

PREFLIGHT AND IN-FLIGHT EXERCISE CONDITIONING FOR ASTRONAUTS ON THE INTERNATIONAL SPACE STATION

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BACKGROUND: The physiological demands of spaceflight require astronauts to have certain physical abilities. They must be able to perform routine and off-nominal physical work during flight and upon re-entry into a gravity environment to ensure mission success, such as an Extra Vehicular Activity (EVA) or emergency egress. To prepare the astronauts for their mission, a Wyle Astronaut Strength Conditioning and Rehabilitation specialist (ASCR) works individually with the astronauts to prescribe preflight strength and conditioning programs and in-flight exercise, utilizing Countermeasure Systems (CMS) exercise hardware. **PURPOSE:** To describe the preflight and in-flight exercise programs for ISS crewmembers. **METHODS:** Approximately 2 years before a scheduled launch, an ASCR is assigned to each astronaut and physical training (PT) is routinely scheduled. Preflight PT of astronauts consists of carrying out strength, aerobic and general conditioning, employing the principles of periodization. Exercise programs are prescribed to the astronauts to account for their individual fitness levels, planned mission-specific tasks, areas of concern, and travel schedules. Additionally, astronauts receive instruction on how to operate CMS exercise hardware and receive training for microgravity-specific conditions. For example, astronauts are scheduled training sessions for the International Space Station (ISS) treadmill (TVIS) and cycle ergometer (CEVIS), as well as the Advanced Resistive Exercise Device (ARED). In-flight programs are designed to maintain or even improve the astronauts' pre-flight levels of fitness, bone health, muscle strength, power and aerobic capacity. In-flight countermeasure sessions are scheduled in 2.5 h blocks, six days a week, which includes 1.5 h for resistive training and 1 h for aerobic exercise. **CONCLUSIONS:** Crewmembers reported the need for more scheduled time for preflight training. During flight, crewmembers have indicated that the in-flight exercise is sufficient, but would like more reliable and capable hardware.