



*your window to space*

# **capcom**

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***Space-X  
Falcon 9  
first stage  
successfully  
lands on "Of  
Course I Still  
Love You"  
droneship***

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# space news roundup

## Cover Story

On 8 April 2016, SpaceX successfully launched their Falcon 9 rocket and its Dragon cargo ship to the International Space Station. Whilst the CRS-8 mission, the delivery of Dragon to the ISS was the primary goal of the mission. SpaceX attempted and successfully executed a first stage landing on their drone barge ship "Of Course I Still Love You".

This feat of engineering was then repeated in May when another SpaceX Falcon 9 rocket lit up the night skies over Florida's Space Coast in the early morning hours of 6 May, lifting the JCSat-14 communications satellite to orbit and successfully completing a challenging high-energy return of the rocket's first stage to land on the Drone Ship deployed to the Atlantic Ocean.

## Critical NASA Science Returns to Earth aboard SpaceX Dragon Spacecraft

A SpaceX Dragon cargo spacecraft splashed down in the Pacific Ocean at 19:51 p.m. EDT Wednesday, 11 May, about 261 miles southwest of Long Beach, California, with more than 3,700 pounds of NASA cargo, science and technology demonstration samples from the International Space Station.

The Dragon spacecraft will be taken by ship to Long Beach where some cargo will be removed and returned to NASA, and then be prepared for shipment to SpaceX's test facility in McGregor, Texas, for processing.

A variety of technology and biology studies conducted in the unique microgravity environment of the space station returned aboard the commercial resupply spacecraft, including research in the burgeoning field of nanotechnology. The Microchannel Diffusion study, for example, examined how microparticles interact with each other and their delivery channel in the absence of gravitational forces. In this one-of-a-kind laboratory, researchers were able to observe nanoscale behaviors at slightly larger scales – knowledge which may have implications for advancements in particle filtration, space exploration and drug delivery technologies.

NASA  
<http://www.nasa.gov/spacex>

## NASA Welcomes New Director for its Jet Propulsion Laboratory

The following is a statement from NASA Administrator Charles Bolden on the selection of Michael Watkins as the new director of the agency's Jet Propulsion Laboratory (JPL) in Pasadena, California.

"President Thomas Rosenbaum and his leadership team at the California Institute of Technology (Caltech) have made an outstanding choice in naming Dr. Michael M. Watkins as the new director of JPL. I, for one, cannot wait to work with him to advance our Journey to Mars, along with our understanding of our own planet, our universe, and humanity's place in it.

"Dr. Watkins is no stranger to the NASA family. In more than two decades at JPL, Dr. Watkins played a major role in the Mars Curiosity Rover, Cassini, Mars Odyssey, GRACE, GRAIL, and the GRACE Follow-on missions -- to name just a few. I am confident that he will do an excellent job as he begins a new chapter in the incredible legacy that Caltech and NASA have written together through JPL for generations.

"Dr. Watkins will have some very big shoes to fill in succeeding retiring JPL Director Charles Elachi. When American astronauts reach Mars in the 2030s it will be in large part because of the work that Dr. Elachi and his JPL team have done in tandem with NASA colleagues, collaborators and contractors throughout the nation, and indeed our world."

NASA  
<http://www.nasa.gov>

## James Webb Space Telescope's Golden Mirror Unveiled

NASA engineers recently unveiled the giant golden mirror of NASA's James Webb Space Telescope as part of the integration and testing of the infrared telescope.

MSS On 27 April 2016 engineers unveiled the giant golden mirror of NASA's James Webb Space Telescope as part of the integration and testing of the infrared telescope at NASA's Goddard Space Flight Center, Greenbelt, Maryland.

The 18 mirrors that make up the primary mirror were individually protected with a black covers when they were assembled on the telescope structure. Now, for the first time since the primary mirror was completed, the covers have been lifted.

Standing tall and glimmering gold inside NASA's Goddard Space Flight Center's clean room in Greenbelt, Maryland, this mirror will be the largest yet sent into space. Currently, engineers are busy assembling and testing the other pieces of the telescope.

Scientists from around the world will use this unique observatory to capture images and spectra of not only the first galaxies to appear in the early universe over 13.5 billion years ago, but also the full range of astronomical sources such as star forming nebulae, exoplanets, and even moons and planets within our own Solar System. To ensure the mirror is both strong and light, the team made the mirrors out of beryllium. Each mirror segment is about the size of a coffee table and weighs approximately 20 kilograms (46 pounds). A very fine film of vaporised gold coats each segment to improve the mirror's reflection of infrared light. The fully assembled mirror is larger than any rocket so the two sides of it fold up. Behind each mirror are several motors so that the team can focus the telescope out in space.

The James Webb Space Telescope is the scientific successor to NASA's Hubble Space Telescope. It will be the most powerful space telescope ever built. Webb will study many phases in the history of our universe, including the formation of solar systems capable of supporting life on planets similar to Earth, as well as the evolution of our own solar system. It's targeted to launch from French Guiana aboard an Ariane 5 rocket in 2018. Webb is an international project led by NASA with its partners, ESA (European Space Agency) and the Canadian Space Agency.

NASA  
<http://www.nasa.gov/jwst>

## Second Exomars Mission Moves to next Launch Opportunity in 2020

On 14 March 2016, the Roscosmos State Corporation and the European Space Agency (ESA) launched the jointly-developed ExoMars 2016 interplanetary mission, comprising the Trace Gas Orbiter (TGO) and the Schiaparelli lander, on a Proton rocket from Baikonur, thus marking the first phase in the European-Russian ExoMars cooperation programme.

The success achieved by Russian and European experts involved in ExoMars 2016 is the result of long and fruitful cooperation. The ExoMars 2016 spacecraft are due to arrive at Mars in October 2016.

The second ExoMars mission involves a Russian-led surface platform and a European-led rover, also to be launched on a Proton from Baikonur. Russian and European experts made their best efforts to meet the 2018 launch schedule for the mission, and in late 2015, a dedicated ESA-Roscosmos Tiger Team, also including Russian and European industries, initiated an analysis of all possible solutions to recover schedule delays and accommodate schedule contingencies.

The Tiger Team presented its final report during a meeting of the Joint ExoMars Steering Board (JESB) held in Moscow. Having assessed the possible ways to ensure successful mission implementation, the JESB concluded that, taking into account the delays in European and Russian industrial activities and deliveries of the scientific payload, a launch in 2020 would be the best solution.

ESA Director General Johann-Dietrich Woerner and Roscosmos Director General Igor Komarov discussed the ExoMars 2018 situation. After considering the Tiger Team report and the JESB recommendations, they jointly decided to move the launch to the next available Mars launch window in July 2020, and tasked their project teams to develop, in cooperation with the industrial contactors, a new baseline schedule aiming towards a 2020 launch. Additional measures will also be taken to maintain close control over the activities on both sides up to launch.

The successful implementation of both ExoMars missions will allow Russia and Europe to jointly validate cutting-edge technologies for Mars entry, descent, and landing, for the control of surface assets, to develop new engineering concepts and service systems that can be used by other Solar System exploration missions, and to carry out novel science at Mars.

Both Directors General have reiterated their resolve to implement ExoMars programme successfully and step up Russian-European cooperation in Solar System exploration.

ESA  
<http://www.esa.int>

## New Landing Date For ESA Astronaut Tim Peake

ESA astronaut Tim Peake and his crewmates Yuri Malenchenko and Tim Kopra will return to Earth on 18 June, giving them almost two more weeks more in space than their original mission.

Each International Space Station crew flies as a trio to the outpost and back to Earth in a Soyuz spacecraft. About every three months, a crew returns to Earth shortly before a new one arrives, often leaving a few days when only three astronauts look after the Station.

Tim, Tim and Yuri will stay longer in space because ground control aims to keep the Space Station operating at full capacity with six astronauts.

Tim Peake says: "Although I am looking forward to being back on Earth and seeing friends and family again, each day spent living in space is a huge privilege and there is much work to do on the Station.

"This extension will keep the Station at a full crew of six for several days longer, enabling us to accomplish more scientific research. And, of course, I get to enjoy the beautiful view of planet Earth for a little while longer!"

With three supply vessels recently arrived, the astronauts will be kept busy. Tim Peake released the first Filipino satellite into space from Japan's Kibo laboratory on Wednesday and he operated a rover in Stevenage, UK, as he flew 400 km above Earth today.

Meanwhile, the Station's incubators are experimenting with growing blood vessels in weightlessness from cell cultures that line the interior of human blood vessels.

Tim recently became the second ESA astronaut to use the Mares muscle-measurement unit that charts his fine motor control as well as giving a detailed overview of muscle torque and speed.

Looking at muscle contraction at a specific moment gives little information but Mares provides a full picture of muscle speed and force as an elbow or knee joint bends.

### Excercise

Astronauts must exercise up to two hours a day to keep fit and healthy for their return. Mission control tries to give them a free day on Sunday – but the exercise regime continues.

On Sunday 24 April Tim Peake ran a full marathon on the Station's treadmill at the same time as the London Marathon was being held on Earth. Tim's time was just over three-and-a-half hours, running 42 km while the Station flew almost 100 000 km.

