time astronauts have in orbit to conduct science vital to spaceflight research, as well as investigations into benefits for those on Earth.

The arm and tower have been constructed between Atlas V launches at SLC-41. The arm was built at a construction yard near NASA's Kennedy Space Center and trucked to the launch pad on on 11 August. The tower was built in segments close to the launch pad and stacked together to form the nearly 200-foot-tall structure. It is the first new crew access structure at the Florida spaceport since the space shuttle's Fixed Service Structures were put in place before Columbia's first flight in 1981. It also is the first new crew access tower at Cape Canaveral Air Force Station since the Apollo Program.

The advances reminded some of the early days of human spaceflight when the first generation Atlas rockets put astronauts into orbit.

Earth is not the only place work is underway to prepare for Commercial Crew missions. Astronauts on the International Space Station will perform a spacewalk Friday to install an International Docking Adapter to a station port that will allow visiting spacecraft including those on commercial crew missions to dock with the orbiting laboratory. Carried into orbit during the most recent cargo resupply mission, the IDA will become a doorway for astronauts as they cross from their spacecraft into the station. The adapters are outfitted with a network of sensors and fixtures that work with automated systems to dock the spacecraft to the port.

By Steven Siceloff,
NASA's Kennedy Space Center, Florida
www.nasa.gov

NASA's OSIRIS-REx Speeds Toward Asteroid Rendezvous

NASA's first asteroid sampling mission launched into space at 00:05 BST on FrIday 9 September from Cape Canaveral Air Force Station in Florida, beginning a journey that could revolutionize our understanding of the early solar system.

The Origins, Spectral Interpretation, Resource Identification, Security-Regolith Explorer (OSIRIS-REx) spacecraft is designed to rendezvous with, study, and return a sample of the asteroid Bennu to Earth. Asteroids like Bennu are remnants from the formation of our solar system more than 4.5 billion years ago. Scientists suspect that asteroids may have been a source of the water and organic molecules for the early Earth and other planetary bodies. An uncontaminated asteroid sample from a known source would enable precise analyses, providing results far beyond what can be achieved by spacecraft-based instruments or by studying meteorites.

In 2018, OSIRIS-REx will approach Bennu – which is the size of a small mountain – and begin an intricate dance with the asteroid, mapping and studying Bennu in preparation for sample collection. In July 2020, the spacecraft will perform a daring maneuver in which its 11-foot arm will reach out and perform a five-second "high-five" to stir up surface material, collecting at least 2 ounces (60 grams) of small rocks and dust in a sample return container. OSIRIS-REx will return the sample to Earth in September 2023, when it will then be transported to NASA's Johnson Space Center in Houston for examination.

The OSIRIS-REx mission will be the first U.S. mission to carry samples from an asteroid back to Earth and the largest sample returned from space since the Apollo era.

NASA
http://www.nasa.gov/osiris-rex

NASA Approves 2018 Launch of Mars InSight Mission

NASA has set a new launch opportunity, beginning May 5, 2018, for the InSight mission to Mars. InSight is the first mission dedicated to investigating the deep interior of Mars. The findings will advance understanding of how all rocky planets, including Earth, formed and evolved.

NASA is moving forward with a spring 2018 launch of its InSight mission to study the deep interior of Mars, following final approval this week by the agency's Science Mission Directorate.

The Interior Exploration using Seismic Investigations, Geodesy and Heat Transport (InSight) mission was originally scheduled to launch in March of this year, but NASA suspended launch preparations in December due to a vacuum leak in its prime science instrument, the Seismic Experiment for Interior Structure (SEIS).

The new launch period for the mission begins May 5, 2018, with a Mars landing scheduled for Nov. 26, 2018. The next launch opportunity is driven by orbital dynamics, so 2018 is the soonest the lander can be on its way.

"Our robotic scientific explorers such as InSight are paving the way toward an ambitious journey to send humans to the Red Planet," said Geoff Yoder, acting associate administrator for NASA's Science Mission Directorate, in Washington. "It's gratifying that we are moving forward with this important mission to help us better understand the origins of Mars and all the rocky planets, including Earth."

The SEIS instrument -- designed to measure ground movements as small as half the radius of a hydrogen atom -- requires a perfect vacuum seal around its three main sensors in order to withstand harsh conditions on the Red Planet. Under what's known as the mission "replan," NASA's Jet Propulsion Laboratory in Pasadena, California, will be responsible for redesigning, developing and qualifying the instrument's evacuated container and the electrical feedthroughs that failed previously. France's space agency, the Centre National d'Études Spatiales (CNES), will focus on developing and delivering the key sensors for SEIS, integration of the sensors into the container, and the final integration of the instrument onto the spacecraft.

The German Aerospace Center (DLR) is contributing the Heat Flow and Physical Properties Package (HP3) to InSight's science payload.

NASA's budget for InSight was $675 million. The instrument redesign and two-year delay add $153.8 million. The additional cost will not delay or cancel any current missions, though there may be fewer opportunities for new missions in future years, from fiscal years 2017-2020.

InSight's primary goal is to help us understand how rocky planets formed and evolved. Jim Green, director of NASA's Planetary Science Division, said, "We've concluded that a replanned InSight mission for launch in 2018 is the best approach to fulfill these long-sought, high-priority science objectives."

CNES President Jean-Yves Le Gall added, "This confirmation of the launch plan for InSight is excellent news and an unparalleled opportunity to learn more about the internal structure of the Red Planet, which is currently of major interest to the international science community."

The InSight Project is managed by JPL for NASA's Science Mission Directorate, Washington. Lockheed Martin Space Systems, Denver, built the spacecraft. InSight is part of NASA's Discovery Program, which is managed by NASA's Marshall Space Flight Center in Huntsville, Alabama.

NASA/JP-Caltech
http://insight.jpl.nasa.gov/

Jupiter's North Pole Unlike Anything Encountered in Solar System

Juno successfully executed the first of 36 orbital flybys on Aug. 27 when the spacecraft came about 2,500 miles (4,200 kilometers) above Jupiter's swirling clouds. The download of six megabytes of data collected during the six-hour transit, from above Jupiter's north pole to below its south pole, took one-and-a-half days. While analysis of this first data collection is ongoing, some unique discoveries have already made themselves visible.

"First glimpse of Jupiter's north pole, and it looks like nothing we have seen or imagined before," said Scott Bolton, principal investigator of Juno from the Southwest Research Institute in San Antonio. "It's bluer in color up there than other parts of the planet, and there are a lot of storms. There is no sign of the latitudinal bands or zone and belts that we are used to -- this image is hardly recognizable as Jupiter. We're seeing signs that the clouds have shadows, possibly indicating that the clouds are at a higher altitude than other features."

One of the most notable findings of these first-ever pictures of Jupiter's north and south poles is something that the JunoCam imager did not see.

Along with JunoCam snapping pictures during the flyby, all eight of Juno's science instruments were energized and collecting data. The Jovian Infrared Auroral Mapper (JIRAM), supplied by the Italian Space Agency, acquired some remarkable images of Jupiter at its north and south polar regions in infrared wavelengths.

"JIRAM is getting under Jupiter's skin, giving us our first infrared close-ups of the planet," said Alberto Adriani, JIRAM co-investigator from Istituto di Astrofisica e Planetologia Spaziali, Rome. "These first infrared views of Jupiter's north and south poles are revealing warm and hot spots that have never been seen before. And while we knew that the first-ever infrared views of Jupiter's south pole could reveal the planet's southern aurora, we were amazed to see it for the first time. No other instruments, both from Earth or space, have been able to see the southern aurora. Now, with JIRAM, we see that it appears to be very bright and well-structured. The high level of detail in the images will tell us more about the aurora's morphology and dynamics."

Among the more unique data sets collected by Juno during its first scientific sweep by Jupiter was that acquired by the mission's Radio/Plasma Wave Experiment (Waves), which recorded ghostly-sounding transmissions emanating from above the planet. These radio emissions from Jupiter have been known about since the 1950s but had never been analyzed from such a close vantage point.

"Jupiter is talking to us in a way only gas-giant worlds can," said Bill Kurth, co-investigator for the Waves instrument from the University of Iowa, Iowa City. "Waves detected the signature emissions of the energetic particles that generate the massive auroras which encircle Jupiter's north pole. These emissions are the strongest in the solar system. Now we are going to try to figure out where the electrons come from that are generating them."

The Juno spacecraft launched on Aug. 5, 2011, from Cape Canaveral, Florida and arrived at Jupiter on July 4, 2016. JPL manages the Juno mission for the principal investigator, Scott Bolton, of Southwest Research Institute in San Antonio. Juno is part of NASA's New Frontiers Program, which is managed at NASA's Marshall Space Flight Center in Huntsville, Alabama, for NASA's Science Mission Directorate. Lockheed Martin Space Systems, Denver, built the spacecraft. Caltech in Pasadena, California, manages JPL for NASA.

NASA
http://www.nasa.gov/juno
http://missionjuno.org

Astronaut News

By Rob Wood

ISS Crewing Updates

We have some news out of Russia on Soyuz/ISS crews 2018 into 2019. The new selections are preliminary and have not been officially agreed by the Interdepartmental Commission for the selection of cosmonauts and their appointments to flight crews. The preliminary crews are for the third and fourth Soyuz flights to the ISS in 2018 and the first flight of 2019.

The new crews are Soyuz MS-10/ISS Expeditions 57/58 (expected launch in September 2018): Gennady Padalka, Andrey Babkin and Serena Auñón. Soyuz MS-11/ISS Expeditions 58/59 (November 2018): Oleg Kononenko, David Saint-Jacques and a NASA astronaut. Soyuz MS-12/ISS Expeditions 59/60 (March 2019): Sergey Volkov, with Sergey Kud-Sverchkov or Denis Matveev (both have been nominated) and a NASA astronaut.

A mix of experience, with either extreme veterans or rookies. Padalka has spent more time in space than any other human. Kononenko and Volkov are both in the top fifteen for accumulated time spent in space. Between the three of them they have 11 long duration spaceflights adding up to almost 2000 days in space. The rest will all be making their first spaceflights.

Gennady Ivanovich Padalka (Colonel, Russian Federation Air Force Ret.) already holds the duration record for the most time spent in space with 878 days of flight time over five missions. He was born on 21 June 1958 in Krasnodar, Russia. He served as a fighter-pilot in the Soviet Air Force flying several Mikoyan-Gurevich and Sukhoi aircraft including the MiG-17 high subsonic jet fighter aircraft, the Su-7 swept wing supersonic fighter aircraft and the Su-24 supersonic all weather attack aircraft.

