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Author: Mr. Davide Demartini
ISAE-Supaero University of Toulouse, France

Ms. Morgane LE NET
ISAE-Supaero University of Toulouse, France

Mr. Hemanth Alapati
ISAE-Supaero University of Toulouse, France

Ms. Sannya Amoikon
ISAE-Supaero University of Toulouse, France

Mr. Romuald Duret
ISAE-Supaero University of Toulouse, France

Mr. Titouan Offredo
ISAE-Supaero University of Toulouse, France

Ms. Lisa HEDIN
ISAE-Supaero University of Toulouse, France

PROPOSAL FOR A PLANETARY COMMUNICATION RELAY AND NAVIGATION SYSTEM

Abstract

This paper presents the work conducted by a team of students from ISAE-SUPAERO, Politecnico di Torino, and University of Leicester in the development of a planetary telecommunication and navigation system to assist the exploration of Mars. The wider context for the study is the Artemis Accords and the goal is to identify the state of the art in terms of lunar technologies aimed at human exploration and adapt them to suit a martian endeavor. The team covered a variety of areas in their effort, ranging from human habitation facilities, ground vehicles, space transportation solutions for both humans and cargo, and resource exploitation equipment. This article focuses on the definition of the architecture of a proposed telecommunication and navigation system, starting from the definition of the requirements given by the mission. Then, the three segments that compose the system - space, ground Mars, and ground Earth -, are studied. In the case of the Mars ground segment, a solution is proposed for both stationary and mobile equipment, while the space segment is analyzed in terms of the constellation architecture and the subsystem composition of the individual satellite. Finally, the realization phases are outlined and a schedule is proposed, taking into account the production, delivery, and gradual setting-up of the various segments.