

**Statement of
Chris Cassidy
Captain, U.S. Navy and
Chief Astronaut of the Astronaut Office
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, I appreciate the opportunity to appear before you and discuss the efforts of NASA's Astronaut Office to safeguard and maintain the health of NASA's astronaut corps.

The Chief of the Astronaut Office is the most senior leadership position for active astronauts in the Astronaut Corps. I serve as head of the Corps and am the principal adviser to the NASA Administrator, and the NASA chain of command, on astronaut training and operations. In this position, I am responsible for managing the resources, operations, and safety programs for the entire astronaut corps. As the 500th person to fly into space, and a veteran of two space flights (first on the Space Shuttle Endeavour (STS-127) and later on a Soyuz (TMA-8M)), I have experienced firsthand the physical and mental challenges astronauts undergo.

Our office provides spaceflight operators for a variety of spacecraft; ground support for spaceflight; evaluation, testing, and development of new vehicle designs; and support for the education and public outreach office, which coordinates astronaut appearances to speak to and inspire students and the public. The International Space Station (ISS) has had a continuous human presence for over 15 years. An international mix of six crew members is maintained on the ISS, and each of these crew members begins training two and a half years before an anticipated launch. These are six-month missions, which includes research, technology demonstrations, extra-vehicular activity, robotics, payloads, cargo, and resupply. Additionally, we also support the Mission Control Center, which handles all command and control of the ISS and communications with the onboard crew.

We work closely with the Office of the Chief Health and Medical Officer (OCHMO). As the office responsible for policy and oversight of all health and medical activities at NASA, OCHMO coordinates and supports space medicine, including ground-based analogs for space missions, the development of vehicles for human and animal access to space, ISS activities, and planning for future space missions.

While human spaceflight has always been inherently dangerous, and though astronauts accept that risk, my job, and the job of the Agency, is to understand and minimize that risk. As is the case for all NASA leadership, I am very committed to that aspect of our mission. One of the most precious resources we have on the ISS is the astronaut's time. Every minute of the 16 hours of awake crew time per day is treated as a critical resource similar to air, water, and food. This time is used to accomplish the hundreds of scientific experiments, perform corrective and preventive maintenance, load and unload supply ships, and execute many operational tasks required to keep the ISS functioning. Yet, despite these competing priorities for crew time, NASA will always allocate two hours per day to exercise. We have learned that resistive exercise is the single most effective countermeasure to the muscle mass loss and bone density loss that is caused by microgravity. NASA's willingness to commit those precious hours to safeguard the health of the crew demonstrates how seriously we take protection of the Agency's astronauts.

Our knowledge of the kinds of health challenges associated with exposure to space has increased as more astronauts fly on the ISS. Conditions have surfaced after long-duration spaceflight that are not apparent in short-term space exposure. For example, the muscle atrophy and associated loss of bone densification experienced on long-duration flights were not a concern on shorter flights. With new knowledge, we now can proactively treat this condition using daily exercise. Extended missions on the ISS enabled NASA to discover the problem and develop an effective countermeasure.

As you know, NASA has learned and continues to learn a tremendous amount from Scott Kelly's one-year mission. The Agency has also taken advantage of the fact that retired astronauts Scott and Mark Kelly are twins. While Scott spent almost a year in space, Mark stayed here on earth. The Twins Study now will look at the differences and similarities between them to go further in our understanding of the risks of exposure to spaceflight. The Twins Study was the first study of its kind to compare molecular profiles of identical twin astronauts with one in space and another on Earth. We are hopeful that the integration of scientists, research, and data in this study may lead to personalized countermeasure packages to optimize the safety and performance of individual astronauts.

I will point out that Scott and Mark Kelly are now both retired from NASA. NASA's retired astronauts are vital to our continued research into the health challenges of space exploration. Former astronauts are invited to voluntarily participate in NASA's Lifetime Surveillance of Astronaut Health. A limited health status evaluation is provided to former crew members on an annual basis at the Johnson Space Center Flight Medicine Clinic. The limited medical data collected by NASA is reviewed to inform the Agency of the potential long-term health consequences of spaceflight.

However, the inability to perform more extensive medical evaluations limits NASA's understanding of conditions that may not surface until years or even decades after exposure to

space. Expanding the tests and conditions NASA can proactively monitor would greatly assist in establishing the evidence base we need. It would also increase the numbers of astronauts who participate. With only approximately 250 former astronauts and payload specialists living, and only 60% of them participating in the limited health status evaluation, every additional astronaut who is encouraged to participate is vital.

Expanding the occupational surveillance and preventive medicine exams is critical in tailoring treatment, informing the requirements for new spaceflight medical hardware, and developing controls in order to prevent disease occurrence in the astronaut corps due to spaceflight. As NASA moves forward with commercial crew and beyond low-earth orbit mission design, part of the job of the Astronaut Office is to ensure those designs incorporate the latest information on the physical challenges of human spaceflight. All the data we can collect and every condition we can proactively monitor is important to NASA and the future of humankind off the planet Earth.

In 2014, the Institute of Medicine (IOM) released their “Health Standards for Long Duration and Exploration Spaceflight: Ethics Principles, Responsibilities, and Decision Framework.” In this study, the IOM stated:

The agency should also provide preventive long-term health screening and surveillance and lifetime health care to protect astronaut health, support ongoing evaluation of health standards, improve mission safety, and reduce risks for current and future astronauts.

This was no surprise, as the Institute of Medicine said essentially the same thing in their 2001 and 2004 studies.

I know firsthand that risks can come up unexpectedly. On July 16, 2013, I was on an extra-vehicular activity (EVA) with Luca Parmitano, when Luca had cooling water leak into his helmet, covering his face with water. We quickly and safely ended the EVA, thanks to the “buddy system” NASA has in place for EVAs, but it demonstrates that unexpected health risks can appear at any time. Who would have thought that drowning could be an issue in spaceflight?

As Chief Astronaut, charged with the safety and health of NASA astronauts, I would welcome Congressional leadership to allow NASA to better provide for the health care needs of our current and former astronauts. As someone involved in the standards for designing human spacecraft so the hardware prevents exposure to risk, I support this measure that would allow us to collect the data on human spaceflight factors we desperately need.

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