

IAF SPACE EXPLORATION SYMPOSIUM (A3)
Solar System Exploration including Ocean Worlds (5)

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FEASIBILITY STUDY OF A ROBOTIC SPACE MISSION FOR SEARCHING TRACE OF LIFE ON EUROPA

Abstract

The search for extraterrestrial life is one of the main topics in the frame of space exploration. The Ocean World Europa, due to the liquid water buried underneath its surface, could potentially host primordial life forms, giving humankind the chance to discover for the first time living organisms outside Earth.

Despite the enormous scientific interest that surrounds these ocean worlds, as well as Enceladus and Titan, a space mission focused on these as primary objectives has not been launched yet due to technology constraints, high costs, and investment choices. For this purpose, the Project Work performed during the 2nd Level Specializing Master Programme SEEDS (SpacE Exploration and Development Systems), now in its fourteenth edition, has developed a feasibility study for a future space mission towards Europa with the aim of highlighting the huge scientific value owned by such an ambitious target.

Thanks to the involvement of three Universities (i.e., Politecnico di Torino, ISAE-SUPAERO and University of Leicester), space agencies and industries (i.e., ASI, Thales Alenia Space, CNES and ESA), a team of forty-five students has been hosted in the cities of Turin, Toulouse, and Leicester during a five-months period to accomplish the different phases of the Project Work, which final outcome is a Pre-Phase A feasibility study. At the end of the Master, the activities will be presented at ESA/ESTEC in Noordwijk (Netherlands).

This paper describes the proceedings and the results of trade-off analysis conducted by the team, for a feasible robotic space mission on the surface of Europa to retrieve samples and to analyze them, searching for evidence of existing life on Jupiter's moon. A detailed design of a lander capable of drilling, moving, and employing ice probes has been presented, considering the engineering and technical challenges given by the hostile environment of Europa.