He was selected for cosmonaut training in 1989. He completed his basic training in January 1991 and was officially confirmed as a test cosmonaut by the Interdepartmental Qualification Committee on 1 February 1991. This made him eligible for advanced training, taking on ground positions associated with actual space missions and eventual assignment to a space crew. His career includes numerous assignments including several as back-up and five spaceflights. He has flown once to the Mir space station and four times to the ISS on missions lasting between 124 days and 198 days. He has also trained to fly a rescue mission involving the ISS.

The rescue mission was during the early days of ISS assembly. The Zvezda Service Module was to be the third module launched to the station. If its automatic docking systems failed, Padalka and his flight engineer Nikolay Budarin would fly a Soyuz to Zvezda to try and facilitate a manual docking with the other two modules. Zvezda launched on 12 July 2000 and successfully docked with the rest of the ISS on 25 July 2000. Padalka's contingency crew was therefore stood down.

His spaceflights were: Soyuz TM-28/Mir-26 (13 August 1998 – 28 February 1999), Soyuz TMA-4/ISS-9 (19 April 2004 – 24 October 2004), Soyuz TMA-14/ISS-19/20 (26 March 2009 – 11 October 2009), Soyuz TMA-04M/ISS-31/32 (15 May 2012 – 17 September 2012) and Soyuz TMA-16M/ISS43/44 (27 March 2015 – 12 September 2015).

In addition to his pilot-engineer qualifications from his early days in the air force he also has degrees in Engineering-Ecology (1994) and Public Administration and National Security (2009). He said of the latter degree that, "maybe it will help me after being retired, I hope." He retired from the Russian Air Force in March 2009 but there was little sign of a wind down in his cosmonaut career. Even before his fifth spaceflight started he hinted he would seek yet another mission.

Andrey Nikolayevich Babkin is a spaceflight rookie who became a cosmonaut candidate following a career with the S P Korolyov Rocket and Space Corporation Energiya. He was born on 21 April 1969 in Bryansk, Russia. He is a graduate of the Bryansk Institute of Transport Engineering and the Moscow Aviation Institute. He holds the Russian equivalent of a Ph.D. from the latter (2006).

He joined Energiya in 1997, where he worked on the human spaceflight programme. He applied for the 2006 Energiya cosmonaut selection but was unable to pass the medical checks. This changed when he next applied. He passed the Chief Medical Commission in March 2010 and was accepted for cosmonaut training in April 2010.

He completed his basic training course in July 2012 but the Interdepartmental Qualification Committee did not immediately confer the status of test cosmonaut on him. Without test cosmonaut status a candidate would not be considered for flight assignment. The committee required him to conduct further training. On 12 November 2012, the committee reassessed his candidature and awarded him the qualification of test cosmonaut.

Serena Maria Auñón has an academic background in both engineering and medicine. She has a Bachelor of Science degree in Electrical Engineering and a Doctorate of Medicine degree. In addition she has a Master of Public Health degree. She was born on 9 April 1976 in Indianapolis, Indiana.

Through a contractor company she was employed as a flight surgeon at the Johnson Space Center from August 2006. Over the next three years she served in a number of roles supporting medical operations for ISS crew members, including spending nine months in Russia. Amongst her other roles was as the Deputy Crew Surgeon for STS-127 (flew in 2009) and as Deputy Lead for Orion's medical operations.

She was selected as a NASA astronaut in 2009 (NASA Astronaut Group 20). Her advanced training included two NASA NEEMO space analogue undersea exploration missions. In 2012 she served on the crew for the DeepWater2000 submersible during NEEMO 16 and in 2015 she was an aquanaut on the NEEMO 20 mission to the Aquarius undersea research habitat.

There has been no NASA news release regarding her assignment to Soyuz MS-10/ISS Expeditions 57/58 but it is quite normal for crewing news to break out from Russia first. Often the official NASA biography is updated to show an assignment before any NASA news release but this has not happened in this case as of 12 August 2016.

Oleg Dmitriyevich Kononenko is another of the veteran Russian cosmonauts. He has flown three long duration missions reaching 533 days of spaceflight time. He was born on 21 June 1964 in Chardzhou, then part of the Soviet Republic of Turkmen. He has a degree in Mechanical Engineering and worked as a design engineer at the TsSKB-Progress Design Bureau in Samara.

He was selected as a cosmonaut in 1996 and following basic training received the qualification of test-cosmonaut on 20 March 1998. His spaceflights were: Soyuz TMA-12/ISS-17 (8 April 2008 – 24 October 2008), Soyuz TMA-03M/ISS-30/31 (21 December 2011 – 1 July 2012) and Soyuz TMA-17M/ISS44/45 (23 July 2015 – 11 December 2015).

David Saint-Jacques (Ph.D., M.D.) is representing the Canadian Space Agency (CSA). He was born on 6 January 1970 in Quebec City, although he grew up in Saint-Lambert, near Montreal. He is an experienced medical doctor but also has degrees in Engineering Physics and Astrophysics. He was selected as a Canadian astronaut in 2009 (CSA Group 3). He joined NASA's 2009 astronaut candidates (NASA Astronaut Group 20) for his basic training.

The CSA cooperate with many other space agencies and as part of these programmes he has worked on spaceflight anologue missions. He was

an aquanaut during NASA's NEEMO 15 undersea exploration mission to the Aquarius undersea research habitat off the coast of Florida in October 2011 and a cavenaut on ESA's CAVES 2012 mission, caving on the Mediterranean island of Sardinia in September 2012.

He was appointed a crew support astronaut for ISS Expeditions 35/36 (part of which was Chis Hadfield's mission), which took place in 2013. He undertook CapCom duties for: ISS Expedition 38 (2013/2014); the Cygnus-1 through to Cygnus-4 ISS resupply missions (2013/2014); and the SpaceX CRS-6 ISS resupply mission (2015). The CSA officially named him to the Soyuz MS-11/ISS Expeditions 58/59 mission on 16 May 2016 (see full story in July/August 2016 edition of CapCom).

Sergey Aleksandrovich Volkov (Colonel, Russian Federation Air Force Ret.) is a second generation cosmonaut. His father is Aleksandr Volkov who made three spaceflights in the 1985 to 1992 period. Sergey Volkov was born on 1 April 1973 in Chuguyev, then part of the Soviet Republic of Ukraine. Whilst his father was an active cosmonaut, Sergey went to High School in Zvezdny Gorodok (Star City) where the Yuri Gagarin Cosmonaut Training Centre is based. He is a graduate of the Tambov Higher Military Aviation School and went on to fly the Ilyushin IL-76 four-engine turbofan strategic airlifter for the Russian Air Force. He left the air force in 2012.

He was selected as a cosmonaut in 1997 and following basic training received the qualification of test-cosmonaut on 1 December 1999. His spaceflights were: Soyuz TMA-12/ISS-17 (8 April 2008 – 24 October 2008), Soyuz TMA-02M/ISS-28/29 (8 June 2011 – 22 November 2011) and Soyuz TMA-18M/ISS45/46 (2 September 2015 – 2 March 2016).

Sergey Vladimirovich Kud-Sverchkov was born on 23 August 1983 in the city of Leninsk, then part of the Soviet Republic of Kazakhstan. Leninsk was originally constructed to serve the Baikonur Cosmodrome and its workers. Leninsk was re-named Baikonur on 20 December 1995. He studied at the Moscow Bauman State Technical University from where he graduated with honours in 2006 receiving a degree in Rocket Systems. In August 2006 he took up an engineering position at the S P Korolyov Rocket and Space Corporation Energiya.

He passed the Chief Medical Commission for fitness to proceed to cosmonaut training in 2008 but had to wait for the 2010 selection to start his training. Having completed the initial training course the Interdepartmental Qualification Committee passed him as a test cosmonaut at their meeting on 3 August 2012. He was a cavenaut on ESA's Caves 2014 mission.

Denis Vladimirovich Matveyev has been named as one of an either/or two candidates for Soyuz MS-12/ISS Expeditions 59/60. This is quite unusual and (although this is pure speculation on my part) maybe related to an earlier medical question. Matveyev was previously named to a crew in 2015 but was replaced due to, what was then described, as a temporary medical issue.

He was born on 25 April 1983 in Leningrad (now St Petersburg), Russia. He graduated from the Moscow Bauman State Technical University in 2006 with a degree in Computers. The same year he commenced employment at the Yuri Gagarin Cosmonaut Training Centre becoming a chief engineer in 2009. He was accepted for cosmonaut training in 2010 and following completion of the initial training course in July 2012 the Interdepartmental Qualification Committee passed him as a test cosmonaut at their meeting on 3 August 2012.

Taikonaut Commander

Earlier this year, CRI English, the official English-language broadcast of China Radio International, described Major-General Nie Haisheng as "Chief of China's Astronaut Brigade." This phrase has been repeated on other websites since but the originating source appears to be CRI. The phrase appears to indicate that Nie is China's current Chief Astronaut.

Nie is China's most experienced astronaut or as they are often called taikonaut. He is top of both their cumulative and individual spaceflight records. He has made two spaceflights accumulating 19 days in space. He shares the single spaceflight record with the two taikonauts who were with him on the 14 day Shenzhou 10 mission, Zhang Xiaoguan and Wang Yaping. He is also unique in having a prime or back-up assignment for all of China's human spaceflights through to their last mission in 2013.

Nie Haisheng was born on 13 October 1964 (Gregorian calendar – see note 1) in a small village near the town of Yangdang, Zaoyang City, in central China's Hubei province. He nearly did not complete his schooling because his father died young. Nie takes up the story, "I was in second year of junior high school when my father died. I was forced to stop school and work in order to earn money. My teacher visited my family many times to try and persuade me to return. Finally, I went back to school. I wouldn't have what I have now without my teacher. That was the most important turning point of my life."

Following graduation from high school, he joined the People's Liberation Army (PLA) in June 1983. He enrolled at the First Flying Basic School at Changchun the following year. In May 1987, he graduated from the Seventh Flying Academy at Changchun. He served as a fighter-pilot in the PLA Air Force. One of his aircraft was the Chengdu J-7 supersonic fighter aircraft. He was promoted to Major-General in 2011.

He passed the medical tests for taikonaut selection in 1996. He was formally selected for taikonaut training in January 1998 (China Group 1). He was the second back-up for Yang Liwei on Shenzhou 5, the first Chinese manned spaceflight which was launched on 15 October 2003. His first spaceflight was as the co-pilot/operator for Shenzhou 6 (12-17 October 2005), China's second manned mission.

