

SPACE DEBRIS SYMPOSIUM (A6)  
Mitigation and Standards (4)

Author: Dr. Akira Kato  
Japan Aerospace Exploration Agency (JAXA), Japan

## EFFECTIVE SOLUTIONS FOR THE LONG TERM SUSTAINABILITY OF SPACE ACTIVITIES

**Abstract**

The long term sustainability of space activities are widely discussed in the world, and United Nations COPUOS Committee on the Peaceful Uses of Outer Space also has assembled the working group and four expert groups beneath it for specific topics. One of the most serious risk factors is malfunction of spacecraft and launch vehicles which may cause accidental fragmentation generating numerous number of debris directly, or make them un-functional being unable to conduct debris mitigation activities such as deorbit from protected orbital regions, prevention of break-up, and collision avoidance. As the first step of this study the typical on-orbital failure in these decades years will be surveyed, and their causes will be analyzed statistically. Next step will be identification of risk factors which invited those malfunction. Those risk factors will be assessed by their risk magnitude defined by probability and influences. If the risk magnitude can't be ignored, a contingency planning should be studied in the next third step. In the third step, the contingency planning which will consist of "Preventive Measures", "Detection of Threat and Warning", "Recovery Corrective Actions" and "Permanent Measures" will be done. The solution will be given from the aspects of design technology, operation manner, and support of ground facilities. This approach will identify the problems that we are facing now and clarify the best practices to be established by the international cooperation. In operating spacecraft and launch vehicles, there are potential threats including natural environment, artificial environment (mainly including induced environment, electro static discharging), orbital debris, and undesirable human factors (mainly due to lack of quality and reliability, and faculty from the aspects of management and technology). A full set of solutions will be given at the first time when we study every fact beyond the traditional debris mitigation requirements, and extend to the human factors which are failed to cope with natural environment, artificial environment, etc. Also, the measures to bridge beyond the gap between the North-South Divide should be mentioned.