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June 15, 2016

Statement of
Scott Kelly
Retired Astronaut
National Aeronautics and Space Administration

before the

Subcommittee on Space
Committee on Science, Space and Technology
U. S. House of Representatives

Mr. Chairman and Members of the Subcommittee, thank you for the opportunity to appear before you today to discuss the importance of understanding the medical impacts of human space flight on astronauts and the proposed legislation on astronaut health. This issue is of critical importance to me and to our nation's future space exploration initiatives.

I recently returned with my colleague Russian Cosmonaut Mikhail Kornienko from nearly a year in space aboard the International Space Station which serves as our best asset for understanding how human physiology behaves in a microgravity environment. Until at least 2024 the space station will continue to provide a platform for research on astronaut health and many other scientific investigations.

The major objective of this Year in Space mission was to expand the experience and knowledge base required to safely send humans deeper into our solar system. A Mars mission is no easy feat and could require astronauts to be in space for three years or more. During this mission, we conducted more than 400 experiments in the fields of biology, material sciences, chemistry and physics. Many of these experiments focus on how the human body responds to weightlessness and other effects of long duration spaceflight. One of these experiments dubbed the "Twins Study," gave researchers the unique opportunity to study my physiology while in space compared to my twin brother, retired astronaut and Navy Captain Mark Kelly, on Earth. Data acquired from this Year in Space mission will help NASA make determinations that will directly affect decisions regarding crew safety in the years to come in areas from the design of future spacecraft to medical and psychological risk mitigation. Although I have been home for 100 days, much of the data is still being analyzed by researchers from around the world.

Much attention is paid to the risks astronauts face while launching aboard rockets or returning to Earth in a giant fireball. Much less attention is given to the other risks astronauts face which are much more insidious but potentially just as fatal. The environment astronauts are exposed to while in space is unlike anything we experience here on Earth. Specifically, astronauts are exposed to high levels of radiation and carbon dioxide, and a micro-gravity

environment which causes loss of bone and muscle, vision impairment and effects on our immune system to name just a few. These are very real issues that need to be solved before the human race is able to reach destinations beyond the Earth and Moon.

When I returned after 340 days, I was surprised at how differently I felt compared to my previous long-duration mission of 159 days. My muscles more quickly stiffened, and because my skin had not touched anything for nearly a year, it was extremely sensitive and became inflamed. I developed a hive-like rash on every surface of my skin that came in contact with ordinary surfaces on Earth during normal activities like sitting or lying in bed. My legs were swollen due to the shift of fluid gravity forced upon my body. I even had flu-like symptoms that appear to have been a result from my extended time in space.

Exposure to the space environment has permanent effects we simply do not fully understand. The "Lifetime Surveillance of Astronaut Health" Program NASA has in place to study astronaut long term health is too limited to provide the data needed to ensure the safety of our space explorers. If we are to go beyond low-Earth orbit, NASA needs the ability to proactively and aggressively monitor, diagnose and treat astronauts who serve our country in the name of science and exploration. Expanding healthcare coverage for our U.S. astronaut corps will enable NASA to more effectively and efficiently support it and collect the data necessary to push out further into our solar system.

Furthermore, continued investigation of space-related ailments and mitigation steps will help in treating similar ailments on Earth, such as osteoporosis, muscle wasting diseases, high blood pressure, glaucoma and certain brain disease, to name a few. There are already FDA-approved treatment modalities which are a result of space based research.

Although Mars and other long-term NASA objectives seem to be many years ahead of us, laying a secure foundation for astronaut health is imperative to the continuance of our nation's ability to explore. Healthcare for our astronauts is critically important. Our astronauts are exposed to numerous health risk factors while in space and while we are aware of some of the impacts we need more data from astronauts in space and on the ground to better understand the negative effects the harsh microgravity environment of space has on the human body.

The proposed legislation on astronaut health will not only help us learn more about the impacts of human spaceflight but also will serve to protect the health of those who push the boundaries in the name of exploration on behalf of our nation.

We are on the cusp of a new space age – one in which greater numbers of Americans will travel to space and go farther than ever before. I was honored to play a small role in paving the way for those future pioneers but want to make it clear this Year in Space mission was not my achievement. It was the achievement of thousands of dedicated professionals that believe like I do that the benefits of human spaceflight are vital to the continued success and development of our nation and our species.

Mr. Chairman, I would be happy to respond to any questions you or the other Members of the Subcommittee may have.

Biographical Data

Lyndon B. Johnson Space Center
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National Aeronautics and Space Administration
February 2016

SCOTT J. KELLY (CAPTAIN, USN, RET.)
NASA ASTRONAUT

Pronunciation: SKOT KEH-lee

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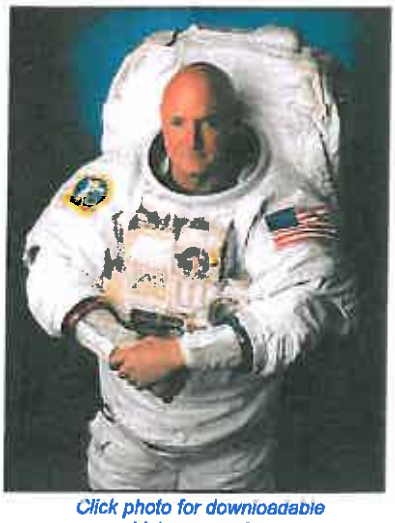

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PERSONAL DATA: Born February 21, 1964 in Orange, New Jersey. He has two children.