He returned to back-up duties for Shenzhou 7 and Shenzhou 9 (Shenzhou 8 was an unmanned mission). Shenzhou 7 was launched on 25 September 2008 and Nie was a co-pilot/operator on the reserve crew. For Shenzhou 9, Nie was the back-up commander. This was China's first manned space station expedition and was launched on 16 June 2012.

China's space station, Tiangong 1, had been launched on 29 September 2011 and would be the destination for Nie's second spaceflight. He was commander for Shenzhou 10/Tiangong 1 (11-26 June 2013). This was China's second manned space station mission and the flight also holds the record for China's longest manned spaceflight.

Note 1: Dates of birth often differ depending on the source . This is because, although the Gregorian calendar is supposed to be used in modern China, they often reference the more traditional lunisolar calendar when giving dates. Nie's Gregorian date of birth given in the article above therefore translates to 8 August 4662 (or 1964) for traditional China usage. Strangely, even where the traditional date is used by Chinese sources the year is usually given in Gregorian years.

Where Are They Now - Ex-Astronaut Movements in the Private and Public Sector

On 17 April 2016, Canadian Olympic Committee president Tricia Smith announced the appointment of Julie Payette as a member of the committee's board of directors. She was a CSA astronaut from 1992 to 2013 and flew twice on the United States Space Shuttle, STS-96 (1999) and STS-127 (2009). Both flights visited the ISS. Since she left the CSA she has been Chief Operating Officer of the Montreal Science Centre.

On 6 June 2016, Aquatic, aerospace and extreme environment research and training company, Blue Abyss Ltd., announced the appointment of Scott Parazynski as Non-Executive Director. He will advise and guide on neutral buoyancy training and human physiology in extreme environments. Blue Abyss, a UK based company, is planning to build the world's largest and deepest, multi-level, indoor research, training and development pool. Located on the University of Essex's Knowledge Gateway site in Colchester it is scheduled to be fully operational in mid-2018. Parazynski served as a NASA astronaut from 1992 to 2009, making five spaceflights on the US Space Shuttle. As a crewmember of the shuttle, he visited the Russian space station Mir and the ISS (twice). On 19 May 2009 he became the first astronaut to reach the summit of Mount Everest.

On 1 July 2016, Chris Ferguson was appointed to the Astronaut Scholarship Foundation (ASF) Board of Directors. The ASF provides college scholarships for selected students pursuing science, technology, engineering or math degrees. Christina Koch a NASA astronaut from the 2010 selection (surname Hammock on selected) received funding for her education from the ASF. Ferguson was a NASA astronaut from 1998 to 2011 when he took up his current position as the Director of Crew and

Mission Operations for the CST-100 Starliner at The Boeing Company. He was pilot on STS-115 (2006) and commander of STS-126 (2008) and STS-135 (2011). STS-135 was the last spaceflight of the Space Shuttle system.

As well as Chris Ferguson, Apollo 15 astronaut Al Worden also joined the ASF's board of directors on 1 July 2016. He had been previously on the board and a past chairman of the foundation and was rejoining after a short absence. Worden was the Apollo 15 command module pilot in 1971.

Veteran Cosmonaut Retires

Oleg Kotov had accumulated 526 days in space over three spaceflights in a 20-year cosmonaut career. On 4 May 2016, he retired from the Russian cosmonaut team at his own request to take up a new position within the space programme. The following day, he was appointed as Head of the Human Spaceflight Centre of the Central Scientific-Research Institute of Machine Building.

The Central Scientific-Research Institute of Machine Building (TsNIIMash) was founded in 1946 as the Scientific-Research Institute No. 88 (NII-88). NII-88's role was to look after Soviet rocket development and this evolved into the Soviet Space Programme. Sergey Korolyov's design bureau, which would later become the S P Korolyov Rocket and Space Corporation Energiya was born out of this organisation.

TsNIIMash is currently involved in research, development and control of many aspects of the Russian space programme, including launch vehicles, manned and unmanned spacecraft, and space stations. The Human Spaceflight Centre of TsNIIMash has recently been created to look after scientific and technical support, and prospective research studies on the Russian human spaceflight programme.

Oleg Valeryevich Kotov was born on 27 October 1965 in Simferopol, Crimea, which was then part of the Soviet Republic of Ukraine. His father was a serving military officer and so he had to move about frequently in connection with his father's postings. At various times, he lived in the Ukraine, Moldova, Leningrad (now St Petersburg) and Moscow.

He graduated from a high school in Moscow in 1982 and then attended the Kirov Military Medical Academy in Leningrad. He graduated in 1988 as a military doctor with the rank of lieutenant. Following graduation, he served at the Yuri Gagarin Cosmonaut Training Centre as a flight surgeon where he supported crews training for missions to the Mir space station.

He also continued his education and picked up a number of qualifications/degrees both before and after he became a cosmonaut including in aerospace medicine (1990), patenting (1992) and public administration (2013). From 1992 to 1996 he studied as an external student at the Kachinsk Military Pilot College and graduated as a pilot-engineer. In 2010 he successfully defended his dissertation in the area of Astronautical Medicine to obtain a Candidate of Medical Sciences degree.

He passed the Chief Medical Commission for fitness to proceed to cosmonaut training on 9 February 1996 and this was officially confirmed on 7 June 1996 when his candidature was accepted. Following completion of the initial training course in March 1998 the Interdepartmental Qualification Committee passed him as a research cosmonaut at their meeting on 20 March 1998. This made him eligible for assignment to the third seat of the Soyuz spacecraft and for space station duties.

He did not have long to wait for an assignment because in May of the same year he was appointed back-up cosmonaut researcher for Soyuz TM-28. He was replacing Yuri Shargin who was unable to train due to an upper respiratory tract infection. Kotov backed up Yuri Baturin who flew a visiting mission profile to the Mir space station. The flight launched on 13 August 1998.

Kotov continued his advanced cosmonaut training after his Soyuz TM-28 duties but from October 1998, the emphasis changed to preparations for missions to the ISS. From March to October 1999, he was the representative of the Yuri Gagarin Cosmonaut Training Centre at the Johnson Space Center. Part of his training was in order to qualify as a test cosmonaut (a higher rating than research cosmonaut which would enable him to fulfil the full range of cosmonaut duties) and this was confirmed by the Interdepartmental Qualification Committee at their meeting on 1 December 1999.

He received his first back-up ISS assignment in October 2000 but initially due to a reorganisation of cosmonaut assignments and then as a result of the Columbia Space Shuttle disaster he would have quite a wait before his first actual spaceflight. When they came, they came thick and fast. Because of the changes he did not serve an actual back-up assignment all the way through to the launch date, except for just before his third spaceflight when he was a back-up for Soyuz TMA-08M/ISS-35/36.

His spaceflights were: Soyuz TMA-10/ISS-15 (7 April 2007 – 21 October 2007), Soyuz TMA-17/ISS-22/23 (21 December 2009 – 2 June 2010) and Soyuz TMA-10M/ISS37/38 (25 September 2013 – 11 March 2014). He commanded all three Soyuz flights but mixed flight engineer and commander positions during his time on the ISS. He was commander of the ISS for ISS expeditions 23 and 38 and was a flight engineer for the rest. He carried out six spacewalks during the missions.

Rookie Cosmonaut Retires

Shortly after Kotov retired from the cosmonaut team it became known that a rookie cosmonaut, Oleg Blinov, was also to leave the team. Apparently the decision was finalised on the same day as Kotov, 4 May 2016, but the order was not made official until 20 June 2016.

The official word was that his retirement was at his own request but later it became known that the decision was taken by the leadership of the training centre because Blinov was not reaching the very high levels of achievement required of a cosmonaut. He will be remaining at the training centre as Chief Instructor of an EVA simulator team. This was where he was working prior to his selection as a cosmonaut.

Oleg Vladimirovich Blinov was born on 17 August 1978 in the village of Tatars, Kirov-Chepetsk District, Kirov Oblast, Russia. In 1998 he graduated from the Kirov Military Aviation Technical School as an Aircraft Engineer. From 1998 to 2002 he conducted his military service flying as a technician on Mil Mi-8 helicopters. He was also studying at the Vyatka State Agricultural Academy, in Kirov, from where he graduated as a Mechanical Engineer in 2001.

From 2002 he worked as an engineer and instructor in the EVA branch at the Yuri Gagarin Cosmonaut Training Centre. He applied for cosmonaut training in 2006 and 2010 but was rejected on medical grounds. The Chief Medical Commission finally approved his application for cosmonaut training on 7 June 2012. He was officially accepted for cosmonaut training by the State Interdepartmental Commission on 8 October 2012. Having completed the initial training course the Interdepartmental Qualification Committee passed him as a test cosmonaut at their meeting on 16 June 2014.

In 2014, he graduated from the Moscow Aviation Institute with a Master of Science degree in Aeronautical Engineering. He holds the military rank of Lieutenant Colonel in the reserves.

Robots or Humans

In an interview given to New Scientist magazine on 13 July 2016, Tim Peake says that the complexities involved in what astronauts do in space are such that it will probably be 100 years before robots have sufficient artificial intelligence to do them properly.

Although, there was no mention of it in the New Scientist article, I would like to think that perhaps it was a response to our Astronomer Royal's recent comments. Martin Rees told Sky News on 18 June 2016 that, "I think the future of human spaceflight worldwide is really only as an adventure and spectator sport. As robots get better they can do more of what people were doing in the past. So the case for sending people is getting weaker all the time."

His view was that ESA should concentrate on robotic missions and leave human spaceflight to the private sector, "In the long run the only case for sending people into space is if they are funded by private ventures like SpaceX in the US," said Lord Rees. "I say that because it's not public money and also because private organisations can take high risks and cut prices at a level that can't be done by publicly funded civilian programmes."

These views are not new from Lord Rees. He has always been lukewarm at best towards human spaceflight. Did I say lukewarm? That might be argued is a little understated. In 2010 he said, "It's hard to see any particular reason or purpose in going back to the moon or indeed sending people into space at all." Perhaps less than lukewarm on further analysis.

Thankfully, not everybody agrees with Lord Rees including myself, which will come as no surprise to those who know me. Has he noticed the publicity and coverage given to Tim Peake's flight? Think of how that is going to inspire today's youngsters to study STEM subjects. More than one million UK school children have been involved in projects related to Peake's flight. Human spaceflight encourages the advancement of the human race and if there is one lesson to be learned from history it is that to stand still leads to stagnation then regression and collapse.

