your window to space

capcom

Volume 29 Number 3 January February 2019

Meet ESA's EXO Mars Rover "Rosalind Franklin"

CapCom is published by Midlands Spaceflight Society

www.midspace.org.uk

Editor: Mike Bryce | President: David J Shayler| Secretary: Dave Evetts
Honorary Member: Helen Sharman OBE

space news roundup

ESA's Mars Rover Has a Name "Rosalind Franklyn"

The ExoMars rover that will search for the building blocks of life on the Red Planet has a name: Rosalind Franklin. The prominent scientist behind the discovery of the structure of DNA will have her symbolic footprint on Mars in 2021.

A panel of experts chose 'Rosalind Franklin' from over 36 000 entries submitted by citizens from all ESA Member States, following a competition launched by the UK Space Agency in July last year.

The ExoMars rover will be the first of its kind to combine the capability to roam around Mars and to study it at depth. The Red Planet has hosted water in the past, but has a dry surface exposed to harsh radiation today.

The rover bearing Rosalind Franklin's name will drill down to two metres into the surface to sample the soil, analyse its composition and search for evidence of past – and perhaps even present – life buried underground.

Rosalind Franklin

The rover is part of the ExoMars programme, a joint endeavour between ESA and the Russian State Space Corporation, Roscosmos.

What's in a name?

Rosalind Elsie Franklin was a British chemist and X-ray crystallographer who contributed to unravelling the double helix structure of our DNA. She also made enduring contributions to the study of coal, carbon and graphite. ESA has a long tradition of naming its missions for great scientists, including Newton, Planck and Euclid.

"This name reminds us that it is in the human genes to explore. Science is in our DNA, and in everything we do at ESA. Rosalind the rover captures this spirit and carries us all to the forefront of space exploration," says ESA Director General Jan Woerner.

The name was revealed this morning in the 'Mars Yard' at Airbus Defence and Space in Stevenage, in the United Kingdom, where the rover is being built. ESA astronaut Tim Peake met the competition entrants who chose the winning name, and toured the facility with UK Science Minister Chris Skidmore.

"This rover will scout the Martian surface equipped with next-generation instruments – a fully-fledged automated laboratory on Mars," says Tim.

"With it, we are building on our European heritage in robotic exploration, and at the same time devising new technologies."

The rover will relay data to Earth through the Trace Gas Orbiter, a spacecraft searching for tiny amounts of gases in the martian atmosphere that might be linked to biological or geological activity since 2016.

Rosalind already has a proposed landing site. Last November a group of experts chose Oxia Planum near the Martian equator to explore an ancient environment that was once water-rich and that could have been colonised by primitive life.

On our way to Mars, and back

Looking beyond ExoMars, bringing samples back from Mars is the logical next step for robotic exploration. ESA is already defining a concept for a sample return mission working in cooperation with NASA.

"Returning Martian samples is a huge challenge that will require multiple missions, each one successively more complex than the one before," says David Parker, ESA's Director of Human and Robotic Exploration.

"We want to bring the Red Planet closer to home. We want to delve into its mysteries and bring back knowledge and benefits to people on Earth. Returned planetary samples are truly the gift that keeps on giving – scientific treasure for generations to come," he adds.

Long-term planning is crucial to realise the missions that investigate fundamental science questions like could life ever have evolved beyond Earth?

ESA has been exploring Mars for more than 15 years, starting with Mars Express and continuing with the two ExoMars missions, keeping a European presence at the Red Planet into the next decade.

ExoMars Rover: from concept to reality

Science is everywhere at ESA. As well as exploring the Universe and answering the big questions about our place in space we develop the satellites, rockets and technologies to get there. Science also helps us to care for our home planet. All this week we're highlighting different aspects of science at ESA. Join the conversation with #ScienceAtESA.

For moreinformation plese visit:
http://www.esa.int/Our_Activities/Space_Science/ExoMars
http://exploration.esa.int

——- STOP PRESS ——- ——- STOP PRESS ——- ——- STOP PRESS ——- ——- STOP PRESS ——-

On 2nd Mach 2019 SpaceX successfully launched the Crew Dragon capsule from launch pad 39A at Kennedy Space Center on an uncrewed test flight (Demo 1) to the ISS. More on this in the next issue of CapCom.

Firefly Aerospace Announces Mass Production Facility and Cape Canaveral Launch Site

Firefly Aerospace, Inc. (Firefly), a provider of economical and dependable launch vehicles, spacecraft and in-space services, announced on 22 February 2019 the execution of a binding term sheet with Space Florida, under which Firefly will establish business operations at Cape Canaveral Spaceport, including launch operations at historic Space Launch Complex 20 and manufacturing facilities at Exploration Park, Florida. Firefly's announcement is concurrent with its receipt of a Statement of Capability from the 45th Space Wing.

As Florida's spaceport development authority, Space Florida will enable the company's Florida operations by matching the company's infrastructure investments up to $18.9M via the Florida Department of Transportation Spaceport Improvement Program. Firefly will invest $52 million and will bring more than 200 high paying jobs to Florida.

"Firefly Aerospace is proud to be the newest member of the Florida Space Coast family," said Firefly CEO Dr. Tom Markusic. "Our mass production manufacturing facility in Exploration Park will enable Firefly to produce 24 Alpha vehicles a year, enabling a launch cadence that will support a rapidly expanding global small satellite revolution and the commercialization of cislunar space."

"Space Florida is pleased to welcome Firefly Aerospace to the Cape Canaveral Spaceport," said Frank DiBello, Space Florida President and CEO. "Firefly's presence in the State of Florida further solidifies that Florida's Spaceport System is poised to lead the world in this next space era. We look forward to the new launch and manufacturing capabilities that Firefly brings to SLC-20 and Exploration Park, respectively."

"The 45th Space Wing welcomes new launch providers who wish to assist in furthering America's assured access to space. The Statement of Capability represents an important first step for Firefly Aerospace to obtain certification for launch operations on the Eastern Range," according to John Way, 45th Space Wing spokesperson.

"SLC-20 will allow Firefly access to lower inclination orbital trajectories for its customers and enable access to lunar trajectories for its lander program as part of our Commercial Lunar Payload Services contract with NASA." stated Brad Obrocto, Firefly Director of Launch Operations.

