National Aeronautics and Space Administration

International Space Station

[MISSION SUMMARY]

EXPEDITION 46

Expedition 46 began December 11, 2015 and ends March 1, 2016. This expedition includes human research, biology and biotechnology, astrophysics research, physical science investigations and education activities. One spacewalk is tentatively planned during Expedition 46.

THE **CREW:**

Soyuz TMA-18M Launch: September 2, 2015 • Landing: March 1, 2016
(Note: Kelly and Kornienko launched on Soyuz TMA-16M on March 27, 2015)

Scott Kelly (NASA) – Flight Engineer

Born: Orange, New Jersey
Interests: racquetball, running, water sports and weight lifting
Spaceflights: STS-103, STS-118, Exps. 25 and 26
Bio: http://go.nasa.gov/SbcMZD
Twitter: @StationCDRKelly
Instagram: stationcdrkelly

Mikhail Kornienko (Roscosmos) – Flight Engineer (Kor-knee-EHN-koh)

Born: Syzran, Russia
Interests: mountaineering
Spaceflights: Exps. 23 and 24
Bio: http://go.nasa.gov/Tg0ksk

Sergey Volkov (Roscosmos) – Flight Engineer (SIR-gay VOLL-koff)

Born: Chuguyev, Kharkov Region, Ukraine
Interests: sports, tennis, windsurfing, reading and museums
Spaceflights: Exps. 17, 28 and 29
Bio: http://go.nasa.gov/10s4JYn
Twitter: @Volkov_ISS

Soyuz TMA-19M Launch: December 15, 2015 • Landing: June 5, 2016

Timothy Kopra (NASA) – Flight Engineer

Born: Austin, Texas
Interests: running, swimming, reading, home improvement projects, and spending time with family and friends
Spaceflights: STS-127, Expedition 20
Bio: http://go.nasa.gov/bgyJnW
Twitter: @astro_tim

Tim Peake (ESA) – Flight Engineer

Born: Chichester, England
Interests: skiing, scuba diving, cross-country running, climbing, and mountaineering
Spaceflights: Exps. 46/47 mark his first space station missions
Bio: http://go.nasa.gov/1MkB4Ja
Twitter: @astro_timpeake
Instagram: @astro_timpeake

Yuri Malenchenko (Roscosmos) – Flight Engineer

Born: Svetlovodsk, Kirovograd Region, Ukraine
Interests: sports, games and music
Spaceflights: STS-106, Exps. 7, 16, 32 and 33
Bio: http://go.nasa.gov/195yzKl

THE **SCIENCE:**

What are some of the investigations the crew is operating?

During Expedition 46, crew members will install equipment and conduct experiments that help researchers test the use of inflatable space habitats in microgravity, analyze microbes living on the space station and study the protein crystal growth enablement of structure-based drug design (SBDD), an integral component in the drug discovery and development process. Investigations like these demonstrate how space station crews help advance NASA's journey to Mars while making discoveries that can benefit all of humanity.

Bigelow Expandable Activity Module (BEAM)

Future space habitats for low-Earth orbit, the moon, Mars, or other destinations need to be lightweight and relatively simple to construct. The Bigelow Expandable Activity Module (BEAM) is an experimental expandable capsule that attaches to the International Space Station (ISS). After installation, BEAM inflates to roughly 13 feet long and 10.5 feet in diameter to provide a habitable volume where a crew member can enter.

Expandable habitats, occasionally described as inflatable habitats, greatly decrease the amount of transport volume for future space missions. These "expandables" weigh less and take up less room on a rocket while allowing additional space for living and working. They also provide protection from solar and cosmic radiation, space debris, and other contaminants. Crews traveling to the moon, Mars, asteroids, or other destinations could use them as habitable structures.

BEAM is scheduled to launch on SpaceX's Commercial Resupply Services Mission 8, also known as CRS-8. BEAM will be installed via the Canadarm2, which will remove BEAM from the capsule and connect it to the aft port of the International Space Station's Node 3. It will be inflated at a later date.

Microbial Tracking Payload Series/Microbial Observatory-1

Along with crew members and experimental payloads, the space station is home to a variety of microbes, which could potentially threaten crew health and jeopardize equipment. The Microbial Payload Tracking Series project uses microbial analysis techniques to establish a census of the microorganisms living on space station surfaces and in its atmosphere. Crew members will sample the United States modules three times during one year, which enables researchers to conduct long-term, multigenerational studies of microbial population dynamics. This analysis can help determine whether some microbes are more virulent in space, and which genetic changes might be involved in this response. This will provide a better understanding of microbe diversity onboard the station, as well as genetic strategies for identifying specific subsets. Results from this investigation can be used to evaluate cleaning strategies, and to mitigate microbe-related risks to crew health and spacecraft system performance.

CASIS Protein Crystal Growth 4 (CASIS PCG 4)

CASIS PCG 4 comprises two investigations that both leverage the microgravity environment in the growth of protein crystals and focus on structure-based design (SBDD). SBDD is an integral component in the drug discovery and development process. Primarily, SBDD relies on the three-dimensional, structural information provided by protein crystallography to inform the design of more potent, effective and selective drugs.

One investigation will study the effect of microgravity on the co-crystallization of a membrane protein with a medically relevant compound. It has been established that growing protein crystals in microgravity can avoid some of the obstacles inherent to protein crystallization on Earth, such as sedimentation. As a result, scientists will attempt to grow co-crystals of a human membrane protein in the presence of a medically relevant compound in microgravity in order to determine its three-dimensional structure. This will enable scientists to chemically target and inhibit, with "designer" compounds, an important human biological pathway that has been shown to responsible for several types of cancer.

The second investigation, A Co-Crystallization in Microgravity Approach to Structure-based Drug Design, seeks to determine whether crystals formed in microgravity represent an improvement over crystals formed by ground-based methods. Scientists expect the crystals formed in microgravity to diffract to a higher resolution than those developed on Earth, and thereby, provide greater molecular detail. This will permit more confident evaluations of ligand-binding (when a signal-triggering molecule binds to a site on a target protein). The resulting structures could be used to advance the medical-chemistry effort through improved/enhanced SBDD.

THE MISSION **PATCH:**

The 46 icon in the foreground of the patch represents the forty-sixth expedition on the International Space Station. Earth is depicted at the top with the flags of the countries of origin of the crew members: the United States, Russia and the United Kingdom. The Union flag of the UK is displayed in a position of prominence in recognition of the significance of the first British ESA (European Space Agency) astronaut to fly in space. The outer border is in the shape of a triangle with an unbroken border, symbolizing the infinite journey of discovery for past, present and future space explorers. The names of the six Expedition 46 astronauts and cosmonauts are shown in the border.

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NP-2015-12-043-JSC