



INTERNATIONAL SPACE STATION



# EXPEDITION 61

[https://www.nasa.gov/mission\\_pages/station/expeditions/expedition61/index.html](https://www.nasa.gov/mission_pages/station/expeditions/expedition61/index.html)



Soyuz MS-13 Launch: July 20, 2019  
Landing: February 6, 2020\*



**DREW MORGAN (NASA)**  
Flight Engineer

**Born:** New Castle, Pennsylvania  
**Interests:** Running, swimming, reading, and family travel  
**Spaceflights:** First flight  
**Bio:** <https://go.nasa.gov/2Su7ESF>  
**Twitter:** @AstroDrewMorgan



**LUCA PARMITANO (ESA)**  
Flight Engineer

**Born:** Paternò, Italy  
**Interests:** Weight training, biking, running, reading, and playing music  
**Spaceflights:** Expedition 36/37  
**Bio:** <https://go.nasa.gov/2SuquJe>  
**Twitter:** @astro\_luca



**ALEKSANDR SKVORTSOV (Roscosmos)**  
Flight Engineer

**Born:** Schelkovo, Russia  
**Spaceflights:** Expedition 23/24, 39/40  
**Bio:** <https://go.nasa.gov/31aBbWJ>

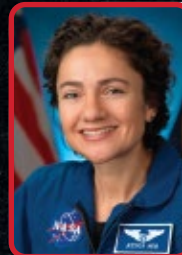


Soyuz MS-15 Launch: September 25, 2019\*\*  
Landing: April 1, 2020



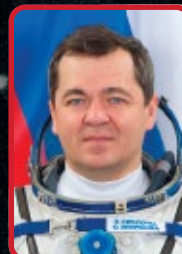
**CHRISTINA KOCH (NASA)**  
Flight Engineer

**Born:** Grand Rapids, Michigan  
**Interests:** Backpacking, rock climbing, paddling and sailing  
**Spaceflights:** First flight  
**Bio:** <https://go.nasa.gov/2QCRHbX>  
**Twitter:** @Astro\_Christina



**JESSICA MEIR (NASA)**  
Flight Engineer

**Born:** Caribou, Maine  
**Interests:** Skiing, hiking, running, cycling, soccer, and SCUBA diving  
**Spaceflights:** First flight  
**Bio:** <https://go.nasa.gov/2OIErQd>  
**Twitter:** @Astro\_Jessica



**OLEG SKRIPCHKA (Roscosmos)**  
Flight Engineer

**Born:** Nevinnomyssk, Russia  
**Spaceflights:** Expedition 25/26, 47/48  
**Bio:** <https://go.nasa.gov/2MWfDJU>

\*Drew Morgan will return to Earth on Soyuz MS-15 on April 1, 2020

\*\*Christina Koch launched to the space station aboard Soyuz MS-12 on March 14, 2019

# EXPEDITION 61

Expedition 61 began in October 2019 and ends in February 2020. This expedition will include research investigations and technology demonstrations not possible on Earth to advance scientific knowledge of Earth, space, physical and biological sciences.



# SCIENCE ON THE



During Expedition 61, crew members will make improvements to the Alpha Magnetic Spectrometer in an effort to extend its life and support its mission of looking for evidence of dark matter, they will provide input on how a vest designed to protect vital organs from radiation fits as they perform daily tasks, they will operate an exploration rover on Earth from space to test for future Lunar or Martian exploration and will work to understand cotton root systems to enable the development of cotton cultivars more robust in the face of drought and pests.

## Targeting Improved Cotton Through Orbital Cultivation

Cotton is an integral part of our daily lives. Many of the consumer products that we use today, from t-shirts, to jeans, to bed sheets, to coffee filters, are derived from cotton. It is estimated that more than 25 million tons of cotton are produced around the world each year. While the economic and personal benefits of cotton are well understood, the environmental impacts of cotton production are significant. It is estimated that to produce one kilogram of cotton requires thousands of liters of water. Additionally, the intensive use of agricultural chemicals in cotton farming and production can have health impacts on workers and surrounding ecosystems. Organizations around the world are looking for new and innovative ways to address this critical issue over the next few decades. This experiment will improve the understanding of cotton root systems and associated gene expression enabling development of cotton cultivars more robust in the face of drought and pests.



## AMS-02

Stars, planets and the molecules that make them are only about five percent of the total mass in the universe — the rest is either dark matter or dark energy, but no one has ever seen this material or been able to study it. What's more, the Big Bang theory holds that the universe should be made of equal parts matter and antimatter, but scientists have never detected naturally occurring antimatter. The Alpha Magnetic Spectrometer - 02 (AMS-02) looks for evidence of these mysterious substances, along with very high-energy radiation coming from distant stars that could harm crew members traveling to Mars. The AMS-02 has collected and analyzed billions of cosmic ray events, and identified nine million of these as electrons or positrons (antimatter). The number of high energy positrons increases steadily rather than decaying, conflicting with theoretical models and indicates a yet to be identified source of positrons. Researchers also observed a plateau in the positron growth curve and need additional data to determine why. Results suggest that high-energy positrons and cosmic ray electrons may come from different and mysterious sources. Solving the origin of cosmic rays and antimatter increases understanding of our galaxy. As with many items that are exposed to the harsh environment of space, AMS now requires repairs to keep up its data collection. These fixes will be performed over a series of spacewalks during Expedition 61.



## AzTechSat-1

Inter-satellite communication is critical to human space exploration. The AztechSat-1 primary focus is to conduct inter-satellite communication demonstrations between AztechSat-1 and the Globalstar Satellite Constellation. These demonstrations will further mature this capability with potential applications for deep-space SmallSat missions. AztechSat-1 will accomplish this primary focus area by using two onboard communication systems - Globalstar STINGR modem and an UHF/VHF amateur band radio. The Globalstar STINGR modem has an embedded L-Band radio and a GPS, through which the modem's crosslink communication is a patch antenna. This is the first international collaboration program between NASA and the Mexican Space Agency (AEM).