"The space industry is expected to be fastest growing segment of the worldwide economy in the coming decades, with analysts predicting a global market of over a $1 trillion a year by 2040," said Firefly CEO Dr. Tom Markusic. "Firefly Aerospace is uniquely positioned to be successful in this new economy. With launch sites on both coasts and a mass production facility to support future growth, our global team of over 300 highly accomplished engineers and technicians will provide space solutions from LEO to the surface of the Moon and beyond."

News story from PR Newswire
www.prnewswire.com

Firefly Aerospace
https://fireflyspace.com/

NASA Completes Booster Motor Segments for First Space Launch System Flight

NASA and its industry partners have completed manufacture and checkout of 10 motor segments that will power two of the largest solid propellant boosters ever built. The solid rocket fuel will help produce 8.8 million pounds of thrust to send NASA's Space Launch System rocket on its first integrated flight with the Orion spacecraft. Technicians at Northrop Grumman in Promontory, Utah, in coordination with SLS program leads at NASA's Marshall Space Flight Center in Huntsville, Alabama, finalized the fabrication of all 10 motor segments and fitted them with key flight instrumentation. They'll be shipped to NASA's Kennedy Space Center in Florida, joined with booster forward and aft assemblies, and readied to power the SLS Exploration Mission-1 test flight when it launches from Kennedy. The uncrewed test launch will pave the way for a new era of groundbreaking science and exploration missions beyond low-Earth orbit, carrying crew and cargo to the Moon and on to Mars. Marshall manages the Space Launch System for NASA.

Image Credit: NASA
www.nasa.gov

Hayabusa2, the Successful First Touchdown

National Research and Development Agency Japan Aerospace Exploration Agency (JAXA) executed the asteroid explorer Hayabusa2 operation to touch down the surface of the target asteroid Ryugu for sample retrieval.

Data analysis from Hayabusa2 confirms that the sequence of operation proceeded, including shooting a projectile into the asteroid to collect its sample material. The Hayabusa2 spacecraft is in nominal state. This marks the Hayabusa2 successful touchdown on Ryugu.

National Research and Development Agency
Japan Aerospace Exploration Agency (JAXA)

Virgin Galactic Makes Space for Second Time in Ten Weeks with Three On Board, Reaching Higher Altitudes and Faster Speeds, as Flight Test Program Continues

On 22 February 2019, Virgin Galactic conducted its fifth powered test flight and second space flight of its commercial SpaceShipTwo, VSS Unity. Please find reporting materials below for news coverage and multimedia reporting.

In its fifth supersonic rocket powered test flight, Virgin Galactic reached space for the second time today in the skies above Mojave California. Spaceship VSS Unity reached its highest speed and altitude to date and, for the first time, carried a third crew member on board along with research payloads from the NASA Flight Opportunities program.

This space flight means Chief Pilot Dave Mackay and co-pilot Michael "Sooch" Masucci become commercial astronauts and the 569th and 570th humans in space. Beth Moses, Virgin Galactic's Chief Astronaut Instructor, flew as the third crew member in a first, live evaluation of cabin dynamics. She is the 571st person to fly to space and the first woman to fly on board a commercial spaceship.

In addition to this element of envelope expansion, VSS Unity flew higher and faster than ever before, as its world record-holding hybrid rocket motor propelled the spaceship at Mach 3.04 to an apogee of 295,007ft.

The crew enjoyed extraordinary views of Earth from the black skies of space and, during several minutes of weightlessness while the pilots "feathered" the spaceship in preparation for a Mach 2.7 re-entry, Beth floated free to complete a number of cabin evaluation test points. The human validation of data previously collected via sensors, and the live testing of other physical elements of the cabin interior, are fundamental to the provision of a safe but enjoyable customer experience.

The glide back home was followed by a smooth runway landing and a rapturous reception from the crowd on the flight line, which included staff and some of Virgin Galactic's 600 Future Astronaut customers.

Chief Pilot Dave Mackay, a born and bred Scotsman as well as an ex-RAF test pilot and Virgin Atlantic Captain, led his crew of newly qualified astronauts from VSS Unity accompanied by a kilted piper.

Today's flight notched several additional firsts for the industry: The flight was the first time that a non-pilot flew on board a commercial spaceship to space, and it was the first time that a crew member floated freely without restraints in weightlessness in space onboard a commercial spaceship; it was the first time that three people flew to space on a commercial spaceship, and Dave Mackay became the first Scottish-born astronaut (Brian Binnie, who was raised in Scotland, flew to space in 2004).

Addressing colleagues and guests Dave said: "Beth, Sooch and I just enjoyed a pretty amazing flight which was beyond anything any of us has ever experienced. It was thrilling yet smooth and nicely controlled throughout with a view at the top, of the Earth from space, which exceeded all our expectations. I am incredibly proud of my crew and of the amazing teams at Virgin Galactic and The Spaceship Company for providing a vehicle and an operation which means we can fly confidently and safely. For the three of us today this was the fulfillment of lifelong ambitions, but paradoxically is also just the beginning of an adventure which we can't wait to share with thousands of others."

Sir Richard Branson said: "Flying the same vehicle safely to space and back twice in a little over two months, while at the same time expanding the flight envelope, is testament to the unique capability we have built up within the Virgin Galactic and The Spaceship Company organizations. I am immensely proud of everyone involved. Having Beth fly in the cabin today, starting to ensure that our customer journey is as flawless as the spaceship itself, brings a huge sense of anticipation and excitement to all of us here who are looking forward to experiencing space for ourselves. The next few months promise to be the most thrilling yet"

For more information and downloadable media please visit: Virgin Galactic www.virgingalactic.com

NASA Seeks Small Business Innovation Research for Future Missions, Commercialisation

Small businesses are at the cutting edge of research, with fresh and unexpected ideas. NASA hopes to leverage innovative small business concepts for use on Earth, at the Moon and beyond.

NASA's Small Business and Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs seek proposals that could be integrated into NASA missions and commercial markets. The 2019 solicitation encourages U.S. small businesses and research institutions to submit ideas related to NASA's aeronautics, human exploration, science and space technology objectives.

"Small businesses are a source of innovation within the United States," said Jenn Gustetic, SBIR/STTR program executive for NASA's Space Technology Mission Directorate in Washington. "We see examples time and time again of small companies developing and delivering new technologies using NASA-supported platforms such as the International Space Station and those provided through the Flight Opportunities program."

