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And now a Starliner to Space

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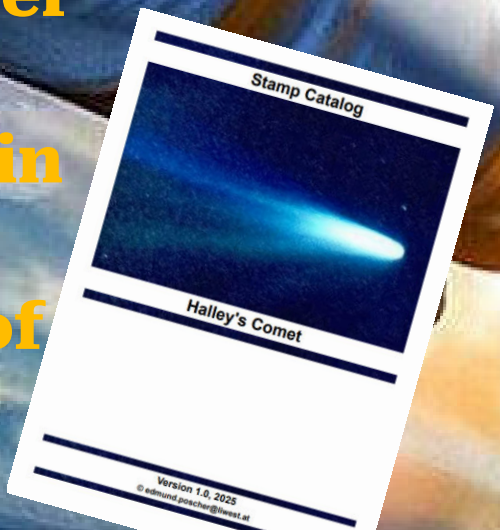
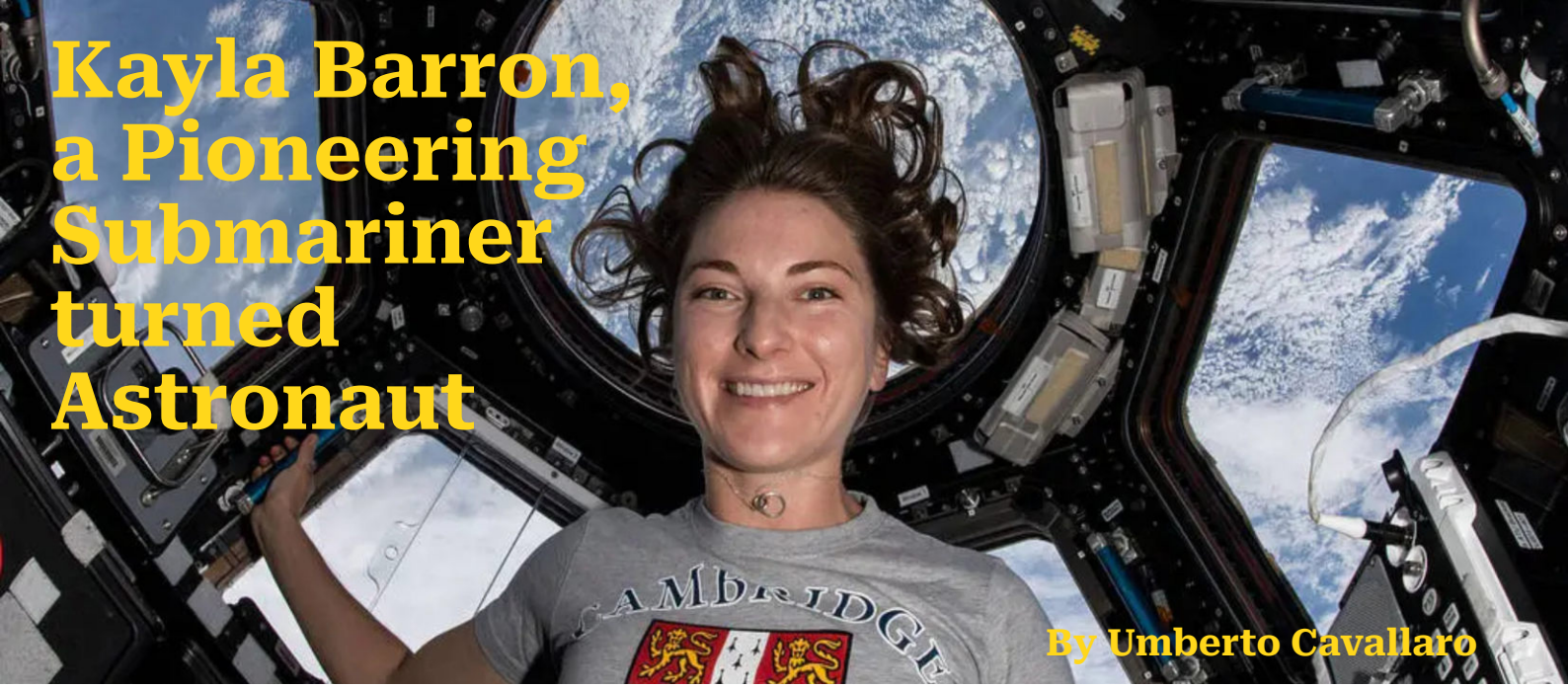
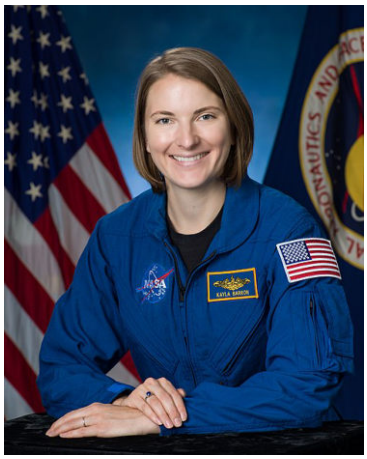