Tim will land in the steppe of Kazakhstan and return straight to the European Astronaut Centre in Cologne, Germany, for checkups and research into how humans adapt to living in space.

European Space Agency (ESA)  
<http://www.esa.int>

## NASA Installs First Expandable Habitat on ISS

The first human-rated expandable structure that may help inform the design of deep space habitats was installed on the International Space Station on Saturday 16 April 16.

The Bigelow Expandable Activity Module (BEAM) was attached to the station's Tranquility module over a period of about four hours. Controllers in mission control at NASA's Johnson Space Center in Houston removed BEAM from the unpressurised trunk of SpaceX's Dragon spacecraft, using the robotic Canadarm2, and moved it into position next to Tranquility's aft assembly port. NASA astronauts aboard the station then secured BEAM using common berthing mechanism controls.

BEAM, developed and built by Bigelow Aerospace under a NASA contract, launched aboard Dragon on 8 April from Cape Canaveral Air Force Station in Florida. At the end of May, the module will be expanded to nearly five times its compressed size of 8 feet in diameter by 7 feet in length to roughly 10 feet in diameter and 13 feet in length.

Astronauts will first enter the habitat about a week after expansion and, during a two-year test mission, will return to the module for a few hours several times a year to retrieve sensor data and assess conditions.

Expandable habitats are designed to take up less room on a rocket, but provide greater volume for living and working in space once expanded. This first test of an expandable module will allow investigators to gauge how well the habitat performs overall and, specifically, how well it protects against solar radiation, space debris and the temperature extremes of space. Once the test period is over, BEAM will be released from the space station, and will burn up during its descent through Earth's atmosphere.

NASA  
<http://www.nasa.gov>



## First Work Platforms Powered On and Tested in Vehicle Assembly Building for Space Launch System

NASA Kennedy Space Center in Florida is one power step closer to processing the agency's Space Launch System (SLS), the most powerful rocket in the world, for its first flight, Exploration Mission 1 (EM-1), and NASA's journey to Mars. During a preliminary test April 28, the two J-level work platforms installed on the north and south sides of Vehicle Assembly Building High Bay 3, where the SLS will be prepared for launch, were successfully activated to test their functionality and simulate how they will surround the massive rocket on the mobile launcher.

Mike Bolger, Ground Systems Development and Operations Program (GSDO) manager, stood on the walkway on the 16th floor, above the J-level platforms, as construction contractor Hensel Phelps operated the controls and began the test.

"It was an amazing sight to look down and watch as the platform smoothly extended out into the open air of High Bay 3," Bolger said. "As each half of the J platforms slowly extended, I couldn't help but think forward to the day when the SLS core stage and boosters will fill the void between the platform halves."

The J-level work platforms are just one of 10 levels of platforms that will surround the SLS rocket and Orion spacecraft in the high bay. The platforms will extend and retract and will have the capability to be adjusted up or down as required to give engineers and technicians access to various areas of the giant rocket, twin solid rocket boosters, Orion and its launch abort system during processing and testing.

Each of the platform halves are about 62 feet wide and 38 feet long and

weigh between 300,000 and 325,000 pounds. The J-level platforms are located about 112 feet above the VAB floor, or nearly 11 stories high, and will provide access to the SLS booster.

For this first test, initial power-up and platform extension took about 30 minutes. When the system is fully operational it will take less time, according to Jose Perez Morales, GSDO VAB Element senior project manager.

"The success of this test is another step in the realization of years of design and construction to prepare High Bay 3 for the Space Launch System rocket," said Morales.

Two independent motors and chains, called drive chain rail activators, are located on the rails on either side of the platform. They were tested, along with the motors and tracks, to confirm they functioned properly. As each platform extended, it glided on four rollers positioned with two on each side of the platform — much like a kitchen drawer glides in and out. The movement of the mechanical articulated tray that moves with the platform also was tested.

"To the GSDO team, this is another positive indicator that we're making progress and that we're going to be ready when the flight hardware arrives for integration, test and launch from Kennedy Space Center," Bolger said.

"We just accomplished a significant milestone for this project, and we are looking forward to the next ones," said Gary Villa, NASA construction manager.

As additional platforms are installed in High Bay 3, they will undergo the same testing to ensure all of the platforms are ready for the first launch.

**By Linda Herridge**  
**NASA's John F. Kennedy Space Center**  
<http://www.nasa.gov/kennedy>

### A view from the ground up

*A view from below in High Bay 3 inside the Vehicle Assembly Building at NASA's Kennedy Space Center in Florida, shows three work platforms installed for NASA's Space Launch System (SLS) rocket. The lower platforms are the K-level work platforms. Above them are the J-level work platforms. A crane is lowering the second half of the J-level platforms for installation about 112 feet above the floor, or nearly 11 stories high.*



# ASTRONAUT NEWS

By Rob Wood



## Record Holding Astronaut Departs NASA

Just because something occurs on 1 April does not necessarily mean that it is an April Fool Day joke. One does wonder however if the astronaut had a twinkle in his eye when he made it his retirement date from NASA's Astronaut Corps. Although not entirely a surprise, the announcement was more expeditious than I expected. Scott Kelly had only returned to Earth on 2 March 2016 from his nearly year-long spaceflight when on 11 March 2016 NASA's news released proclaimed that Astronaut Scott Kelly was to retire from NASA effective 1 April 2016.

My immediate reaction was that this was too soon and that studies of his re-adaptation to one-G would be compromised, but this concern was somewhat satiated by the news release statement that, "After retiring, Kelly will continue to participate in the ongoing research related to his one-year mission. He will provide periodic medical samples and support other testing in much the same way that his twin brother, former astronaut Mark Kelly, made himself available for NASA's Twins Study during his brother's mission."

Scott Kelly currently holds the American record for the most time spent in space both cumulative and for an individual spaceflight. On the longest individual flight records there are only four who have spent more time in space than Kelly, all Soviet/Russian cosmonauts: Vladimir Titov and Musa Manarov, who flying together returned to Earth in December 1988 having spent a few hours short of 366 days in space; Valery Polyakov who completed his record breaking 437 days in space in 1995; and Sergey Avdeyev who in 1999 chalked up his 379th day in space. Scott Kelly, along with his celestial twin, another Russian cosmonaut, Mikhail Korniyenko are in joint fifth place with their 340 day mission.

One element of controversy is the continuing reference to Scott Kelly's mission being a one-year long spaceflight. It ended on 2 March 2016. Kelly and Korniyenko's flight had lasted for 340 days and eight hours, which is not one year. It is more than three weeks short of one year and should not be referred to as a one-year long spaceflight. I accept that it makes little difference from an experimental and testing point of view but it is just not accurate to describe it as a 'one-year long spaceflight'.

As for cumulative records, Scott Kelly lies 17th on the list with 520 days in space from four spaceflights. There are seventeen Soviet/Russian cosmonauts ahead of him. Top of the list is Gennady Padalka, who launched with Kelly and Korniyenko in March 2015 on his sixth flight, with 878 days in space.

His position as the top American on cumulative time is under imminent threat, a fact that he alluded to in a recent NASA interview, "Records are meant to be broken," Kelly said. "I am looking forward to when these records in space are surpassed." He should not have long to wait. Jeffrey Williams, a fellow alumni from the class of 1996 astronauts, is currently on the ISS on what is his fourth (third long-duration) spaceflight. He is due to be in space until 7 September 2016 and if that schedule remains unaltered then near the end of August he will surpass Scott Kelly's cumulative record.

Brian Kelly, director of Flight Operations at NASA's Johnson Space Center in Houston, paid tribute to Scott Kelly on his retirement. "Scott's contributions to NASA are too many to name. In his year aboard the space station, he took part in experiments that will have far-reaching effects, helping us pave the way to putting humans on Mars and benefiting life on Earth. His passion for this work has helped give hundreds of thousands of people a better understanding of what NASA does. We appreciate his years of service and anticipate many benefits to come from them, thanks to the research he's supporting."

Scott Kelly told the Associated Press that he has not lined up a full-time job but "You need to leave when the time's right for you," he said. "And

the time is right for me." He noted that he would be better able to do what he wanted to do when he was not bound by all the limitations that come from being a government employee.

With a smile he pointed out a win win scenario for NASA, "NASA will only have to pay me \$10 an hour instead of \$70 an hour, so they're getting a good deal," Kelly said. "This just allows me to meet my NASA responsibilities, but do other things." He wants to remain involved in spaceflight in some way, "I would love to stay as involved with human spaceflight as I can. I'm a huge believer in it."

He said that "no part" of him wanted to be still on the ISS. His legs were swollen and sore, his joints were stiff and although he was getting better it was slow going. Despite this he did not rule out a return to space at some point in the future but he indicated this would be through commercial spaceflight and not government employment.

His current plans include joining the speaker circuit and writing about spaceflight. His writings will include, an autobiographical work, a book of photographs taken aboard the ISS and several children's publications. His autobiography is named 'Endurance: My Year in Space and Our Journey to Mars,' to be written with Margaret Lazarus Dean and published by Knopf Doubleday Publishing Group in November 2017. The children's books will be published by Random House.

