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

Author: Mr. Christian Ziach
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, christian.ziach@dlr.de

Dr. Volodymyr Baturkin
DLR (German Aerospace Center), Germany, volodymyr.baturkin@dlr.de
Dr. Tra-Mi Ho
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, Tra-Mi.Ho@dlr.de
Mr. Christian Grimm
Germany, Christian.Grimm@dlr.de
Mr. Jan Thimo Grundmann
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, Jan.Grundmann@dlr.de
Mrs. Caroline Lange
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, Caroline.Lange@dlr.de
Ms. Nawarat Termtanasombat
Luleå Technical University, Germany, nawaratwrn@gmail.com
Ms. Wejmo Elisabet
DLR, German Aerospace Center, Germany, Elisabet.Wejmo@dlr.de
Mr. Ross Findlay
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, ross.findlay@dlr.de
Dr. Josef Reill
Deutsches Zentrum fuer Luft- und Raumfahrt (DLR), Germany, Josef.Reill@dlr.de
Mr. Michael Lange
DLR (German Aerospace Center), Germany, m.lange@dlr.de
Mr. Olaf Mierheim
DLR (German Aerospace Center), Germany, olaf.mierheim@dlr.de
Dr. Jens Biele
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, jens.biele@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
Ms. Belinda Borgs
Deutsches Zentrum fuer Luft- und Raumfahrt (DLR), Germany, Belinda.Borgs@dlr.de
Dr. Matthias Grott
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, matthias.grott@dlr.de
Prof. Ralf Jaumann
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, ralf.jaumann@dlr.de
Mrs. Muriel Deleuze
Centre National d'Etudes Spatiales (CNES), France, Muriel.Deleuze@cnes.fr
Prof. Jean-Pierre Bibring
IAS, France, bibring@ias.u-psud.fr
Dr. Hans-Ulrich Auster

Technische Universität Braunschweig, Germany, uli.auster@tu-bs.de

MASCOT, THE SMALL MOBILE ASTEROID LANDING PACKAGE ON ITS PIGGYBACK JOURNEY TO 1999 JU3: PRE-LAUNCH AND POST-LAUNCH ACTIVITIES

Abstract

Since December 2014 the Japanese spacecraft Hayabusa-II is on its journey to asteroid 1999 JU3. Like its famous predecessor it is foreseen to study and return samples from its target body. This time, the mother spacecraft has several small passengers. One of them is a compact landing package called MASCOT (Mobile Asteroid surface SCOuT), which has been developed by the German Aerospace Centre (DLR) and the Centre National d'Etudes Spatiales (CNES). Once having been released from its mother-spacecraft's cradle, MASCOT will descend to the asteroid and after a few bounces will come to rest at a certain location on the surface. Sitting on the surface, it will perform its scientific investigations of the asteroids surface structure, mineralogical and physical properties, thermal behaviour and magnetic effects by using its suite of four scientific instruments: a spectrometer (MicrOmega, IAS Paris), a camera (CAM, DLR Berlin), a radiometer (MARA, DLR Berlin) and a magnetometer (MAG, TU Braunschweig). These payload operations are made possible, amongst others, by a clever thermal subsystem design specifically devised to cope with the contrasting requirements of cold cruise and hot on-surface operations and a primary battery optimizing mass versus energy output. A mobility mechanism realizes locomotion on the surface supported by an according attitude and motion sensing system and an intelligent autonomy manager, which is implemented in the onboard Software, can operate MASCOT when ground intervention is not available.

In a nutshell, with its many challenging technical hurdles that have been solved, the MASCOT lander can serve as a benchmark for extremely lightweight (10kg), highly integrated mobile small body landing systems with onboard autonomy and high science output.

This paper will summarize the mission and system development. We will provide an overview over the final capabilities of the system as well as discuss the latest challenging pre-launch activities and tests. Further a summary and an outlook regarding the already performed as well as upcoming post-launch activities will follow. Lessons have been learned and will be told to be ready for future upcoming missions in the frame of small body exploration.