SBIR/STTR awards in the International Space Station utilization subtopics, for example, help small businesses demonstrate their innovations in space. Over a dozen awards since 2010 resulted in five flight demonstrations onboard the space station and more than $9 million in subsequent non-SBIR/STTR investment.

Moving forward, NASA also wants SBIR/STTR proposers to consider developing lunar payloads for in-space demonstration enabled by the selection of nine U.S. companies eligible to bid on the agency's lunar delivery services.

Of over one hundred subtopics in the new SBIR/STTR solicitation, 18 subtopics – ranging from in-situ resource utilization to energy storage to coordination of space vehicle swarms and more – specifically highlight the lunar payload opportunity. While not all proposals from these subtopics are expected to submit a payload deliverable, suitable payloads may be eligible (through subsequent competitive selection) for delivery to the lunar surface at no cost.

These technology areas will help NASA understand the lunar resource potential, the lunar environment and effects on human life, and how to live and work on the lunar surface. Early missions will mark an important step toward long-term study and human exploration of the Moon, and eventually Mars.

"It's exciting that small businesses can help us achieve our goals on Earth as well as exploration goals beyond low-Earth orbit," said Gustetic. "We strongly considered how to connect companies with emerging opportunities, like NASA's Moon to Mars exploration approach, as we determined the 2019 solicitation subtopics. With the addition of new subtopics relevant to lunar payloads, we hope to encourage the development of small business technologies for use on the Moon."

NASA's SBIR/STTR programs are highly competitive and proposals are evaluated based on scientific and technical merit and feasibility, experience, qualifications and facilities, effectiveness of the proposed work plan, commercial potential and feasibility, and price reasonableness. NASA will select proposals offering the most advantageous technology to the government and the programs. The 2019 solicitation for Phase I is open Feb. 5 through March 29, 2019.

Phase I awards are valued at approximately $125,000 for up to six months for SBIR and 13 months for STTR to establish the scientific, technical and commercial merit and feasibility of the proposed innovation in fulfillment of NASA needs. Phase I awardees can then apply for Phase II awards, valued up to $750,000 for up to two additional years, that are focused on the development, demonstration, and delivery of the proposed innovation. Phase III is the commercialization of innovative technologies, products and services resulting from either a Phase I or Phase II contract. This includes further development of technologies for transition into NASA programs, other government agencies or the private sector.

NASA's Ames Research Center in California's Silicon Valley manages the SBIR/STTR programs under the Space Technology Mission Directorate.

For more information about the 2019 SBIR/STTR solicitation, visit:

https://sbir.gsfc.nasa.gov/solicit-detail/61545

For more information about the SBIR/STTR programs, visit:

www.sbir.nasa.gov

SpaceX Successfully Launches a Payload Trio

On Friday, 22 February at 01:45 GMT, SpaceX launched the Nusantara Satu satellite from Space Launch Complex 40 (SLC-40) at Cape Canaveral Air Force Station, Florida. Falcon 9 also delivered the Bresheet lunar spacecraft and Air Force Research Laboratory (AFRL) S5 spacecraft to orbit. Deployments occurred at approximately 33 and 44 minutes after liftoff.

Falcon 9's first stage for the Nusantara Satu mission previously supported the Iridium-7 mission in July 2018 and the SAOCOM 1A mission in October 2018. Following stage separation, SpaceX landed Falcon 9's first stage on the "Of Course I Still Love You" drone ship, which was stationed in the Atlantic Ocean.

SpaceX

www.spacex.com

NASA Seeks US Partners to Develop Reusable Systems to Land Astronauts on Moon

As the next major step to return astronauts to the Moon under **Space Policy Directive-1**, NASA announced plans on 13 December to work with American companies to design and develop new reusable systems for astronauts to land on the lunar surface. The agency is planning to test new human-class landers on the Moon beginning in 2024, with the goal of sending crew to the surface in 2028.

Through multi-phased lunar exploration partnerships, NASA is asking American companies to study the best approach to landing astronauts on the Moon and start the development as quickly as possible with current and future anticipated technologies.

"Building on our model in low-Earth orbit, we'll expand our partnerships with industry and other nations to explore the Moon and advance our missions to farther destinations such as Mars, with America leading the way," said NASA Administrator Jim Bridenstine. "When we send astronauts to the surface of the Moon in the next decade, it will be in a sustainable fashion."

The agency's leading approach to sending humans to the Moon is using a system of three separate elements that will provide transfer, landing, and safe return. A key aspect of this proposed approach is to use the Gateway for roundtrip journeys to and from the surface of the Moon.

Using the Gateway to land astronauts on the Moon allows the first building blocks for fully reusable lunar landers. Initially NASA expects two of the lander elements to be reusable and refuelled by cargo ships carrying fuel from Earth to the Gateway. The agency is also working on technologies to make rocket propellants using water ice and regolith from the Moon. Once the ability to harness resources from the Moon for propellant becomes viable, NASA plans to refuel these elements with the Moon's own resources. This process, known as in-situ resource utilization or ISRU, will make the third element also refuellable and reusable.

NASA published a formal request for proposals to an appendix of the second Next Space Technologies for Exploration Partnerships (NextSTEP-2) Broad Agency Announcement (BAA) on 7 February, and responses are due by 25 March.

According to the solicitation, NASA will fund industry-led development and flight demonstrations of lunar landers built for astronauts by supporting critical studies and risk reduction activities to advance technology requirements, tailor applicable standards, develop technology, and perform initial demonstrations by landing on the Moon.

When NASA again sends humans to the Moon, the surface will be buzzing with new research and robotic activity, and there will be more opportunities for discovery than ever before. Private sector innovation is key to these NASA missions, and the NextSTEP public-private partnership model is advancing capabilities for human spaceflight while stimulating commercial activities in space.

The President's direction from Space Policy Directive-1 galvanizes NASA's return to the Moon and builds on progress on the Space Launch System rocket and Orion spacecraft, efforts with commercial and international partners, and knowledge gained from current robotic presence at the Moon and Mars.