Scott Joseph Kelly (Captain, USN, Ret.) was born on 21 February 1964 in the township of West Orange, New Jersey, just a short drive from Manhattan. He is the younger, by six minutes, of identical twins. His parents were both serving police officers in West Orange.

He attended the State University of New York Maritime College under a scholarship from the Reserve Officers' Training Corps (ROTC) programme. The ROTC is a military scholarship programme funding students in return for military service following graduation. He graduated in 1987 with a bachelor's degree in aerospace engineering.

He then received his commission into the United States Navy. He attended flight school and leaned to fly the Beechcraft T-34 Mentor, a propeller driven, single-engine, military trainer. After two years he qualified as a naval aviator. He received his naval aviator wings on 7 July 1989. He then trained on the Grumman F-14 Tomcat supersonic variable-sweep wing fighter aircraft. Following this he was assigned to Fighter Squadron 143 (nicknamed 'Pukin Dogs') and made overseas deployments to the North Atlantic, Mediterranean Sea, Red Sea and Persian Gulf aboard the USS Dwight D. Eisenhower aircraft-carrier.

He attended the US Naval Test Pilot School at Patuxent River, Maryland, from where he graduated in June 1994. After graduation he worked for the centre's Strike Aircraft Test Squadron flying the F-14 and the McDonnell Douglas F/A-18 Hornet supersonic all-weather multi-role fighter aircraft. He was the first pilot to fly an F-14 with an experimental digital flight control system installed, and performed subsequent high angle of attack and departure testing. During his navy career he made more than 250 carrier landings.

Whilst working as a test pilot he studied for a master's degree. In 1995 he applied to join NASA's astronaut corps. In 1996 he received his degree in aviation systems from the University of Tennessee, Knoxville and also found out that he was successful in his application to NASA.

He was selected as a pilot astronaut in 1996 (NASA Astronaut Group 16) along with his twin brother Mark. After two years basic training he was assigned technical duties in the Astronaut Office. During his near 20 years with NASA he flew four spaceflights and had several back-up assignments.

Scott Kelly's first spaceflight was as pilot for the Discovery Space

Shuttle on its STS-103 (19-27 December 1999) mission. This was the third Hubble Space Telescope Servicing Mission. The crew successfully installed new instruments and upgraded systems on the Hubble to enhance its scientific capabilities.

He was then assigned as NASA's Director of Operations at the Yuri Gagarin Cosmonaut Training Centre, where he spent about nine months. He did not originally intend this to be a stepping stone to an ISS residency. He expected to get another shuttle pilot assignment before flying as commander of a shuttle mission.

After he returned to the States, Charles Precourt, the then Chief of the Astronaut Office, asked him to be a back-up for ISS Expedition 5 and after this he said he would give him command of a shuttle flight. The Chief also said he would give him an ISS command subsequent to this. Kelly accepted the proposal. Due to the Columbia tragedy in February 2003 the timeline proved to be longer than he expected.

NASA's press release on 26 March 2001 officially confirmed his assignment as a back-up flight engineer for Expedition 5, which was launched on 5 June 2002 via STS-111 and the Endeavour orbiter. In December 2002, as promised, he was named commander for STS-118. The primary objectives of the flight were to install additional truss segments to increase power and communications to the ISS, and to deliver additional supplies for the station's crew. At this time the launch was scheduled for November 2003.

In September 2002, just prior to the announcement of his STS-118 assignment, he commanded the fourth NASA Extreme Environment Mission Operations (NEEMO) undersea mission aboard the Aquarius underwater laboratory at the National Undersea Research Centre in Key Largo, Florida. The aim of the NEEMO missions is to provide a convincing analog to space exploration. Aquarius is the world's only undersea research station and it provides astronauts with some of the same challenges as they would find in space.

On 1 February 2003, the Space Shuttle Columbia was returning to Earth following its successful STS-107 research mission. During re-entry the shuttle disintegrated resulting in the death of the seven person crew. A seven month investigation followed which concluded that the cause of the accident was a breach in the leading edge of the left wing caused by insulating foam shed during launch. The damage to the thermal protection system led to overheating during re-entry resulting in a catastrophic loss of integrity for the shuttle vehicle.

As a result of the Columbia accident Scott Kelly's second spaceflight would be delayed for nearly four years. In the intervening period he paid a return visit to the Aquarius underwater laboratory as a crew member of NEEMO 8. This took place in April 2005.

His second spaceflight would also be his first visit to the ISS. STS-118 Endeavour (8-21 August 2007), continued the construction of the ISS. During the mission, another truss segment, a new gyroscope and an external spare parts platform was added to the space station. Also a new system that enabled docked shuttles to draw electrical power from the station to extend visits to the outpost was successfully activated. The mission also saw the first flight by a NASA Educator Astronaut (Barbara Morgan).

After post-flight activities, he returned to ISS expedition training and had a second stint as a back-up when he was reserve flight engineer for ISS Expedition 23/24 and Soyuz TMA-18. On the prime crew for this flight was Mikhail Korniyenko. Soyuz TMA-18 launched on 2 April 2010.

His third spaceflight commenced on 7 October 2010 when he was launched aboard Soyuz TMA-01M from Baikonur. He was a flight engineer for the Soyuz and Expedition 25 before on 24 November 2010 taking over as commander of the ISS for Expedition 26. He returned to Earth in central Kazakhstan on 16 March 2011 in the descent module of the Soyuz TMA-01M spacecraft after a flight lasting nearly 160 days. Following his third flight he took over the role as ISS Operations Branch Chief within the Astronaut Office. He retired from the US Navy in June 2012.

It was only in the middle of August 2012 that NASA, through their spokesman Kelly Humphries, admitted they were thinking about a year-long mission to the ISS but in truth they were a lot more advanced

than that. NBC News space analyst James Oberg (a well-known space sleuth) reported that sources close to NASA, who discussed the matter on condition of anonymity, said that specific mission dates and crew candidates had already been evaluated.

On 5 October 2012, NASA confirmed they were GO for the mission. The actual crew announcement came later on 26 November 2012 when the Russian Federal Space Agency confirmed that Mikhail Korniyenko was their selection and NASA named Scott Kelly.

Before the main event Scott Kelly again ran the course of being a back-up. He was a back-up flight engineer for Soyuz TMA-14M, launched on 26 September 2014 and back-up flight engineer for ISS Expedition 41. He then backed up the commander of ISS Expedition 42.

Scott Kelly's final spaceflight commenced with lift-off at 22:42hrs Moscow Time on 27 March 2015 (01:42hrs 28 March local Kazakh time) from the Baikonur Cosmodrome in Kazakhstan. With him on Soyuz TMA-16M were the Soyuz commander, the hugely experienced, Padalka and Kelly's celestial twin Korniyenko.

In terms of days spent in space this was (and remains so until at least 2018) the most experienced crew ever launched. Between them they had spent 1066 days in space over eight spaceflights. Despite this they do not have the oldest average age for a launched crew. That record goes to the crew of Soyuz TMA-7 in 2005 with 55. The Soyuz TMA-16M crew average was 53.

Watching the launch at Baikonur were members of the astronauts families including Scott Kelly's twin brother Mark. Mark is also a former US Navy carrier fighter pilot who like his brother was selected as a NASA astronaut in 1996. He flew four Space Shuttle missions, two as pilot (2001 and 2006) and two as commander (2008 and 2011). Although he left the Astronaut Corps in 2011 he agreed to be a ground based test subject for NASA's 'The Twins Study'.

For this mission Scott Kelly would fulfil the roles of a flight engineer for Soyuz TMA-16M, the Soyuz that would return him to Earth, Soyuz TMA-18M and for ISS Expeditions 43/44. For ISS Expeditions 45/46, he would be the commander of the space station.

Soyuz TMA-16M docked with the ISS at 04:33 (Moscow Time) on 28 March 2015. About two hours later the hatches were opened between the Soyuz and the Poisk module at the space station. First Padalka made his way into the station and he was greeted by resident crewmen Russian cosmonaut Anton Shkaplerov and NASA astronaut Terry Virts. Also aboard was ESA astronaut Samantha Cristoforetti but she was not part of the initial welcoming team.

Next into the station came Korniyenko and Kelly. They moved through the hatch at exactly the same moment. There was no mention of this on the NASA TV feed but this is not a normal ingress and is unlikely to be a coincidence. A sign of their celestial twin status in all probability. The question was would they remember to exit in the same manner at the end of the mission. Alas, they did not. Prior to undocking Kelly moved into the Soyuz first, followed by Korniyenko, then finally the Soyuz commander Sergei Volkov who had earlier replaced Padalka as part of ISS's crew.

For the first time in his space career, Scott Kelly got to walk in space. He conducted three spacewalks during consecutive months of October, November and December 2015 whilst he was in command of the space station.

## Human Spaceflight Records

As a follow on from the previous piece about Scott Kelly, some might be interested in the individual and cumulative records of all nations including the non- American/Soviet/Russian astronauts and also the records for females of all nations. Time precludes me being able to calculate the timings myself so I have used several sources. However, and somewhat annoyingly, there are inconsistencies and so I would warn that the following is for fun and should not be used for serious research.