Kayla Barron, a Pioneering Submariner turned Astronaut



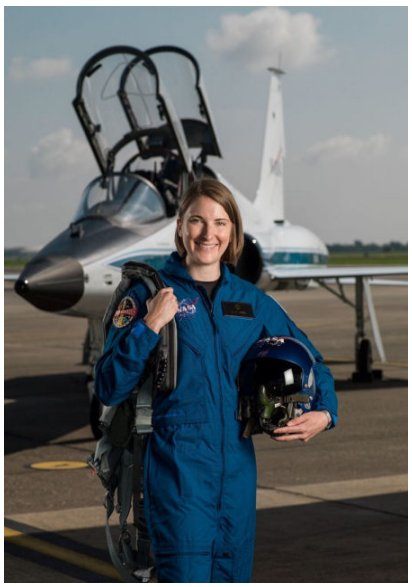
By Umberto Cavallaro



Kayla Barron (Credit: NASA).

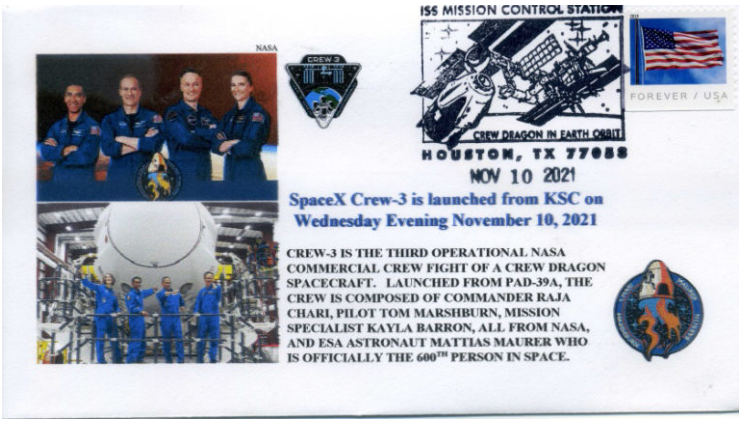
Navy Lt. Cmdr Kayla Barron flew to the International Space Station as the fourth crewmember of SpaceX's Crew-3 mission (*see note 1*). The assignment arrived 5 months after the announcement of the first three colleagues. NASA's original hope was to assign the fourth seat to a Russian cosmonaut but, despite months of negotiations, the agreement with Roscosmos could not be finalised in time (*see note 2*).

She was officially the 601st person to enter space and the 71st Woman Spacefarer in history.



Kayla Barron did her training at NASA.

A naval officer, Kayla was a member of the first Naval Academy class from which women were allowed to commission into the submarine force and to become submarine warfare officer. *"There is no better preparation for spaceflight than serving aboard a submarine"* she said.

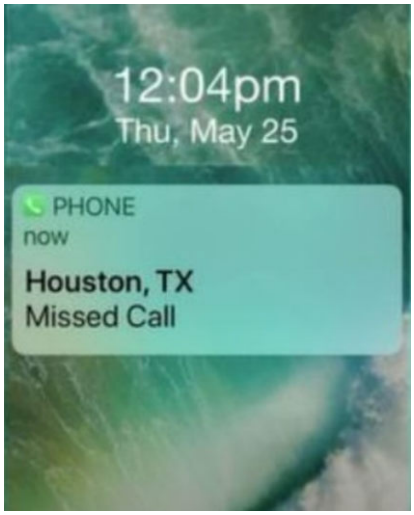


SpaceX Crew-3 launched cover.