For more information about NASA's Moon to Mars exploration plans, visit:

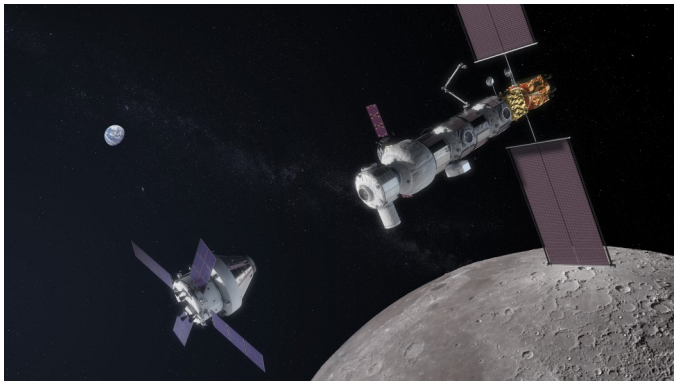
https://www.nasa.gov/moontomars

What is Gateway?

NASA is working with its partners to design and develop a small spaceship that will orbit the Moon called the Gateway. This spaceship will be a temporary home and office for astronauts, just about a five-day, 250,000-mile commute from Earth.

The Gateway will have living quarters, laboratories for science and research, docking ports (like doors) for visiting spacecraft, and more. It will provide NASA and its partners access to more of the lunar surface than ever before, supporting both human and robotic missions.

The Gateway will be our home base for astronaut expeditions on the Moon, and future human missions to Mars. Even before our first trip to Mars, astronauts will use the Gateway to train for life far away from Earth, and we will use it to practice moving a spaceship in different orbits in deep space.



For more information about NASA's Moon to Mars exploration plans, visit:

https://www.nasa.gov/moontomars

NASA, Partners Update Commercial Crew Launch Dates for SpaceX and Boeing

NASA and its Commercial Crew Program providers Boeing and SpaceX have agreed to move the target launch dates for the upcoming inaugural test flights of their next generation American spacecraft and rockets that will launch astronauts to the International Space Station.

The agency now is targeting 2 March for launch of SpaceX's Crew Dragon on its un-crewed Demo-1 test flight. Boeing's un-crewed Orbital Flight Test is targeted for launch no earlier than April.

These adjustments allow for completion of necessary hardware testing, data verification, remaining NASA and provider reviews, as well as training of flight controllers and mission managers.

The un-crewed test flights will be the first time commercially-built and operated American spacecraft designed for humans will dock to the space station. The first flights are dress rehearsals for missions with astronauts aboard the vehicles. Commercial crew has continued working toward these historic missions throughout the month of January.

"The un-crewed flight tests are a great dry run for not only our hardware, but for our team to get ready for our crewed flight tests," said Kathy Lueders, Commercial Crew Program manager. "NASA has been working together with SpaceX and Boeing to make sure we are ready to conduct these test flights and get ready to learn critical information that will further help us to fly our crews safely. We always learn from tests."

In January, SpaceX successfully completed a static fire test of its Falcon 9 with Crew Dragon atop the rocket at Kennedy Space Center's Launch Complex 39A in Florida, in preparation for Demo-1.

Boeing's CST-100 Starliner continues to undergo testing in preparation for its Orbital Flight Test, and United Launch Alliance is conducting final processing of the Atlas V rocket that will launch Starliner from Space Launch Complex 41 at Cape Canaveral Air Force Station in Florida.

"There still are many critical steps to complete before launch and while we eagerly are anticipating these launches, we will step through our test flight preparations and readiness reviews," said Lueders. "We are excited about seeing the hardware we have followed through development, integration, and ground testing move into flight."

NASA's Commercial Crew Program will return human spaceflight launches to U.S. soil, providing safe, reliable and cost-effective access to low-Earth orbit and the space station on systems that meet safety and performance requirements.

To meet NASA's requirements, the commercial providers must demonstrate their systems are ready to begin regular flights to the space station. After the uncrewed flight tests, Boeing and SpaceX will complete a flight test with crew prior to being certified by NASA for crew rotation missions. The following planning dates reflect inputs by the Commercial Crew Program and the two companies and are current as of 4 February 2019.

Test Flight Planning Dates:

SpaceX Demo-1 (un-crewed): March 2, 2019
Boeing Orbital Flight Test (un-crewed): NET April 2019
Boeing Pad Abort Test: NET May 2019
SpaceX In-Flight Abort Test: June 2019
SpaceX Demo-2 (crewed): July 2019
Boeing Crew Flight Test (crewed): NET August 2019

SpaceX also completed a pad abort test in 2015. Following the test flights, NASA will review performance data and resolve any necessary issues to certify the systems for operational missions. Boeing, SpaceX and the Commercial Crew Program are actively working to be ready for the operational missions. As with all human spaceflight vehicle development, learning from each test and adjusting as necessary to reduce risk to the crew may override planning dates.

For more information visit:

https://www.nasa.gov/exploration/commercial/crew/index.html

NASA Awards Support Services Contract for Exploration Ground Systems Program

NASA has selected LJT & Associates, Incorporated of Columbia, Maryland, to provide support services to the Exploration Ground Systems (EGS) Program at the agency's Kennedy Space Center in Florida.

The cost-plus fixed-fee, indefinite-delivery/indefinite-quantity contract begins April 1 with an 18-month base period, followed by five one-year options that, if exercised, will extend to Sept. 30, 2026. The total contract value including options is $124.8 million.

Under the contract, LJT & Associates will provide engineering and technical services, program and business management support services and administrative support services to the EGS Program. The contract also includes support for ground systems and space flight systems planning and design; project management and integration; operations integration and analysis; technical requirements development, management, and compliance; cost, risk, information and configuration management; and schedule integration and analysis.

For more Information about NASA and agency programs, visit:

https://www.nasa.gov

Astronaut News

Rob Wood

NASA Changes Crew for Boeing Test Flight

On 3 August 2018, NASA released the names of astronauts who were to fly the early missions of the new Commercial Crew Vehicles that have been developed by The Boeing Company and Space Exploration Technologies Corporation (better known as SpaceX). The Commercial Crew Vehicles are Boeing's CST-100 Starliner and SpaceX's Crew Dragon (also known as Dragon V2 or Dragon 2).

> See the July/August 2018 edition of CapCom for the Astronaut News main item on the announcement but the crews were named as:-
>
> Test flight Crew Dragon: Robert Behnken and Douglas Hurley
>
> Test flight Starliner: Eric Boe, Nicole Mann and Christopher Ferguson
>
> First operational flight Crew Dragon: Victor Glover and Michael Hopkins
>
> First operational flight Starliner: Josh Cassada and Sunita Williams

On 22 January 2019, NASA released the news that Mike Fincke had taken the place of Eric Boe who is unable to fly due to [unstated] medical reasons. Finke was the assistant to the Chief for Commercial Crew in the Astronaut Office at the Johnson Space Center (JSC) in Houston, Texas. Boe will replace him in that role.