During the Kelly piece, I have already detailed the top positions for the longest single spaceflight for the male gender but just for the record (pun intended) they are: Valery Polyakov (437 days), Sergey Avdeyev (379), Vladimir Titov and Musa Manarov (365), and Scott Kelly and Mikhail Korniyenko (340). Next we have Yuri Romanenko (326). The second American is Michael López-Alegría (215) who is joint thirteenth on the list.

The longest single spaceflight by a female astronaut is Samantha Cristoforetti (ESA/Italy - 199) and this is followed by: Suni Williams (USA – 194), Peggy Whitson (USA – 191), Shannon Lucid (USA – 188), Peggy Whitson again (184), Tracy Caldwell-Dyson (176) and Yelena Kondakova (Russia - 169).

As well as the longest single spaceflight by a female astronaut, Samantha Cristoforetti also holds the single record for both sexes for the non-American/Soviet/Russian astronauts with her 199 day flight. André Kuipers (ESA/Netherlands - 192) is next followed by Jean-Pierre Haigneré (ESA/France - 188). We then have three astronauts on 187 days - Koichi Wakata (JAXA/Japan), Frank De Winne (ESA/Belgium) and Robert Thirsk (CSA/Canada).

As for cumulative records, Scott Kelly lies 17th on the list with 520 days in space from four spaceflights. There are sixteen Soviet/Russian cosmonauts ahead of him. Top of the list is Gennady Padalka, who had launched with Kelly and Korniyenko in March 2015, with 878 days in space. Then we have: Sergei Krikalyov (803), Aleksandr Kaleri (769), Yuri Malenchenko (764 - as of 16 April 2016 – he is currently in space and should be in second place when he returns to Earth in June 2016), Sergei Avdeyev (747), Valeri Polyakov (678) and Anatoli Soloviyov (651).

Cumulative records for US astronauts have Scott Kelly (520) on top until August 2016. As I wrote in the Kelly piece his position as the top American on cumulative time is under imminent threat. Jeffrey Williams is currently on the ISS on what is his fourth (third long-duration) spaceflight. He is due to be in space until 7 September 2016 and if that schedule remains unaltered then near the end of August he will surpass Scott Kelly's cumulative record.

Jeffrey Williams is already in second place for the U.S. with 390 days (as of 16 April 2016 when he completed the 28th day of his current mission). The next several are: Mike Fincke (381), Peggy Whitson (376), Mike Foale (373), Donald Pettit (369) and Suni Williams (321).

The top two U.S. females in the cumulative lists, Whitson and Suni Williams, are shown above and the next few are: Shannon Lucid (223), Susan Helms (210), Tracy Caldwell-Dyson (188), Cady Coleman (180) and Karen Nyberg (180). The Soviets/Russians have only flown four female cosmonauts and their records are: Yelena Kondakova (178), Yelena Serova (167), Svetlana Savitskaya (19) and Valentina Tereshkova (2).

Cumulative records for non- American/Soviet/Russian astronauts are: Thomas Reiter (ESA/Germany – 350), Koichi Wakata (JAXA/Japan - 347), Jean-Pierre Haigneré (CNES/ESA/France - 209), Robert Thirsk (CSA/Canada – 203), André Kuipers (ESA/Netherlands - 203), Samantha Cristoforetti (ESA/Italy - 199) and Frank De Winne (ESA/Belgium - 198).

As we can see from the previous paragraph, Cristoforetti has 199 days and in the cumulative list of all nation female spacefarers is fifth after four Americans, Whitson, Suni Williams, Lucid and Helms. Kondakova, the highest placed Soviet/Russian is ninth. For the cumulative non-American/Soviet/Russian female astronauts, Cristoforetti is first. She is followed by: Claudie Haigneré (CNES/ESA/France - 25), Julie Payette (CSA/Canada – 25) and Chiaki Mukai (JAXA/Japan – 23).

Missing from the above lists is China who is in the nascent stage of their Human Space Programme. Nie Haisheng is top of both their cumulative and individual records. He made two spaceflight 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. The latter being the record holder in both female taikonaut categories.

## New Astronaut Selections Update

### United States of America

On 14 December 2015, NASA announced that the astronaut candidate application website was live and accepting submissions up to 18 February 2016 for its 22nd class of astronauts. The day after the closing date NASA confirmed that a record number of Americans had applied to become an astronaut.

Over 18,300 had applied to join NASA's 2017 astronaut class, almost three times the number of applications received for the last selection that was finalised in 2013 and far surpassing the previous record of 8,000 in 1978.

"It's not at all surprising to me that so many Americans from diverse backgrounds want to personally contribute to blazing the trail on our journey to Mars," said NASA Administrator Charlie Bolden, a former Space Shuttle pilot and commander. "A few exceptionally talented men and women will become the astronauts chosen in this group who will once again launch to space from US soil on American-made spacecraft."

NASA expects to announce 8 to 14 successful applicants in mid-2017. Between now and then, NASA's Astronaut Selection Board will review the applications, assessing each candidate's qualifications. The board then will invite the most highly qualified candidates to NASA's Johnson Space Center in Houston for interviews before the final selection is made and the new astronaut candidates report to Johnson for training.

"We have our work cut out for us with this many applications," said Brian Kelly, director of Flight Operations at Johnson. "But it's heartening to know so many people recognize what a great opportunity this is to be part of NASA's exciting mission. I look forward to meeting the men and women talented enough to rise to the top of what is always a pool of incredible applicants."

### Management Astronaut in New Position

It was not only offices that she was swapping when she accepted a new posting. She drove away from Houston, Texas, with temperatures touching 80 degrees fahrenheit but found it snowing on arrival in Cleveland, Ohio. Janet Kavandi moved to Ohio to become the Deputy Director at NASA's Glenn Research Center. The appointment had been announced on 12 February 2015 and she started her new job early the following month.

Obviously, the weather and job suited her because one year later she has become the centre's director. On 14 March 2016, NASA announced that Administrator Charles Bolden had named former astronaut Janet Kavandi as director of the agency's John H. Glenn Research Center in Cleveland, Ohio, effective from that date. She succeeds Jim Free, who was transferring to the agency's Human Exploration and Operations Mission Directorate in Washington as a deputy associate administrator.

As director, Dr Kavandi will lead a center that carries out research and development of innovative technologies for both aeronautics and spaceflight. She will oversee more than 3,200 civil service and contractor employees, and an annual budget of approximately \$580 million. A multitude of NASA human spaceflight missions have included elements related to Glenn, from Mercury and Gemini, to the Space Shuttle and ISS.

The centre was founded in 1941 by the National Advisory Committee for Aeronautics (NACA), which was the precursor to NASA. Glenn was initially called the Aircraft Engine Research Laboratory. It then became the Flight Propulsion Research Laboratory in 1947 before taking the name of George W. Lewis in 1948. Lewis was the head of NACA from 1919 to 1947. For the next ten years it was known as the Lewis Flight Propulsion Laboratory before becoming the NASA Lewis Research Center in 1958.

It received its current name in 1999, in honour of former astronaut John Glenn who was the first American to orbit Earth when he flew the Mercury-Atlas 6 mission in 1962. He later became a US Senator and also ran for the Democratic presidential nomination for the 1984 election. Aged 77, he became the oldest person to fly in space when he flew on STS-95 Discovery in 1998. As a payload specialist he carried out geriatric research.

The name Lewis was transferred to the main campus area where the research centre is located. It is near Cleveland Hopkins International Airport and the Cleveland Metroparks' Rocky River Reservation. The now named Lewis Field is situated on 350 acres of land and contains more than 150 buildings. The facilities at Lewis Field include wind tunnels, drop towers, vacuum chambers and an aircraft hangar.

Also part of the Glenn Research Center is Plum Brook Station which is about 50 miles from the main campus. It is located 50 miles west of Cleveland in Sandusky, Ohio, on 6,400 acres of land. It has large, unique facilities that simulate the environment of space. Both of Glenn's locations enable NASA, other governmental agencies, and academic and industry partners from across the country to perform specialized research and testing.

"Janet has demonstrated extraordinary leadership throughout her NASA career, from her spaceflights to her continued dedication to our mission at the Johnson Space Center and Glenn," said NASA Administrator Charles Bolden. "I know she'll bring that same excellence to bear on Glenn's critical role in our journey to Mars.

Janet Lynn Kavandi (Ph.D.) was born on 17 July 1959 in Springfield, Missouri. She holds bachelor and master degrees in chemistry, and a doctorate in analytical chemistry. She worked in private industry with Eagle-Picher Industries (1982 to 1984) and the Boeing Aerospace Company (1984 to 1994). With Boeing she worked on military and space projects. The space projects included Space Stations, Lunar/Mars Bases, Inertial Upper Stage, Advanced Orbital Transfer Vehicle and Get-Away Specials.