Kayla Barron (Kayla Jane Sax) was born on 19 September 1987 in Pocatello, Idaho to Laura and Scott Sax. Her family moved to Richland, Washington, which she considers to be her hometown. She graduated in 2006 from Richland High School. Kayla didn't grow up thinking she would become an astronaut. Since a young age she was interested in STEM, especially engineering and, inspired by 9/11, she decided to enter the military service to help counter what she realised was a 'darker' world than she knew as a child, *"I did not dream specifically of becoming an astronaut growing up, which makes me a little different from some of my colleagues at NASA"*, she says.

Naval Academy

Her interests drove her to study engineering at the U.S. Naval Academy. After high school, Barron attended therefore the United States Naval Academy, in Annapolis, Maryland, where she graduated in 2010 with a Bachelor of Science with Honours in Systems Engineering. Encouraged by a mentor, as she was very interested in renewable and clean energy, as well as in helping develop



Being in a parade when NASA rang her mobile on May 25th, 2017, Kayla missed the call, but it was impossible to call or text back on that number (Credit Kayla Barron).

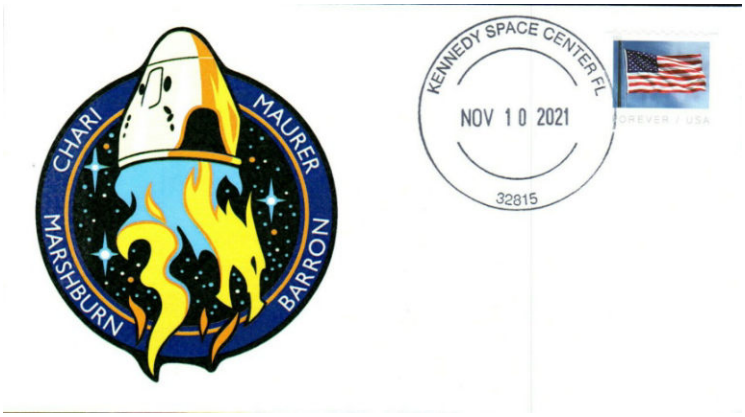
solutions to climate change, she eventually became a Gates Cambridge Scholar, and in 2011 earned a master's degree in Nuclear Engineering from the University of Cambridge, UK, focusing her research on modelling the fuel cycle for a next-generation, thorium-fueled nuclear reactor concept known as an accelerator-driven subcritical reactor *"I realised* – she says – *that nuclear energy was a hugely underutilised resource around the world, so I became really interested in next-generation reactor concepts. That is how I found my way to being interested in studying at Cambridge, working with Dr Geoff Parks for my MPhil project on modelling the fuel cycle for a next-generation, thorium-fueled nuclear reactor concept."*

Meanwhile, Kayla was appointed as a Navy officer in 2010, and qualified as a submarine warfare officer, thus becoming a member of the first class of women enlisted in the submarine community. Assigned to the USS Maine (SSBN 741), an Ohio-class ballistic missile submarine homeported in Bangor, Washington, she completed three strategic deterrent patrols while serving aboard the Maine as a division officer.

NASA Astronaut

After this experience on the submarine she had a chance to meet NASA astronaut Kay Hire, who had already served the Navy before and to talk about her missions assembling the International Space Station, and about the engineering challenges the crew faced and the teamwork required to succeed. Talking to her was for Kayla, a "lightning strike" moment. She found parallels between what it takes to live, work and complete a mission aboard a submarine, and to live in the confined space station, and was intrigued by the

Dragon Crew-3 patch.



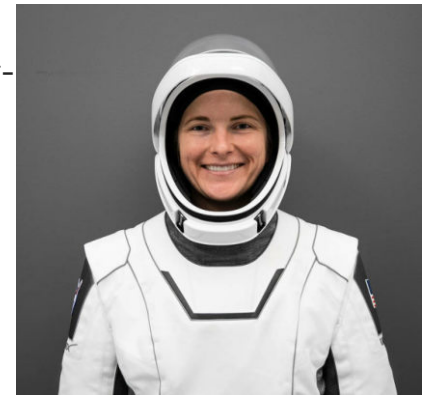
Dragon Crew-3 mission cover.

similarity. Encouraged by her mentor, Admiral Ted Carter – then Superintendent of the Naval Academy – she decided to apply to become a NASA astronaut.
More that 18,300 applications were received by NASA in 2016: the largest applicant pool ever. The whole process took about 18 months. She was one of the twelve astronaut candidates chosen in the NASA Group 22 (The Turtles). Being in a parade when NASA rang her mobile on 25 May 2017, she missed the call, but it was impossible to call or text back on that number. A second call arrived 45 minutes later. *"It was one of the most cherishable moments of my life"* she said. She reported for duty in August 2017.

