Astrowright "Flight Readiness Status" Fitness Benchmark Testing

Ashley A. Boron, Ben W. McGee and W. Kyle Dooley
(Astrowright Spaceflight Consulting LLC, Las Vegas, NV, USA)

Summary/Impetus

A coherent set of standards or guidelines regarding the physical fitness requirements of commercial spaceflight professionals has yet to be established. Considering this reality, and in response to burgeoning industry demand for a professional spaceflight credential able to demonstrate a holder's "readiness" to conduct operations in a space environment, Astrowright Spaceflight Consulting LLC (Astrowright) has created a Flight Readiness Status (FRS) certification program. Based upon industry-standard fitness benchmarking combined with original cognition tests, the FRS scheme and subsequent results from preliminary calibration trials are explained and discussed.

Conventional Flight Readiness

The FAA currently qualifies commercial spaceflight participants and crew only by means of medical examinations, which may serve as an indicator of physical and mental capability in only the most superficial manner. The NASA astronaut physical fitness training regime, on the other hand, includes fitness conditioning leading up to benchmark testing pre-and-post-flight (NASA 2005). However, these tests are performed only in order to gauge potential negative individual effects of microgravity exposure and adaptation, which are essentially meaningless in the short-term context of suborbital spaceflight and are not suited to demonstrating the ability of a commercial spaceflight professional to conduct in-flight operations.

Spaceflight Fitness Requirements

Whereas conventional fitness testing tends to stress linear increases in strength and cardiovascular fitness, spaceflight trainees demonstrating a high degree of cardiovascular and physical fitness have been shown to recover more slowly when returning from flight (Frey 1987). Additionally, research by Saiki et al. (1981) suggests that athletes respond more poorly to hypodynamic conditions than their less fit counterparts. Consequently, demonstrating flight readiness need not require demonstrating excessive strength and cardiovascular fitness. Instead, a more tempered set of physical fitness benchmarks in combination with demonstrations of mental focus is warranted.

Flight Readiness Status Certification

Golding's (1989) seminal work on physical fitness testing, which established standard fitness training "norms" and benchmarks by age and gender based on a study sampling of greater than 20,000 people, provides the foundation for the Astrowright FRS certification program. Married to this fitness benchmark paradigm is a series of simultaneous, simple, timed cognition tests designed and calibrated by Astrowright staff to demonstrate the ability of a trainee to perform complex tasks while undergoing physical exertion, (e.g., launch, microgravity translation, reentry,) allowing a single, standardized, multi-part test to demonstrate both the physical as well as mental competency of a spaceflight professional during all phases of flight. In this light, cognition benchmark calibration issues as well as implications for the broader adoption of the FRS standard are reviewed and discussed.

References

Frey, M.A., 1987. Considerations in prescribing preflight aerobic exercise for astronauts. ASEM 58(10), 1014-1023.

Golding, A.L., Meyers, C.R., Sinning, W.E., 1989. Y's way to physical fitness: the complete guide to fitness testing and instruction. Human Kinetics Publishers, Champaign, IL.

NASA, 2005. Medical Requirements Integration Documents (MRID), Revision A. NASA/JSC28913.

Saiki, H., Nakaya, M., Abe, M., Taketomi, Y., Oh'Ishi, K., Saiki, Y., Saiki, A., 1981. Effect of physical fitness and training on physiological responses to hypogravity. Acta Astronautica 8(9-10), 959-969.