She was selected as a mission specialist (MS) astronaut in December 1994 (NASA Astronaut Group 15). On completion of basic training she was assigned to the Payloads and Habitability Branch where she supported payload integration for the ISS. She served as an active astronaut until 1998 making three spaceflights, STS-91 Discovery (2-12 June 1998), STS-99 Endeavour (11-22 February 2000) and STS-104 Atlantis (12-24 July 2001).

STS-91 was the final US Space Shuttle mission to dock with the Russian Mir Space Station. Kavandi was MS-3 and assisted with the transfer of equipment, experiments and supplies to Mir. Some U.S. science experiments were loaded onto the shuttle for return to Earth along with items that were no longer required on the station. During the flight she also operated the shuttle's Canadarm robotic manipulator system.

Following a spell working as a CapCom in NASA's Mission Control Centre she flew on STS-99. This was the Shuttle Radar Topography Mission, which mapped more than 47 million miles of the Earth's land surface to provide data for a highly accurate three-dimensional topographical map. She was the flight engineer (MS-2) and assisted the commander and pilot on the flight deck during launch, landing and orbital manoeuvres. She had also trained as lead-spacemaker in case an EVA was required in an emergency but she did not have to put these skills into practice.

She subsequently worked in the Robotics Branch before returning to training for her third and final spaceflight. STS-104 was the tenth Space Shuttle mission to dock with the ISS. She was the main Canadarm operator for the shuttle which she used during the missions spacewalks. The flight brought and installed the 'Quest Joint Airlock' to the space station.

After the flight she had a number of duties for the Astronaut Office. One of her roles was working with the family members of the astronauts who died in the Columbia accident in 2003. She became Deputy Chief of the Astronaut Office from 2005. At this time she was still technically an active astronaut but her two children were very uneasy about her flying in space again in the wake of Columbia and they asked her to not fly again. "Sometimes you have to choose between your family and your job," she said. She relinquished her active status.

She decided to remain with NASA and in January 2008 became Deputy Director of Flight Crew Operations at the Johnson Space Center. In March 2011 she took over as the Director of Flight Crew Operations before taking up the position of Deputy Director of the Health and Human Performance Directorate in August 2014. In 2015, she transferred to the Glenn Research Center.

## 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.

- Al Worden: 11-14 July 2016 at the Farnborough International Airshow.
- Mark Kelly and Scott Kelly: 7-8 October 2016 with Space Lectures events in Pontefract.
- Kenneth Cameron, Gregory Chamitoff, Shannon Lucid and Charles Walker: 5-6 November 2016 at the Autographica Autograph Show in London.

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](mailto: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.

## COMMENTS & UPCOMING IN THE NEXT ISSUE OF ASTRONAUT NEWS

Astronaut News is a little smaller than normal this time out. Not as many relevant items have popped up out of the ether (or should that be the cloud). However, a couple of items have already appeared for the next issue as I close this one down so we may have a busier issue. We have an ex-astronaut in a NASA management position that is leaving the agency for a second time and NASA confirm ISS crew members for missions to the orbiting laboratory due in 2017.

### Acknowledgements and sources:

Associated Press; Autographica; CapCom (previous issues); Collect Space; Google; LinkedIn; Manned Spaceflight Log II 2006-2012 ©2013 by David J Shayler and Michael D Shayler; NASA and its various centres; Spacefacts; Space Lectures; S P Korolyov Rocket-Space Corporation Energiya; Wikipedia; You Tube.





# ISS MISSION UPDATE

*By George Spiteri*

**Expedition Forty-Seven has just kicked off. The International Space Station (ISS) is crewed by its new US Commander Tim Kopra, together with Flight Engineers, Jeff Williams from the US, Russians Yuri Malenchenko, Oleg Skripochka and Alexei Ovchinin and from Great Britain, Tim Peake.**

Packed with one and a half tons of trash and other disposable items, the unmanned Orbital ATK Cygnus commercial cargo vehicle was unberthed from the Station's Unity Module at 1040 GMT on 19<sup>th</sup> February and released by Canadarm2 nearly two hours later at 1226 GMT and sent to a destructive re-entry over the Pacific Ocean the following day.

Scott Kelly celebrated his 52<sup>nd</sup> birthday on 21<sup>st</sup> February and thanked everyone via his Twitter page, adding that he was looking forward "to spending the next year back on Earth!"

There was the traditional Change of Command ceremony on 29<sup>th</sup> February, when Kopra took over Command of the Station from Kelly. Kopra described Kelly as "a great role model" after Kelly had thanked "everyone on the ground" during his record breaking mission.

Soyuz TMA-18M/44S with Kelly, Kornienko and Volkov in Command undocked from Poisk at 0102 GMT on 2<sup>nd</sup> March to signal the official start to Expedition 47.

The Descent Module landed over three hours later at 0426 GMT (1026 local time) South East of Dzhezkazgan, Kazakhstan to complete a mission of 340 days 8 hours 42 minutes for Kelly and Kornienko and 181 days 23 hours 48 minutes for Volkov. Kelly and Kornienko looked remarkably well once they were extracted from the capsule. Kelly told reporters at the landing site that "the air feels great....I have no idea why you guys are all bundled up!" Kelly was flown by NASA private jet back to Houston whilst his Russian colleagues returned to Star City outside Moscow.

The ISS remained under temporary three person operations until the next crew of veterans Jeff Williams, Oleg Skripochka and rookie Alexei Ovchinin lifted-off from Baikonur aboard Soyuz TMA-20M/46S at 2126 GMT on 18<sup>th</sup> March (0326 19<sup>th</sup> March local time). According to RIA Novosti, this was the last flight of the Soyuz TMA-M variant. Soyuz docked at the vacated Poisk Module at 0309 GMT on 19<sup>th</sup> March and once the hatches were opened returned the complex to a six person complement.

The next Orbital ATK Cygnus Commercial Resupply Services (CRS) OA-6 vehicle was launched from Cape Canaveral at 0305 GMT on 23<sup>rd</sup> March (2305 22<sup>nd</sup> March local time). Named in honour of Space Shuttle Commander Rick Husband who died aboard "Columbia" in 2003, the unmanned spacecraft was grappled by the Station's Canadarm2 at 1051 GMT on 26<sup>th</sup> March and berthed to the Station's Unity Module over four hours later. Cygnus delivered approximately 7700 pounds of supplies and equipment to the orbiting outpost, including a second generation 3D printer, an experiment to test adhesive technologies and the Saffire-1 experiment, which will attempt to create a controlled fire inside Cygnus once it departs the complex, to better understand the growth of fires in space.

Progress M-29M/61P was undocked from Zvezda's aft port at 1515 BST on 30<sup>th</sup> March and after completing several days of engineering tests was sent to a destructive re-entry over the Pacific Ocean on 8<sup>th</sup> April. This paved the way for the next unmanned Russian cargo vehicle, Progress MS-02/63P to be launched from Baikonur's Site 31 at 1723 BST (2223 local time) on 31<sup>st</sup> March and docked at Zvezda's vacated aft port at 1858 BST on 2<sup>nd</sup> April delivering nearly three tons of food, fuel and supplies to the Station.

Peake celebrated his 44<sup>th</sup> birthday on 7<sup>th</sup> April and received numerous congratulatory Tweets, including the UK Space Agency, the National Space Centre in Leicester and NASA who advised him to celebrate by enjoying the "out of this world view" from ISS.

Another US commercial unmanned cargo spacecraft was launched at 2143 BST (1643 local time) on 8<sup>th</sup> April, when SpaceX launched their Dragon vehicle atop a Falcon 9 rocket from Cape Canaveral on the CRS-8 mission. Image below. This was the first Dragon mission to the ISS since their last launch to the Station exploded during launch in June 2015. Dragon was due to arrive at the orbital outpost on 10<sup>th</sup> April delivering nearly 7000 pounds of supplies and the much anticipated Bigelow Expendable Activity Module (BEAM).

As of 8<sup>th</sup> April, Kopra, Malenchenko and Peake have been in space for 116 days, whilst Williams, Skripochka and Ovchinin have logged three weeks in orbit.

**Image Credit: NASA TV**



# They Also Served:

## In Memory of those we lost in 2015

### The Ground Crew – Part One

#### By Rob Wood

**Viktor Pavlovich Legostayev (1931-2015)** was an associate of the person who is often credited as the founder of the Soviet space programme, Sergey Korolyov. Korolyov was the head and chief designer of OKB-1 (or Special Design Bureau number 1) who died in 1966. The bureau continued under a number of names until it was named for Korolyov in 1991.

Viktor Legostayev joined OKB-1 in 1960 and from 6 August 2014 until his death was the head of the company under the title General Designer of the now named S P Korolev Rocket and Space Corporation Energiya. He had contributed on many manned and unmanned projects during his life.

He was born in Moscow on 6 June 1931. He graduated from the Bauman Moscow State Technical University in 1955 and steadily rose up the degree and academia ranks culminating in his becoming a member of the Russian Academy of Sciences: Candidate of Science (1959), Doctor of Sciences (1987), Professor (1991), Honoured Scientist of the Russian Federation (1996), corresponding member of the Russian Academy of Sciences (1997), member of the Russian Academy of Sciences (2003).