Edward Michael 'Mike' Fincke (Colonel, USAF, Ret.) was born on 14 March 1967 in Pittsburgh, Pennsylvania but considers Emsworth, also in Pennsylvania, to be his hometown. He wanted to be an astronaut from an early age and remembers watching the Apollo missions with his family. He later said that this inspired him for his entire life. He was certainly in it for the long haul and even before he made his second spaceflight he noted that he would seek further missions. He has been an astronaut for over 20 years, has made three spaceflights and, of his 35 US classmates, he is one of only four still active.

His academic achievements include bachelor degrees in Aeronautics and Astronautics, and secondly in Earth, Atmospheric and Planetary Sciences, both from the Massachusetts Institute of Technology (MIT), Cambridge, Massachusetts (1989); a master's degree in Aeronautics and Astronautics from Stanford University, California (1990); an associate of science degree in Earth Sciences (geology) from El Camino College in Torrance, California (1993); and another master's degree, this time in Physical Sciences (planetary geology) from the University of Houston - Clear Lake, Texas (2001).

He was a United States Air Force (USAF) Reserve Officers' Training Corps (ROTC) student whilst he studied at MIT and Stanford. The ROTC is a military scholarship programme funding students in return for military service. The military had sponsored him for Aeronautics and Astronautics but he also followed his heart and double majored with Earth, Atmospheric and Planetary Sciences.

Following graduation from MIT, he attended a summer exchange programme with the Moscow Aviation Institute, in what was then still the Soviet Union, where he studied cosmonautics. He continued his studies at Stanford and only entered active military service after he completed his master's degree in 1990. It was then that he had a rare failure in his life. He was sent for jet pilot training but after about six months it became clear that, as Finke himself noted, "I wasn't going to be God's gift to aviation that I thought I was going to be and I wasn't destined to become a fighter pilot, so I washed out of pilot training." This was on 14 March 1991, so not the best birthday present for him.

However, the good news was that the USAF was quite happy to reassign him as a Space Systems Engineer and a Space Test Engineer at the USAF Space and Missiles Systems Center at Los Angeles Air Force Base (AFB). His career took off, "So I went and started working on spacecraft engineering in Los Angeles and, just as bad as I was as a potential fighter pilot, it turns out that perhaps I was that good as an engineer," he said with a smile many years after. "I found my niche and what I was able to do and the Air Force agreed and they said, well, you're pretty good at this engineering stuff, why don't you become a flight test engineer, help us fly and test new airplanes."

After three years at Los Angeles AFB, he was sent to the USAF Test Pilot School at Edwards AFB in California, where he graduated top of his class as a Flight Test Engineer in 1994. He was right; he was pretty good at this engineering role. He worked out of Edwards AFB and Elgin AFB in Florida on the McDonnell Douglas F-15 Eagle, twin-engine, all weather tactical fighter aircraft and the General Dynamics F-16 Fighting Falcon, single-engine, supersonic multirole fighter aircraft test programmes.

In January 1996, he was assigned as the US Flight Test Liaison to the Japanese/US Mitsubishi F-2 multirole fighter program at the Gifu Test Center, at the Japan Air Self-Defense Force's Gifu Air Base, Japan. The F-2 was derived from the F-16 so he was already familiar with this type of aircraft and he had a gift with languages so being conversant in Japanese also helped him get this assignment. He could also speak Russian which presumably did him no harm at all when he applied to be an astronaut.

NASA started the ball rolling for its sixteenth group of astronauts on 15 June 1995 when it was announced applications would be accepted immediately. All serving military personnel have to apply through their branch of the armed forces and Fincke did. The USAF agreed to pass his name on to NASA for consideration and he found himself amongst about 2,400 other contenders. On 1 May 1996, 35 finalists were named for astronaut training including Fincke. He reported to the JSC for astronaut candidate training in August 1996. They were joined by nine international candidates, making this, at 44, the largest ever group of astronauts.

He was selected as a mission specialist astronaut in 1996 (NASA Astronaut Group 16). He became eligible for flight assignment after successfully completing two years of basic training. Initially, as was normal for a newly trained astronaut, he was assigned technical

duties in the Astronaut Office. Amongst his early duties was as an ISS CapCom, a member of the Crew Test Support Team in Russia and as the space station Crew Procedures Team Lead.

During his astronaut career he has participated in a number of space analogue missions. He was the commander of the second NASA Extreme Environment Mission Operations (NEEMO 2) mission, living and working underwater on the Aquarius undersea research habitat off the coast of Florida for 7 days in May 2002, and was on the ESA Cooperative Adventure for Valuing and Exercising human behaviour and performance Skills (CAVES) 2012 crew, living underground and exploring caves on the Mediterranean island of Sardinia for six days in September 2012.

The aim of these activities is to provide a convincing analogue to space exploration. They provide astronauts with some of the same challenges underground and 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.

He served two back-up assignments before he made his first spaceflight. He was back-up for STS-108/ISS-4 (flew 5 December 2001 – 19 June 2002) and STS-113/ISS-6 (flew 24 November 2002 – 4 May 2003). It was unusual to have two back-up ISS assignments without flying in between but he was a late replacement for Carlos Noriega as back-up for STS-113/ISS-6. Noriega was removed for medical reasons. Fincke was already in training as a prime crew member for ISS-9 when he joined the back-up crew for STS-113/ISS-6 in April 2002.

He completed his assignment for STS-113/ISS-6 and then continued to work towards his first spaceflight, but on 1 February 2003, the Columbia Space Shuttle broke up on re-entry, killing all the crew. With shuttle missions suspended, there were alterations to ISS expedition crewing, e.g. ISS crews becoming two persons instead of the three it had been up to the accident. Fincke's position was quite fluid for a while and he even spent a month on the prime crew for ISS-10 before circumstances, including another astronaut, William McArthur, being disqualified (temporarily) for medical reasons, saw Fincke back to the ISS-9 crew.

In a NASA pre-flight interview prior to his first spaceflight, he was asked about flying in a two person crew and how on any space mission, the crew, as a group, has got to have all the talents to do all the jobs required and as the interviewer put it, "In your case, 'everybody' is just two people. Fincke's response was, "Well, that's what I really enjoy about being on a space station crew. I'm not really a mission specialist; I'm a mission generalist. Gennady [mission commander Gennady Padalka] and I need to know how to do everything."

