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Author: Mr. Davide Conte
Pennsylvania State University, United States

Mr. Leszek Orzechowski
Poland

A MISSION DESIGN OF A TWO-PERSON MARS FLYBY BY 2024

Abstract

The work outlined here is the result of the 2016 International Gemini Mars Design Competition, an international student competition that took place during the 19th Annual International Mars Society Convention, in September 2016. The Moon missions were named after Apollo and it is only suitable to name a Mars and Deimos flyby mission after his twin sister – the Greek goddess Artemis. Artemis is a conceptual mission design in which two humans will be sent on a 700-day Mars flyby mission. This paper describes the design elements required to support the mission from concept and design, to launch, deployment, and safe return to Earth. The goal of this conceptual design is to outline a cost-effective, safe, and simple mission to fly in 2024 a Mars freereturn flyby trajectory. The mission and vehicle design described in this paper are the result of operational and iterative design approaches. Launch vehicle and spacecraft component selections were motivated primarily by Technology Readiness Level (TRL) and crew safety, yielding a highly feasible mission design for the propose dates. The Artemis mission provides a comfortable 34 cubic meters habitable volume for the two crew members. A highly efficient environmental control and life support system (ECLSS) allows for significant consumable mass savings. Furthermore science experiments carried aboard the spacecraft are focused on additional supplies renewal. Earth reentry will be performed with an aerocapture aboard a capsule carried throughout the Mars transit. A detailed schedule and cost breakdown for Artemis mission is provided to ensure the mission meets the required launch window while maintaining a reasonable budget. While the 2024 Mars flyby trajectory can be considered a safe schedule, the estimated budget total ranges from $6B to $8B to be dispersed across the 8 year program duration (2017-2025).