National Aeronautics and Space Administration

International Space Station

[MISSION SUMMARY]

EXPEDITION 53 began in September 2017 and ends in December 2017. This expedition includes astrophysics, technology demonstrations, cellular biology and biotechnology. Three spacewalks are tentatively planned during Expedition 53.

THE **CREW:**

Soyuz MS-05 Launch: July 2017 • Landing: December 2017

Randolph Bresnik (NASA) – Commander

Born: Fort Knox, Kentucky
Interests: travel, music, photography, weight training, sports, scuba diving, motorcycling, and flying warbirds
Spaceflights: STS-129
Bio: https://go.nasa.gov/2rq5Ssm
Twitter: @AstroKomrade

Sergey Ryazanskiy (Roscosmos) – Flight Engineer

Born: Moscow, Soviet Union
Interests: Numismatics, playing the guitar, tourism, sport games
Spaceflights: Exps. 37/38
Bio: https://go.nasa.gov/2rpXf0K
Twitter: @Ryazanskiy_ISS

Paolo Nespoli (ESA) – Flight Engineer

Born: Milan, Italy
Interests: scuba diving, piloting aircraft, assembling computer hardware, electronic equipment and computer software
Spaceflights: STS-120, Exps. 26/27
Bio: https://go.nasa.gov/2rq0tlk

Soyuz MS-06 September 2017 • February 2018

Aleksandr Misurkin (Roscomos) – Flight Engineer

Born: Yershichi, Smolensk Region, Russia
Interests: badminton, basketball, downhill skiing, carting
Spaceflights: Exps. 35/36
Bio: https://go.nasa.gov/2vAiNdr

Mark T. Vande Hei (NASA) – Flight Engineer

Born: Falls Church, Virginia
Interests: exercise, camping, windsurfing and reading
Spaceflights: Expedition 53 will be his first spaceflight.
Bio: https://go.nasa.gov/2vzY0a8
Twitter: @Astro_Sabot

Joseph Acaba (NASA) – Flight Engineer

Born: Inglewood, California
Interests: camping, hiking, biking, kayaking and scuba diving
Spaceflights: STS-119, Exps. 31/32
Bio: https://go.nasa.gov/2vA7vWu
Twitter: @AstroAcaba

THE **SCIENCE:**

What are some of the investigations the crew is operating?

During Expedition 53, researchers will study the cosmic ray particles, demonstrate the benefits of manufacturing fiber optic filaments in microgravity, investigate targeted therapies to improve muscle atrophy and explore the abilities of a new drug to accelerate bone repair.

Cosmic Rays, Energetics and Mass

Cosmic ray particles reach Earth from far outside the solar system with energies well beyond what man-made accelerators can achieve. The Cosmic Ray Energetics and Mass (ISS-CREAM) instrument measures the charges of cosmic ray particles ranging from hydrogen to iron nuclei. The data collected from the instrument will be used to address fundamental science questions such as:

- Do supernovae supply the bulk of cosmic rays?
- What is the history of cosmic ray particles in the galaxy?
- Can the energy spectra of cosmic rays result from a single mechanism?

The three-year mission will help the scientific community to build a stronger understanding of the fundamental structure of the universe.

Optical Fiber Production in Microgravity

Optical Fiber Production in Microgravity (Made in Space Fiber Optics), a U.S. National Lab investigation sponsored by the Center for the Advancement of Science in Space (CASIS), demonstrates the benefits of manufacturing fiber optic filaments in a microgravity environment. This investigation will attempt to pull fiber optic wire from ZBLAN, a heavy metal fluoride glass commonly used to make fiber optic glass. When ZBLAN is solidified on Earth, its atomic structure tends to form into crystals. Research indicates that ZBLAN fiber pulled in microgravity may not crystalize as much, giving it better optical qualities than the silica used in most fiber optic wire. Results from this investigation could lead to the production of higher-quality fiber optic products both in space and on Earth.

Rodent Research 6

Spaceflight has significant and rapid effects on the musculoskeletal system. Rodent Research 6, a National Lab investigation funded by CASIS, explores targeted therapies that could improve some of the detrimental side effects of extended spaceflight through the slowing or reversal of muscle atrophy. Mice living aboard the space station will be implanted with a drug delivery chip, which will release the treatment drug, then studied against Earth-based control groups.
Results from this investigation could lead to the improved treatments for ailments related to prolonged immobilization, cancer and aging on Earth, as well as in space.

Synthetic Bone

The microgravity environment of space impacts bone cell growth and healing in a way that mimics the symptoms observed in osteoporosis. Synthetic Bone, a National Lab investigation funded by the CASIS, explores the abilities of Tetranite, a synthetic bone material capable of adhering bone to metal within minutes, to accelerate bone repair. Understanding how bone cells interact with Tetranite could provide insight into the post-fracture bone healing response and assist in the development of more effective treatments for patients with osteoporosis.

THE MISSION **PATCH:**

The International Space Station is our launch pad into the future of human space exploration. Collectively, our world stands at the cusp of incredible developments as a spacefaring species. Onboard the space station we continue to evolve the technologies vital to the sustainment and longevity of humans in the harsh realities of living without gravity or the protection of our atmosphere. These self-sustaining or regenerative technologies continually developed aboard the space station not only improve life here on Earth, but they are essential to human beings existence beyond low-Earth orbit (LEO). The space station is the linchpin for this next great phase of development and is instrumental in expanding the use of space, not only as a world-class science laboratory, but also as a destination for next-generation space vehicles.
This journey beyond LEO is depicted in the Expedition 53 patch as we, the crew, will endeavor to accomplish the work that allows future missions to further explore our solar system. This journey will only be accomplished as an international team, represented by our multinational crew as well as by the many countries depicted on the globe. The myriad of stars represent the untold number of passionate and supremely dedicated people that endeavor across the planet daily to make the space station the amazing vehicle it is as well as prepare us for the next great steps forward in space exploration.

National Aeronautics and Space Administration

Lyndon B. Johnson Space Center
Houston, Texas 77058

www.nasa.gov

NP-2017-09-020-JSC