If looking at the subject from a serious point of view does not convince you then forget all of that. In the final analysis – human spaceflight is exciting. How many non-spaceflight enthusiasts watched the launch of Tim Peake? A lot of people tuned in. How many will watch the launch of OSIRIS-REx (Origins, Spectral Interpretation, Resource Identification, Security, Regolith Explorer) mission to return a sample of material from the near-Earth asteroid Bennu due 8 September 2016? One man and his dog probably.

How many have watched the movie 'The Martian', where an astronaut is marooned on Mars? A lot based on gross takings of $597,353,138 Worldwide as of mid-January 2016. Shall we make a multi-million dollar movie about the drama of the Beagle 2 mission? No, I didn't think so.

I suspect some of the scientists etc who advocate robotic over human spaceflight are doing so because they think it will free up more money for robotic exploration. I suspect all it would do is give politicians the excuse to reduce space budgets. I seriously doubt that unmanned projects would be much better off.

The human race needs to advance and if it is to survive long-term explore space. This is not going to be successful if only robots are used. As Peake said to the New Scientist, "It's important that we have humans working in space."

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.

- Reinhold Ewald, Luca Parmitano, Tim Peake and Thomas Reiter: 15 September 2016 at ESA conference in the Science Museum, London.

- Tim Peake: 22 September 2016 at New Scientist Live, ExCel London.

- Mark Kelly and Scott Kelly: 7-8 October 2016 with Space Lectures events in Pontefract.

- Chris Hadfield: 8 October 2016 at Bath Children's Literature Festival.

- Chris Hadfield: 9 October 2016 at Cheltenham Literature Festival.

- Chris Hadfield: 12 October 2016 at Question of Science 2016 in Glasgow Science Centre.

- Chris Hadfield: 13 October 2016 at National Space Centre in Leicester.

- Mike Massimino: 24 October 2016 at a talk and book signing at the Royal Institution in London.

- Mike Massimino: 25 October 2016 at a talk and book signing in Blackburn – organised by Silverwood Events.

- Mike Massimino: 27 October 2016 at a talk and book signing at Blackwell's bookshop in Oxford.

- Kenneth Cameron, Gregory Chamitoff and Charles Walker: 12-14 May 2017 at the Autographica Autograph Show in London. The date has changed and Shannon Lucid is no longer listed.

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/ Chris Hadfied has his own website - **http://chrishadfield.ca/** I think it is official and not just a fan site as at the bottom of each page it reads '© 2016 Chris Hadfield Inc.'

2/ On 10 June 2016, Jack Fischer had knee surgery. He said it should not affect his training for his ISS mission next year (commences in July 2017). He was indeed back in training ten days later.

3/ On 19 August 2016, Jeff Williams, at 58 years and about 7 months, became the oldest US astronaut to make an EVA beating Story Musgrave who was about 100 days younger on his final EVA when repairing the Hubble Space Telescope on 8 December 1993. The record holder is Russian Cosmonaut Pavel Vinogradov who was a year older than Williams at a bit over 59 years and 7 months when he made a spacewalk in 2013.

4/ Whilst we are talking about Jeff Williams, he became the US cumulative duration spent in space record holder on 24 August 2016 beating Scott Kelly's 520 days in space. Williams is 17th on the World listings with 16 Russian cosmonauts ahead of him, although he should jump to 14th when he comes back to Earth in September 2016.

4/ And, whilst we are on the subject of number records, NASA astronaut Kathleen Rubins became the 60th woman to fly in space on 7 July 2016 when she launched on Soyuz MS-1 for the start of her mission to the ISS.

COMMENTS & UPCOMING IN THE NEXT ISSUE OF ASTRONAUT NEWS

Next time we have news of retirements from NASA and will have an astronaut who, having reached the top, heads in the other direction.

Acknowledgements and sources:

Americaspace.com; Astronaut.ru; Autographica; Blue Abyss Ltd; Canada Lands Company; CapCom (previous issues); Cbc.ca; China Central Television; Chinadaily.com; China.org.cn; China Radio International; Chrishadfield.ca/; Collect Space; CSA; ESA; Glasgow Science Centre; Globalsecurity.org; Google; The Guardian newspaper; Hubei.gov.cn; imdb.com; International Astronautical Federation; Linkedin; Manned Spaceflight Log II 2006-2012 ©2013 by David J Shayler and Michael D Shayler; NASA and its various centres; NASASpaceflight.com; New Scientist magazine; Novosti Kosmonavtika; Praxis Manned Spaceflight Log 1961-2006 ©2007 by Tim Furniss and David J Shayler with Michael D Shayler; Prokerala.com; The Soviet Space Race With Apollo ©2000 by Asif A Siddiqi; S P Korolyov Rocket-Space Corporation Energiya; Spacefacts; Sputnik and the Soviet Space Challenge ©2000 by Asif A Siddiqi; Timeanddate.com; Tsniimash.ru/; Twitter; Wikipedia; Yuri Gagarin Cosmonaut Training Centre.

ISS Mission Update

By George Spiteri

Expedition Forty-Eight is into its second month of operations. The International Space Station (ISS) is Commanded by US astronaut Jeff Williams, who is manning the orbital complex with Flight Engineers, American Kate Rubins, Russians Alexei Ovchinin, Oleg Skripochka and Anatoli Ivanishin and Japan's Takuya Onishi.

The traditional Change of Command Ceremony took place on 17th June, with Williams replacing US astronaut Tim Kopra as the Station's latest Commander.

Kopra together with Flight Engineers, Russian Yuri Malenchenko and Great Britain's Tim Peake undocked their Soyuz TMA-19M/45S vehicle from the Rassvet Module at 0652 BST on 18th June, signalling the official start to Expedition Forty-Eight. With Malenchenko in Command of Soyuz, the spacecraft landed over three hours later at 1015 BST (1515 local time) approximately 90 miles South-East of Dzhezkazgan, Kazakhstan, completing a flight of 185 days 22 hours 11 minutes, 2,076 orbits of Earth, travelling 78.7 million miles. In an impromptu interview at the landing site, Peake told reporters that the re-entry was the "best ride I've been on ever" and he looked forward to a pizza and a cold beer! He was flown back to the ESA's European Astronaut Centre in Cologne, Germany, whilst Kopra was taken to Houston and Malenchenko flew back to Moscow.

The Station remained under temporary three person operations for about three weeks, during which time the Cygnus Commercial Resupply Services-6 (CRS-6) OA-6 unmanned vehicle burned up in the Earth's atmosphere as planned on 22nd June, having left the Station several days before and Progress MS-01/62P undocked from the Station's Pirs Module at 0636 BST on 1st July and re-docked to Pirs 29 minutes later in a test of the Telerobotically Operated TORU manual docking system which had been upgraded by Russian technicians. According to veteran Russian space reporter, Anatoli Zak, Ovchinin was ordered by Mission Control Korolev to switch from TORU to the automatic KURS system when Progress was a few feet away from re-docking to Pirs. Zak also stated that there was an accidental firing of Progress' attitude thrusters which "was clearly visible on live TV" causing Progress to pitch significantly. Initially the Russians declared the test a success but RSC Energia later conceded that "failure can occur in the very system under test.... it is permissible for a truck of a new series".

Progress was finally undocked at 0448 BST on 3rd July and sent to a destructive re-entry over the Southern Pacific Ocean later that same day.

The two Russian cosmonauts joined their US counterpart and celebrated US Independence Day on 4th July. Williams Tweeted several photographs of the USA on its birthday, including a special one of Philadelphia!

Soyuz MS-01/47S was launched from Baikonur at 0236 BST on 7th July (0736 local time) with veteran Anatoli Ivanishin and rookies Kate Rubins and Takuya Onishi on board. This was the first flight of the new modified and upgraded Soyuz vehicle, which docked to Rassvet at 0506 BST on 9th July and returned the ISS to a six person complement.

Progress MS-03/64P was launched from Baikonur at 2241 BST on 16th July (0341 on 17th July local time) and docked to Pirs at 0120 BST on19th July, delivering three tons of food, fuel and supplies to the crew.

In between Progress' launch and docking, SpaceX launched their latest Dragon unmanned vehicle atop a Falcon 9 rocket at 0545 BST on 18th July (0045 local time) from Cape Canaveral Air Force Station's Launch Complex 40 on the Commercial Resupply Services-9 (CRS-9) mission. SpaceX also managed to achieve a successful landing of Falcon 9's first stage booster back at Cape Canaveral. Dragon was grappled by Canadarm2 at 1156 BST on 20th July and berthed onto the Harmony Module's Earth facing port over three hours later at 1503 BST, delivering nearly 5,000 pounds of supplies to the ISS including the critical International Docking Adapter-2 (IDA-2) which will be used for future commercial vehicles to dock at the ISS such as Boeing's Crew Space Transportation-100 (CST-100) Starliner and SpaceX's crewed Dragon spacecraft. This also marked the first time in ISS history that two cargo vehicles have arrived at the Station within such a short space of time, only 35 hours.

The crew devoted most of late July and early August unloading both Progress and Dragon plus conducting a wealth of scientific experiments and maintenance on the orbital complex.

As of 12th August, Williams, Ovchinin and Skripochka have been in space for 21 weeks, whilst Ivanishin, Rubins and Onishi have logged 37 days in orbit.

George Spiteri

UPDATE: Soyuz Lands in Kazakhstan

The Soyuz TMA-20M spacecraft landed with Expedition 48 crew members NASA astronaut Jeff Williams, Russian cosmonauts Alexey Ovchinin, and Oleg Skripochka of Roscosmos near the town of Zhezkazgan, Kazakhstan on Wednesday, 7 Sepember 2016 (Kazakh time). Williams, Ovchinin, and Skripochka are returning after 172 days in space where they served as members of the Expedition 47 and 48 crews onboard the International Space Station. They landed safely southeast of the remote town of Dzhezkazgan at 7:13 a.m. local time.

Having completed his fourth mission, Williams now has spent 534 days in space, making him first on the all-time NASA astronaut list. Skripochka now has 331 days in space on two flights, while Ovchinin spent 172 days in space on his first. Together, the Expedition 48 crew members contributed to hundreds of experiments in biology, biotechnology, physical science and Earth science aboard humanity's only orbiting laboratory.

UPDATE: Soyuz Launch Postponed

On 20 September Roscosmos decided to postpone the planned 23 September 2016 launch of the spacecraft "Soyuz MS – 02" for technical reasons after routine tests at the Baikonur Cosmodrome. The launch date of the spacecraft will be announced later.