On leaving Bauman he joined design bureau NII-1 where he worked on missiles and spacecraft attitude control systems. He was part of the team that developed the USSR's first active attitude control systems for the Luna-3 interplanetary spacecraft and the Vostok manned spacecraft.

After five years at NII-1 he transferred to OKB-1. From 1960 to 1989 he worked on many projects including the development of attitude and control systems for interplanetary missions such as Mars and Venera; unmanned spacecraft such as Luna, Zenit and Molniya; and manned spacecraft and their support vehicles such as Vostok, Voskhod, Soyuz, Progress, Salyut and Mir.

From 1989 to 2014, he served as vice-president, first deputy general designer and headed work under International Space Projects such as the ISS and the Sea-Based Rocket and Space Complex Sea Launch system. He supervised the development of telecommunication satellites and remote sensing satellites, and the organization of research for space stations.

He received many awards during his career including: Labour Red Banner order (1961); Lenin Prize winner (1966); decorated with Lenin order (1976); USSR and Russian Federation State Prize winner (1989) and (1999); and Russian Federation Government Prizes winner (2004, 2010). He was the author or co-author of more than 250 scientific papers and inventions. He died on 8 January 2015.

**Edward Chris Dittmer (1918-2015)** was involved in the precursor programmes for manned spaceflight, working with humans and animals. Before and after this he served as a medic during two major conflicts involving America, World War Two and the Vietnam War.

Hands folded across his chest, quietly waiting, Ham the chimpanzee glanced around the humans gathered on the deck of the recovery vessel, a dock landing ship, the USS Donner. The cover had just been removed from his space cockpit. The humans approached and there was shaking of hands with them. He squealed with delight at the fuss but with a certain amount of dignity; the chimp was after all an experienced professional.

However, it is doubtful that he was keen to re-live the experience of spaceflight. A few days after the mission there was a press shoot and NASA wanted Ham to pose back in his flight couch but Ham was having none of it. He refused to go near it. He knew what it might mean. Another spaceflight? No thank you!

As a precursor to manned spaceflight, animals were used to test how living subjects reacted to the environs of space. One of the humans involved in this work was Edward Dittmer, who had a hand in the design of equipment used, the training of the animals and their medical care. He also played a part in other space related research involving humans.

Edward Dittmer was born in Luverne, Minnesota, on 24 September 1918. Following high school he joined the Civilian Conservation Corps, a public work relief programme as part of the New Deal. As a child he had found some work in an Ice Rink but with the Great Depression adult employment was very hard to come by. In the years 1933 to 1942, three million young American males were helped by the Civilian Conservation Corps. The programme ended in 1942 as World War Two provided a huge economic boom for the United States providing plenty of employment.

He enlisted in the United States Army on 1 April 1942. His original enlistment was for the duration of the war plus six months. He trained as a medic and served in the Pacific theatre. World War Two ended in September 1945 with the surrender of Japan but Dittmer did not have to do the extra six months he had signed for. Towards the end of the war, the United States War Department introduced a points system to decide how quickly their military personnel could return home. It was given the grand title of Advanced Service Rating Score. For the service men and women this was simply known as 'points'.

It was near the end of 1945 and Dittmer had enough points to come home and get out of the Army. He did this and found work with a construction company and then a machinist company. He also worked in a Veterans Administration Hospital but he wanted to further his education and thought he would have better opportunities back in the military. In 1947, he re-enlisted, although this time he chose the United States Army Air Force (soon to become the United States Air Force).

He had a number of home assignments including spending a few months in Alaska and a couple of years in Great Falls, Montana. Whilst based at Great Falls he took a training course 'Air Evacuation and Aeromedical Training' at Gunter Air Force Base in Alabama. He then received an overseas posting to the United Kingdom.

After four years in the United Kingdom, he returned to the states and reported to an Air Force Base near Baltimore. But, he found this a difficult assignment. Housing was not easy to find and what was available was expensive. He was on a technical sergeant's pay with five children dependent on him. He applied for a reassignment and that is how he found himself in Alamogordo, New Mexico, at Holloman Air Force Base, where he would become an important member of the Aeromedical Field Laboratory's Space Biology Department.

He reported to Holloman on 1 February 1957 and took part in a number of projects related to aeronautical and astronautical research. He was involved in high altitude balloon and rocket research, underwater gravity experiments, and G-force and zero-G studies.

He made parabolic flights in a Lockheed F-94 Starfire, a twin-seat, jet-

powered, interceptor-aircraft. The flights would last about an hour and make 14 to 20 parabolas. He conducted zero-G experiments including eating, urinating and studying the effects of zero-G on water with goldfish.

The Manhigh project was to place humans at high altitudes via a capsule carried by a balloon. Dittmar was the project non-commissioned officer and helped take care of the pilots. He also carried out some design and building work.

For Manhigh, each main mission would be flown by one pilot. It initially involved unmanned and animal flights before moving on to the manned phase. The three main flights, June 1957, August 1957 and October 1958, reached a height of over 95,000 feet with the middle one at just over 100,000 feet. At those heights, the atmosphere was so limited, that functionally, the pilot was operating in an almost outer-space type environment.

During one of the training flights, prior to the third main flight, the prime pilot, Captain Grover Schock and capsule and balloon designer Otto Winzen were critically injured in a crash landing. Schock had a serious neck wound and was losing a lot of blood. Dittmer arrived on the scene in a chase-truck and gave first aid. He is credited with saving Schock's life.

There was the 1958 Mouse-in-Able project, where three Thor-Able intermediate-range ballistic missiles were launched each with a small capsule carrying a single mouse. Dittmer was one of the main designers of the capsule which contained a life support system and telemetry equipment. The mice were named Minnie, Laska and Wickie.

They launched in that order in April 1958 and two in July 1958. The heights reached for the latter two were records, reaching about 600 miles. Unfortunately, none of the mice survived. The first rocket exploded killing Minnie, and although telemetry indicated that Laska and Wickie survived their flights, the recovery teams in the South Atlantic did not locate the re-entry portions of the rockets.

Perhaps, of all the projects he was involved in, he will be best remembered for his work with the astrochimps. After he completed his assignment with the Mouse-in-Able project he linked up with the chimpanzees. He was initially involved in teaching them simple tasks before progressively increasing the complexity. The chimpanzees were being trained to take part in the first United States manned space programme, Project Mercury.

From an original list of 40 candidates the chimpanzees were narrowed down to six and it was these that transferred to Cape Canaveral on 2 January 1961. They were accompanied by 20 of Holloman's staff including Dittmer. On 31 January 1961, Dittmer together with an air force scientist accompanied the chosen chimpanzee into the launch gantry lift and up to the level of the Mercury spacecraft. They put him in the Mercury capsule.

The Chimpanzee was named Ham. He was born in 1957 in the French Cameroons in Africa. He was only given the name Ham on the eve of his flight. Previously, he was 'Subject 65' then Chang. Officially, Ham was named after the Holloman Aerospace Medical Center but there is a suspicion that one eye was also on the lab's boss, Colonel Hamilton Blackshear.

Mercury-Redstone-2 launched at 11:55hrs on 31 January 1961. Ham performed his assigned tasks almost faultlessly. A testament to Dittmer's training allied with the chimp's own intelligence. Just like the human astronauts, Ham had conducted training flights in aircraft so was used to sudden noise, being shaken and G-forces and lack of gravity.

Ham was trained to operate a control panel which had two levers and two lights. He had to pull the right hand lever when the white light came on and the left hand one when the blue light lit up. When he got it right he received a banana flavoured pellet as a reward. He would receive a mild electric shock to the bottom of his feet if he got it wrong.

All the chimpanzee candidates did the training and according to Life magazine were more skilful than the humans in operating the levers. One of the female candidates worked out that if she used her feet to work the levers this would leave her hands free to take and eat the banana pellets.

Ham's responses to his tasks during the spaceflight were as good as on Earth. In fact he only received two electric shocks for failing to pull the levers when a malfunction in the Redstone rocket led him to experience a higher than expected 17 G's. A response, that might easily have been mirrored by a human astronaut when faced by similar circumstances. Splashdown in the Atlantic Ocean occurred 16 minutes and 39 seconds after launch with Ham having experienced a little over 6½ minutes of microgravity.

Dittmer was then involved in preparing for a second chimpanzee flight. This time it would be a longer flight; a precursor to John Glenn's orbital flight. The longer duration allowed Dittmer to not only be present at the launch but also on the recovery ship at the end of the mission.

Enos, the chimpanzee selected, was, like Ham, born in 1957 in the French Cameroons. Dittmer considered Enos to be the most intelligent of the chimps he had trained but he was not a people chimp like Ham was. He was not one for cuddles ... although he did make an exception to this on recovery at the end of his spaceflight.

When his space cockpit was opened on the recovery ship, a Sumner class destroyer named USS Stormes, Enos ran out and jumped into Dittmer's arms. His spaceflight had made him re-think his no-cuddling rule. Perhaps not surprising considering the number of electric shocks he had received. Obviously, Enos had correctly operated the levers. Unfortunately, part of the control panel malfunctioned and so he received totally undeserved shocks.

