your window to space

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space news roundup

ESA Astronaut Tim Peake Begins Six-Month Stay On Space Station

ESA astronaut Tim Peake, NASA astronaut Tim Kopra and Russian cosmonaut commander Yuri Malenchenko arrived at the International Space Station, six hours after their launch at 11:03 GMT on 15 December 2015.

The Soyuz TMA-19M spacecraft docked with the Space Station at 17:33 GMT. The astronauts opened the hatch at 19:58 GMT after checking the connection between the seven-tonne Soyuz and the 400-tonne Station was airtight.

They were welcomed aboard by Russian cosmonauts Mikhail Korniyenko and Sergei Volkov, and NASA astronaut Scott Kelly.

This marks the start of Tim's six-month Principia mission and the culmination of six years of training since being selected for the European astronaut corps in 2009.

A large educational programme is set to inspire and involve children and students with computer coding, fitness regimes and lessons from space with Tim as the instructor.

Tim is the third ESA astronaut to stay on the orbiting research complex in 2015 alone. Samantha Cristoforetti ended her record-breaking 199-day mission in June, while Andreas Mogensen completed a busy 10-day tour in September.

Principia will see Tim working on dozens of experiments for researchers on Earth as he orbits our planet at 28 800 km/h. Highlights of his scientific roster include growing crystals and blood vessels in space, simulating atomic structures and charting areas in the brain as they adapt to stressful situations.

Yuri, Tim and Tim took a few days to settle in and get used to working in weightlessness before starting their 40-hour work weeks running experiments and maintaining the Station.

They are in good company: Scott Kelly and Mikhail Korniyenko have been living on the Station for more than 300 days since March as part of their marathon stay to probe how the human body adapts to longer missions.

Just a month after arriving on board ISS, Tim Peake becomes the first UK astronaut to carry out a spacewalk...

Tim And Tim Safely Back In Space Station After Spacewalk

After a 4 hour 43 minute spacewalk on 15th January to replace a failed power regulator and install cabling, ESA astronaut Tim Peake and NASA astronaut Tim Kopra are back inside the International Space Station.

The meticulously planned and executed sortie was stopped early after Tim Kopra reported a small amount of water building up in his helmet. The two Tims worked in close cooperation with each other to return to the Space Station, with NASA commander Scott Kelly and cosmonaut Sergei Volkov waiting inside to help them out of their suits.

They left the confines of the weightless research laboratory at 12:48 GMT after their five-hour preparations to don their spacesuits and purge their bodies of nitrogen to avoid decompression sickness.

This was the first spacewalk for a British astronaut, but also the first sortie for the suit used by Tim Peake, which arrived on the Station in December.

Tim Kopra went first to the far end of the Station's starboard truss, with Tim Peake following with the replacement Sequential Shunt Unit. Swapping the suitcase-sized box was a relatively simple task but one that needed to be done safely while the clock was ticking.

To avoid high-voltage sparks, the unit could only be replaced as the Station flew in Earth's shadow, giving spacewalkers half an hour to unbolt the failed power regulator and insert and bolt down its replacement.

Tims' spacewalk

With their main task complete, the Tims separated for individual jobs for the remainder of their time outside. Tim Kopra reinstalled a valve that was removed as part of the relocation of the Leonardo module last year but was told by Mission Control to return to the airlock before he could start his next task, after he had reported the water in his helmet.

Tim Peake was installing new cables for a new docking system when Mission Control decided to end the spacewalk early, asking the duo to clean up their work and move back to the airlock two hours ahead of schedule.

The spacewalk officially ended at 17:31 GMT when the Tims began the repressurisation of the Quest airlock.

Back to science

It has been a busy time for the pair. Since their 15 December arrival they have taken part in two spacewalks – probably one of the most intensive but exhilarating part of an astronaut's job description.

The Station is now operating again at full power capacity, after it had dropped by an eighth when the regulator failed in November. That unit will be returned to Earth for inspection and possible refurbishment.

With the spacewalk completed, Tim has a few days of rest before continuing work on the extensive scientific programme that is part of his six-month Principia mission.

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Principia mission
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Eurapean Space Agency
www.esa.int

Engineers Mark Completion of Orion's Pressure Vessel

NASA's Orion spacecraft is another step closer to launching on its first mission to deep space atop the agency's Space Launch System (SLS) rocket. On 13 January technicians at Michoud Assembly Facility in New Orleans finished welding together the primary structure of the Orion spacecraft destined for deep space, marking another important step on the journey to Mars.

"We've started off the year with an key step in our process to get ready for Exploration Mission-1, when together Orion and SLS will travel farther than a spacecraft built for humans has ever traveled," said Mike Sarafin, Exploration Mission-1 manager at NASA Headquarters in Washington. "This brings us closer to our goal of testing our deep space exploration systems in the proving ground of lunar space before we begin sending astronauts days to weeks from Earth."

Welding Orion's seven large aluminum pieces, which began in September 2015, involved a meticulous process. Engineers prepared and outfitted each element with strain gauges and wiring to monitor the metal during the process. The pieces were joined using a state-of-the-art process called friction-stir welding, which produces incredibly strong bonds by transforming metals from a solid into a plastic-like state, and then using a rotating pin tool to soften, stir and forge a bond between two metal components to form a uniform welded joint, a vital requirement of next-generation space hardware.

"The team at Michoud has worked incredibly hard produce a lightweight, yet incredibly durable Orion structure ready for its mission thousands of miles beyond the moon," said Mark Kirasich, Orion program manager. "The work to get us to this point has been essential. Orion's pressure vessel is the foundation on which all of the spacecraft's systems and subsystems are going to be built and integrated."

The pressure vessel provides a sealed environment for astronaut life support in future human-rated crew modules. After final checkouts, technicians will prepare the pressure vessel for shipment to NASA's Kennedy Space Center in Florida in the agency's Super Guppy aircraft. At Kennedy, it will undergo several tests to ensure the structure is sound before being integrated with other elements of the spacecraft.

The uncrewed Exploration Mission-1 will pave the way for future missions with astronauts. During the flight, in which SLS and Orion will launch from NASA's modernized spaceport at Kennedy, the spacecraft will venture to a distant retrograde orbit around the moon. This first exploration mission will allow NASA to use the lunar vicinity as a proving ground to test technologies farther from Earth, and demonstrate it can get to a stable orbit near the moon in order to support sending humans to deep space.

NASA
www.nasa.gov

Eve of Launch: 2016 Goals Vital to Commercial Crew Success

NASA's Commercial Crew Program and its aerospace industry partners Boeing and SpaceX are on the eve of America's return to human spaceflight launches. By the time the year closes, Boeing's CST-100 Starliner and SpaceX's Crew Dragon will be poised for the flight tests that allow our astronauts to travel to the International Space Station lifting off from Florida's Space Coast.

It won't be easy. Successful missions will require a comprehensive testing regimen of numerous systems on the ground and in space. That is why the outline of tasks for 2016 is so important. The result of each evaluation will be vital in the design of the systems. From parachute tests, to launch pad certifications, to the completion of spacecraft that will fly into orbit, this year offers both companies opportunities to build on the momentum of 2015 and carry it through to landmark space achievements in 2017.

"A year always seems like a long time when it starts, but the team at NASA and the teams at Boeing and SpaceX know it is going to feel like a very short time as we continue to progress from one step to the next in the final development of a new generation of American spacecraft," said Kathy Lueders, manager of NASA's Commercial Crew Program. "Our success depends on the work we're doing now to make sure every component and system that will go into these vehicles is safe and reliable for the future."

Boeing and SpaceX are developing separate spacecraft and launch systems, along with the network of mission and ground support capabilities required to safely fly astronauts to the International Space Station. Commercial crew flights will add an additional crew member to the station, effectively doubling the amount of science and research crews can conduct in the orbiting laboratory.

NASA

www.nasa.gov

Cygnus Named for Astronaut Deke Slayton

Orbital ATK's enhanced Cygnus spacecraft carries the name S S Deke Slayton II as a tribute to the Mercury astronaut who became a pioneer of commercial spaceflight endeavors after retiring from NASA. Slayton, a decorated Air Force test pilot before being chosen as one of the original astronauts, flew on the Apollo-Soyuz Test Project in 1975.

S S Deke Slayton was launched by a United Launch Alliance Atlas V launcher from Launch Complex 41 at Cape Canaveral Air Force Station on 6 December 2015.

Orion's Power System To Be Put To the Test

NASA is about to begin testing the heart of Orion's power systems at the world's largest, most powerful space environment simulation facility early next year. Test engineers at NASA Glenn Research Center's Space Power Facility (SPF) in Sandusky, Ohio, are preparing to put a full-size test version of the European Service Module (ESM) for the spacecraft through a series of crucial tests to verify the structural integrity of the hardware to withstand the dynamic environment of launch into space atop the agency's Space Launch System (SLS) rocket.

ESA's European Service Module

Engineers will begin to evaluate the integrated stack hardware provided by ESA (European Space Agency) and its partners in February 2016. The hardware brings together new technology and lightweight materials while also taking advantage of spaceflight-proven elements.