NASA
http://www.nasa.gov

The Cavenauts Of Sa Grutta Human Spaceflight Analogue Mission

by Rob Wood

On 1 July 2016, many parts of Europe were holding events commemorating the start of the bloodiest battle on European soil 'The Battle of the Somme'. Not well known is the role of tunnellers during that battle, indeed in the whole war. At 07:28hrs on 1 July 2016 the Lochnagar mine, just south of the French village of La Boisselle, was detonated under a German position known as Schwaben Höhe. The crater it left has been described as the biggest made by man in anger. More than a dozen other mines were detonated on the opening day of the battle (see note 1).

A hundred years on from the opening rounds of the Somme battle saw a team of cavers on the Mediterranean island of Sardinia preparing to and then entering the Sa Grutta caves. As well as the support cavers, there was also the group that was the raison d'être for this particular caving programme. Five men and one woman, they were not called cavers but went by the title of cavenauts because of their normal day job. They were astronauts.

Tunnelling has been used as a tool of war throughout history, with existing holes or caves used for shelter and as a starting point for tunnelling operations. Caving (called potholing in the UK) developed into a leisure pastime more recently. It started in the last quarter of the nineteenth century and became more popular in the 1930's when it developed into both an exploration and recreational activity.

The Convoluted Acronym

It was the exploration aspect that interested the European Space Agency (ESA). ESA's CAVES concept dates back to 2006. ESA considered that their survival training was a good basis to work from for team building and stress training but it lacked direct similarities with spaceflight. They looked at how caving could be used in the training of astronauts. "After organising operational outdoor training courses in combination with land and sea survival skills, ESA started to study ways to have a closer link to how space is experienced," explained Loredana Bessone in 2012; she is responsible for ESA's Human Behaviour and Performance training and is project manager, course designer and course director for CAVES.

I should explain that CAVES is an acronym and stands for 'Cooperative Adventure for Valuing and Exercising human behaviour and performance Skills'. Someone must have worked hard to get there. It is convoluted but it does work rather well in its acronym form.

How is caving a good analogue to spaceflight? Caving has confinement, minimal privacy, technical challenges and limited hygiene and comfort. It has psychological issues. For example, the use of artificial light in constant darkness alters the perception of time and of colour. The absence of natural time clues from daylight has the potential to alter the circadian rhythm and effect sleep patterns. All of these aspects have similarities to spaceflight.

Caving involves the use of tethers at times, just like in spacewalking operations. Tasks have to be carefully planned; safety protocols managed and daily timelines followed just like in space. The cavenauts carry out a programme of exploring, mapping, surveying and science experiments such as sampling of cave organisms, all of which can be linked to exploring in space.

A test module took place in 2008 and since then the course has been refined to make ESA's caving even closer to the spaceflight experience. ESA's spaceflight international partners attended that test course as observers. NASA already had their underwater NEEMO (NASA Extreme Environment Mission Operations) space analogue. NEEMO had started back in 2001 and included international participants from the start. The international partners agreed cave training for astronauts was a good idea and came aboard.

The location for ESA's CAVES experience is the Sa Grutta caves. They are located within the the Supramonte cave complex in the Lanaitho Valley, part of the Gennargentu National Park, in the middle of the Italian island of Sardinia. The caves are located in a Karst area of Sardinia. Karst topography is a type of landscape formed by the dissolution of rocks, including limestone, dolomite and gypsum with typical related features such as fissures, sinkholes, underground streams, caverns and caves.

Discovered in the 1950s, the cave system is just a few kilometres away from civilisation but is remote enough to offer the isolation typical of spaceflight. Once inside the caves, the cavenauts find the branches of the tunnels getting progressively more difficult and it becomes harder to advance. There are plenty of maze-like environments, three-dimensional pathways, unexplored passages and obstacles. There are also larger caverns, which allow the cavenauts to set up camp for the night.

The first full ESA caving course took place in 2011; named appropriately CAVES 2011, the astronauts involved were ESA's Tim Peake and Thomas Pesquet, Randolph Bresnik from NASA, Norishige Kanai from the Japan Aerospace Exploration Agency (JAXA) and Sergey Ryzhikov from the Russian Federal Space Agency.

Since then we have had CAVES 2012, 2013 and 2014. The 2012 cavenauts were Drew Feustel (NASA), Mike Fincke (NASA), David Saint-Jacques (Canadian Space Agency or CSA), Andreas Mogensen (ESA), Soichi Noguchi (JAXA) and Nikolai Tikhonov (Russia). For 2013 we had Mike Barratt (NASA) Jack Fischer (NASA) Satoshi Furukawa (JAXA) Jeremy Hansen (CSA) Paolo Nespoli (ESA) and Aleksei Ovchinin (Russia). In 2014 the crew were Sergey Kud-Sverchkov (Russia) Alexander Mirsurkin (Russia) Luca Parmitano (ESA) Scott Tingle (NASA) and non-astronaut Matthias Maurer. The first non-astronaut cavenaut, Maurer works out of the European Astronaut Centre (EAC) and was a replacement for NASA astronaut Michael Fossum who had to cancel at the last minute.

Now we have CAVES 2016. The cavenauts were representing Europe, Japan, Russia, United States of America and for the first time on an ESA caving programme, China. They were Richard Arnold (NASA), Pedro Duque (ESA), Ye Guangfu (China National Space Administration or CNSA), Akihiko Hoshide (JAXA), Sergey Korsakov (Russia) and Jessica Meir (NASA).

ESA, JAXA, NASA, Russian and Chinese astronauts working together side-by-side! "There were no borders in this team, said Loredana Bessone. "The variety of organisational, professional and national

cultures enriched the team with a multitude of skills and fresh perspectives." Bessone noted that, "We will make space history," citing the first woman cavenaut, which she described as, "It was about time," and the first taikonaut. She added, "We have a really fantastic crew and we are sooo looking forward to start."

A truly international team working together whilst their political leaders seem to continually look for reasons to be in dispute. The only organisation/country with an astronaut team not represented was Canada, but no conspiracy theories needed as both their astronauts had already participated in previous years caving experiences. At a time when the general feeling is one of divisiveness, spaceflight continues to show we can work together.

As someone tweeted, "Best Astronaut Mission Ever! Japan, Russia, USA, China, Europe, walk into a cave & work together because we're all human". There was also a nice tweet from Ricky Arnold during the training period, "Cosmonaut Sergei Korsakov teaches Taikonaut Ye Guang Fu to speak Russian using the English alphabet...awesome!" Another tweet read, "NASA, ESA, Roscosmos, JAXA, CNSA all in one picture… How cool is that?"

Going Underground

The astronauts arrived in Sardinia on 23 June 2016, As Jessica Meir noted in her blog entry, "our international crew converged upon the island of Sardinia from all directions of the planet to embark upon the CAVES 2016 mission." They conducted a week of training to prepare them for the mission. It is rare that any of the astronauts have previous significant caving experience. Meir commented that, "It has been a knowledge filled and action packed week so far as the exceptional ESA CAVES training team attempts to bestow their impressive expertise into our novice minds (no small feat!)."

The astronauts were given different responsibilities for the mission. Command, just like the ISS, would see a swap mid-mission. Aki Hoshide commanded initially before handing over to Ricky Arnold. They exchanged duties as campsite manager. Pedro Duque was the expedition's scientist for environmental science, geology and microbiology, Ye Guangfu took the role of survey and data engineer, Sergey Korsakov had the photograph and video engineer duties, and Jessica Meir was the mission biologist.

With the week of training over the astronauts descended into the caves on 1 July 2016 at about 19:00. They were accompanied by mission director Loredana Bessone and a support team of cave safety professionals and speleologists (karst scientists). They were now true cavenauts. They made their way to the 'Witch's Hat', a section of the caves only a few hundred meters from the entrance. They conducted microbiology training and did some photogrammetry work, making 3D models from pictures. After about 4 hours they set up a basic campsite where they spent the night.

The next day saw them descend further into the cave system. They moved through the section known as 'Via Ferrata' to where they would set up the main basecamp. They put their training to good use and set up tents, a kitchen area and a latrine. From 3 July 2016, they began their main exploration programme. They explored the '4th Wind Branch', which extended north from the main basecamp for approximately 1.1 kilometres till the 'Baikal Lake'. Past Baikal Lake they set up an advanced campsite.

The advanced site needed to have a water source close by and a decent sleeping area which although might not be totally flat and soft, should at least not be on rocks. They also needed to establish communications with basecamp. Once these tasks were completed they returned to basecamp for the night. The following day they returned to the advanced campsite and started to survey the area and conduct science experiments that continued into another day when they moved beyond the advanced campsite.

On 6 July 2016 they left the main campsite again but now heading south through the 'Lake's Branch' to 'Jericho Wall', about 2.4 kilometres through lakes in wetsuits in a more testing environment for the cavenauts than they had encountered during their underground mission to date. They did some surveying at Jericho Wall to help make a more accurate map of the area and found life forms in 'Monviso', part of the caves system not far from Jericho Wall. They returned to basecamp for their sixth and last night underground. They returned to the surface on 7 July 2016.

During the mission the team explored further than any other CAVES course, they mapped their progress, and took samples of the environment and life they found. They tested new techniques for making accurate 3D models of objects and the environment using standard cameras. Tests on wireless communication devices were performed such as an xFERRA Radio, which can transmit up to one kilometre through rock strata and three kilometres through subterranean passages. Although CAVES 2016 was now over, as Aki Hoshide said in his blog entries "the underground adventure will continue…"

The Cavenauts

Richard Robert 'Ricky' Arnold was born on 26 November 1963 in Cheverly, Maryland. He received a Bachelor of Science degree in Accounting from Frostburg State University, Maryland, in 1985 and three years later completed the university's teacher certification programme. Whilst a postgraduate student at Frostburg he worked as an Oceanographic Technician at the United States Naval Academy at Annapolis, Maryland.

Following completion of his teacher training he started what would become more than 10 years of teaching experience in the USA and in American International schools in other countries. Whilst teaching in Maryland and as part of his studies towards a master's degree, he conducted research in biostratigraphy at the University of Maryland's Horn Point Environmental Laboratory in Cambridge, Maryland.

He then formally enrolled at the University of Maryland and during this period spent time working in the marine sciences at the US National Park Services' Cape Cod National Seashore and aboard a sail training/ oceanographic vessel headquartered in Woods Hole, Massachusetts. In 1992, he received a Master of Science degree in Marine, Estuarine & Environmental Science from the University of Maryland.

In 1993, he started his first overseas teaching job in Casablanca, in Morocco. His later teaching positions included Riyadh, in Saudi Arabia; West Papua, in Indonesia and Bucharest, in Romania.