He discussed the difference between a Space Shuttle crew and an ISS crew, "On a Space Shuttle mission, there's a mission specialist who's in charge of the EVAs, and another one in charge of the robotic arm, and a payload specialist or payload commander. I get to have my fingers in all of that. My duties are to be a flight engineer, which means I'm responsible to see that the American systems and the Russian systems are operating correctly, and if something goes wrong, I'm the guy there to help fix it. I'm also a specialist for the Canadian robotic arm, so that I'm the lead of the team when we move things around with the arm. I am the NASA Science Officer so for all of the experiments that we're doing, I am to lead those experiments and to make sure everything gets done right. That's a lot of work."

His first spaceflight was Soyuz TMA-4/ISS-9 (flew 19 April – 24 October 2004). As the NASA space station Science Officer and Soyuz/ISS Flight Engineer, he spent six months aboard the station, continuing science operations, maintaining station systems and performing four spacewalks. His first spacewalk, intended to replace a faulty circuit breaker on the exterior of the ISS, was ended after 14 minutes because of a pressure loss in the primary oxygen tank of his Orlan spacesuit. This was spotted very quickly by Russian flight controllers on the ground. NASA said that the overall pressure in his suit remained stable at all times and he was not in danger, but, without the prompt action by the Russian flight controllers to cancel the spacewalk quickly, he might have been.

Similar to the period before his first spaceflight, he again pulled two ISS back-up roles before he made his second spaceflight: Soyuz TMA -8/ISS-13 (flew 30 March – 29 September 2006) and Soyuz TMA-11-ISS-16 (flew 10 October 2007 – 19 April 2008). The first of these two back-up positions was again due to an astronaut losing his position on an ISS crew. However, this time it was not for medical reasons, John Grunsfeld was reassigned to a Hubble Space Telescope repair mission.

His second spaceflight was Soyuz TMA-13/ISS-18 (flew 12 October 2008 – 8 April 2009). He was a flight engineer for the Soyuz and commander for the ISS expedition. During the mission, he helped prepare the station for future six-person crews and hosted two Space Shuttle visits: STS-126 and STS-119. He conducted two spacewalks.

On 11 August 2009, NASA announced his assignment to the crew of STS-134. His third mission took place as STS-134 Endeavour (flew 16 May – 1 June 2011). The mission marked the final flight of Space Shuttle Endeavour. He was MS-1 and part of the EVA team and was one of the robotic arm operators. He carried out three spacewalks during the flight. The shuttle delivered the Alpha Magnetic Spectrometer, a state-of-the-art cosmic ray particle physics detector, to the ISS.

Following his third spaceflight, he served in the Exploration Branch of the Astronaut Office where he supported NASA's Commercial Crew Program and served as a space station CapCom. In 2015, he was named assistant to the Chief for Commercial Crew in the Astronaut Office at the JSC, where he worked closely with both Boeing and SpaceX, and with the astronauts already assigned to their vehicles, on the development and testing of the new spacecraft.

Eric Allen Boe (Colonel, USAF, Ret.) was born on 1 October 1964 in Miami, Florida but considers Atlanta, Georgia, to be his hometown. His father was a pilot in the USAF. Growing up around aircraft saw his interest in aviation grow and led his way to a career as a pilot, test pilot and astronaut.

His academic achievements include a bachelor's degree in Astronautical Engineering from the USAF Academy, Colorado (1987). Ten years later he obtained a master's degree in Electrical Engineering from the Georgia Institute of Technology, Atlanta, Georgia.

He was commissioned into the USAF in 1987 and went to Sheppard AFB, Texas, for his pilot training. He graduated in 1988. The following years saw a number of assignments and qualifications. He was an instructor pilot and test pilot, and flew several types of aircraft including the McDonnell Douglas F4-E Phantom, the Northrop T-38 Talon and the McDonnell Douglas F-15C Eagle. During his test career he even got to fly Huey helicopters (Bell UH-1 Iroquois).

In the mid-1990's, he flew 55 combat missions over Iraq in support of Operation Southern Watch, flying the F-15C. He graduated from the USAF Test Pilot School at Edwards AFB, California, in 1997. After graduation, he was assigned as the Director of Test, Air-to-Air Missile Test Division, 46th Test Wing, at Eglin AFB, Florida.

He was selected as a pilot astronaut in 2000 (NASA Astronaut Group 18). After two years basic training he was assigned technical duties in the Astronaut Office. From October 2005 to October 2006, he served as the Astronaut Office's Director of Operations at the Yuri Gagarin Cosmonaut Training Centre. He has made two spaceflights as pilot on the now retired US Space Shuttle.

His first spaceflight was on STS-126 Endeavour (flew 15-30 November 2008); as well as being an ISS expedition crew exchange mission, it also delivered equipment to enable larger crews to reside aboard the complex. His second spaceflight was on STS-133 Discovery (flew 24 February – 9 March 2011), which delivered the Leonardo Permanent Multipurpose Module to the ISS. The Italian built Leonardo was also on STS-126 when it was used in its original role as a logistics carrier. This was the last spaceflight for the Discovery Space Shuttle.

STS-133 was an all veteran crew, with all having experienced at least one previous spaceflight. Boe talked about this during a pre-flight NASA interview, "Well, it always makes things a little easier when you've had a group that's done the tasks that you're going to do, so a lot of things will be familiar to us," he said. "You obviously do a lot of training on the ground and the training gets you very well ready for what needs to be done on orbit. But there are a lot of things that you just can't train, what it's like to actually, to move around, we call it translation in space, how's it to eat? You know just all your kind of basic functions, sleeping. A lot of those things are unknowns until you get up in space so it makes things a little easier for the group because you kind of know how to adapt. You've done it before and you know you can get back there and do it again."

From August 2011 to March 2015, he served as a Deputy Chief of the Astronaut Office. There were two deputies and his responsibilities included the Commercial Crew Programme. He retired from the USAF in February 2012. In July 2015, he was named as one of four astronauts to commence generic training for the first flights of the Commercial Crew Vehicles. During his flying career he has accumulated more than 6,000 flight hours in more than 50 different aircraft.