EDUCATION: Graduated from Mountain High School, West Orange, New Jersey, in 1982; received a Bachelor of Science degree in Electrical Engineering from the State University of New York Maritime College in 1987 and a Master of Science degree in Aviation Systems from the University of Tennessee, Knoxville, in 1996.

ORGANIZATIONS: Associate Fellow, Society of Experimental Test Pilots; Member, Association of Space Explorers

SPECIAL HONORS: Two Defense Superior Service Medals, Legion of Merit, Distinguished Flying Cross, Navy Commendation Medal, Navy Achievement Medal, two Navy Unit Commendations, National Defense Service Medal, Southwest Asia Service Medal, Kuwait Liberation Medal, Sea Service Deployment Ribbon, NASA Distinguished Service Medal, NASA Exceptional Service Medal, NASA Outstanding Leadership Medal, three NASA Space Flight Medals, Russian Federation Medal for merit in Space Exploration. Korolev Diploma from the Federation Aeronautique Internationale, 1999. Honorary Doctorate of Science degree from the State University of New York, 2008.

EXPERIENCE: Kelly received his commission from the State University of New York Maritime College in May 1987 and was designated a naval aviator in July 1989 at Naval Air Station (NAS) in Beeville, Texas. He then reported to Fighter Squadron 101 at NAS Oceana, Virginia Beach, Virginia, for initial F-14 Tomcat training. Upon completion of this training, he was assigned to Fighter Squadron 143 and made overseas deployments to the North Atlantic, Mediterranean Sea, Red Sea and Persian Gulf aboard the USS Dwight D. Eisenhower (CVN-69). Kelly was selected to attend the U.S. Naval Test Pilot School in January 1993 and completed training in June 1994. After graduation, he worked as a test pilot at the Strike Aircraft Test Squadron, Naval Air Warfare Center, Aircraft Division, Patuxent River, Maryland, flying the F-14 Tomcat and F/A-18 Hornet. Kelly was the first pilot to fly an F-14 with an experimental digital flight control system installed and performed subsequent high angle of attack and departure testing. He has logged over 8,000 hours in more than 40 different aircraft and spacecraft and has over 250 carrier landings. Kelly holds a United States Coast Guard Third Mate's license. Kelly retired from the U.S. Navy in June of 2012.

NASA EXPERIENCE: Selected by NASA in April 1996, Kelly reported to the Johnson Space Center in August 1996. Following completion of training, he was assigned technical duties in the Astronaut Office Spacecraft Systems/Operations branch. Kelly has logged more than 520 days in space on four space flight, and currently holds the record for time in orbit by a U.S. Astronaut. He served as Space Shuttle pilot on STS-103 in 1999 and was the Mission Commander on STS-118 in 2007. Following STS-103, Kelly served as NASA's Director of Operations in Star City, Russia. He served as a backup crewmember for Interanation Space Station (ISS) Expedition 5 and as the Astronaut Office Space Station Branch Chief. Kelly also served as a Flight Engineer for ISS Expedition 25 and as the Commander of ISS Expedition 26. In March 2015, Kelly launched for a one-year mission to the ISS, serving as a Flight Engineer for increments 43 and 44, and Commander for increments 45 and 46.

SPACEFLIGHT EXPERIENCE: STS-103 (December 19 to December 27, 1999) was an 8-day mission, during which the crew successfully installed new instruments and upgraded systems on the Hubble Space Telescope (HST). Enhancing HST scientific capabilities required three spacewalks (EVAs). The STS-103 mission was accomplished in 120 Earth orbits, traveling 3.2 million miles in 191 hours and 11 minutes.

STS-118 (August 8 to August 21, 2007) was the 119th space shuttle flight, the 22nd flight to the ISS, and the 20th flight for Endeavour. During the mission, Endeavour's crew successfully added another truss segment, a new gyroscope and an external spare parts platform to the ISS. A new system that enables docked shuttles to draw electrical power from the station to extend visits to the outpost was successfully activated. A total of four EVAs were performed by three crewmembers. Endeavour carried approximately 5,000 pounds of equipment and supplies to the station and returned to Earth with approximately 4,000 pounds of hardware and equipment. Traveling 5.3 million miles in space, the STS-118 mission was completed in 12 days, 17 hours, 55 minutes and 34 seconds.

Kelly launched aboard the Soyuz TMA-M spacecraft on October 7, 2010 to serve a tour of duty on the ISS. He assumed command of Expedition 26 once the Soyuz TMA-19 undocked on November 24, 2010. After a 159 day stay aboard the ISS, Commander Kelly and Russian Flight Engineers Alexander Kaleri and Oleg Skripochka safely landed their Soyuz spacecraft on the Kazakhstan Steppe on March 16, 2011.

Kelly and cosmonaut Mikhail Kornienko launched in March 2015 for a year-long mission to the International Space Station. The mission's goal is to understand how the human body reacts and adapts to the harsh environment of space. During the 340-day mission, almost 400 experiments were conducted on the station. Data from the expedition will be used to reduce risks to the health of crewmembers as NASA prepares to advance space travel beyond low Earth orbit. Kelly was a Flight Engineer for increments 43 and 44, and the International Space Station Commander for increments 45 and 46. Kelly's year in space included 5,440 orbits around the Earth and he conducted three spacewalks before returning home in March 2016.

Scott Kelly retired from NASA March 2016.