In January 2003, NASA officially rolled out the start of its educator astronaut recruitment programme. Its goals were to generate renewed interest in science and mathematics, and cultivate a new generation of scientists and engineers by inspiring new generations of explorers. Arnold applied and then the Columbia Space Shuttle accident happened. He did not allow the disaster to put him off. He believed in the job and later noted that, "this is something that needs to be done and we'll learn from the mistakes." He added "We'll take those lessons and do the best we can to make sure it doesn't happen again, but that's no reason to quit trying."

He was selected as an educator mission specialist astronaut in May 2004 (NASA Group 19). The first thing he had to do was move back to the USA with his family. He joked at the time that, "My kids have never lived in America before, even though they think of it as home." He received normal mission specialist training so he could carry out full mission requirements as well as education duties. He successfully completed ascan training in February 2006. Amongst his initial assignments for the Astronaut Office was working on technical issues with JAXA hardware for the ISS.

In August 2007, he was an aquanaut on NEEMO 13 and in October 2011 took part in NEEMO 15 serving on the crew for the DeepWater2000 submersible. DeepWater2000 was itself used as a space analogue as it was acting as a stand-in for NASA's experimental Space Exploration Vehicle, a flexible concept which could see its use for general microgravity space missions and for the exploration of planetary bodies.

In between his water assignments he made his first and to date only spaceflight. On 19 October 2007, NASA announced his assignment to STS-119. It was targeted for launch in November 2008 but typical of the Space Shuttle programme suffered from some delay. It took place the following March.

STS-119 Discovery (15-28 March 2009) delivered the fourth and final

starboard truss segment and the fourth and final set of the United States solar arrays to the ISS. He was MS-3 for the mission and was part of the Extra-vehicular Activity (EVA) team, making two spacewalks.

Pedro Francisco Duque was born on 14 March 1963 in Madrid, Spain. He has a degree in Aeronautical Engineering from the Escuela Técnica Superior de Ingenieros Aeronáuticos at the Universidad Politécnica, Madrid, in 1986. Following graduation he joined the Grupo Mecánica del Vuelo (GMV – in English 'Flight Mechanics Group').

GMV had only been founded in 1984 but had quickly won a contract for ESA's European Space Operations Centre (ESOC) in Darmstadt, Germany, and it was there that Duque started his association with ESA. He worked with the Precise Orbit Determination Group. His duties included developing models for orbit determination and algorithms, and implementing orbit computation software.

He was also part of the Flight Control Team for ESA's first remote sensing satellite ERS-1 launched on 17 July 1991 and Eureca, the European Retrievable Carrier, which was carried into space on the Atlantis Space Shuttle on 31 July 1992 and nearly a year later re-acquired by the shuttle Endeavour.

Even before Eureca was carried aloft by Atlantis, Duque Knew his future was away from GMV. In 1989, ESA began the process that would lead to its second group of astronauts. Member states were asked to submit their own candidates numbering three to five. Spain received 658 applications from June 1990 and in April 1991 five candidates were selected for submission to ESA including Duque.

In May 1992, he was selected as part of ESA's second group of astronauts. He completed an introductory training course at the EAC (June-July 1992); a four-week training programme at the Tsentr Podgotovki Kosmonavtov (Yuri Gagarin Cosmonaut Training Centre) abbreviated as TsPK (November-December 1992); and then formal basic training at the EAC (January-April 1993).

He did not have long to wait for his first mission assignment and was named to the ESA–Russian EuroMir missions. The contract for two flights, Euro-Mir 94 and Euro-Mir 95, was signed with Energiya in July 1993. In August 1993, he returned to the Yuri Gagarin Cosmonaut Training Centre for training on the missions and in May 1994 was named back-up research cosmonaut to German astronaut Ulf Merbold for Euro-Mir 94. The flight took place as Soyuz TM-20/Euro-Mir 94/Soyuz TM-19 (3 October – 4 November 1994). Duque acted as a CapCom in the Russian Mission Control Centre in Moscow, co-ordinating contacts between European scientists and the Mir Space Station.

It was not long before he received another back-up assignment. This time it was ESA's cooperative projects with the USA that led to his selection as an alternate payload specialist for a Life and Microgravity mission, which featured the European developed Spacelab laboratory. The mission took place as STS-78 Columbia (20 June – 7 July 1996). He again was a CapCom during the flight, providing a conduit for contacts with the ground. ESA flew five major facilities on the mission and was responsible for more than half of the experiments performed.

In August 1996, he joined NASA's 16th astronaut class at the Johnson Space Center (JSC) in Houston, USA, for mission specialist training. ESA's astronaut biography notes that the training led to his certification as a mission specialist in April 1998 qualifying him for assignments on the Space Shuttle. Interestingly, he had already been assigned to a mission by that date. On 13 February 1998, NASA announced his assignment as a mission specialist for STS-95 scheduled for launch in November the same year. He said before the mission that, "I always tell everybody that I have won the lottery many times in a row."

His first spaceflight took place as STS-95 Discovery (29 October – 7 November 1998), which saw more than 80 science experiments conducted in medical and materials research and included the deployment and retrieval of the Spartan solar-observing spacecraft but is best remembered for Mercury astronaut John Glenn's return to space at the age of 77. As MS-1, Duque's responsibilities included five ESA scientific facilities and for the computer system on the Space Shuttle.

In 1999, he was assigned to the European Space Research and Technology Centre (ESTEC) in Noordwijk, the Netherlands, in the Directorate of Manned Spaceflight and Microgravity. He worked on the ISS programme and was crew support for Europe's Columbus laboratory and the Cupola module. In April 2001, he commenced advanced ISS training. ESA records that in 2003 he had qualified for an early European long-term mission assignment to the ISS although at that point he had already been assigned to pay the ISS a short visit.

In December 2002, he was assigned as a flight engineer for Soyuz TMA-2, which was due to be the fifth Russian Soyuz taxi flight to exchange Soyuz's berthed to the ISS. He was due to fly a ten day flight over April/May 2003 but the Columbia Space Shuttle disaster of February 2003 led to the Soyuz spacecraft taking over expedition crew swap duties. Subsequent changes in crewing assignments meant he was removed from the crew of Soyuz TMA-2. In May 2003, he was reassigned to another Soyuz mission as a flight engineer. It was still a short-term flight but now he would be exchanging crew mates as well as Soyuz spacecraft.

His second spaceflight took place as Soyuz TMA-3/ISS/Soyuz TMA-2 (18-28 October 2003). His return to Earth was on the Soyuz vehicle he was originally due to launch. ESA named their part of the mission 'Cervantes' after the Spanish writer Miguel de Cervantes. His most famous work, 'Don Quixote' visited the space station in compact disc form. During his short stay on the ISS, Duque conducted an extensive experiment programme in life and physical sciences, Earth observation, education and technology. The mission also involved the swap-out of ISS expedition crews.

He returned to ESTEC after his second flight until he was appointed as Director of Operations of the Spanish User Support and Operations Centre in Madrid. He managed the implementation and first operations of the Centre until 2006. In October 2006, he took special leave of absence from ESA to join a newly formed private company, 'Deimos Imaging' as head of its Earth observation project. He was first Managing Director and then Executive President. Their first satellite 'Deimos-1 was launched in July 2009 during his time with the company.

In October 2011, he returned to ESA to head the Flight Operations Office at the Columbus Control Centre near Munich. He supervised the work of the flight controllers and support personnel that perform ground operations of the European module on the ISS and its utilisation programme. He was still a member of ESA's Astronaut Corps but had non-flight management status.

Early in 2015, he returned to general astronaut duties and to full flight status. This, together with his assignment to a CAVES crew suggests he might be in the running for an ISS residency assignment in the near future.

Ye Guangfu was born in 1980 in the Sichuan province of China. He is a member of the People's Liberation Army Air Force (PLAAF) of China. He spent four years serving as a fighter-pilot and four years as an instructor-pilot amassing 1100 flight hours.

He was recruited as a taikonaut trainee for China's Astronaut Centre in 2010 as part of their second Shenzhou selection. His group contained five male and two female candidates. He qualified for flight assignment in 2014. He visited the EAC in May 2016 with his colleague Chen Dong before travelling to Sardinia for CAVES 2016. Chen was most probably Ye's back-up for CAVES 2016.

Following the week of preparatory training in Sardinia he commented that, "It's my honour to take part in the CAVES training with astronauts from USA, Russia, Spain and Japan. I am really pleased to be a member of the international crew." He added that he was "eager to start the breath taking and challenging adventure underground."

Akihiko Hoshide was born on 28 December 1968 in Setagaya-ku, Tokyo. He spent several of his early years living in New Jersey whilst his father worked in New York. During this time he made his first visit to the Kennedy Space Center. He saw the Saturn 5 rocket displayed there and as he later said he thought, "it was just overwhelming." The visit had a huge impact on him.

He was in high school when the first Japanese astronauts were selected in 1985 and this turned his mind towards a career involving space. He wanted to apply for astronaut selection when Japan choose their next

astronaut in 1992 but was not eligible because he did not have the work experience necessary. He decided to apply for employment as an engineer with Japan's space agency.

He received a Bachelor of Science degree in Mechanical Engineering from Keio University in 1992 and following graduation joined the National Space Development Agency of Japan (NASDA). He worked out of their Nagoya office on the development of Japan's H-II satellite launch rocket. In 1994 he transferred to NASDA's Astronaut Office as an astronaut support engineer where he was involved in the development of Japan's own astronaut training programme and the evaluation of crew interface designs.

One of his duties was supporting Japanese astronaut Koichi Wakata during his training and flight on STS-72 Endeavour (11-20 January 1996). This and other duties saw him spend time working at the JSC. He was also continuing with his education studies and in 1997 received a Master of Science degree in Aerospace Engineering from the University of Houston, Cullen College of Engineering.

He was selected as a Japanese astronaut (NASDA Group 4) in February 1999. He underwent basic NASDA astronaut training from April 1999 to January 2001 and this included survival training in Russia. Whilst continuing his astronaut training he worked on the development of the hardware and operation of the ISS Japanese Experiment Module (JEM) named 'Kibo' and the ISS Japanese unmanned supply vehicle H-II Transfer Vehicle (HTV) also named 'Kounotori'. He spent more time at the TsPK and also conducted training at the EAC.

In October 2003, NASDA was amalgamated with two other Japanese aerospace organisations, the Institute of Space and Astronautical Science, and the National Aerospace Laboratory, to form JAXA. Hoshide seamlessly transferred to the new agency.