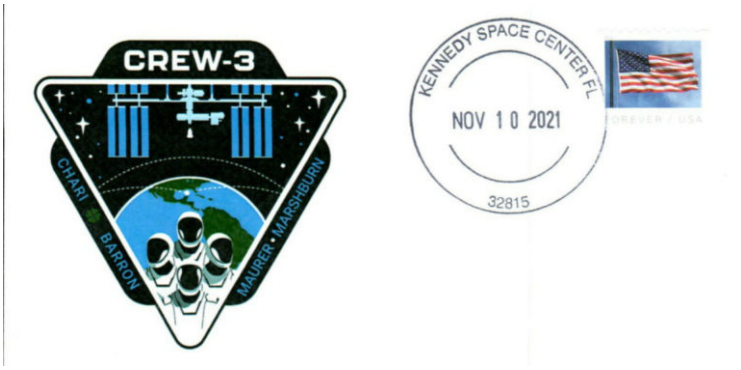
"It's important to give yourself the freedom to take things one step at a time," she said in an interview. *"I think it's important to dream and have big goals and things that you shoot for, but ... where I expected to be as a kid is different from the path I ended up walking because along the way I was always on evaluating the range of opportunities that lie ahead."* And the key, she added, is to never lose the sense of curiosity and willingness to dream or push yourself to the next adventure.

After completing her two years basic training in spacewalking, robotics, ISS systems, T-38 jet proficiency, and Russian language, she became eligible to be selected to fly in space.

Kayla was assigned to the Dragon Crew-3 mission, SpaceX's fifth crewed spaceflight, with NASA astronauts Raja Chari, Tom Marshburn, and European Space Agency Matthias Maurer.



Kayla in her Dragon Crew-3 spacesuit.



Crew-3 mission cover.

The training was impacted by the ongoing Covid-19 pandemic. Due to Covid concerns, most of the training took place at NASA's Johnson Space Center in Houston, and at SpaceX in Hawthorne, California. The crew also traveled a few times to Germany and Russia to train with their international partner agencies, and did remote training with the Japanese space agency.

Halloween night

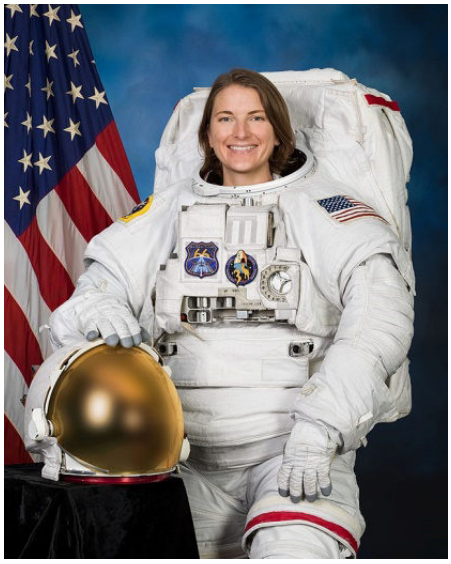
Originally, Crew-3 was supposed to launch on October 31st, on Halloween night, but instead of a treat they got a trick, and a series of delays kept stalling the Crew-3 launch, first due to bad weather, then further delayed due to a "minor medical issue" affecting one of the astronauts, then again because of unfavourable weather. The spacecraft could finally take off from NASA's Kennedy Space Center Launch Complex 39A on November 11.

After a brief welcome ceremony, broadcast live on NASA TV, Kayla and the other members of SpaceX Crew-3 joined NASA astronaut Mark Vande Hei and Russian cosmonauts Anton Shkaplerov and Pyotr Dubrov to complete the station's Expedition 66 crew.

Evacuate the Space Station

A few days later, on 15 November, the seven inhabitants of the International Space Station faced a dramatic moment when they received an emergency early call from the mission control in Houston, warning them that they needed to scramble into their spacesuits and evacuate the space station and take shelter in their transport spacecraft, ready to head for home.