The test campaign aims to analyse and validate every element and function of the structural test article, which represents Orion's power and life support systems. The tests are critical to ensuring the flight readiness and structural integrity of the module containing all the air, nitrogen and water for the astronaut crew, as well as in-space propulsion, batteries and solar arrays to generate power during deep space missions.

The Orion spacecraft is being developed to send astronauts to destinations including an asteroid placed in lunar orbit and on a journey to Mars. It will launch on the agency's SLS rocket from a modernized spaceport at the NASA's Kennedy Space Center in Florida. The first exploration mission of Orion and SLS will allow NASA to use the lunar vicinity as a proving ground to test technologies farther from Earth, and demonstrate it can get to a stable orbit in the area of space near the moon in order to support sending humans to deep space.

European Space Agency
http://www.esa.int

ISS Mission Update

By George Spiteri

Expedition Forty-Six has just started following the safe return to Earth on Friday 11 December of Russian Oleg Kononenko, American Kjell Lindgren and Japanese Kimiya Yui. The International Space Station (ISS) is crewed by its US Commander Scott Kelly and Flight Engineers, Russians Mikhail Kornienko, Sergei Volkov and Yuri Malenchenko, American Tim Kopra and Great Britain's Tim Peake.

Scott Kelly became the US cumulative space record holder on 16th October when he passed Mike Fincke's 381 days 15 hours 11 minutes in space. Fincke having flown three space missions, one less than Kelly. On 29th October, Kelly passed Michael Lopez-Alegria's individual record for the longest single space mission by a US astronaut of 215 days 8 hours 22 minutes he achieved on Expedition Fourteen in 2006/07 and at the same time Kelly and Kornienko also surpassed Lopez-Alegria and Russian Mikhail Tyurin's mission to make their flight the longest ISS mission thus far.

On 28th October, Kelly and Lindgren exited the Quest airlock at 1203 GMT to begin the mission's first spacewalk. During the seven hour 16 minute EVA, the crew placed a thermal cover over the Alpha Magnetic Spectrometer (AMS), greased a number of components to Canadarm2's end effector and rigged power and data cables for the future arrival of International Docking Adaptors to the Station.

On 31st October the ISS achieved another milestone, marking the 15th year since Expedition One was launched and the subsequent continuous occupation of the orbiting complex since 2000.

Kelly and Lindgren left Quest again at 1122 GMT on 6th November to begin the mission's second EVA and the sixth for 2015. The astronauts restored the P6 Truss ammonia cooling system to its original configuration and returned ammonia to the desired levels in both primary and back-up systems. Also, the crew ran out of time to cinch and cover the Trailing Thermal Control Radiator (TTCR) and Lindgren re-deployed the TTCR into place in a dormant state after having retracted it earlier in the spacewalk. The EVA lasted 7 hours 48 minutes and was the 190th spacewalk dedicated to ISS assembly and maintenance totalling 1192 hours 4 minutes or 49 days 15 hours 4 minutes.

The crew celebrated US Thanksgiving Day on 26th November with a traditional turkey dinner and a short message to Earth from Kelly and Lindgren which included demonstrations of the food they enjoyed on orbit.

Following three delays due to poor weather, the Orbital ATK Commercial Resupply Services-4 (CRS-4) Cygnus unmanned mission to the ISS was launched from Pad 41 at Cape Canaveral Air Force Station in Florida at 2144 GMT on 6th December (1644 local time). Cygnus was launched atop an Atlas V rocket, which was used for the first time for an ISS related flight and it was Cygnus' first flight since the explosion shortly after launch from Wallops, Virginia in October 2014. The vehicle delivered over 7,700 pounds of supplies, including scientific and EVA hardware and was grappled by the Station's Canadarm2 at 1119 GMT on 9th December and berthed onto the Earth facing port of the Unity Module over three hours later at 1426 GMT.

Kononenko, Lindgren and Yui undocked their Soyuz TMA-17M/43S from the Station's Rassvet Module at 0949 GMT on 11th December to signal the official start to Expedition Forty-Six and landed in snowy, overcast and windy conditions over three hours later at 1312 GMT (1912 local time). It was the first ISS-era post sunset Soyuz landing, 78 miles North-East of Dzhezkazgan, Kazakhstan to complete a mission of 141 days 16 hours 9 minutes.

Soyuz TMA-19M/45S was launched from Baikonur at 1103 GMT on 15th December (1703 local time) carrying veteran commander Yuri Malenchenko on his sixth space fight together with Tim Kopra on his second mission and rookie Tim Peake. Malenchenko took over manual control to dock Soyuz to the Station's Rassvet Module over six hours later at 1733 GMT and the Station returned to a six person complement after its brief three person operations. The new arrivals spoke to family, friends and VIPs still at Baikonur and were given the mandatory safety briefing by Kelly.

On 18th December, Peake spoke to journalists from his new orbital home. He admitted the "first twenty-four hours is pretty rough" adapting to zero gravity but "was amazed at how the body has adapted" to weightlessness. He added that the one thing that amazed him "was the blackness of space.....it's the blackest of black". Asked if the ISS smelt in anyway? He said that it had a "kind of a metallic smell....quite distinctive". He also attempted a summersault inside the Columbus Module for TV viewers but said he hadn't "mastered it" and would probably get better in a week's time.

As of 18th December, Kelly and Kornienko have completed 38 weeks of their planned year in space, Volkov has logged 108 days aboard the orbiting outpost and Malenchenko, Kopra and Peake are on their 4th day in space.

Tim Peake on board ISS giving a press conference with the usual ESA and Union flags in the background

NASA via BBC

Astronaut News

By Rob Wood

NASA Underwater Mission 2015

The acronym NEEMO stands for 'NASA Extreme Environment Mission Operations'. The missions are conducted using the Aquarius Reef Base, located 62 feet below the surface of the Atlantic Ocean and 5.4 miles off the coast of Florida. The centerpiece of the Aquarius Reef Base is the Aquarius Underwater Research Habitat: a research station where scientists live for days and weeks beneath the sea. The Habitat is 43 feet long, sleeps six and is located next to a coral reef.

Saturation diving techniques allow aquanauts to remain underwater for extended periods while postponing decompression requirements until the end of a mission. Each day the Aquanauts can spend 8-9 hours in the water working. This is an order of magnitude more time than is possible using surface oriented diving techniques. NEEMO missions typically last for 10-14 days.

The aim of the NEEMO activities is to provide a convincing analogue to space exploration. They provide astronauts with some of the same challenges underwater as they would face in space. International crews representing various space agencies test technologies and research crew behaviour in what is an extreme environment.

NEEMO 20, NASA's underwater mission of 2015, took place from 20 July 2015 to 2 August 2015. It focused on evaluating tools and techniques for future Extravehicular Activity (EVA) that may take place on a variety of surfaces and gravity levels, ranging from asteroids, to the moons of Mars, and the Martian surface. Also evaluated was hardware developed by ESA that allows astronauts to read the next step in a procedure without taking their hands or eyes away from the task, using a tablet, a smartphone and a head-mounted interface. Tests were also carried out on time delays in communications involving potential mission destinations.

The crew for NEEMO 20 included astronauts from the European Space Agency (ESA), the Japan Aerospace Exploration Agency (JAXA) and the National Aeronautics and Space Administration (NASA). The commander was ESA astronaut Luca Parmitano. He is the only member of this NEEMO team to have flown in space. He conducted an International Space Station (ISS) residency in 2013 as part of the crew of Soyuz TMA-09M/ISS-36/37. He was joined on NEEMO 20 by JAXA astronaut Norishige Kanai and NASA astronaut Serena Aunon. Rounding out the crew was NASA EVA Management Office engineer David Coan.

Parmitano, an Italian Air Force fighter pilot and test pilot, was born on 27 September 1976 and selected as an astronaut in 2009. Aunon, an engineer and medical doctor, was born on 9 April 1976 and selected as an astronaut in 2009. She is awaiting a spaceflight assignment. Kanai, another medical doctor, was also selected as an astronaut in 2009 and has recently been assigned to an ISS residence mission (see next story).

JAXA Names Number Eight

On 26 August 2015, JAXA announced the eighth Japanese ISS residency crewmember. He will be part of ISS Expeditions 54/55. Launch and return will be on a Soyuz spacecraft and the mission is scheduled to commence in about November 2017. Norishige Kanai is the nominated astronaut and will be making his first spaceflight.

With this announcement, all of JAXA's active astronauts have either flown in space or been assigned a space mission. The only other rookie in the team, Takuya Onishi, is due to start his first spaceflight in June 2016. There have been six completed residencies by five Japanese astronauts. Koichi Wakata, Japan's most experienced astronaut, with four spaceflights, has made two.

Norishige Kanai was born in Tokyo, in 1976, but was brought up in Chiba, an area near Tokyo. In 1995, he graduated from Toho High School in Chiba before attending the National Defense Medical College, Tokorozawa, Saitama Prefecture. He graduated from there in March 2002 and received his military commission. He spent two years at the medical college's own hospital before being assigned to the Japan Self Defense Force Ominato Hospital, Mutsu, Aomori Prefecture, in 2004.