In May 2004 he was certified as a Soyuz TMA flight engineer. The following month saw him on his way to the JSC in Houston where he joined NASA's 19th astronaut class for basic mission specialist training. He received training on Space Shuttle and ISS systems. He successful completed the course in February 2006, making him eligible for flight assignment. He was attached to NASA's Astronaut Office at the JSC where he worked on preparations for the launch of the various components of Kibo. He also carried out CapCom duties.

JAXA announced his assignment to Space Shuttle mission STS-124 on 23 March 2007. This was a special flight for Japan. The second of three Kibo/ISS assembly flights involving the Space Shuttle, STS-124 was to deliver the Pressurized Module (PM) and the Japanese Experimental Module Remote Manipulator System (JEMRMS - a robotic arm) of Kibo.

His first spaceflight took place as STS-124 Discovery (31 May – 14 June 2008). He was MS-4 for the mission. Hoshide operated the Canadarm2, the ISS's own robotic arm, to install the PM and to relocate the Japanese Experiment Logistics Module-Pressurized Section (ELM-PS), which had been taken to the ISS by STS-123 Endeavour mission of March 2008 and temporary located on the Node 2 'Harmony' module of the ISS. During the flight, he helped activate the PM and the Japanese robotic arm.

Following post-flight duties and downtime he played a supporting role in the third Space Shuttle Kibo assembly mission, STS-127 Endeavour (15-31 July 2009), and HTV-1 (10 September – 1 November 2009), the first Japanese supply vehicle mission to the ISS. Also in 2009, he was involved in coaching the newly recruited JAXA astronaut candidates chosen that year.

On 18 November 2009, JAXA announced his assignment to an ISS residency mission. He served as a back-up flight engineer for Soyuz TMA-03M/ISS-30/31, which launched on 21 December 2011.

His second spaceflight was Soyuz TMA-05M/ISS-32/33 (15 July – 19 November 2012). He spent over 4-months on the space station conducting experiments in Kibo, ISS maintenance duties and supporting operations for several vehicles including HTV-3. He conducted three EVA's during his time on the ISS.

Launched on 21 July 2012, HTV-3 rendezvoused with the ISS on 27 July 2012 and Hoshide helped with the capture of the vehicle by NASA astronaut Joseph Acaba who used the Canadarm2. Hoshide then operated the robotic arm to berth the supply vehicle to the Harmony module. HTV-3 left the ISS on 12 September 2012 and burned up as planned when it re-entered Earth's atmosphere on 14 September 2012.

Part of HTV-3's cargo was the Japanese Experiment Module Small Satellite Orbital Deployer (J-SSOD) along with five CubeSats (very small satellites). Hoshide deployed the CubeSats on 4 October 2012 using the newly installed J-SSOD mounted on the JEMRMS.

The SpaceX Dragon CRS-1 unmanned cargo spacecraft was launched on 7 October 2012. On 10 October 2012, it rendezvoused with the ISS. Hoshide was again on Canadarm2 duties as he captured the spacecraft and helped berth it to Harmony.

Following in the footsteps of five of his JAXA colleagues he served on a NASA underwater NEEMO mission in July 2014. He served as commander for NEEMO 18 and was the second Japanese astronaut to take a command position. Koichi Wakata had commanded NEEMO 10 in 2006.

Sergey Vladimirovich Korsakov was born on 1 September 1984 in Frunze, Kirghiz Soviet Socialist Republic (now Kyrgyzstan). In 2006 he was an engineering graduate of the Bauman Moscow State Technical University with a specialty in Rocket Engines. Prior to his selection as a cosmonaut he was employed by a private company, 'Info Capital Group'.

It was back in October 2010 when the decision was made to have an open recruitment for the selection of cosmonauts. It took some time to work out the requirements and logistics for the process and it was not until 27 January 2012 that the Russian Federal Space Agency and the TsPK officially announced the call for cosmonauts using the new procedures.

In the past cosmonaut recruitment was normally although not exclusively through the Soviet/Russian armed forces or civilian engineers working for the S P Korolyov Rocket and Space Corporation Energiya (the builders of the spacecraft they would ultimately get to fly into space).

For the new selection there were several hurdles to be overcome, including a Competition Commission, made up of representatives of the TsPK, Energiya and the Academy of Sciences' Institute of Bio-Medical Problems, the Chief Medical Commission, and the State Interdepartmental Commission.

Korsakov applied and steadily passed each stage. On 18 July 2012, the Chief Medical Commission approved his application for cosmonaut training and on 5 September 2012 the Competition Commission recommended his candidature to the State Interdepartmental Commission. He was formally accepted as a candidate cosmonaut by the Interdepartmental Commission on 8 October 2012.

Korsakov and the rest of his selection were presented at the TsPK on 29 October 2012. Basic training ran from 30 October 2012 to 5 June 2014 when he passed the state examinations at the TsPK with a score of 4.8 out of 5. He was officially confirmed as a 'Test Cosmonaut' by the Interdepartmental Qualification Committee on 16 June 2014. He was presented with his identification card as a 'Test Cosmonaut' by Alexander Kaleri (a veteran of five spaceflights). He was now eligible for advanced training, taking on ground positions associated with actual space missions and eventual assignment to a space crew.

Jessica Ulrika Meir (Ph.D.) was born on 15 July 1977 in Caribou, Maine. She has a Bachelor of Arts degree in Biology from Brown University, Providence, Rhode Island, in 1999. Whilst at Brown she was part of a student team that submitted a proposal under NASA's Reduced Gravity Student Flight Opportunities Program. Her team was successful and she got her first taste of microgravity when she flew on NASA's Boeing KC-135 Stratotanker aircraft (nicknamed the 'vomit comet'), during parabolic arc manoeuvres.

She then attended the International Space University (ISU) in Strasbourg, France, where she graduated from the ISU Master of Space Studies Programme in 2000. At the ISU she worked on a team project

continued on the back page ...

I Must Have Misread That

by Rob Wood

This comes under the heading of the most ridiculous space story I have seen since the dodgy emails about the stranded Nigerian cosmonaut on Mir. Having spent 35 years as a Civil Servant my views on politicians are somewhat coloured anyway but if the English politician did ask Vladimir Putin the question then I cannot describe my opinion in writing other than to say I am utterly incredulous.

As far as I can ascertain the story appears to have been spread by the Daily Mail newspaper and if I can quote from Tommy Docherty a [in] famous soccer manager who amongst many football clubs spent periods in charge of Chelsea, Aston Villa, Manchester United, Derby County and Wolverhampton Wanderers, "I've always said there's a place for the press but they haven't dug it yet." I can think of another old fashioned use for the Daily Mail but I'd better not go down that road!

On 4 May 2016, the Daily Mail reported that Tobias Ellwood MP had asked President Vladimir Putin of Russia in person for an assurance that Timothy Peake would not be abandoned on the ISS.

Tobias Ellwood has dual British-American nationality. He was born on 12 August 1966 in New York City. He is the Conservative Member of Parliament for Bournemouth East. He served in the Royal Green Jackets (1991-1996); reaching the rank of Captain and is currently an army reservist. He was elected to Parliament in 2005. He was appointed as Parliamentary Under Secretary of State at the Foreign and Commonwealth Office in July 2014.

Following the completion of the previous four paragraphs, I began to put together the rest of the Daily Mail story so I could continue writing about it for these pages. I quickly realised the newspaper had said Ellwood was speaking during a Westminster Hall debate on Anglo-Russian relations. If this was correct then there should be a public record. So a search of Hansard followed and there it was, proof the Daily Mail was accurate in its reporting of what Ellwood said he had done.

After I picked myself up from the floor, I compared Hansard to the Daily Mail story. Fair play to the newspaper; to all intent and purposes the Daily Mail gave an accurate read of what went on at the Westminster Hall debate.

Hansard recorded the following:

I had the opportunity to meet President Putin at the European Games in Baku in Azerbaijan last year. I was not quite expecting to see him, but I told him that a friend of mine had cause to use Russian transport and was a bit concerned about international developments—the east and west—in case he got stuck at the end of his destination and was unable to get back. That friend of mine was called Tim Peake. He was using a Soyuz space capsule to get up to the international space station and did not want to be abandoned up there. Mr Putin grabbed my arm and said, "Mr Ellwood, tell Mr Peake that we will notabandon him."

As well as using some quotes from Hansard the Daily Mail wrote:

British astronaut Tim Peake feared being left stuck in space if the West's relations with Russia deteriorated, a Foreign Office minister has said. But Tobias Ellwood told MPs he had received assurances from Russian President Vladimir Putin that Major Peake will not be abandoned on the International Space Station. The Tory frontbencher, who said he is a friend of the astronaut, raised the issue with Mr Putin during the 2015 European Games in Baku, Azerbaijan.

This brings me back to the beginning. I remain incredulous and repeat – I must have misread that – I don't believe there is a particular symbol to use, maybe an 'emoticon' from the world of emails or Facebook but nothing for CapCom that would show the shaking of my head from side-to-side, but that is what I am doing.

I struggle to believe that Tim Peake would have voiced a concern such as is suggested to an MP, or that he would even have thought it was possible that the Russians would have "abandoned" him on the ISS. I leave you to imagine my exact thoughts; I cannot put them down in writing as I do not have parliamentary privilege.

In the cold light of a new day, I have giving this story a little more thought and with the help of my good lady carried out more research. If, I do not have a problem with the Daily Mail's coverage of the story then the same cannot be said of the Daily Mirror newspaper headline "Major Tim Peake is TERRIFIED of ending up lost in space" or where they write "Tim Peake is terrified of the prospect that a breakdown in relations between Russia and the West could leave him marooned in space, a UK Foreign Office minister has revealed."

I like the way "a bit concerned" has become "terrified." Can you imagine Tim Peake, ex-army helicopter test pilot who includes on his CV flying combat missions in Bosnia and Afghanistan, being terrified on a vague premise of being stranded on the ISS? The idea is utterly ridiculous.

Gizmodo UK, a tech/SciFi website blog excelled itself with its headline "Vladimir Putin Comforted Tim Peake When He Was Afraid of Going Into Space" they added that "Tim Peake….was one worried man." Even the Bournemouth Echo, the MP's local newspaper, got into the act. At least their story was the basic version without embellishment and I only mention it here because of their readers wonderful comments including, "Toby Ellwood, a waste of good skin" and "Why do we pay this moronic media monkey." They might say that. I couldn't possibly comment.