Enos flew into space on Mercury-Atlas-5 on 29 November 1961. It was supposed to make three orbits of the Earth but technical problems resulted in high propellant usage by the attitude control thrusters and the mission was aborted after two orbits. The flight had lasted for 3 hours, 20 minutes and 59 seconds.

In 1963, the now Master Sergeant Ed Dittmer was transferred to the Military Advisory Group in Saigon, South Vietnam, where he worked as an instructor to the South Vietnam military. He instructed in rescue and operational medicine but also went into the field on actual combat rescue missions in Sikorsky H-34 helicopters. On one occasion his helicopter was shot down by small arms fire that hit the engine and he had to be rescued by another helicopter.

In 1973 he retired from the military as a senior master sergeant with 30 years of distinguished service. In later life he visited schools to talk about his experiences. He also cooperated with authors, documentary filmmakers and reporters to help them with their works. He volunteered at the New Mexico Museum of Space History and in 2001 he was inducted into the International Space Hall of Fame for his work with the astrochimps.

He died on 2 January 2015, in Alamogordo, New Mexico. He is survived by two sons; four daughters; thirteen grandchildren; twenty-two great-grandchildren; and one great-great grandchild.

**David Garratt Hoag (1925–2015)**, was an aeronautical engineer who was the lead engineer on the development of the guidance, navigation and control systems for the Apollo Command Module and the Lunar Module. He witnessed the first lunar landing from the VIP room of NASA's Mission Control Center.

"If you don't watch him, he won't take the credit he deserves," Deputy Director Ralph R. Ragan, of the Instrumentation Laboratory told the Boston Globe in 1969, shortly before the first lunar landing. "He is the prime mover on this project," Ragan added.

He was born in Boston, Massachusetts, on 11 October 1925. He served in the United States Navy and was a student at MIT from where he received a bachelor's degree in electrical communications and a master's degree in aeronautical engineering instrumentation

He joined the Instrumentation Laboratory, based at MIT, which was later renamed the Charles Stark Draper Laboratory in honour of its founder. He spent his working life based there. He served as the technical director of the Polaris Missile Guidance System before in 1961 taking on a similar role as technical director and program manager for the Apollo Command Module and the Lunar Module's guidance system.

Norman Sears worked with him on Apollo. He recalled that, "Technically, he was about as gifted a person as I have ever encountered. Many engineers are gifted technically, but aren't as skilled as a manager or director. Dave had both."

In 1972, he became the department head of the NASA/Army Programs Department and later director of the Advanced Systems Department. In 1980 he was appointed a technical adviser to the President of Draper Laboratory. After retirement he provided consultancy services to many organisations.

He died on 19 January 2015 of complications from Dementia. He is survived by his wife Grace who he married in 1952, five children, eight grandchildren and one great grandchild.

## Norman Moore 'Norm' Carlson (1934-2015)

is credited with the idea to have built-in holds in launch countdowns, and was also involved in the development, testing and launch of several manned space programmes, but if Napoleon's adage of 'an army marches on its stomach' is true then perhaps his most important contribution was 'launch beans and cornbread'.

Norman Carlson was born in Meno, Oklahoma, on 12 February 1934. He served in the United States Army for two years from 1954 to 1956 and then attended Oklahoma State University from where he graduated in 1960 with a bachelor's degree in mechanical engineering. Following graduation he took up employment with NASA at the Marshall Space Flight Center in Huntsville, Alabama.

He helped to develop and test the Saturn launch vehicles that sent Apollo astronauts to the moon and this led to his transfer to the Kennedy Space Center in July 1964. For the next twelve years he served as a launch vehicle test conductor for Apollo, Skylab and Apollo-Soyuz.

Within the launch countdown there are built in holds which are pauses in the countdown. They are to allow the launch team to target a precise launch window, and to provide a cushion of time for certain tasks and procedures without impacting the overall schedule. Carlson is credited with the idea but there is some evidence that it was used prior to his arrival with NASA. He certainly helped hone its use with the manned space programme even if he might not have been the first to have the idea.

From March 1976 to December 1977, he worked with the Space Shuttle Columbia during factory checkout at Palmdale, California and with the shuttle Enterprise during the Approach and Landing Tests at NASA's Dryden Flight Research Center at Edwards Air Force Base, California. In January 1978, he returned to Kennedy as a test director for Space Shuttle Integrated Test Operations, including the first five manned launches.

"He was unflappable, never a temperamental, blow-your-stack type person," said Bob Sieck, a shuttle launch director, who worked with him. "He was always in charge of what he was responsible for."

It was with the launch of STS-1 on 12 April 1981 that he started the tradition of 'Beans Are Go'. When the mission control launch teams were training, and running tests and simulations, prior to the first flight, team members would bring food to share with their co-workers. Carlson participated in this practice and on 12 April 1981 he brought in a crockpot of northern beans with a side dish of cornbread.

After the successful launch of STS-1 the hungry team members rapidly tucked into the food. Seeing how well the food had gone down Carlson decided to double up for the launch of STS-2 in November 1981. It was soon gone and so a tradition was born. The shout of or the holding up of a sign 'Beans Are Go' was the signal for the end of a successful launch phase. Carlson kept bringing more crockpots and it all kept going. He switched to an 18 quart cooker which soon became plural. As well as his role as NASA test director he was also known as 'Chief Bean Cook and Server'.

From October 1982 until March 1991, he was chief of the Vehicle Processing Division, overseeing all aspects of the shuttle test operations. Following the loss of the Challenger shuttle in January 1986, he was appointed as a charter member to the Space Flight Panel, overseeing all flight safety issues for Return to Flight. From March 1991 to March 1995, he was deputy director of Shuttle Operations.

Carlson retired from NASA in March 1995 but this did not mean the end of 'Beans Are Go'. Carlson handed over his role as 'Chief Bean Cook and Server' to Kennedy's catering services. By the time shuttle launches were coming to an end in 2011 they were preparing 12 cookers of beans with contents totalling 60 gallons worth. This was feeding hundreds of launch team members, managers and dignitaries who would mass in the Launch Control Center lobby after each successful shuttle launch. As many as 400 to 500 bowls of the food were being eaten.

Carlson own recipe for successful Launch Beans was:

- Put 6 lbs. of dried Great Northern Beans in an 18-quart electric cooker.
- Cut 10 lbs. of smoked ham into cubes.
- Add ham and ham bones to beans.
- Add ½ shaker of lemon pepper.
- Add 3 lbs. chopped onions.
- Add 2 stalks chopped celery.
- Add 1 tsp. liquid smoke.
- Cover with water and cook for at least 8 hours.
- Enjoy!

At the end of the shuttle programme, Mike Leinbach, another former shuttle launch director spoke of the tradition. "It spans generations, it spans employees. It's something that kind of ties STS-1 to STS-135 and I'm not sure a heck of a lot else does that." The tradition may also continue when the commercial crew vehicles launch NASA astronauts back into space from Kennedy.

Following his death former astronaut and now Kennedy Space Center Director, Robert Cabana said, "Norm also left us his recipe. I hope it's a tradition we continue, and we all enjoy Norm's beans again next time we launch astronauts from U.S. soil." Cabana also paid tribute to his contribution to the space programme. "He became the chief test director and was the consummate professional, working tirelessly to ensure the success of the missions and the safety of all of the astronauts."

He was the recipient of numerous awards, including three NASA Exceptional Service Medals, in 1971, 1981 and 1989; the Superior Achievement Award in 1981; Manned Flight Awareness Honoree in 1983; the Astronauts Personal Achievement Award, better known as the Silver Snoopy, in 1989; the Center Director's Award in 1990; and the National Space Club Florida Committee's annual Lifetime Achievement Award recognizing contributions to the U.S. space programme.

He died on 1 March 2015 in Titusville, Florida, of complications from congestive heart failure. He was predeceased by his wife in 2007. He is survived by three children and three grandchildren.

**Marjorie Trees Townsend (1930-2015)** became the first woman to manage a US spacecraft launch when SAS-1 entered orbit in December 1970. This was a big achievement for a woman at the time. During the first few decades of spaceflight, it was very much a man's world. Despite this, there were exceptions, such as Marjorie Townsend who was one of the first female engineers to be employed by NASA.

Even in her young teen years she was considered an interloper in the male dominated discipline of engineering. "The thought seems to lurk in people's minds that women go into a man's field to catch a husband. In fact, there was a wager on the line when I went to school that I would get married and never graduate," she told The Washington Post in 1957. "That gentleman had to pay up".

The male had made the mistake of including 'never graduate' in the wager. She did meet Charles 'Chuck' Townsend, a medical student, in her third year at university and they married in June 1948. She had no intention of quitting college but did have to make allowances for her new status. She obtained daytime work with the National Bureau of Standards in their radon testing laboratory; in part to help fund her husband's medical training expenses. She continued her own education in the evening and this meant it took her longer to get to the end of her course.

She was born in Washington as Marjorie Trees Rhodes on 12 March 1930. Her father was an engineer and inventor. She was a bright



student and excelled in maths and science. She skipped several grades and graduated from high school at the age of 15. In the autumn term of 1945 she enrolled at George Washington University to study electrical engineering. In 1951 she became the first woman to receive a bachelor's degree in electrical engineering from the university.