Also in 2004, he trained to provide medical assistance underwater and qualified as a Diving Medical Officer. In 2006, he attended the United States Navy's Diving Medical Officer Course, as an international military student, at the Naval Diving Salvage and Training Center, Florida. He returned to the National Defense Medical College Hospital in 2006 where he worked in the Department of Surgery. In 2008, he was transferred to the Japan Self Defense Force Hospital Kure, Seto Inland Sea, Hiroshima Prefecture.

The recruitment process for the Japanese Space Agency's fifth astronaut selection was announced on 28 February 2008. A total of 963 applications were received between 1 April 2008 and 20 June 2008 of which 124 were female and 839 male. This was the largest number of applications received for a Japanese astronaut selection. On 25 February 2009, JAXA announced the selection of two astronaut candidates, Takuya Onishi and Kimiya Yui, but said a third might be nominated later.

In the meantime, Kanai was posted to the Japan Maritime Self Defense Force, Medical Service Division, 1st Service School, commencing in June 2009. On 8 September 2009, JAXA announced Kanai as their third astronaut candidate and he officially joined the agency on 12 September 2009. He barely had time to pack his bags before he was on the way to Houston where he joined NASA's Group 20 astronauts of the same year for astronaut candidate (ascan) training.

His ascan training included scientific and technical briefings, intensive instruction on the ISS systems, EVA, Robotics, physiological training, flight training using the T-38 jet trainer, and water and wilderness survival training. He successfully completed ascan training in July 2011 making him eligible for advanced training, taking on ground positions associated with actual manned space missions and eventual assignment to a space crew. He participated in NEEMO 20, NASA's underwater mission of 2015.

On his nomination for ISS 54/55 he said, "I am very proud that I was commissioned for such an important mission following my predecessor astronauts from Japan who are highly regarded in the world, including NASA, while I brace myself with firm resolution to go through tough training for about two years in order to respond to tremendous expectations." He added that he was "determined to work hard through training and aim to proudly report space science and experiment results to Japanese people in two years through contributions to breathtaking and innovative experiments that will surprise world scientists and researchers."

He was due to begin training for the mission in January 2016 and faces extensive work in preparation for the flight. This will involve long hours for weeks on end at various facilities around the world including his home base at the Tsukuba Space Centre, Ibaraki Prefecture, Japan; the European Astronaut Centre, near Cologne in Germany; Montreal in Canada; the Yuri Gagarin Cosmonaut Training Centre near Moscow in Russia and the Johnson Space Center (JSC) in Houston, USA.

ISS Crewing Updates

In the period 29 June 2015 to 13 July 2015, a number of astronaut teams gathered to conduct water survival training at the EMERCOM Agency 179th Rescue Operation Centre in Noginsk, near Moscow. In general these teams are grouped as Soyuz crews and by extrapolation an ISS expedition team. Within the latest five teams was a new one. The first named and presumably Soyuz commander was Fyodor Yurchikhin, followed by Paolo Nespoli and Jack Fischer.

We did not have too long to wait for NASA to officially release the names. NASA's press release came out on 6 August 2015 in which they

also confirmed the team in line to fly from March 2017, Aleksandr Misurkin, Nikolay Tikhonov and Mark Vande Hei (see September/October 2015 issue of Capcom for details of this crew as their names appeared following an Interdepartmental Commission meeting at the Yuri Gagarin Cosmonaut Training Centre on 22 June 2015).

Yurchikhin's team will form part of the crews of ISS Expeditions 52/53. They are due to launch on Soyuz MS-5 in May 2017. Nespoli is representing the Italian Space Agency (Agenzia Spaziale Italiana or ASI) and ESA (I wrote about his assignment in the last issue of CapCom). Yurchikhin will represent the Russian Federal Space Agency and Fischer is a NASA astronaut. Fischer is the only rookie on the crew.

Yurchikhin has already flown to the ISS four times, initially as a mission specialist on the US Space Shuttle (2002) for a short visit followed by three ISS Expeditions (2007, 2010 and 2013), accumulating over 537 days in space. He was born in Batumi, Georgian Soviet Socialist Republic (now Georgia), on 3 January 1959. He was accepted for cosmonaut training in 1997. Prior to selection as a cosmonaut he worked for the S P Korolyov Rocket and Space Corporation Energiya.

Fischer was born on 23 January 1974. He was selected as an astronaut in 2009 (NASA Group 20). Prior to this he served as a fighter-pilot and test-pilot for the United States Air Force (USAF). Flying the McDonnell-Douglas F-15E Strike Eagle he has flown combat missions in support of the United States wars against Afghanistan and Iraq. He has yet to fly in space. Based upon current assignments he will be the fifth of his class of nine to fly in space.

Virgin Galactic Hires New Pilots

During the second half of 2015, Virgin Galactic announced the hiring of two new space pilots to fly the SpaceShipTwo and WhiteKnightTwo commercial space programme vehicles as part of the company's commercial flight team. On 26 August 2015 they named former Italian Air Force pilot Nicola Pecile and on 9 November 2015 former USAF pilot Kelly Latimer. Latimer is Galactic's first female pilot.

Virgin Galactic's Senior Vice President of Operations, Mike Moses, has spoken about both appointments. "Nicola is a great representative of the cutting edge aerospace development that exists in Mojave and the Antelope Valley. His extensive experience with high performance vehicles, excellent engineering skills, and career as a test pilot instructor, in addition to his teamwork abilities and passion for our mission, make him a natural fit for Virgin Galactic. Virgin Galactic continues to grow and attract top talent like Nicola, and we couldn't be more proud of our distinguished pilot corps."

On Latimer he said, "Our pilot corps, led by Chief Pilot Dave Mackay, is an integral part of Virgin Galactic's talented commercial operations team, and Kelly's impressive leadership in operations and experience with heavy aircraft and as a test pilot make her well-suited for our upcoming return to flight. We look forward to Kelly's contributions in what is sure to be a busy and exciting year ahead."

Nicola Pecile (Lieutenant Colonel, Italian Air Force, Ret.) was born in Udine, Italy. He attended the Italian Air Force Academy from 1992 to 1996 and received a bachelor degree in Aeronautical Science. He graduated with First Class Honours and finished second in his class of 48. Fifteen years later, in 2011, he received a master degree in Astronautics Engineering (Space Missions) from the Sapienza University of Rome.

During his time at the Air Force Academy he learned to fly the propeller-driven SIAI-Marchetti SF.260 military trainer aircraft. From this small start he went on to log over 5,300 flight hours in 132 types of aircraft. These include gliders, general aviation aircraft, multi-engine non centreline thrust aircraft, military jet trainers, tactical high performance fighters, and helicopters. Amongst the aircraft he flew were the Northrop T-38A 'Talon' jet trainer, the Aermacchi MB-339A single-engine jet military trainer/light attack aircraft and the Panavia Tornado (Air Defence Variant) twin-engine jet interceptor.

He attended Sheppard Air Force Base (AFB) in Texas where he took the Euro-NATO Joint Jet Pilot Training course and graduated as top of his class. Further training followed at the Italian flight school at Lecce-Galatina AFB and at Royal Air Force Coningsby where he trained on the Panavia Tornado. He served as an operational fighter-pilot in the Italian Air Force from 1999 to 2001 flying the Panavia Tornado before attending the French Test Pilot School, Ecole du Personnel Navigant d'Essai et Réception (EPNER) from where he again graduated as top of his class in 2003.

Since then he has had a long career in test flying, initially for the Italian Air Force (2003-2011) followed by work as a civilian test pilot at the National Test Pilot School (NTPS - 2011-2015). The NTPS is located at the Mojave Air & Space Port in California and is a civilian test pilot school. He had retired from the Italian Air Force in 2011. He is a United States Green Card holder which means he is authorised to live and work in the United States on a permanent basis.

He is an Associate Fellow of the Society of Experimental Test Pilots (SETP) and currently serves as Treasurer of the SETP Board of Directors. He is also a space fan. He said "Since a young age, I have been very passionate about aviation in general and spaceflight in particular." He is a member of the American Institute of Aeronautics and Astronautics, The Planetary Society, and the National Space Society. His comment on the Apollo Moon project was, "Probably, the greatest achievement of all times. When are we going back?"

On being hired by Virgin Galactic he said, "Virgin Galactic is transforming the overall concept of accessing space, by enhancing space flight capabilities and operations and by projecting humanity to become a truly spacefaring civilization. I am really honoured to be selected as a pilot to join this amazing group of talented people at Virgin Galactic, and I cannot wait to provide my contribution to this revolutionizing programme!" He officially joined Virgin Galactic in September 2015.

Kelly Jane Latimer (Lieutenant Colonel, USAF, Ret.) is, like Pecile, a space fan, "I have wanted to go to space ever since I can remember doing anything," she said. She has several links to NASA including during her time at graduate school and later in making several applications to join their astronaut corps whilst serving in the USAF. She has also worked for the agency as a test pilot during and subsequent to her time in the air force.

She attended the USAF Academy at Colorado Springs (1982-1987) from where she graduated with a bachelor degree in Astronautical Engineering (with honours and distinction). She then continued her education at George Washington University, Washington DC (1987-1988), and obtained a master degree in Astronautics. Whilst at George Washington she worked with the Joint Institute for the Advancement of Flight Sciences at NASA's Langley Research Center.

