MMOD Mitigation Objectives Hierarchy
MMOD Mitigation Objectives Hierarchy – Top Level

Top Objective: Near-earth space environment is preserved and the risk to human life and space missions due to orbital debris and micrometeoroids is mitigated

Strategy: Limit the amount of orbital debris in the near-earth space environment

Objective: Orbital debris and its growth are controlled to an acceptable level (1)

Strategy: Mitigate impact risks from orbital debris and micrometeoroids through environmental management and definition, modeling, risk assessments, and protection practices

Objective: MMOD environment is defined and risk to human life (public and crew) and space missions from the environment is minimized or limited (2)
Objective: Orbital debris and its growth are controlled to an acceptable level

Strategy: Implement effective mitigation strategies to slow the growth of orbital debris (1.A)

Objective: Debris released during normal operations is controlled (1.A.1)

Strategy: Design spacecraft and rocket bodies to minimize debris released during normal operations (1.A.1.A)

Strategy: Limit on-orbit lifetime of released debris (1.A.1.B)

Objective: Potential for debris generated by accidental explosions is limited (1.A.2)

Strategy: Design spacecraft and rocket bodies to eliminate or limit the likelihood of failure modes which can lead to explosion (1.A.2.A)

Strategy: Safely deplete or safe on-board sources of stored energy (pressure, propellants, electrical power) when no longer needed (1.A.2.B)

Objective: Potential for disintegration or loss of control from collision with MMOD is limited (1.A.3)

Strategy: Design mission profile to limit the probability of collision with known debris (1.A.3.A)

Strategy: Design to withstand collision with small debris to retain post-mission disposal capability (1.A.3.B)

Strategy: Evaluate tethered systems for both intact and severed conditions (1.A.3.C)

Objective: Potential for future space operations to collide with expended or decommissioned space objects is minimized (1.A.4)

Strategy: Dispose of post-mission spacecraft and rocket bodies using approved disposal methodologies (reentry, storage orbit, or retrieval) (1.A.4.A)

Strategy: Evaluate tethered systems for both intact and severed conditions (1.A.4.B)

Objective: Existing orbital debris is reduced to stable levels (1.B.1)

Strategy: Implement effective remediation strategies to remove existing debris (1.B)
Objective: MMOD environment is characterized and risk to human life (public and crew) and space missions from the environment is minimized or limited

(2)

Context: Risk identification and mitigation is an iterative process

Strategy: Characterize the current and near term environments through measurements, modeling, and analysis

(2.A)

Objective: Sufficient knowledge of the micrometeoroid and orbital debris environments exists to enable design and operation decisions

(2.A.1)

Strategy: Identify and characterize micrometeoroids and orbital debris populations through optical, radar, infrasound, and in-situ measurements, and anomaly data

(2.A.1.A)

Strategy: Use statistical modeling methodologies to predict micrometeoroid and orbital debris environment

(2.A.1.B)

Strategy: Use dynamical modeling and computer simulation to extend knowledge of micrometeoroid environment through solar system

(2.A.1.C)

Strategy: Mitigate the risks to human life (public and crew) and space missions from impacts with micrometeoroids and debris

(2.B)

Objective: Impact risks from micrometeoroids and orbital debris to spacecraft and crew are mitigated

(2.B.1)

Strategy: Design-in spacecraft shielding to protect against damage from impacts from micrometeoroid and debris impacts

(2.B.1.A)

Strategy: Perform conjunction assessments to monitor for threat of impacts

(2.B.1.B)

Strategy: Conduct operations to protect against impacts (spacecraft safing, reorientation of craft, etc.)

(2.B.1.C)

Strategy: Employ collision avoidance maneuvers

(2.B.1.D)

Objective: Impact risks to public associated with reentry of debris are limited to acceptable levels

(2.B.2)

Strategy: Design to demise (design reentering craft and rocket bodies such that components burn up upon reentry)

(2.B.2.A)

Strategy: Employ operational measures such as controlled reentry or disposal on-orbit if risk from uncontrolled reentry is unacceptable

(2.B.2.B)