Following graduation she obtained employment with the Naval Research Laboratory. In a strange quirk of the time, her married status actually helped her get the job. The hiring manager was not keen on single women because he thought they would be looking for a husband in the workplace and not concentrating on their job. As she was married he considered her safe to employ.

She was assigned to work on sonar-signal-processing mechanisms for anti-submarine warfare. "We wanted to pull submarines out of the background to distinguish them from whales or fishing nets," she explained later. The team she worked with successfully designed a new submarine detection classification technique which became standard equipment in the U.S. submarine fleet.

In 1959, NASA was temporarily housing its weather satellite group at the Naval Research Laboratory. She was looking to advance her career and they had an employment opportunity for someone who could help develop the ground equipment for the infrared experiment on its TIROS Program (Television InfraRed Observation Satellite). She successfully applied for the job.

The TIROS Program was NASA's first project to determine if satellites could be useful in the study of the Earth. The TIROS Program's first priority was the development of a meteorological satellite information system. At the time weather forecasting was deemed the most promising application of space-based observations.

TIROS proved extremely successful, providing the first accurate weather forecasts based on data gathered from space. TIROS satellites began continuous coverage of Earth's weather in 1962 and was used by meteorologists worldwide. The programme's success with many instrument types and orbital configurations led to the development of more sophisticated meteorological observation satellites.

She relocated to NASA's Goddard Space Flight Center in 1959. The work was challenging which she welcomed but so was the environment that left her less than enamoured. Many of the males there did not consider their profession was for women. There were only a handful of women engineers at NASA and she considered some of the men in management actually tried to undermine their roles and make them fail.

As she would later explain she was also personally discriminated against. She felt resentment from some of her male colleagues and one manager she worked for "tried his hardest to get rid of me. He had destroyed a couple of other women that were there. He gave me a specification for noise which was the theoretical limit of noise which was impossible to meet." She reported this to his boss but it required the intervention of Dr Rudolf Stampfl to rescue her.

He was her main boss and had been away on sabbatical but fortunately returned just in time. He was more interested in ability than stupid gender biases. Dr Stampfl designed the Nimbus satellite electrical bus system and active thermal control system concepts, and managed the early Nimbus development activity. Nimbus was the second generation NASA meteorological satellite programme that Townsend would also work on. She was granted a patent for a digital telemetry system that was aboard the NIMBUS satellite.

Her work was slowly winning over her sceptics and she was given more responsibility. Still, there was discrimination. Despite the fact she was 'de facto' a section head, leading a team of 22 engineers and 10 technicians she was not given the title of Section Head. Two males had already failed in the post and as she puts it, her boss asked her to take over "out of sheer desperation." And, "I had the same responsibilities as all the other section heads, but they wouldn't give me the title."

In 1966 a project manager opening came up. This was for the Small Astronomy Satellite (SAS) project, part of the Explorer series of spacecraft. Explorer-1 was the first U.S. satellite. SAS was a project to detect cosmic X-ray sources.

The Principal Investigator had a reputation for being difficult to work with and no one wanted the job. Except for Marjorie Townsend and she got the post. The Principle Investigator was Riccarado Giacconi, a Nobel Prize-winning astrophysicist, and despite his alleged reputation they worked together well. As she put it "We had the same goals."

On 12 December 1970, SAS-1 was launched by a Scout launch vehicle from the San Marco Launch Platform. The platform was a former oil rig operated by the Italian Space Agency. It is located off the coast of Kenya. The launch date is Kenya's Independence Day and in recognition of this the satellite was given another name, Uhuru, after the Swahili word for freedom. The satellite was considered to be part of the Explorer series and is also known as Explorer-42.

SAS-1 'Uhuru' was the first earth-orbiting mission dedicated entirely to celestial X-ray astronomy. It detected 339 sources, including binaries, supernova remnants, active galactic nuclei and clusters of galaxies. It was operational for over two years until March 1973. She continued in the role of programme manager and oversaw two further SAS launches in 1972 and 1975. For a short period in 1975 and 1976 she was also programme manager for the Applications Explorer Missions.

During her last five years at NASA, she was responsible for all advanced mission planning for future scientific and applications satellites, as well as National Oceanic and Atmospheric Administration's meteorological satellites.

For her contribution to U.S. and Italian space efforts she was named a Knight of the Italian Republic Order by the Italian government (1972). She has also received the NASA Exceptional Service Medal (1971) and the NASA Outstanding Leadership Medal (1980).

She retired from NASA in 1980 and moved into consultancy. She worked with private aerospace companies and provided consulting services to NASA and other aerospace entities. She fully retired in 1996 to enjoy spending more time with her family.

She died on 4 April 2015 at a hospital in Washington. She was predeceased by her husband in 2001. She is survived by four sons, 11 grandchildren and nine great-grandchildren. Her legacy is continued by many women, including her granddaughter Alicia Townsend, who is studying Engineering at West Virginia University and is already a member of the Society of Women Engineers.

Philip Edgar Culbertson (1925–2015) was a long service NASA manager with an engineering background. He had already been involved with the Mercury Program during his 11 years at General Dynamics when he joined NASA in 1965. He held many management positions through to 1988 including on the Lunar Program, Skylab, Apollo-Soyuz, Space Shuttle and Freedom Space Station (which did not fly as such but morphed into the International Space Station).

He was born in Pullman, Washington State, on 19 August 1926. He enlisted in the U.S. Navy towards the end of World War Two. He wanted to be a pilot but the end of the war precluded that. He continued his education and earned his bachelor's degree in aeronautical engineering from Georgia Tech University. He received his Navy commission following graduation and worked on cutting edge missile guidance systems.

After leaving the Navy, he spent four years as a research associate at the University of Michigan primarily focusing on designing and wind tunnel testing of advanced supersonic aircraft. He also worked towards and received a master's degree in aeronautical engineering from the university.

He then joined General Dynamics where he held many engineering and technical management positions including on the conversion of the Atlas missile into a manned booster for the Mercury program and as a deep space launch vehicle. He became the principal liaison to NASA and in 1965 accepted an offer to join NASA at their headquarters in Washington, DC.

In his 23 years at NASA, he held a multitude of management positions. He was Director, Lunar Mission Studies (1965-1967); Director, Skylab Integration Program (1967-1969); Director, Advanced Manned Mission

Program (1969-1972); Director, Mission & Payload Integration (1972-1976); Executive Director, President's Committee on Science and Technology (1976-1977); Deputy Associate Administrator for Space Transportation Systems (Technical) (1977-1979); Assistant for the Space Transportation System (1979-1981); Associate Deputy Administrator (1981-1984); Associate Administrator for Space Station (1984-1985); NASA General Manager (1985-1987); and Associate Administrator for Policy and Planning (1987-1988).

He also played an integral part in the planning of the Apollo-Soyuz Test Project in 1975 and served as the NASA representative in the 1979 anti-satellite treaty negotiations. Following retirement from NASA in 1988 he undertook consultancy work in the aerospace industry.

He was NASA's General Manager at the time of several launch failures in 1986, which saw three out of America's four launch vehicles out of action: Space Shuttle, Titan and Delta. "We basically have four launch vehicles in this country, and three of them have had successive failures. That seems to defy insurmountable odds." He said during an interview. "If you asked a few months ago whether this could ever happen, the answer certainly would have been no."

He died on 4 April 2015 as a result of complications of Alzheimer's disease. He was predeceased by his wife. He is survived by one son, one daughter and 11 grandchildren. In accordance with his final wishes some of his remains will be sent into space on a Celestis Inc. launch.

### Conclusion Notes

Many others who played a part in space programmes died in 2015. Sadly, there are too many to write about for one issue of CapCom. Part two will follow in a future issue of CapCom.

### Acknowledgements and sources:

Air Force Magazine; American Association for the Advancement of Science; Animals in Space ©2007 by Colin Burgess and Chris Dubbs; The Boston Globe; Collect Space; Fedcoop.com; Florida Today; Hamilton-O'Dell Funeral Home; The History of Manned Space Flight ©1991 by David Baker; HistoryNet.com; Ispyspace.com; Jane's Spaceflight Directory ©1984 by Reginald Turnill; Legacy.com; LinkedIn; Los Angeles Times; MooseRoots.com; NASA and its various centres; NASASpaceflight.com; New Mexico Museum of Space History; The New York Times; Project Mercury ©2001 by John Catchpole; Public Broadcasting Service; Russian Federal Space Agency; The Soviet Space Race With Apollo ©2000 by Asif A Siddiqi; S P Korolyov Rocket and Space Corporation Energiya; Virginia Heritage; The Washington Post; Wikipedia; You Tube.

## Advance Notice

**Wednesday 5 October**

### BIS West Midlands Space Day Event

**This year the BIS West Midlands Space Day Event will be held on Wednesday 5 October at a new home at the Hive in Worcester**

More details to follow in future editions of CapCom

Space and astronomy organisations are encouraged to get in touch to have a stand or for members to give a talk

Anyone interested should contact:  
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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](mailto:capcom.editor@midspace.org.uk).*

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