She received her commission from the USAF Academy in 1987 and later attended Reese AFB, Lubbock, Texas, for her initial pilot training. She qualified in 1990 and remained at Reese as a T-38 instructor pilot. Her next posting was to McChord AFB, Tacoma, Washington (1993-1996), where she flew as an aircraft-commander on the Lockheed C-141 Starlifter, a military strategic airlifter, as part of the 62nd Airlift Wing.

In 1996 she applied for and was accepted to attend the USAF Test Pilot School at Edwards AFB, California. Following graduation in 1997 she was assigned to the base as a test pilot where she flew Boeing C-17 Globemaster III transport aircraft and the C-141 which she was already familiar with. In 2000, she was appointed Chief of the Performance Branch and a T-38 instructor pilot at the test pilot school.

In 2002, she reported back to McChord AFB to re-join the 62nd Airlift Wing where she was the Operations Officer and an aircraft-commander flying the C-17 for the 62nd Operations Support Squadron. In 2004 she was named commander of the 418th Flight Test Squadron based at Edwards. She was also the Director of the Global Reach Combined Test Force where she led more than 650 military, civilian and contractor personnel on developmental and operational testing of airlift and special operations systems.

From 1997 to 2004 she made three attempts to join NASA's astronaut corps. In 1997, she was one of 125 candidates submitted to NASA by the USAF for astronaut selection but was not called for interview prior to final selection in 1998 (NASA Group 17). She got as far as the NASA astronaut selection board on both her next attempts but was not part of the final groups when they were named in 2000 and 2004 (groups 18 and 19).

In 2005, she took part in a NASA study to reduce aircraft noise flying an USAF C-17 on various landing approaches to the Edwards' runway. The noise footprint was recorded by a team of California Polytechnic State University students and Northrop Grumman personnel.

In 2006, she was deployed to Iraq as a senior advisor to the Iraqi Air Force. She was attached to Number 70 Squadron IqAF based at Basrah Air Station. The squadron is one of two reconnaissance squadrons of the new Iraqi Air Force. At the time the squadron flew two types of aircraft, the Seabird SB7L-360 Seeker 2 and the Aircraft Manufacturing and Design, Sama CH2000. She often found herself behind the controls of these aircraft flying over 90 sorties.

Her last active duty tour was as an instructor at the USAF Test Pilot School. She retired from active military duty in 2007 and in March of that year joined NASA as a research pilot at the Dryden (renamed Armstrong in 2014) Flight Research Center. Although a civilian research establishment it is located inside Edwards AFB. She was Dryden's first female research test pilot.

Although she was only with NASA for a short period she flew a number of aircraft including the highly modified Boeing 747 jet airliner known as the 747SP Stratospheric Observatory for Infrared Astronomy (SOFIA) aircraft and another modified 747 used to ferry Space Shuttles called the Shuttle Carrier Aircraft (SCA). She flew the SCA as a training aide for the SOFIA missions and did not actually fly the aircraft on an orbiter ferry flight. Amongst other aircraft flown were the Beechcraft T-34 Mentor single-prop-driven trainer aircraft, the Beechcraft B-200 Super King Air twin-prop-driven aircraft, the T-38 and the C-17.

She left NASA in November 2007 and joined The Boeing Company at a civilian test pilot; although her flight testing involved some military projects, such as the developmental flight testing of the Boeing KC-46 Pegasus military aerial refuelling and tanker aircraft which Boeing had developed from its 747 jet airliner. She flew the first test flights of this aircraft. She was also Boeing's Chief Test Pilot for the C-17.

On being hired by Virgin Galactic she said, "Flying is the tip of the iceberg: some the most meaningful work for me will be joining Virgin Galactic's team with their incredible experience and organization to complete the vehicles' design and test and setting up operations before the first flight. I'm thrilled that my test pilot experience has led me to Virgin Galactic and look forward to making access to space for everybody a reality."

She brings to Virgin Galactic a massive amount of flight experience. She has logged more than 6,000 flight hours, including more than 1,000 hours in test flying, in over 30 military and civilian aircraft. From heavy transport aircraft, through jet-fighters, to light-aircraft, she has flown many kinds of air vehicles. She is type rated to fly the 7 range of Boeing's commercial airplanes including the B737, B757, B767 and B787.

Astronaut Drain Continues Apace – part three

As 2015 ends, we can look back on a year when several astronauts transitioned from active status into management roles (see last issue) and others made their final goodbyes from NASA. Over the last two CapCom's I have discussed the departures of Nicole Stott and Tony Antonelli. This time out we look at Stephen Frick, Mike Foreman and Steve Swanson.

Stephen Nathaniel Frick (Captain, USN, Ret.) is a veteran of two Space Shuttle missions. After ten years in the navy he joined NASA's astronaut programme. Following his retirement from NASA he has joined Lockheed Martin Space Systems Company in Palo Alto, California, as Advanced Technology Center Director of Operations.

He was born on 30 September 1964 in Pittsburgh, Pennsylvania. He graduated from Richland High School (now Pine-Richland) in 1982. He was always intrigued by the idea of flying off aircraft-carriers and this interest led him down the road of applying to attend the United States Naval Academy at Annapolis. He was accepted and was a student from 1982 to 1986. He graduated with a bachelor degree in Aerospace Engineering.

He received his commission on graduation from the Naval Academy and this was followed by his initial pilot training leading to the designation as a Naval Aviator in February 1988. He was assigned to Strike Fighter Squadron (VFA) 106 at Naval Air Station (NAS), Cecil Field, for training on the McDonnell Douglas F/A-18 Hornet twin-engine supersonic, all-weather carrier-capable multirole combat jet.

His operational career started with VFA-83 but this did not require a change in station as he was still based at Cecil Field. During his time with VFA-83 he deployed to the Middle East on the aircraft-carrier USS Saratoga where he took part in Operation Desert Storm during the first US-Iraq War (1990-1991). He flew 26 combat missions off the USS Saratoga, stationed in the Red Sea, against targets in Iraq and Kuwait. He completed his assignment with VFA-83 in December 1991.

He entered a joint programme involving the United States Naval Postgraduate School in Monterey, California, and the United States Naval Test Pilot School at Patuxent River (commonly referred to as Pax or Pax River), Maryland (1992-1994). He spent 15 months on postgraduate studies and 12 months at the test pilot school. On graduation in June 1994, he received a master's degree in Aeronautical Engineering and qualified as a test pilot.

He stayed at Pax, working as a test pilot on the F/A-18 for the Strike Aircraft Test Squadron. He flew the aircraft on shore-based and shipboard test flights collecting data and ascertaining suitability for carrier-deployment. In May 1995, NASA opened a new astronaut recruitment campaign. He applied through the United States Navy (USN). They approved and forwarded his application to NASA. He was called for interview and examination in early 1996.

He had been posted to VFA-125 at NAS Lemoore to prepare for a return to a deployed F/A-18 squadron when on 1 May 1996 NASA announced his selection as part of their 16th class of astronauts. He said of his selection, "I've kind of headed down the path that makes it possible that I could try to do this astronaut thing. I had the basic requirements, so I put in an application and basically just got lucky. There are a tremendous number of pilots out there that are as qualified, or more qualified than me. I just had a little luck of the draw opportunity and was able to get in." It was actually his second attempt to become a NASA astronaut as he had previously tried to get in the exclusive club that is NASA's Astronaut Corps..

After basic training he was assigned technical duties in the Astronaut Office whilst awaiting a flight assignment. On 11 April 2001, NASA announced that he had been assigned as the pilot for STS-110, targeted for launch early in 2002. He actually had some difficulty in accepting the offer for his first flight. The problem was that he was holidaying in what, based on the story must have been some backwater country. I will let Captain Frick take up the telling of the tale. He was with his wife Jennifer.

"She had just finished her Ph.D. and we were celebrating with a tour around some of the cathedrals in that area," explained Frick. "We came back to our bed and breakfast that night and found a note on the door from Charlie Precourt, the head of the Astronaut Office, that had asked me if I was interested in flying as a pilot on STS-110. So the most difficult part was trying to find a phone so I could call back and say, yes, I was interested in that." I did not realise that even in that far distant past that it was that difficult to find a phone in England.

A first attempt to launch STS-110 on 2 April 2002 was scrubbed due to a leak in a liquid hydrogen vent line of the Mobile Launcher Platform. There was a late hic-cup in the countdown for the next launch attempt on 8 April 2002. An unscheduled hold at the 5-minute mark occurred due to data dropouts in a backup Launch Processing System. The Launch Processing System team reloaded the data and the countdown resumed. It was a close run thing as liftoff occurred with only 11 seconds remaining in the launch window.

The main mission objective of STS-110 Atlantis (8-19 April 2002) was the installation of the S-Zero truss, which was successfully completed over four spacewalks. The truss was to serve as a platform on which other trusses were attached along with additional solar arrays mounted to form a 356-foot-long space station. The mission was also notable for the first manoeuvring of spacewalkers using the ISS robotic arm and the first mission on which all spacewalks were based out of the station's Quest Airlock.

He served as liaison to NASA HQ for return-to-flight activities after the Columbia accident of 1 February 2003. He was also the lead CapCom for the STS-114 return to flight mission in July/August 2005. He was Chief of the Safety Branch for the Astronaut Office for about one year over 2005/2006.

