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PERFORMANCE OF CITIZEN ASTRONAUT CANDIDATES WHEN CONDUCTING EGRESS OF  
SPACECRAFT AND INGRESS A LIFE RAFT

**Abstract**

Orion is a NASA spacecraft in development to transport humans to and from the Moon and Mars. On re-entry Orion will nominally perform a Stable 1 (upright) water landing with the side hatch being the primary exit mode. However, off-nominal conditions may occur due to sea states that may require crew to abandon the spacecraft via the side or top hatch. Another scenario may require crews to egress into a personal or group life raft. This study evaluated the ability of citizen astronaut candidates (CAC's) to egress an Orion mock-up via the top hatch wearing a commercially available intravehicular activity (IVA) spacesuit. 8 CAC's, male and female, aged 17 to 51 (median age 34 SD 2 yrs) were tested. Median anthropometric measures of participants were within the 5th percentile range female and 95th percentile male stated in NASA-SRD-3000. The Orion measured 16.5 feet in diameter, 10 ft 10 inches in height with a habitable volume of 691 ft<sup>3</sup>. The interior was fitted with 4 seats in a configuration similar to Orion. The Final Frontier Design Third Generation (3G) IVA spacesuit was used in this evaluation. There were 2 objectives: 1. Evaluate the performance of a suited CAC performing top hatch egress in the Stable 1 position. 2. Evaluate the ability of a suited CAC to ingress a life raft. During egress heart rate increased by 46.4 beats per minute (6.7) between the recumbent position and gaining access to the top hatch and increased an additional 21.3 bpm (4.3) between gaining access to the top hatch and ingress of the life raft. Respiration rate increased by 12.7 breaths per minute (7.1) between the recumbent position and gaining access to the top hatch and increased an additional 6.9 breaths per minute (6.4) between gaining access to the top hatch and ingress of the life raft. Mental, temporal and effort demands scales yielded the smallest differences (j5