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

Author: Mr. Noah Saks
Airbus DS GmbH, Germany, Noah.Saks@airbus.com

Dr. Alan Harris
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, alan.harris@dlr.de
Dr. Craig Brown
Astrium Ltd, United Kingdom, Craig.Brown@airbus.com
Mr. Erwan Kervendal
Astrium SAS, France, Erwan.Kervendal@airbus.com
Ms. Noela Despre
Astrium SAS, France, Noela.Despre@airbus.com
Mr. Juan L. Cano
Deimos Space S.L., Spain, juan-luis.cano@deimos-space.com
Mr. Gabriele Bellei
Deimos Space S.L., Spain, gabriele.bellei@deimos-space.com

MISSION ARCHITECTURES AND TECHNOLOGIES TO ENABLE NEOSHIELD, A GLOBAL APPROACH TO NEO IMPACT THREAT MITIGATION

Abstract

The threat from Near-Earth Objects (NEOs) to the future of our civilization is measurable and scientifically well-founded. Past impacts on the Earth probably altered the course of evolution itself, and asteroids and comets will continue to impact the Earth at irregular intervals into the future. On-going surveys discover several hundred new NEOs each year. NEOShield is a 3.5-year, 5.8 million Euro project in the European Union's Seventh Framework Programme (FP7), which will prepare for a space mission to demonstrate the feasibility of preventing the collision of a NEO with the Earth. The project will examine scientific, technical and programmatic issues associated with the demonstration missions that will be developed during the study. The NEOShield concept includes laboratory experiments and associated modelling, combined with interpretation of relevant observational data and theoretical models of asteroid surfaces, to improve our understanding of NEO properties and allow the feasibility of mitigation techniques and mission designs to be accurately assessed. This scientific expertise will be combined with the engineering know-how of world-class space companies within and outside Europe to elaborate several mission architectures for asteroid deflection missions. These include: a kinetic impactor mission, where a large mass is launched from Earth to impact the NEO and the impulse transfer deflects its path; a blast deflection mission, where a large explosion is detonated in the vicinity of the NEO; a gravity tractor mission, where a large spacecraft or multiple spacecraft are flown next to a NEO, and the gravitational pull of the NEO on the spacecraft will be matched by an equal pull of the spacecraft on the NEO, slowly changing its course over time. Variations on these measures will also be investigated. In addition, key technologies required for these missions will be studied, in particular the Guidance Navigation and Control (GNC) of both high velocity approaches and in the vicinity of an asteroid. The mission architectures developed will include detailed mission designs, leading to a proposal for the rapid implementation of a demonstration mission. They will also prepare for future rapid development of further missions. Another important aspect of the project is to prepare an international response strategy for implementation when

an impact threat materialises. To this end, a toolbox will be developed that will allow key decision makers to rapidly assess the threat and plan and implement the appropriate mitigation strategy accordingly.