On 20 July 2006, NASA announced that he had been assigned to command STS-122 on its mission to deliver ESA's Columbus module to the ISS. No target date was given, nor which orbiter was to be used. However, the mission was originally to be flown by the orbiter Discovery. But that would change. On 15 April 2007, NASA released the news that it was targeted for no earlier than 6 December 2007 and that the shuttle Atlantis would be used.

NASA did try to get STS-122 off the ground on 6 December 2007 but engine cutoff sensor reading errors caused the launch to be postponed. A second attempt three days later was called off for the same problem. An electrical connector was found to be at fault and was repaired. There would be a 60 day delay but it was a case of 'third time lucky'.

STS-122 Atlantis (February 7-20, 2008) delivered Columbus as planned. The shuttle and ISS crews including ESA astronauts Leopold Eyharts and Hans Schlegel worked together on the installation of the module. ESA named their science laboratory after the European explorer Christopher Columbus. As well as the Columbus delivery the flight also swapped out ISS crew members with Eyharts exchanging places with NASA astronaut Daniel Tani who would complete a near 120-day spaceflight on landing, prompting Frick to comment "Dan was doing great. He looked better than I did. Really!"

Frick was Chief of the Astronaut Office Exploration Branch from July 2010 to October 2011. He retired from the USN in September 2010 and stood down as an active astronaut in October 2011. He was assigned to the Naval Postgraduate School from October 2011, initially as a NASA Visiting Professor in the Mechanical and Aerospace Engineering Department and then from June 2013 as NASA Chair Professor, Space Systems Academic Group.

On 27 July 2015, NASA released the news that he had retired from the agency. His official last day was 13 July 2015. "Steve has been a great asset to the Astronaut Office and NASA, and we are sad to see him leave," said Chris Cassidy, Chief of the Astronaut Office. "We wish him continued success as he transitions to a new career." In the press release it was noted that he had accumulated more than 4,300 flight hours in 38 different kinds of aircraft and completed 370 carrier-arrested landings.

Prior to his STS-122 flight he was asked why is it worth taking the risk of flying in Space. "I think if you asked every person that flies in space, they would say it's absolutely worth it," he answered. "Because it's the human race exploring beyond their current bounds, and whether it's, folks hundreds of years ago crossing the oceans or a hundred years or so ago going to the Arctic or the Antarctic, places which were completely unknown at the time, didn't know what they were getting into, and frankly took terrible losses in those exploratory missions and travels. I think it's the same in space. It's a place we have to go. We have to keep going farther, and until you get a human some place I don't think we really feel like the human race has reached out that far.

Michael James Foreman (Captain, USN, Ret.) is, like Frick, also a veteran of two Space Shuttle missions. Another navy man, his academic background and career has many similarities with Frick. Following his retirement from NASA he joined the Houston based Venturi Outcomes, LLC (limited liability company), a construction project management consulting company started and run by his wife, Lorrie, in 2009. She is the Chief Executive Officer and he is the Chief Financial Officer and Vice-President for Business Development.

He was born on 29 March 1957 in Columbus, Ohio, but considers his home town to be Wadsworth, also in Ohio, where he grew up. He was about five when he became interested in flying. His father had an airplane and used to take him up in the air. This sparked an interest in flying to which spaceflight would shortly be added. These interests had a part to play in his academic and career choices. He noticed that a lot of astronauts were navy pilots and this together with his father having served in that branch of the armed forces led him down that path.

Following graduation from Wadsworth High School in 1975 he joined the United States Naval Academy. He graduated four years later with a bachelor degree in Aerospace Engineering. On graduation he received a commission and this was followed by pilot training at NAS Pensacola and NAS Corpus Christi. He was designated a Naval Aviator in January 1981. He was then assigned to Patrol Squadron (VP) 23 at NAS Brunswick; where he flew the Lockheed P-3 Orion four-engine turboprop maritime patrol aircraft and made several overseas deployments.

He enrolled at the United States Naval Postgraduate School in 1984 where as a student he made his first link with NASA when he conducted thesis research at the agency's Ames Research Center at Moffet Field in California. In 1986, he graduated with distinction receiving a master degree in Aeronautical Engineering. He was next posted as Assistant Air Operations Officer and pilot on the aircraft-carrier USS Coral Sea. He flew the Northrop Grumman E-2 Hawkeye airborne early warning aircraft for Carrier Airborne Early Warning Squadron (VAW) 120 and VAW-127.

He was accepted into the United States Naval Test Pilot School at Pax and enrolled in July 1989. He graduated in June 1990 and was assigned to the Force Warfare Aircraft Test Directorate (based at Pax), initially as the Lockheed P-7 four-engine turboprop maritime patrol aircraft Project Officer. This assignment did not last for long. The P-7 was the proposed replacement for the P-3 but the USN cancelled the project due to cost overruns and design problems.

In 1991, he was reassigned as a Flight Instructor and the Operations Officer at the test pilot school. As an instructor he worked with a number of aircraft including jet fighters, large aircraft and gliders. In 1993, he was posted to the Naval Air Systems Command in Crystal City, Virginia, first as the Deputy and then as the Chief Engineer for the McDonnell Douglas T-45 Goshawk trainer jet-aircraft programme.

Next he returned to Pax as the Military Director for the Research and Engineering Group of the Naval Air Warfare Center Aircraft Division. In addition to his duties at Pax, he was assigned as the Navy liaison to NASA's JSC. He was working as the Technical Lead for the Advanced Orbiter Cockpit Project team at JSC when he was selected as an astronaut in 1998.

He had previously applied to join NASA's astronaut corps. In fact he made a total of eight attempts. He was certainly following the old adage of 'if at first you don't succeed…', "If you fail at something that many times, it starts to hurt a little bit," he once told elementary school students during an outreach event. Then he added, "Once I was in space, I forgot all about those rejections." He had wanted to be an astronaut since the age of about eight or nine when he watched the Gemini missions on television and read about them in newspapers.

It was on his seventh try that he finally got close to his goal. In May 1995, NASA opened a recruitment campaign for its sixteenth class of astronauts. He applied through the normal route of his home service, the USN. They approved and forwarded his application to NASA. He was called for interview and examination in December 1995 but was not one of those selected in 1996.

The next recruitment commenced in 1997. Again he was approved by the USN and again NASA called him for interview and examination. On 4 June 1998, when NASA announced their seventeenth group of astronauts, he had made it. He later commented that, "I don't think I've ever been that excited."

Following ascan training he was assigned technical duties for the Astronaut Office. His first assignment was representing the Astronaut Office on training issues in the Space Station Branch. For about 18 months he was an ascan supervisor for the astronaut class that followed his own. In 2002, he was assigned as liaison between the JSC and the Kennedy Space Center for the Astronaut Office Space Shuttle Branch.

On 12 December 2002, NASA announced the crew for STS-120, then scheduled for launch in February 2004. The mission was to deliver the United States Node Two, marking completion of the United States core assembly of the ISS. Foreman was named as a mission specialist (MS). Alas, the loss of the Columbia orbiter on its return to Earth on 1 February 2003 led to a suspension of all Space Shuttle flights.

It was not until July 2005 that shuttle flights resumed and almost a further year before an announcement of crew members for STS-120 was made. This was on 19 June 2006. It was all change except for one exception. Foreman was still one of the mission specialists for the mission. However, in January 2007, NASA slightly shuffled crew members for upcoming shuttle flights. He was reassigned to STS-123, targeted for launch in December 2007. There would of course be some delay as was quite normal for shuttle missions. This time, it was partially due to damage on the External Tank of STS-117 during a hail storm on 26 February 2007. This delayed the STS-117 mission and had a knock-on effect for those that were due to follow.

STS-123 Endeavour (11-26 March 2008), delivered the first component of JAXA's Kibo Laboratory and the final element of the ISS's Mobile Servicing System (the Canadian-built Special Purpose Dexterous Manipulator, known as Dextre). Foreman was MS-2 and acted as the flight-engineer on the flight deck during launch and landing. He conducted three spacewalks whilst the shuttle was docked to the space station.

Following STS-123 post-flight duties he did not have long to wait for a further shuttle assignment. On 30 September 2008, NASA confirmed his appointment to the crew of STS-129, due for launch in October 2009. In June 2009, whilst training for this, his second spaceflight, he retired from the Navy.

The shuttle programme is littered with examples of long delays but for STS-129 it was minimal; perhaps somewhat surprising considering the Russian Mini-Research Module 2 was due to arrive at the ISS at almost the same time and two non-ISS related satellite launches were due from Cape Canaveral around the launch window for the shuttle. Despite plenty of opportunity to find causes for delay the shuttle actually got away pretty much as planned.

STS-129 Atlantis (16-29 November 2009), delivered two Express Logistics Carriers containing nearly 30,000 pounds of replacement parts for the space station. Foreman was MS-3 and Lead for the EVA operations. He conducted two of the three spacewalks and was the intra-vehicle crew member for the mission's third. The flight was also notable for being the last time a STS spacecraft returned an ISS crewmember to Earth. Nicole Stott had returned home following a three month spaceflight.