Mr Ellwood by the way was one of only a handful of MP's who spoke in favour of an Independent Parliamentary Standards' Authority recommended 10% pay rise for MP's in 2015. He said, "I never expected to be watching the pennies at my age." At this time he received a basic annual salary of £67,060 plus an extra £20,000 for his role as a Parliamentary Under Secretary of State. I would not mind watching those pennies – all eight million, seven hundred and six thousands of them. At the time the national average wage was £26,500. Most MP's did recognise how this pay rise would look to the public at a time of Austerity so either kept quiet or spoke out against it.

In returning to the Westminster Hall debate, Daniel Kawczynski, Conservative MP for Shrewsbury and Atcham, said he, "called this debate because I am very concerned about the growing anti-Russian sentiment in the House of Commons." Later in the debate he commented that "President Putin is now being treated almost as a pantomime villain in this House." Perhaps Mr Ellwood meant to illustrate this point with the telling of his story or is that a bit Wishy Washy or perhaps Widow Twanky. No further comment.

Did someone say, 'what were the dodgy emails about with regard the stranded Nigerian cosmonaut on Mir?' A story for another day methinks involving Mir, Salyut and many more.

Acknowledgements and sources not named in the above story:

Anorak.co.uk; Google; Gov.uk; Sabotagetimes.com; The Space Review; Wikipedia and Researcher Supreme none other than Jill Wood.

Boost for UK satellite technology and data for businesses

The UK Space Agency has unveiled new support to help the UK space and satellite technology sector maintain their leading position in earth observation and help tackle global issues such as deforestation and disaster monitoring. This support includes a new £2m joint programme for UK companies and academia to develop innovative technologies to observe Earth from space. A new online portal will also provide businesses and academics with access to real-time high quality satellite data to help them monitor changes in our planet.

Working together with the University of Leicester, Airbus Defence and Space UK, and RAL Space, the £2m funding from UK Space Agency will support UK companies and academia to develop their technologies and help them gain access to a government funding pot of £10m to take their ideas to the next level.

The launch of the Sentinel Data Access Service (SEDAS) web portal will allow anyone in the UK to access 30 days of high-quality satellite data through the Copernicus Programme. Funded by the UK Space Agency in partnership with the Satellite Applications Catapult, this improved data access will help drive growth in the UK, maximising the industrial and scientific benefit of observations of Earth from orbit.

The announcement is the next step in the government's National Space Policy which aims to make the UK a European hub for commercial spaceflight and space sector technologies. Worth £11.8 billion to our economy, the Government is committed to growing the UK's commercial space sector with the ambition to capture 10 per cent of the global market – supporting 100,000 new jobs and generating £40 billion for our economy by 2030.

Satellite technology development

New funding for satellite technology development will be managed on behalf of the UK Space Agency by the Centre for Earth Observation Instrumentation (CEOI), a consortium of world-class academia and industry experts. Previous grant winners have achieved remarkable success to date by developing technology and positioning UK industry to win over £150m in external contracts over a 10 year period.

Over the next five years, CEOI will be responsible for managing Earth observation technology projects with a total value of up to £20m including industrial co-investment, ensuring the UK remains competitive in the global space sector, supporting a growing community of SMEs and maintaining a leading role for UK scientists.

The University of Leicester held a signing event this week for the contract with the CEO of the UK Space Agency, the Vice-Chancellor of the University of Leicester and attended by senior figures from Airbus Defence and Space, and STFC RAL Space.

Better data access

Using the expertise at Satellite Applications Catapult, Airbus Defence & Space, Deimos UK and GeoCento, the SEDAS portal opens up a key Earth Observation satellite data stream for UK companies, scientists, policy makers and members of the public.

Radar data from the Copernicus programme's Sentinel 1 satellite can be searched by location by drawing a shape or uploading a shape file to define the area of interest or time. Results for existing data can be downloaded, and details of data scheduled to be collected over the next fortnight will help users plan ahead.

Optical data from Sentinel 2 will be added to the SEDAS portal in the near future, further expanding the opportunities to exploit and produce market leading Earth Observation products and services for all users.

This data could help businesses in nearly every sector of the economy benefit from the unique vantage point of space. Satellite data already helps efforts to tackle deforestation, food security, disaster monitoring and coastal pollution. The satellites provide global coverage of the Earth's land surface every ten days, allowing users to track gradual changes.

For example, this satellite data is already proving its value in monitoring land use. Its high revisit frequency, ability to distinguish between different crop types and deliver timely data on plant indices has the potential to transform precision farming.

UK Space Agency
https://www.gov.uk/government/organisations/uk-space-agency

JPL Seeks Robotic Spacecraft Development for Asteroid Redirect Mission

NASA's Jet Propulsion Laboratory in Pasadena, California, has issued a request for proposal (RFP) seeking design, development and build of the robotic spacecraft that will capture a multi-ton asteroid boulder from deep space during the first segment of the agency's Asteroid Redirect Mission (ARM). The RFP is open to the four industry partners that previously completed conceptual designs of the spacecraft.

ARM is a two-part mission that will integrate robotic and crewed spacecraft operations in the proving ground of deep space to demonstrate key capabilities needed for NASA's Journey to Mars. The robotic segment of the mission completed its Key Decision Point-B (KDP-B) review in August, which served as authority for JPL to proceed with this next procurement phase.

The four vendors involved with the conceptual design study phase are: Lockheed Martin Space Systems of Denver; Space Systems/Loral of Palo Alto, California; Boeing Satellite Systems, Los Angeles; and Orbital ATK of Dulles, Virginia. Proposal submissions for the design, development and build of the robotic flight system are due to JPL by Oct. 24, 2016. JPL plans to award the ARM spacecraft build and delivery contract in 2017.

The robotic segment of ARM will demonstrate advanced, high-power, high-throughput solar electric propulsion; advanced autonomous precision proximity operations at a low-gravity planetary body; and controlled touchdown and liftoff with a multi-ton mass. The crew segment of the mission will include spacewalk activities for sample selection, extraction, containment and return; and mission operations of integrated robotic and crewed vehicle stack -- all key components of future in-space operations for human missions to the Mars system.

The robotic ARM spacecraft will demonstrate the world's most advanced and most efficient solar electric propulsion system as it travels to a near-Earth asteroid. These asteroids are fewer than 121 million miles (1.3 AU) from the sun at the closest point in their orbit. Although the target asteroid is not expected to be officially selected until 2020, NASA is using 2008 EV5 as the target asteroid while the search continues for potential alternates.

Going to an asteroid such as 2008 EV5 is particularly appealing to the scientific, exploration and industrial communities because it is a primitive, C-type (carbonaceous) asteroid, believed to be rich in volatiles, water and organic compounds. The ability to extract core samples from the captured boulder will allow us to evaluate how its composition varies with depth and could significantly advance our understanding of the origins of our solar system. Astronaut sampling and potential commercial activities could help establish the value of C-type asteroids for commercial mining purposes, which in turn could have significant impacts on how deep space missions are designed and implemented in the future.

After collecting a multi-ton boulder from the asteroid, the robotic spacecraft will redirect the boulder to a crew-accessible orbit around the moon, where NASA plans to conduct a series of proving ground missions in the 2020s that will help validate capabilities needed for NASA's Journey to Mars.

NASA
http://www.nasa.gov/centers/jpl/home/index.html

... continued from page 13

on the use of an Autonomous Lunar Transport Vehicle that would operate between two lunar craters. During her time at ISU she also got her second taste of microgravity, this time on the French Space Agency's version of the vomit comet the Airbus A-300 aircraft.

Between the end of her studies at the ISU in 2000 and the start of her doctorate in 2003 she worked for Lockheed Martin Space Systems Company as a support scientist at the JSC. She was involved in human physiology space experiments for the Space Shuttle and the ISS, science liaison, astronaut crewmember training, and ground support in NASA's Mission Control Center. Again she added to her time spent in microgravity with further flights on NASA's aircraft flying parabolic arcs.

In September 2002, she was one of the aquanauts on NEEMO 4, a NASA undersea mission to test exploration concepts whilst living in an underwater facility off the Florida coast. She helped coordinate the life sciences experiments.

She applied to join NASA's 20th class of astronauts in 2008 and was interviewed by the astronaut selection board in January 2009. However, she was not one of the finalists when the group (number 20) was announced in June 2009.

She received her doctorate in Marine Biology from the Scripps Institution of Oceanography, University of California, San Diego, in 2009. From 2009 to 2012 she was a post-doctoral researcher at the University of British Columbia in Canada. In September 2012 she was appointed as an Assistant Professor at Harvard Medical School, Massachusetts General Hospital, Boston. Over the years she has conducted considerable research on animals in extreme environments.

NASA opened applications for its 21st group of astronauts on 15 November 2011 and she again applied. The group saw the second largest number of applications in NASA's history. From 15 November 2011 to 27 January 2012 a total of 6,372 were received. These numbers were only beaten by the 1978 class which had seen 8,079. This time she would be successful.

She was selected as an astronaut candidate in June 2013 (NASA Group 21). She reported to the JSC in August 2013 to begin basic training. Basic training included Russian language learning, scientific and technical briefings, instruction about ISS systems, tutoring on EVA operations, robotics guidance, physiological schooling, T-38 flight training, and water and wilderness survival training. She successfully completed basic training in July 2015 making her eligible for technical duties in the Astronaut Office and eventual flight assignment.

She has said she has dreamt about flying in space since she was five and was looking forward to her training especially the part about flying in jets, "I have my private pilot's license," she said, "but I'm really excited about going to Pensacola for real flight training in jets." She has about 180 hours of flight time but is clearly eager for more.

Note 1: Two minutes after the Lochnagar mine exploded, British troops went 'over the top' on a day that would be the worst day in the history of the British army with 57,470 casualties including 19,240 dead (some from the British Empire). The Battle of the Somme would go on until 18 November 1916 and see over one million casualties on all sides.

Acknowledgements and sources:

Astronaut.ru; BBC.co.uk; CapCom (previous issues); Cavedivinggroup.org.uk; Chinadaily.com; Energiya-Buran - The Soviet Space Shuttle ©2006 by Bart Hendrickx and Bert Vis; ESA; Facebook; The Free Dictionary; Google; Greatwar.co.uk; The Guardian; Imperial War Museumwm.org.uk; The Independent; Italymagazine.com; JAXA; Linkedin; Lochnagarcrater.org; Manned Spaceflight Log II 2006-2012 ©2013 by David J Shayler and Michael D Shayler; Naplesldm.com; NASA and its various centres; Praxis Manned Spaceflight Log 1961-2006 ©2007 by Tim Furniss and David J Shayler with Michael D Shayler; Spacefacts; SpaceX.com; The Telegraph; Twitter; Wikipedia; You Tube.

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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****.*

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