

SPACE EXPLORATION SYMPOSIUM (A3)
Small Bodies Missions and Technologies (4)

Author: Dr. Tim van Zoest

Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, tim.zoest@dlr.de

Dr. Tra-Mi Ho

Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, Tra-Mi.Ho@dlr.de

Ms. Caroline Lange

Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, Caroline.Lange@dlr.de

Mr. Lars Witte

Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, lars.witte@dlr.de

Mrs. Susanne Wagenbach

Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, susanne.wagenbach@dlr.de

Mr. Christian Krause

Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, christian.krause@dlr.de

Dr. Stephan Ulamec

Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, stephan.ulamec@dlr.de

Dr. Jens Biele

Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, jens.biele@dlr.de

MAGIC (MOBILE AUTONOMOUS GENERALIZED INSTRUMENT CARRIER)

Abstract

In this talk, a medium size mobile robotic surface platform (MAGIC) with a weight of 10 kg for in-situ exploration on small bodies like Asteroids and Comets will be presented. The concept of MAGIC is based on extensive feasibility studies as well as breadboarding activities of a dedicated lander, called MASCOT, studied for the flight opportunity onboard Hayabusa-2, a NEO sample return mission of JAXA/JSPECS (Japan Aerospace Exploration Agency/JAXA Space Exploration Center) to the Asteroid 1999JU3. As a next step, MAGIC will be a standardized lander platform for different mission scenarios and varying payload components. The lander platform design will have functionality such as mobility and autonomy particularly needed to explore the uncertain surface of a small body, such as an Asteroid. The rationale for the mobility function is to access the diversity of several surface sites. Although the lander is commandable from mission control, it requires the high degree of autonomy to execute its mission in an efficient way while acting flexible and responsive in face of the uncertain environment of the asteroid's surface. The platform is designed to be deployed from a supporting main space craft, orbiting or hovering above the target body. Once deployed on the surface it can upright and relocate by hopping and carry its scientific payload to different sampling sites. All surface operations, including hopping, science measurements and data transmission, are conducted fully autonomously.

MAGIC will provide a well balanced combination of system and functional capability, lifetime and Mission flexibility, based on nanosat technology to be integrated and qualified for demanding deep space exploration. In summary, MAGIC shall be able to deliver a wide range possible scientific instrumentation (potentially up to a limit of 3kg total mass), to study the body's physical properties (mass, density, temperature), internal structure, surface and subsurface structure (microscopic to macroscopic scale) and its chemical composition, thus being a complement to any rendezvous or sample return missions to small bodies.