

SPACE DEBRIS SYMPOSIUM (A6)
Space Debris Removal Concepts (6)

Author: Dr. Yuan-wen Zhang
National University of Defense Technology, China, guxiaodi1985@126.com

Prof. Le-ping Yang
China, pointmaker8384@126.com
Dr. Yan-wei Zhu
China, zhangyuanwen1983@163.com
Dr. Huan Huang
China, daijialan84@126.com

A PRELIMINARY INVESTIGATION ON DISABLED SATELLITE REMOVAL APPROACH USING
NON-CONTACTING INTER-SATELLITE ELECTROMAGNETIC FORCE**Abstract**

With the application of non-contacting inter-satellite electromagnetic force, disabled satellite removal could be non-contact accomplished without propellant expenditure and complicated docking or capture mechanism. This paper preliminary investigates the approaches of utilizing one or multiple electromagnetic spacecraft to remove a GEO disabled satellite with functional magnetorquer, including one-to-one and multi-to-one operational approaches. The one-to-one removal problem is firstly formulated, such as its feasibility, controllability and dynamic models, etc. Then, based on LQR method, an optimal trajectory following controller is designed and examined with numerical simulation results. Thirdly, the multi-to-one removal problem is also formulated, such as the number of servicing satellites and operational relative distance required, etc. Then, from the relative equilibrium viewpoint, an invariant spacecraft configuration is designed and investigated for the multi-to-one case, and a multiple spacecraft cluster orbit transfer controller based on the cyclic approach is explored and verified by numerical simulation. Finally, some useful conclusions and the future application prospects are put forward.