From June 2010 to May 2011, Foreman was Chief of External Programs at NASA's Glenn Research Center, which is located in his home state of Ohio. He oversaw both Community and Media Relations, and Educational Programs offices. "I am happy that Mike agreed to join the staff of Glenn Research Center," said Glenn Director Ramon 'Ray' Lugo. "Having a veteran of spaceflight, who happens to be a native of Ohio, will help us inspire the next generation of space explorers here in Northeast Ohio."

He was then assigned to the Exploration Branch of the Astronaut Office where he worked on the Commercial Crew Development Program. From 2012, until his departure from NASA, he served as Safety Branch Chief in the Astronaut Office.

With his experience in EVA operations he should certainly know what he is talking about when it comes to spacewalking problems. In an interview he gave shortly before he left NASA he answered that often wondered question as to what an astronaut does when his nose itches and he has his helmet on, "You know for a fact your nose doesn't itch until they put that helmet on you and then two seconds later of course your nose starts to itch and you're looking for a place to scratch it," he said. He explained that the valsalva device used to block the nose to help equalize the pressure in an astronaut's ears has a more than useful secondary role as a nose scratcher.

On 30 July 2015, NASA released the news that he had retired from the agency. His official last day was 31 July 2015. "Mike is a great American who has served our nation for 35 years," said Chris Cassidy. "We have been lucky to have him as part of our NASA team, and wish him and his family the best." In the press release it was noted that he had accumulated more than 7,000 flight hours in 50 different kinds of aircraft.

Steven Ray 'Swanny' Swanson (Ph., D.) completed three spaceflights during his tenure as a NASA astronaut. He has flown on the US Space Shuttle and the Russian Soyuz. He has served a tour on the ISS and spent over six-months in Earth orbit. He left NASA to join academia at Boise State University in Boise, Idaho, as a distinguished educator in residence.

He was born on 3 December 1960 in Syracuse, New York but considers his home town to be Steamboat Springs, Colorado. He graduated from Steamboat Springs High School in 1979 and then attended the University of Colorado from where he received a bachelor degree in 1983. He continued his education at Florida Atlantic University in Boca Raton and in 1986 picked up his master degree in Computer Systems from there.

Unlike many astronauts he did not have ambitions to be one from childhood. It was not until his mid-20's that he looked to the future and considered what his long-term career aims should be. He wanted something that challenged him in all aspects, including mentally, physically, and with an aspect of adventure to it. He would later say that 'astronaut' just popped into his head and that is what he then worked towards.

He started applying to NASA for employment. At first he had no luck so after graduate school he spent about a year working in the telecommunications industry as a software engineer for GTE in Phoenix, Arizona. Then he was offered a job at NASA. In 1987 he joined them as an engineer working on the highly modified Grumman Gulfstream-II Shuttle Training Aircraft (STA) in the Aircraft Operations Division of the JSC.

The STA is a complex airborne shuttle simulator, which mimics the cockpit configuration and flight characteristics of the Space Shuttle from 35,000 feet to main gear touchdown. During his time with the STA, he worked to improve its navigation and control systems, and incorporate a real-time wind determination algorithm.

He took a year out from NASA to attend Texas A&M University in College Station to work on coursework for his doctorate. He then returned to the Aircraft Operations Division and whilst there produced his dissertation. He received his doctorate in Computer Science from Texas A&M in 1998 shortly before his selection as an astronaut.

He was a semi-finalist for the 1996 class of astronauts having attended for examination and interview that January. He was selected as part of the next class, the seventeenth, in 1998. He underwent basic training and qualified as a MS. He was assigned to the Astronaut Office Robotics Branch and also served as a CapCom.

On 9 February 2005, NASA announced the crew for STS-117 then due to fly the following year. Swanson was named as a MS. By March of 2006, the mission was delayed into January 2007. It got pushed back into March 2007 and then the hail storm on 26 February 2007 that damaged STS-117's External Tank caused further delays. Eventually, the flight took place in June 2007.

STS-117 Atlantis (8-22 June 2007) delivered the second starboard truss segment; the third set of the United States solar arrays, batteries and associated equipment. Swanson was MS-2 and acted as the flight-engineer on the flight deck during launch and landing. He was also part of the EVA team conducting two spacewalks on construction tasks.

He did not have to wait long to receive a further flight assignment. On 19 October 2007, NASA announced his assignment to the crew of STS-119, then targeted for launch in the autumn of 2008. There were the usual shuttle delays so the mission did not occur until March the following year.

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 again part of the EVA team and was the Lead EVA operative. He made two further spacewalks in connection with space station construction work. For the second time he was MS-2 with the usual flight-engineer duties on the flight deck during ascent and re-entry.

In April 2011, Swanson himself revealed that he was due to start training that summer for a six-month mission to the ISS but it was not until January 2013 that NASA released confirmation that the assignment was for ISS-39/40 (this information had already come out of Russia in July 2011). As part of his duties for this assignment he trained as a back-up for ISS-37/38 that launched on Soyuz TMA-10M on 26 September 2013. He was then able to commence full time preparations for his own long-duration spaceflight.

His third spaceflight took place as Soyuz TMA-12M/ISS-39/40 (26 March – 11 September 2014). At 03:17 local Kazakh time on 26 March 2014 (01:17 Moscow Time) Soyuz TMA-12M lifted off from the Baikonur Cosmodrome in Kazakhstan. Swanson was a flight engineer for the Soyuz. The Soyuz was supposed to use the recently introduced six-hour fast rendezvous flight profile to the ISS but a rendezvous burn failed to take place as planned.

Later analysis showed that the problem was in part due to an over-performance of the launch vehicle that put the Soyuz at a slightly higher apogee than planned. Although this was within acceptable limits and two successful orbital corrections were made the computer system failed to fully adjust for what was required for the third orbital correction burn. The computer system, recognizing something was wrong, gave an automated 'no-burn' command. The flight reverted to the two-day rendezvous model and there were no further difficulties. Docking occurred on 28 March 2014.

On arrival at the ISS Swanson took up the position as one of its flight engineers but on 12 May 2014, JAXA astronaut and ISS commander Koichi Wakata handed over command to Swanson. He in turn would hand over command of the station to Russian cosmonaut Maxim Surayev on 9 September 2014 just prior to returning to Earth. During his stay he had participated in many experiments including Earth remote sensing, and biology, bone and muscle studies.

NASA released the news of his impending departure on 13 August 2015. His last official day as a NASA employee was 30 August 2015. "Steve Swanson, or Swanny as we know him, has contributed so much more to the human space program than just serving on his three missions. His infectious laugh, keen intellect and easy going personality have garnered the respect and friendship of everyone with whom he works. He also will be sorely missed on our Wednesday night basketball team!" said Chris Cassidy.

Astronaut Drain Continues Apace – Or Does It!

Is there change afoot in NASA's Astronaut Office? A year ago I wrote "To be listed as a Management Astronaut by NASA is generally viewed today as a position held by astronauts who will not fly in space again. At one time it might have just indicated an astronaut who was on a temporary assignment and not at that point eligible for flight assignments. However, in the last few years it has signaled a permanency to the status."

Perhaps, this is no longer the case as indicated by the return to active status of three-time shuttle veteran Stephanie Wilson. There was no fanfare. The change in her status was seen by a United States space enthusiast in late October 2015 whilst looking at the NASA astronaut biographies pages on the internet and then reporting this on the Collect Space message board.

Following this message, Michael Cassutt (one of the better informed space authors around) commented on Collect Space that "policies change with new chief astronauts". In July 2015, Chris Cassidy had taken that role from Bob Behnken who had been assigned as a NASA nominee for the first test flights of the new commercial crew vehicles. The previous Chief Astronaut, Peggy Whitson who was in charge from October 2009 to July 2012, had introduced the policy in autumn 2010 whereby once an astronaut had moved to management status they were permanently inactive. Behnken did not change this during his tenure in charge.

What is not clear was the reason for the latest change (presuming this is not a one-off exception to the rule). A number of theories have been espoused for Whitson's original policy including whether this was some personal preference of the Chief Astronaut, or for more logistical reasons such as the lack of different types of flight opportunities with the ending of Space Shuttle flights and therefore active astronauts had to be qualified or qualifiable to fly an ISS increment. In the opinion of this writer there were probably a number of reasons behind the change (the cynic, or should that be realist, in me suspects budgets had some part to play).

The latest move might be a new personal preference of the Chief Astronaut or the impending arrival of new crew vehicles opening up different crew requirements. Perhaps it was never intended as a hard and fast rule. Regardless of everything it is presumed that Stephanie Wilson is now awaiting a flight assignment although any mission is certainly several years away.

She was born on 27 September 1966 in Boston, Massachusetts and has degrees in Engineering Science and Aerospace Engineering. She worked for Martin Marietta and the Jet Propulsion Laboratory before becoming an astronaut. Selected as an astronaut in 1996 (NASA Group 16), she went on to fly as a MS on STS-121 (2006), STS-120 (2007) and STS-131 (2010).

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.

Donald Thomas: 25 and 27 February 2016, courtesy of InspireSPACE at events in London (British Interplanetary Society headquarters) and Leicester (National Space Centre).