"Watching the small, incremental changes come together to make revolutionary change is just an amazing thing," said Boe when the crew announcement for the Commercial Crew Vehicles was made. "Spaceflight is about people, and these last few years I've been watching the people and the teams come together, and now we're getting close to spaceflight and I'm looking forward to the journey."

If at First You Don't Succeed

On 3 December 2018, NASA announced that Aleksei Ovchinin and Nick Hague will be recycled to Soyuz MS-12 following their launch abort on Soyuz MS-10 in October 2018. They will fly to the ISS with Christina Hammock-Koch who had been previously assigned to that mission. At this point, launch was scheduled for 28 February 2019 but this later slipped to 14 March 2019.

NASA's news release stated that the three would return to Earth in October 2019 in Soyuz MS-12, but with the flight of the Emirati astronaut being a little up in the air (pun intended), the return position did not seem absolute. Since the abort of Soyuz MS-10, there appears to be a reluctance on the part of the US and Russian space agencies to confirm upcoming crews, and their ups and downs; probably because they were unsure of what they would be themselves.

However, by mid-February 2019, the Spacefacts and NASASpaceflight.com websites were showing Aleksei Ovchinin and Christina Hammock-Koch returning to Earth in Soyuz MS-12 and Nick Hague in Soyuz MS-13. Both these websites have decent records for accuracy but are by no means infallible. With these flights being in the near-term future we should have the official word soon. In the meantime, the NASA news release noted that the three astronauts would form part of the crews for ISS expeditions 59/60

Alexei Nikolaevich Ovchinin (Lieutenant Colonel, Russian Air Force, Ret.) was born on 28 September 1971 in Rybinsk, Yaroslavl Oblast, Russia. He was in the Russian Air Force from 1988 to 2012 and served as a military engineer-pilot and instructor-pilot.

He was selected as a cosmonaut in 2006 and started two years of basic training in 2007. He successfully completed his training and was given the designation 'Test Cosmonaut' on 2 June 2009. He took part in ESA's CAVES 2013 (15-28 September 2013) space analogue mission exploring caves on the Mediterranean island of Sardinia.

He was a back-up for Soyuz TMA-16M/ISS-43/44 (flew 27 March – 12 September 2015). His first spaceflight was Soyuz TMA-20M/ISS-47/48 (flew 18 March – 7 September 2016), on which he was Soyuz commander and a back-up flight engineer for the two ISS expeditions. He was a back-up for Soyuz MS-8/ISS-55/56 (flew 21 March – 4 October 2018).

His second mission to ISS came to a premature end when his Soyuz MS-10 launch vehicle failed shortly after lift-off on 11 October 2018 and he was unable to complete his ISS-57/58 assignment. He was the Soyuz commander. Soyuz MS-10 flew for 19 minutes, 41 seconds and reached an apogee of 57.8 miles (93 kilometers). Despite a lot of discussion on the Internet that this was a spaceflight, it was not.

The Fédération Aéronautique Internationale (FAI) is the governing body for air sports, aeronautical and astronautical world records, and uses the Karman Line boundary for where space starts. The Karman Line is 100 kilometers or 62.137 miles above sea level. The FAI's current code for astronautic records states that, "All flights must exceed an altitude of 100 km in order to qualify for records."

Soyuz MS-12 will therefore be his second spaceflight. He will command the Soyuz and then act as a flight engineer for ISS-59 before taking over command of the station for ISS-60.

Tyler Nicholas 'Nick' Hague (Lieutenant Colonel, USAF) was born on 25 September 1975 in Belleville, Kansas but considers Hoxie, Kansas, to be his hometown. His academic achievements include a bachelor's degree in Aeronautical Engineering from the USAF Academy (1998) and a master's degree in Astronautical Engineering from MIT (2000).

He was commissioned as a Second Lieutenant in the USAF in May 1998. From 2000 to 2002 he was assigned to the Space Vehicles Directorate of the USAF Research Laboratory at Kirtland AFB, Albuquerque, New Mexico, where he worked on solar panels for spacecraft and advanced systems for missile interception.

In 2003, he attended the flight test engineering course at the USAF Test Pilot School at Edwards AFB. On graduation as top flight test engineer for his class he was assigned to the 416th Flight Test Squadron of Edwards' 412th Test Wing where he was involved in the testing of several aircraft. He also helped adapt a Beechcraft C-12

Huron twin-engine turboprop aircraft to carry thermal sensors and ground penetrating radar.

He then deployed to Iraq with the aircraft between November 2004 and April 2005 where he flew 139 combat missions on the C-12 during the US occupation. He was part of Operation Horned Owl, where he conducted experimental counter-IED (Improvised Explosive Device) operations.

At the time of his deployment to Iraq he was technically still based at Edwards. His assignment there ended in June 2006, when he was assigned as an instructor at the USAF Academy. He was Assistant Professor of Astronautics there until July 2009 and was then posted as an Air Force Legislative Fellow in Washington DC. At the time of his selection as an astronaut he was supporting the Department of Defense as Deputy Division Chief of the Joint Improvised Explosive Device Defeat Organization.

He was selected as an astronaut in 2013 (NASA Astronaut Group 21). It was a case of 'third time lucky' for Hague because he had applied for astronaut selection for both the previous classes. He got as far as the interview stage for the 2009 selection but did not make it that far for the 2004 group. There had been 6,372 applicants for the 2013 astronaut class. After two years basic training he was assigned technical duties in the Astronaut Office with the ISS Operations Branch.

He commenced training at the Yuri Gagarin Cosmonaut Training Centre in January 2017, prior to his formal appointment to Soyuz/ISS crews. He was a back-up for Soyuz MS-8/ISS-55/56 (flew 21 March – 4 October 2018). Soyuz MS-12 will be his first flight into space.

Christina Marie Hammock-Koch was born on 2 February 1979 in Grand Rapids, Michigan, but considers Jacksonville, North Carolina, to be her hometown. Her academic achievements include two bachelor degrees from North Carolina State University, firstly in Electrical Engineering (2001) and secondly in Physics (2002). Also in 2002 she earned her master's degree in Electrical Engineering from the same University.

She received funding for her education from the Astronaut Scholarship Foundation (ASF). The ASF is a charity organisation originally founded by the Mercury astronauts in 1984. Now, over one hundred astronauts participate in fundraising for the charity together with the support of corporate and individual donors. She is the first of their scholars to be selected as an astronaut although many others have worked within the space industry.

