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Small Spacecraft for Deep-Space Exploration (8)Author: Mr. Ozan Kara
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Istanbul Technical University, TürkiyeEMERGING SMALL SATELLITE OPERATIONS IN TURKEY: INTERPLANETARY MISSION
INFRASTRUCTURE AND BENEFITS IN THE SPACE SECTOR**Abstract**

Turkey is in the stage of developing, producing and operating communication satellites, Earth observation satellites and scientific CubeSat itself. The space road map of Turkey describes that a variety of spacecraft systems shall be tested for upcoming space events. Moreover, Turkey intends to have own launch systems in the future. Most of the developed subsystems are ready to flight, but some of them may be scalable for small satellites. In order to estimate the needs of satisfied future missions and show the benefits of small satellites, an interplanetary mission would be the next step to keep pace with the rapidly developing area of space technology. The results and benefits of this case study may serve to the developing space awareness and space plans of Turkey. This paper presents the emerging subsystem technologies that are planning to be used for interplanetary small satellite missions. In addition to create an interplanetary mission infrastructure, a potential small satellite Moon mission case is proposed. The Moon mission infrastructure includes subsystem lay-out, propulsion system optimization, mission simulation and cost analysis. The total spacecraft mass is formed between 100 – 300 kg with up to 2kW total spacecraft power. The material of spacecraft is hexagonal carbon-fiber honeycomb material. The propulsion optimization uses xenon-ion thruster. In addition, the optimization process is adopted for maximum 1.5 years of LEO to LLO and maximum 0.5 years of GEO to LLO low-thrust trajectory transfer in order to estimate the convenient propulsion system and mission duration. Organizational challenges, educational benefits and outcomes for the space sector are also discussed. In addition, collaboration among universities, government and the private sector is a crucial point which impress (1) project based university education, (2) social media, (3) press and information activities such as TV programs and news, (4) long-term internship opportunities, (5) relations between students and young professionals, (6) leadership and knowledge management, and (7) public outreach activities to foster space in the society.