Eugene Cernan: 8–9 April 2016 with Space Lectures events in Pontefract.

To be named: 7-8 October 2016 with Space Lectures events in Pontefract - they have said there will be two astronauts attending.

InspireSPACE is based in our own 'backyard' and is also a venture run by Midlands Spaceflight Society member Nick Deakin. See the website for more details http://www.astronautevent.co.uk/

For the October 2016 Space Lectures event the clues from them are that neither are Apollo astronauts but both are very high profile. One person on the Collect Space message board has assumed that means Space Shuttle or ISS astronauts but I think the clues refer to the main Apollo Programme i.e. Apollo 7 to 17. There are no Gemini astronauts who fit the bill but there are several Skylab astronauts who might be considered.

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/ On 19 February 2016, it is expected that the second SpaceShipTwo spacecraft will be rolled out of its hanger at the Mojave Air and Space Port in California. The individual name of the spacecraft will also be announced. For a number of years it had been incorrectly thought the name was 'VSS Voyager' but current rumours suggest 'VSS Unity'.

2/ Recently retired NASA astronaut Nicole Stott has a website. It looks very good and includes examples of her work as an artist, astronaut stuff, and links to other sites of interest - **http://nicolepstott.wix.com/nps-discovery** There is a welcome message from her on the Home Page, "Thank you so much for joining me here! I'm excited about this site and the opportunity to share my artwork and spaceflight experience with you. And I'm really happy to be able to take you along

with me on this next journey of Discovery. Please let me know if you have any ideas for how I can improve this site. Thank you! Nicole"

3/ Whilst on the subject of ex-astronauts and new websites, Leroy Chiao also has one - **http://www.oneorbitcdr.com/** This is more for consultancy or business purposes related to motivational programmes for corporate organisations (also includes programmes related to school children) than a site for space hobbyists. He also has another website - **http://www.leroychiao.com/** which is of more interest to space hobbyists.

4/ The S P Korolyov Rocket and Space Corporation Energiya are developing a new-generation Russian crew transportation spacecraft. A public consultation was launched in August 2015 to help find a name. There were 5817 names proposed. A competition committee selected 10 and put these to a public vote in December 2015. The runaway winner was Gagarin but it is the competition committee that will make the final decision.

UPCOMING IN THE NEXT ISSUE OF ASTRONAUT NEWS

No prizes for guessing that that there will be more ISS crewing news. Also some information on new astronaut selections and an interesting space related job for an astronaut. Having gone AWOL from this issue, '**Ex-Astronaut Movements in the Private and Public Sector Areas' looks like returning to duty and then some.**

Acknowledgements and sources:

Astronaut.ru; CapCom (previous issues); Collect Space; C-Span; Edwards AFB; ESA; Google; Headline and Global News; Janes.com; The Independent on Sunday; JAXA; Linkedin; Manned Spaceflight Log II 2006-2012 ©2013 by David J Shayler and Michael D Shayler; Manta.com; NASA and its various centres; NASA Astronaut Selections ©2003 AIS Publications; NASASpaceflight.com; Novosti Kosmonavtika; Parabolic Arc; Praxis Manned Spaceflight Log 1961-2006 ©2007 by Tim Furniss and David J Shayler with Michael D Shayler; Royal Air Force; RussianSpaceWeb.com; Scramble ((Dutch Aviation Society; Spacefacts; Spaceflight Insider; Space Lectures; S P Korolyov Rocket-Space Corporation Energiya; United States Naval Academy; United States Navy; Venturi Outcomes; Vindy.com; Virgin Galactic; VP-23 Association; Washington Post; Who's Who in Space ©1999 by Michael Cassutt; Wikipedia; You Tube.

NASA Selects Sierra Nevada Corporation's Dream Chaser® Spacecraft for Commercial Resupply Services 2 Contract

On 14 January 2016, NASA competitively selected Sierra Nevada Corporation's (SNC) Space Systems to receive a multi-year contract to provide cargo delivery, return and disposal services for the International Space Station (ISS). SNC received a Commercial Resupply Services 2 (CRS2) contract, to fulfil a minimum of six cargo delivery service missions to and from the ISS utilising SNC's Dream Chaser Cargo System. NASA's selection of SNC for the CRS2 program will enable spacecraft reusability and runway landings for United States' cargo delivery and access to the ISS through 2024.

"SNC is honoured to be selected by NASA for this critical U.S. program," said Eren Ozmen, chairwoman of Sierra Nevada Corporation. "In such a major competition, we are truly humbled by the show of confidence in SNC and look forward to successfully demonstrating the extensive capabilities of the Dream Chaser spacecraft to the world. SNC's receipt of this award is an American Dream come true for all of us. We thank NASA, the Administration and Congress for recognising the importance of this vital program by supporting the CRS2 contract."

SNC is the owner and prime operator of the reusable Dream Chaser spacecraft, which has been in development for over 10 years, including six years as part of NASA's Commercial Crew Program and leverages over 40 years of NASA development and space shuttle heritage.

"The Dream Chaser Cargo System offers NASA a safe, reliable and affordable solution for ISS cargo delivery, return and disposal, ensuring the effective utilisation and sustainability of the ISS for years to come," said Mark N. Sirangelo, corporate vice president of SNC's Space Systems. "Within a few short years, the world will once again see a United States winged vehicle launch and return from space to a runway landing. We wanted to thank our more than 30 industry, university, international and NASA center partners for helping us make history and open up the next generation of spaceflight."

SNC's Dream Chaser Cargo System features include:

An innovative folding-wing design which allows the Dream Chaser spacecraft to fit inside existing launch vehicle fairings, making it compatible with a diverse suite of rockets and assuring access to space;

The ability to simultaneously deliver 5,500 kg of pressurised and unpressurised cargo to the ISS, which exceeds NASA's CRS2 RFP requirements;

High reusability that reduces costs and enables quick reflight. Responsive pressurised cargo return capability – ensuring scientific experiments are promptly returned to the researchers as intended and without contamination;

Low-g reentry and gentle runway landing – critical for the return of sensitive payloads, scientific experiments and immediate access to cargo;

All non-toxic propellants and consumables, making the Dream Chaser spacecraft the first vehicle in history to achieve this level of environmental responsibility

The Dream Chaser program will continue to be based in Louisville, Colorado. SNC expects to significantly expand operations in Colorado and throughout the United States, in conjunction with its international partners, to support contract requirements. The growing employment scope and economic impact of SNC and its partner organizations – the Dream Team – now spans over 25 states and 15 countries and will continue to grow under the CRS2 contract.

Sierra Nevada Corporation
http://www.sncspace.com

The End Of Innocence – STS-51L 30 Years On

Rob Wood

"Lift-off of the 25th Space Shuttle mission and it has cleared the tower," said the NASA public affairs officer. A rather mundane opening to what would be anything but mundane. Just over a minute later there was an explosion. It was T+73 seconds.

Originally, the Space Shuttle was envisaged to be the work horse of the United States space programme. Reusable and flying on a weekly basis, it was supposed to deliver all USA satellites into orbit. It was supposed to provide services to foreign customers. It was supposed to significantly reduce the costs of getting into space. It was supposed to be safe. It was not supposed to kill its crews.

The Space Shuttle on the pad on 28th January 1986 was Challenger. It was the second of the shuttle fleet to be built, on its tenth launch, and it was the favourite of many astronauts. There were seven on this flight. They died when the crew cabin hit the Atlantic Ocean. It would be more than 2½ years before a Space Shuttle next took flight.

A projected list of Space Shuttle missions in Reginald Turnill's 'The Observer's Book of Manned Spaceflight' published in 1978 showed a first launch in 1979 building up to over 50 launches a year from 1986. The first launch however, was not until 1981 when John Young and Robert Crippen took the Columbia Space Shuttle on a two day test flight. Right from the beginning many missions suffered from delays.

The number of missions flown each year crawled up excruciatingly slowly, one by one. There were two in 1981, three in 1982, four in 1983 and five in 1984. Finally in 1985 there was a jump as nine missions took place. Turnill's projected list by the shuttle's fifth year of operations suggested a near weekly launch rate. For 1986, NASA wanted to launch shuttles at a rate greater than one a month but still nowhere near the original plans. It was way too much for the system to stand. Something had to give...

The design of the Space Transportation System, as NASA called it, was based on a compromise of requirements, civilian, military and costs. There were three main components at launch: the orbiter itself; the External Tank (ET) containing liquid hydrogen and liquid oxygen; and two Solid Rocket Boosters (SRB's). This was known as the launch stack. The ET was not reusable.

Morton Thiokol had built the SRBs and some of their engineers were well aware that low temperatures could affect their integrity. Engineers at NASA were also aware of deficiencies in the boosters. They were aware that the O-rings in particular had not worked properly on several shuttle launches. The purpose of the rubber O-rings was to form seals between sections of the SRBs. The astronauts were not apprised of the problem. Some of NASA's management did know. But then, there were the launch rate pressures.

It was not that they were wrong to keep the shuttle flying. The aerospace industry does not ground an aircraft just because of a fault. What they should have done was introduce safer operational constraints whilst a fix was prepared. But then, there were the launch rate pressures.