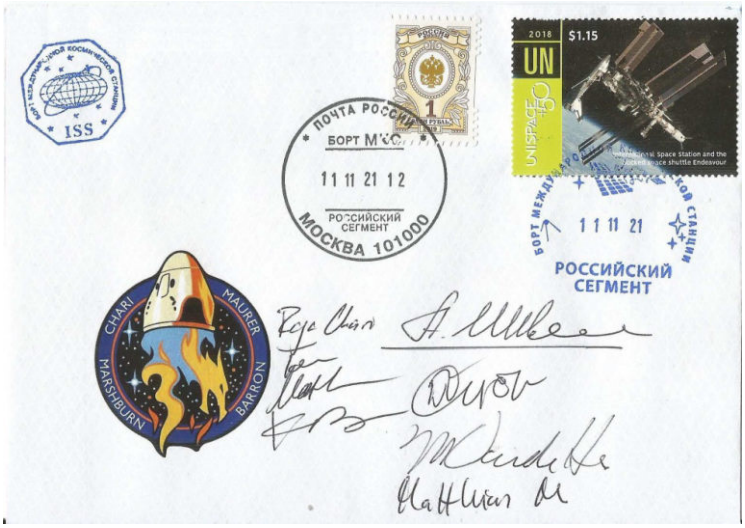
It then turned out that a possible collision was threatening the ISS, after a destructive antisatellite weapon test conducted on that morning by Russia had broken up a two-ton decommissioned Cosmos spy satellite, thus creating a large cloud of more than 1,500 trackable pieces of debris, and many thousands of smaller ones that could not be traced, sending debris in the direction of the ISS.



Kayla was part of the Expedition 66 crew and Dragon Crew-3.

Needless to say that this generated controversies on the ground for the "Russia's irresponsible and destabilising action" as the satellite was flying at an altitude of about 480 km, amidst a fairly congested environment of commercial and government satellites.

It was measured that the kinetic blast sent debris from the satellite across a broad range of altitudes, from as high as 1,100 km and as low as 300 km above the Earth. *"The long-lived debris created by this dangerous and irresponsible test will now threaten satellites and other space objects that are vital to all nations security, economic, and scientific interests for decades to come,"* said U.S. Secretary of State Antony Blinken. *"With its long and storied history in human spaceflight, it is unthinkable that Russia*



Cover commemorating the docking of SpaceX Crew-3 with the ISS, signed by the 8 astronauts onboard the Station. The cover is franked with one 0f the 6 commemorative stamps issued in 2018 by The United Nations Postal Administration (UNPA) to celebrate the 50th anniversary of the first Conference on the Exploration and Peaceful Uses of Outer Space. The $1.15 stamp features a 2011 picture captured by Italian astronaut Paolo Nespoli of the space shuttle Endeavour docked with the orbiting laboratory (the only picture of ISS and Shuttle).

would endanger not only the American and international partner astronauts on the ISS, but also their own cosmonauts. Their actions are reckless and dangerous, threatening the Chinese space station as well," NASA Administrator Bill Nelson said in a statement.

Venture out of the ISS

On November 30, just hours before Kayla was due to venture out of the ISS for a planned EVA with crewmate Thomas Marshburn, to replace a faulty antenna connecting to the NASA's Tracking and Data Relay Satellite System, it was decided to stop the EVA because of the space debris warning, *"While the debris field was very concentrated at first, it has dispersed over time, and it had raised the risk to the spacewalkers by 7%* – NASA said –*The pieces that could penetrate the spacesuits are much smaller than anything we are able to track"*. Kayla's first 6-hour, 32-minute EVA to replace the antenna was completed on December 2.