She joined NASA's Goddard Space Flight Center in 2002 and spent two years as an electrical engineer. Between 2004 and 2007, she worked as a research associate for Raytheon Polar Services and this included a winter-over at Amundsen–Scott South Pole Station in Antarctica for the 2005/6 season as well as time working at Palmer Station, which is also located in Antarctica.

From 2007 to 2009, she worked for the Space Department's Space Science Instrumentation Group at the Johns Hopkins Applied Physics Laboratory. During her time there her main focus was on three particle detector instruments: the Jupiter Energetic-particle Detector Instrument, launched on the Juno deep space mission to Jupiter in 2011; the Van Allen Probes' Ion Composition Instrument, which was launched in 2012 to study the Van Allen radiation belts that surround our planet; and similar devices for the Magnetospheric Multiscale mission launched in March 2015 to study Earth's magnetosphere.

In January 2010, she returned to Raytheon Polar Services as an electronics technician and worked under contract to the National Oceanic and Atmospheric Administration (NOAA). She spent part of the 2011/12 winter at Summit Observatory in Greenland, a NOAA Baseline Observatory and in January 2012, moved to the Alaska Observatory near Barrow. From August 2012, she continued her work as an electronics technician at the American Samoa Observatory before taking over as Station Chief in October 2012.

She was selected as an astronaut in 2013 (NASA Astronaut Group 21) and completed two years of basic training in 2015. In January 2018, she commenced winter survival training in Russia, prior to her formal appointment to Soyuz/ISS crews. The following month she was assigned to the back-up crew for Soyuz MS-12, but in May 2018, she moved up to the prime crew replacing Shannon Walker who was removed from the crew. Soyuz MS-12 will be her first spaceflight.

Ascan Resigns Before End of Training

Just over half-way through his astronaut-candidate (basic training) Robb Kulin resigned from NASA. His resignation, effective on 31 August 2018, was "for personal reasons," said NASA public affairs officer Brandi Dean. No further information was given other than to say that the space agency cannot discuss the reasons due to privacy laws.

It is very rare for a NASA astronaut to resign even before they have completed their basic training and you have to go as far back as the 1960's to find others. Two from the 1967 scientist selection, John Llewelyn and Brian O'Leary, left before completion of their initial training. This was because their skill sets did not fit with astronaut training at that time.

Robb Michael Kulin (Ph.D.) was born on 7 December 1983 in Anchorage, Alaska. His academic achievements include a bachelor's degree in Mechanical Engineering from the University of Denver, Colorado (2004); a master's degree in Materials Science from the University of California, San Diego campus (year unknown) and a doctorate in Engineering from the University of California, San Diego campus (2010).

He has experience as an ice driller in Antarctica on the West Antarctic Ice Sheet and Taylor Glaciers, and as a commercial fisherman in Chignik, Alaska. In 2011, he joined SpaceX in Hawthorne, California, where he was working at the time of his selection as an astronaut.

He had unsuccessfully applied for NASA's 2009 and 2013 astronaut groups and had been a semi-finalist the second time out. He was finally selected as an astronaut in 2017 (NASA Astronaut Group 22). NASA whittled down a record 18,354 applicants to 12 who were named at a ceremony at the JSC on 7 June 2017. They reported for duty at the JSC on 21 August 2017. From January 2019, he has been the owner and exploration consultant for 'infinXplore' LLC.

Acknowledgements and sources:

Astronaut.ru; CapCom (previous issues); Collect Space; Google; The International Space Station Building for the Future ©2008 by John E Catchpole; Linkedin; Manned Spaceflight Log II 2006-2012 ©2013 by David J Shayler and Michael D Shayler; NASA and its various centres; NASASpaceflight.com; Praxis Manned Spaceflight Log 1961-2006 ©2007 by Tim Furniss and David J Shayler with Michael D Shayler; Spacefacts; Space Shuttle Developing an Icon 1972-2013 ©2016 by Dennis R Jenkins; Who's Who in Space ©1999 by Michael Cassutt; Wikipedia; Yuri Gagarin Cosmonaut Training Centre.

Take a Load Off

Starliner structural testing complete

At Boeing's test facility in Huntington Beach, California, a team of engineering and lab test technicians completed structures testing on Boeing's CST-100 Starliner. The two year test series was designed to prove the Starliner spacecraft will keep crews safe during repeated missions to and from the International Space Station (ISS).

Teams conducted testing on a Structural Test Article (STA) while the flight worthy spacecraft was built in parallel at Kennedy Space Center in Florida.

This test series was a complex and challenging endeavor for the vehicle itself and the team that had to reconfigure it over and over again for pressure testing, modal testing, loads testing, shock testing, separation performance testing and model validation.

Each test was demanding in terms of planning, setup and execution. For example, vibrational testing on the STA required specific frequencies, which meant setting up about 750 accelerometers at various points on the vehicle to measure its reaction. "Knowing how the STA reacts to those vibrations is critical, as it tells us whether it will maintain control during travel to and from space, and during docking with the ISS," said Boeing Test & Evaluation Test Leader Robert Bauer.

Boeing Lab Test experts from other locations also came in to support the work, which led to innovation. "By pulling in test experts from the wider BT&E team, we developed some unique instrumentation and have done things people have never done before," Bauer said.

On the more dynamic side, the team conducted numerous ordinance-activated tests – essentially, mini pyrotechnic events – to prove critical components such as the parachutes, ascent cover, forward heat shield and service module deploy or separate as expected.

In all, the team collected several billion points of data for the program engineers to verify the Starliner's design or, in some cases, improve it.

"We learned a great deal about our vehicle," said John Mulholland, vice president and program manager of Boeing's Commercial Crew Program. "We can now confidently say that the Starliner will safely and robustly handle every dynamic phase of flight, from launch and ascent through re-entry and landing."

Boeing
www.boeing.com

Midlands Spaceflight Society

Contact

Dave Evetts, Secretary,
Midlands Spaceflight Society
124 Stanhope Rd, Smethwick
B67 6HP
Tel. 0121 429 8606
(evenings & weekends only) or
e-mail mss.shop@midspace.org.uk

Web Site:

www.midspace.org.uk

Contributions to CapCom

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

capcom.editor@midspace.org.uk

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

Copy Deadline

All contributions intended for the March April 2019 issue should be emailed to the editor by
Friday 22 March 2019