

A BAYLOR UNIVERSITY PAYLOAD CONTRIBUTION TO THE UNIVERSITAET STUTTGART MOON ORBITER LUNAR MISSION BW1. R. Laufer^{1,2}, T. W. Hyde¹, L. Matthews¹, M. Lachenmann², G. Herdrich², R. Srama^{2,3}, H.-P. Roeser², ¹Center for Astrophysics, Space Physics and Engineering Research (CASPER), Baylor University, One Bear Place #97310, Waco, TX 76798-7310, USA (Rene_Laufer@baylor.edu, Truell_Hyde@baylor.edu, Lorin_Matthews@baylor.edu), ²Institute of Space Systems (IRS), Universitaet Stuttgart, Pfaffenwaldring 31, 70569 Stuttgart, Germany (laufer@irs.uni-stuttgart.de, lachenmann@irs.uni-stuttgart.de, herdrich@irs.uni-stuttgart.de, srama@irs.uni-stuttgart.de, roeser@irs.uni-stuttgart.de), ³Heidelberg Dust Research Group, Max Planck Institute for Nuclear Physics, Saupfercheckweg 1, 69117 Heidelberg, Germany (ralf.srama@mpi-hd.mpg.de).

Introduction: The LUNAR MISSION BW1 is an academic small lunar orbiting satellite under development and implementation within the Universitaet Stuttgart, Germany. This lunar exploration and technology demonstration mission will perform both in-situ and remote sensing experiments with a planned scientific focus around particle, dust and meteoroid research [1, 3-5].

As part of a collaborative agreement between Baylor University and the Universitaet Stuttgart, the Center for Astrophysics, Space Physics & Engineering Research (CASPER) is under consideration to contribute an instrument in the field of plasma and/or dust detector research to the scientific payload.

LUNAR MISSION BW1: Stuttgart's LUNAR MISSION BW1 is an academic small satellite with dimensions of approximately 1 m³ weighing 200 kg and designed for lunar exploration and technology demonstration beyond low Earth orbit. The satellite is planned for launch as a piggyback or secondary payload from a geostationary transfer orbit (GTO) into a high inclined low lunar orbit [2]. It is part of the "Stuttgart Small Satellite Program" initiated in 2002 at the Institute of Space Systems (IRS) of the Universitaet Stuttgart.

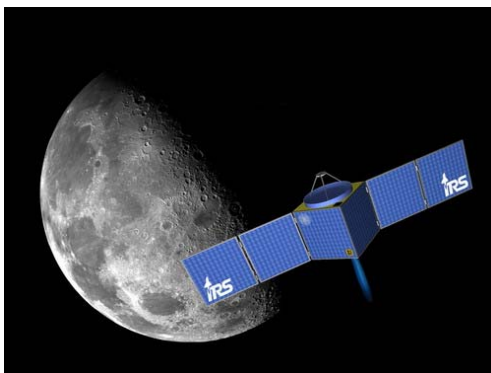


Fig. 1: LUNAR MISSION BW1 (Source: IRS, Univ. Stuttgart)

The spacecraft will be propelled by a solar-electric propulsion system. A 1 kw ammonia-driven thermal arcjet will provide up to 100 mN of thrust during the ascent through the Van-Allen belt. A cluster of pulsed

instationary magneto-plasma-dynamical thrusters providing 1.5 mN each and using solid PTFE (Polytetrafluorethylene a.k.a. Teflon) will act as the main propulsion system during cruise phase.

Various scientific topics of interest for both cis-lunar and lunar observation have been identified. Cruise phase will extend approximately 24 months with a subsequent operations phase of a minimum of 6 months to perform in-situ and remote sensing experiments. A suite of payload instruments including visual/near infrared/thermal infrared imaging systems as well as dust measurement and lunar impact flash detection capabilities is currently under development.

Payload Contribution: Due to an agreement signed in 2007 between Baylor University and the Universitaet Stuttgart, CASPER and the Institute of Space Systems (IRS) are collaborating in the field of space research and space technology applications.

Former and current staff personnel within the Space Science Lab of CASPER, the Institute of Space Systems and the Heidelberg Dust Research Group provide extended heritage and expertise in the fields of dust and plasma research and instrumentation. Staff members from this partnership have been active on missions ranging from Explorer 1 and Lunar Orbiter through Cassini. Results from initial studies on investigating an instrument contribution from Baylor University in the field of plasma and/or dust detector research to the LUNAR MISSION BW1 will be presented.

References: [1] Laufer, R., Bock, D., Lachenmann, M., Roeser, H.-P. & the LUNAR MISSION BW1 Project Team (2008) *IAC2008*, IAC-08-B4.8.05. [2] Zeile, O., Lachenmann, M., Baumstark, E., Mohr, A., Bock, D., Laufer, R., Sneeuw, N. & Roeser, H.-P. (2009) *Acta Astronautica* (66), issue 3-4, 516-527. [3] Laufer, R., Roeser, H.-P. & the LUNAR MISSION BW1 Project Team (2007) *EPSC2007*, EPSC2007-J-00400. [4] Lachenmann, M., Laufer, R., Roeser, H.-P. & the LUNAR MISSION BW1 Project Team (2007) *EPSC2007*, EPSC2007-J-00225. [5] Roeser, H.-P., Auweter-Kurtz, M., Wagner, H.-P., Laufer, R., Podhajsky, S., Wegmann, T. & Huber, F. (2006) *Acta Astronautica* (59), issue 8-11, 1048-1051.