

IAF HUMAN SPACEFLIGHT SYMPOSIUM (B3)  
Governmental Human Spaceflight Programmes (Overview) (1)

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ARTEMIS I: TEST FLIGHT BUYS DOWN RISK FOR HUMANITY'S RETURN TO THE MOON

**Abstract**

The Artemis program successfully demonstrated its foundational deep space human transportation system during the Artemis I test flight in late 2022. This bold mission put the Artemis program on a course to accomplish increasingly complex missions to return humans to the Moon and to prepare for Mars and other destinations.

The Artemis I uncrewed mission tested the Space Launch System (SLS) rocket and the Orion spacecraft using the ground processing, launch systems and recovery operations services provided by the Exploration Ground Systems (EGS) program at the Kennedy Space Center. During the highly successful mission, the Artemis team accomplished key mission priorities that deliberately bought down risk for upcoming crewed missions. The Artemis I mission priorities defined preflight were to 1) demonstrate Orion spacecraft at lunar re-entry conditions; 2) operate systems in flight environment; and 3) retrieve spacecraft. The successful execution of these primary mission objectives across all flight phases; from lift-off thru translunar injection, outbound transit towards the Moon, entry, coast and exit from lunar orbit, transit back to Earth, Earth atmospheric re-entry, descent, splashdown and recovery displayed the readiness of the new deep space human class transportation system for upcoming Artemis missions.

In addition to the primary mission objectives, which were all accomplished, a set of approved Flight Test Objectives (FTOs) and Developmental Flight Test Objectives (DFTOs) were incorporated into the nominal mission plan and were designated as secondary, or priority 4, and were considered "bonus objectives" in terms of crewed flight risk buy-down. These bonus objectives included outreach to the public and sharing remarkable imagery across all flight phases.

During the mission, the team found itself in a position where it was comfortable achieving even more content than originally planned. With power and consumables margins to support additional test objectives and following review and approval by the Mission Management Team (MMT), DFTOs were added during the mission to further buy down risk to later crewed test flights.

This paper presents an overview of the mission priorities and key FTOs and DFTOs planned prior to the Artemis I mission; captures what was actually accomplished during the course of the 25.5-day mission to the DRO, added objectives; and discusses the known implications to the crewed Artemis II and later test flight missions.

Keywords: Artemis, Orion, SLS, Space Launch System, EGS, Exploration Ground Systems, MMT, Mission Management Team, test flight, mission objective, mission priority