## AstroRad Vest

As astronauts travel farther into deep space, new methods for protecting them from exposure to increased radiation are needed. AstroRad Vest uses the International Space Station as a 'phase zero' test platform in the development of this key element of cis-lunar exploration. Lockheed Martin and StemRad, a company based in Tel Aviv, Israel, developed AstroRad Vest and optimized the design to mitigate radiation threats to astronauts on missions to the Moon and Mars. Unpredictable solar particle events may deliver high radiation doses in a few hours. Wearing the AstroRad Vest could reduce the chance of radiation exposure-induced death from radiation-induced fatal cancers and other short- and

long-term adverse health effects. This type of garment shielding protects specific radiation-sensitive organs, tissues and stem cell concentrations. Astronauts will provide input on the garment as they wear it while performing daily tasks, including how easy it is to put on, how it fits and feels, and the range of motion it allows. Garment developers can use this input to improve design, and use of the vest protects crew members on missions to the Moon and Mars.



The Expedition 61 patch represents an exciting and dynamic time aboard the International Space Station as it constantly advances towards a limitless future in space. The overall patch view is from an approaching vehicle in pursuit of the space station. The sun is the most prominent, central element in the patch as the source of energy and life for the Earth, the space station and our entire solar system. As the present focus of human spaceflight, the space station is centered in the emblem while barely eclipsing the sun with its tiny shadow, reminding of us that human exploration is a small part of our quest to understand the universe. Fifteen of the sun's rays represent the 15 original partner members of the space station program, while the 16th ray represents an open invitation for continued collaboration with new partners. The four yellow rays form the cardinal directions of a compass, symbolizing the innate human drive to explore. The advancing terminator represents the dawn of a new day on Earth. The name ring appears to float through space and has no single orientation, emphasizing the variety of viewpoints assembled in an international crew unified under one mission. Nine rays extend beyond the name ring to represent the nine human missions that have braved exploration beyond low earth orbit, thus encouraging us to drive boundlessly out into our solar system.

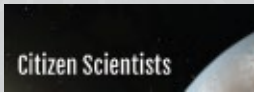
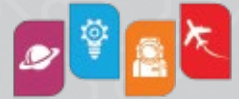


**Space Station Research Explorer** At any given time on board the space station, a large array of different experiments are underway within a wide range of disciplines. Here, you can search the database of experiments to learn more about each experiment's objectives, descriptions, results, and imagery, as well as find links to additional information beyond this database.

[https://www.nasa.gov/mission\\_pages/station/research/experiments/explorer/](https://www.nasa.gov/mission_pages/station/research/experiments/explorer/)

**STEMonstrations** STEMonstrations fit the need for students and educators to have high quality, informative videos that cover the wide range of topics outlined in the Next Generation Science Standards (NGSS). Astronauts film videos instructing students in biology, chemistry, physics, Earth science, and space science. The videos align to a "Try This" one- to two-page lesson plan where students and educators can make connections to topics they are working on in the classroom.

<https://www.nasa.gov/stemonstrations>



**Citizen Science Projects** For years, solar system and exploration have brought excitement and inspiration to people of all ages. This is especially true now, with new opportunities for students and citizen scientists to directly participate in expanding our knowledge of the solar system. Amateur astronomers and students with wide ranges of equipment and expertise are making valuable contributions to our growing understanding of our nearest celestial neighbor. Learn how you can become part of the adventure!

<https://science.nasa.gov/citizenscientists>

**Sally Ride EarthKAM** Sally Ride EarthKAM (Earth Knowledge Acquired by Middle school students) is a NASA educational outreach program that enables students, teachers, and the public to learn about Earth from the unique perspective of space. Students can "program" the camera to take pictures of the Earth from space and study the images they receive.

<https://www.earthkam.org/>



**Spot the Station** Watch the International Space Station pass overhead from several thousand worldwide locations. It is the third brightest object in the sky and easy to spot if you know when to look up. Visible to the naked eye, it looks like a fast-moving plane only much higher and traveling thousands of miles an hour faster!

<https://spotthestation.nasa.gov/>

**Story Time from Space** While in space, astronauts videotape themselves reading books to children on Earth. In addition, cross-content curriculum is designed to support the Next Generation Science Standards and Common Core.

<http://storytimefromspace.com/>



**Amateur Radio on the ISS** ARISS lets students worldwide experience the excitement of talking directly with crew members of the International Space Station, inspiring them to pursue interests in careers in science, technology, engineering and math, and engaging them with radio science technology through amateur radio.

[www.ariss.org/](http://www.ariss.org/)

**In-flight Education Downlinks** Wouldn't it be great if students could talk with an astronaut aboard the International Space Station about what it is like to live and work in space? Well, they can! Educational organizations located in the United States can host an in-flight education downlink with space station crew members. Students pose questions and watch as astronauts answer the questions and demonstrate science, technology, engineering and mathematics concepts in ways that are impossible on Earth.

<https://www.nasa.gov/audience/foreducators/stem-on-station/downlinks.html>



**Expeditionary Skills for Life** Expeditions are journeys made by people who share a definite purpose and specific experiences. To make their expeditions successful, NASA works with astronaut crews on skills that prepare them to live and work together during space missions. Some of these same skills are useful in everyday life here on Earth. This series of activities is designed to take you through various educational expeditions that will help you learn and practice skills that you can apply in almost every aspect of life.

<https://www.nasa.gov/education/4H>