It was cold on the morning of 28 January 1986; it turned out to be too cold for the O-rings. To put it simply, the cause of the disaster was the failure of the O-ring on the bottom joint on the right side SRB to seal correctly as a consequence of the cold weather. This allowed burning gases to reach the outside impacting on the rest of the launch stack causing it to break up.

Some would argue that the cause of the failure was in NASA Management and the Presidential Commission appointed to investigate the disaster did apportion plenty of blame as to how NASA was run. Astronaut Mike Mullane in his book 'Riding Rockets' puts it succinctly, "Only janitors and cafeteria workers at NASA were blameless in the deaths of the Challenger Seven," whilst discussing the astronauts own part in injecting a launch urgency due to, "our own mad thirst for flight."

During the post-flight investigations it was revealed that there had been problems with the O-rings on fourteen of the twenty-four previous Space Shuttle launches. Or as Mullane put it in his book, "I learned that my rookie flight, STS-41D, had been one of the fourteen O-ring near misses."

The Astronauts

The crew of Challenger were a mixture of full-time and part-time astronauts, and a microcosm of American culture and backgrounds, but it was the inclusion of one part-time astronaut that had peaked press interest. She was a teacher and one of several guest astronauts who were to fly around this time for political and publicity purposes.

Christa McAuliffe was a 37-year-old full-time teacher who was selected from more than 10,000 applicants for NASA's 'Teacher in Space Project'. She had been planning to give two live teaching lessons from space: 'The Ultimate Field Trip' and 'Where We've Been, Where We're Going, Why?' She was classed as a payload specialist.

President Reagan told the American public in his post-disaster address to the nation that more civilians, volunteers and teachers would continue to go into space. Subsequently, NASA concluded that spaceflight was still too dangerous for non-professional astronauts. McAuliffe's back-up was Barbara Morgan and eventually she was selected as a full-time astronaut (1998) and flew on STS-118 in 2007.

The second payload specialist was 41-year-old Greg Jarvis. He was an engineer from the Hughes Aircraft Corporation and was due to look after the Fluid Dynamics Experiment. The aim was to improve the company's understanding of how fluids act in orbiting spacecraft paving the way for more efficient and less costly spacecraft. It was not what he was originally selected to do. He was not even supposed to be on this flight. As an industry payload specialist he was picked to babysit a Hughes satellite that he had helped to build on its deployment mission but problems caused the satellite's launch to be postponed. His place on that mission (STS-61C) was given to a politician and he was moved to STS-51L.

The five full-time astronauts were crew commander Dick Scobee, shuttle pilot Mike Smith and mission specialists Ellison Onizuka, Judy Resnik and Ron McNair. Smith was the only spaceflight rookie of the five and the only one not to have been selected as an astronaut in 1978. The other four had each completed one spaceflight and been part of the first group of astronauts specifically selected to fly the Space Shuttle (NASA Group 8).

Scobee, aged 46, had, in a 20-year career with the United States Air Force, flown twin-engine cargo aircraft on combat missions in Vietnam and qualified as a test pilot before joining NASA's astronaut corps. He was pilot on STS-41C in 1984. He had privately told family and friends that he would not look for another spaceflight after STS-51L.

Smith, aged 40, had been an aircraft-carrier pilot and test pilot for the United States Navy. Like his commander he also completed a combat tour in Vietnam. He was selected as a pilot astronaut in 1980 (NASA Group 9). Before the launch of STS-51L, he knew that he had been assigned as a pilot for another shuttle flight due later in 1986.

Onizuka, aged 39, was an Asian-American born in Hawaii. He served as a flight test engineer with the United States Air Force prior to his selection

Official NASA crew portrait of shuttle mission STS-51L. Back row (L-R): Ellison Onizuka, Christa McAuliffe, Gregory Jarvis, Judith Resnik. Front row (L-R): Michael J. Smith, Francis "Dick" Scobee, Ronald McNair.

as an astronaut. He was a mission specialist on STS-51C in 1985. In the TV series Star Trek: The Next Generation, a small shuttlecraft bearing his name appears in several episodes.

Resnik, aged 36, held a doctorate in Electrical Engineering. She had also trained as a classical pianist. Her parents were Jewish immigrants from the Ukraine and she would later be described as the first Jewish astronaut. It was a title she was not keen on. By the time she was an astronaut she was no longer practising Judaism. She was a mission specialist on STS-41D in 1984 when she became the second US female astronaut in space. As well as her position as a mission specialist for STS-51L she was also the flight engineer.

McNair, aged 35, was an African-American. He held a doctorate in Physics from MIT. He was a mission specialist on STS-41B in 1984 and became the first person to play a saxophone in space. For his second flight he had planned to record an original piece of music on which he had worked with composer Jean Michel Jarre for Jarre's album 'Rendezvous'.

The Explosion

If it looks like an explosion, it probably is an explosion. Apparently though, not in this case. What we thought was an explosion from the TV footage, was large amounts of liquid oxygen and hydrogen vaporizing and burning. When is an explosion not an explosion? In the second edition of his book, 'The All American Boys', Apollo 7 astronaut Walter Cunningham referred to it as, "an explosive burn".

The gasses escaping from the right SRB caused the booster to come loose and strike the ET. The ET was breached and this was followed by massive structural failure of the tank. The launch stack broke up due to aerodynamic and G-forces. Challenger also broke up. However, camera footage suggested that although trailing some wires and tubing, the crew cabin was essentially intact. The cabin fell to the Atlantic Ocean. It hit hard and at over 200mph a lot of evidence was compromised or destroyed.

What was the situation for the crew at break-up of the stack? Analysis later determined that the stress loads of the break up were not sufficient to have incapacitated them. However, if cabin integrity had been compromised to the extent that it had caused explosive depressurisation then the crew would have lost consciousness after a few seconds.

The astronauts were alive at break-up. The evidence is clear on this. Some, if not all were still conscious. Electrical switches had been operated and three personal emergency air packs were switched on. One belonged to Mike Smith but the others could not be identified. What also could not be confirmed from the evidence recovered was whether any of the astronauts were still conscious when the cabin hit the sea. What is not in doubt is that the crew would have died instantly on impact with the water.

Examination of the wreckage did not indicate an explosive depressurisation at the point of break-up but could not rule out a rapid enough loss to have caused a speedy loss of consciousness. The rest is speculation and instinct based on circumstantial evidence. There are astronauts who believe the crew were aware of what was happening right up to impact with the sea. These include Mike Mullane, Story Musgrave and Robert Overmyer. Spaceflight authors seem divided in their opinion.

Considering what Challenger went through on break-up and the lack of solid evidence of actions by the astronauts following the first few seconds it seems likely that the integrity of the crew cabin was compromised and fairly rapid depressurization followed. The astronauts therefore would lose consciousness early on. The use of personal emergency air packs is not evidence of continuing consciousness. They provided breathable oxygen at sea level pressure but which would not have kept them conscious at the altitude they were at break-up without a pressurized cabin. But then again…

Acknowledgements and sources:

The All American Boys ©2003 by Walter Cunningham; Disasters and Accidents in Manned Spaceflight ©2000 by David J Shayler; Jane's Spaceflight Directory ©1988 by Reginald Turnill; NASA; New York Times; The Observer's Book of Manned Spaceflight ©1978 by Reginald Turnill; Riding Rockets ©2006 by Mike Mullane; Spacefacts; Space Shuttle Challenger ©2007 by Ben Evans; The Story of the Space Shuttle ©2004 by David M Harland; United Press International; Who's Who in Space ©1999 by Michael Cassutt; Wikipedia; Jill Wood; You Tube; https://upload.wikimedia.org/wikipedia/commons/3/3f/Challenger_flight_51-l_crew.jpg

British Interplanetary Society West Midlands Event

Saturday 20 February 2016

Start Time: 2:00 pm

End Time: 4:30 pm

Venue: The Gardeners Arms, Vines Lane, Droitwich, Worcs, WR9 8LU

Dave Shayler will be giving a talk on the Hubble Space Telescope and signing copies of his recent books.

Mark Perman will talk about the First German Rocket Research Establishment Kummersdorf and will show pictures of the remaining test facilities.

For updates please visit:
https://www.facebook.com/events/1705556672991497/

Keep up-to-date with branch activities via our Facebook page (you need to be a member of Facebook though):
https://www.facebook.com/groups/569776719819420/

US Astronaut Donald A Thomas

Four time space shuttle Astronaut Don Thomas is the special guest of **astronautevent.co.uk** in February 2016

Two separate opportunities are being arranged including book signing opportunities, autograph signings, photoshoots and lectures and to top it all 'Breakfast with an Astronaut' and 'Lunch with an Astronaut' experiences, watch this SPACE.

Thursday 25th February 2016: Lecture/book signing at the British Interplanetary Society, London

http://www.bis-space.com/2015/12/11/15761/an-evening-with-former-nasa-astronaut-don-thomas.

Saturday 27th February 2016: Whole day of events at the National Space Centre, Leicester.

http://www.spacecentre.co.uk/special-events/astronaut-visit-don-thomas

Astronaut Event
www.astronautevent.co.uk

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Copy Deadline

All copy intended for the **March/ April 2016** issue should be emailed to the editor by
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