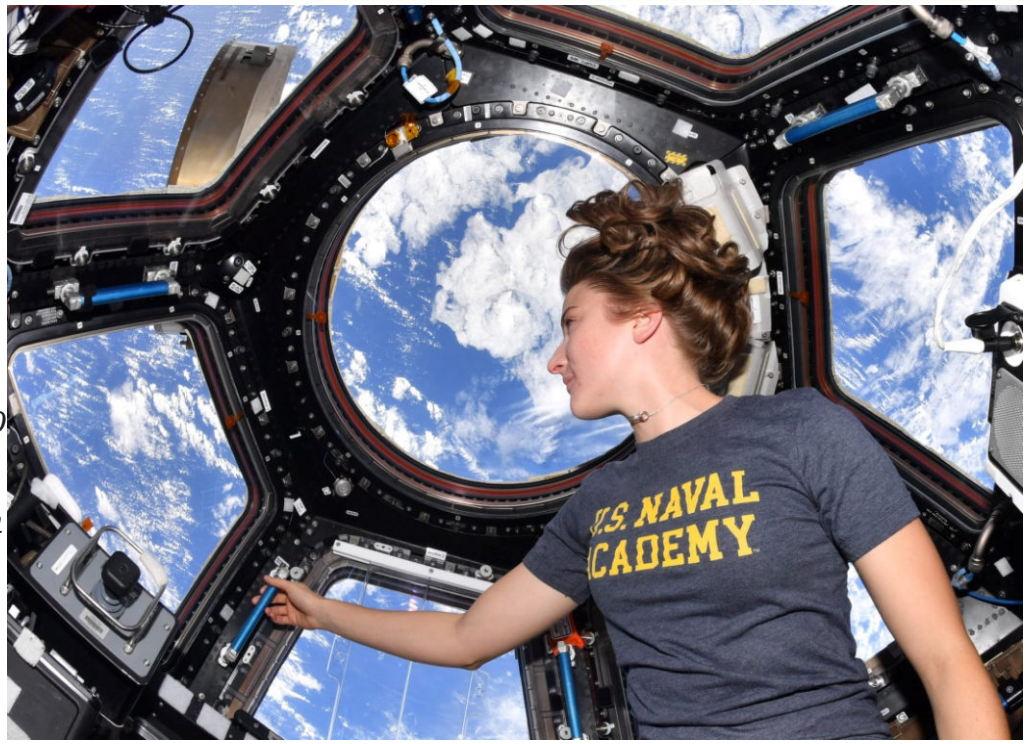
She also participated in many experiments, including space gardening and the GRASP human research experiment that tests how astronauts perceive up and down movements and grip and manipulate objects in microgravity.

"We're doing a lot of amazing stuff on ISS that will contribute to lunar missions," she said. *"We're doing some technology demonstrations of environmental control and life support, so really trying to understand how we can reclaim all the water and turn it back into drinking water, how we can generate oxygen. We've had these systems aboard the space station for 20 years, but what we're trying to understand is how to improve their reliability and make them easier to maintain, because now, if something breaks, we have these cargo resupply missions coming to the space station every couple of months,"* she says. *"So we can get new hardware to replace things, but we're not going to have that luxury, really, on the moon or especially on a trip to Mars"*.

On 15 March 2022 she ventured into the vacuum of space for her second spacewalk – the first spacewalk of the year – with crewmate Raja Chari, to assemble and install modification kits required for upcoming solar array upgrades. During the six hours and 54 minutes Kayla and Chari installed struts and brackets that will be used to support new ISS Roll-Out Solar Arrays that were delivered at the space station on 5 June by the 22nd SpaceX Dragon cargo resupply mission. The new improvement is expected to increase the available supply from 160 kilowatts to 215 kilowatts.

As part of the NASA Artemis generation of astronauts, Kayla is one of the 9 women who have a chance at being the first women to walk on the Moon. Among other things she worked with the engineering team designing and developing the space suits that will be used for future exploration missions of the Artemis program *"...Unlike Apollo, we hope to go to the moon to stay. We want to build permanent habitats. We want to explore new areas of the moon."*

This article first appeared in AD-ASTRA - N° 52 – March 2022 and is reprinted with permission.



Kayla Barron in space

Note 1: SpaceX Crew-3 was the third operational NASA Commercial Crew flight of a Crew Dragon spacecraft, and the fourth crewed flight for NASA. Crew-3 flew with a brand new Dragon spacecraft, called "Endurance" to honour both the SpaceX and NASA teams that built the spacecraft and trained the astronauts, and the workers who endured through a pandemic.

Note 2: A barter agreement was proposed to Roscosmos by NASA, to exchange seats between Crew Dragon and Russia's Soyuz crew vehicle in order to allow the space agencies to maintain their segments of the orbital outpost even if their own space taxis are grounded for a longer period of time. Roscosmos expressed concerns about the safety of the vehicle's systems and was reluctant to fly Russian cosmonauts on the private American spacecraft, citing SpaceX's lack of experience.