

1 FEBRUARY 2001



Operations

SATELLITE DISPOSAL PROCEDURES

NOTICE: This publication is available digitally at: <https://midway.peterson.af.mil/2letters/sc/css/scr/norad-us/utable.htm>.

OPR: J35X (LCDR Steven R. White)
Supersedes UPD10-39, 3 Nov 97.

Certified by: JS (COL Robert A. Hammerle)
Pages: 7
Distribution: F

This policy directive establishes United States Space Command (USSPACECOM) policy on the disposal of Department of Defense owned satellites which Commander-in-Chief, US Space Command (USCINCSpace) exercises Combatant Command (COCOM) authority as defined by the current Forces for Unified Commands document. It does not apply to Air Force Reserve Command (AFRC) nor Air National Guard (ANG) units.

SUMMARY OF REVISIONS

This policy directive incorporates updated guidance for satellite disposal methods/regions, with majority of revisions found in paragraphs 5.-5.6. A bar (|) indicates a revision from the previous edition.

1. General. The space environment is critical as a medium for the collection and dissemination of data and information crucial to the warfighter's mission accomplishment. If the practice of abandoning spacecraft in-place within high value operational orbits at the end of their mission life continued, there will be an ever-increasing threat of collision between abandoned and operational satellites. Furthermore, such collisions themselves will become a major secondary source of orbital debris, posing a geometrically growing threat to future space operations that will be virtually impossible to control. To protect this vital resource from being polluted by space debris, this document provides direction and guidance for the proper disposal of satellites. These procedures comply with the minimization and mitigation of space debris as directed by National and Department of Defense (DOD) Space Policy. The guidelines do not preclude any end-of-life testing that the organization with satellite system responsibility deems necessary either prior to or following the placement into a disposal orbit.

2. Mission Payload/Vehicle Health. Removing a non-mission capable satellite from its operational orbit into an established disposal region is of paramount importance. As a satellite approaches the end of its operational life, each SATCOM System Expert (SSE) responsible for the satellite bus, or their equivalent for non-SATCOM systems (see **Table 1.** and **Table 2.**), will ensure that every satellite maintains adequate disposal capability. This is to include assuring command/control capability and maintaining the required amount of fuel to reach the disposal region. Disposal of vehicles approaching the end of their

operational life will be recommended if further degradation precludes future removal from high-value operational orbits.

Table 1. Organizations With System Responsibility (Communication Satellites and Secondary Payloads).

SATELLITE SYSTEMS/ PAYLOADS	SATCOM OPERATIONAL MANAGER (SOM)	SATCOM SYSTEM EXPERT (SSE)
FLTSAT, UHF Follow-On (UFO), FEP, UFO(E), UFO(EE), Polar EHF, GBS Phase II	USSPACECOM	NAVSPACECOM
DSCS	USSPACECOM	DISA
Milstar, AFSATCOM, SCTS, Polar UHF, LES	USSPACECOM	AFSPC

Table 2. Organizations With System Responsibility (Non-Communication Satellites).

SATELLITE SYSTEMS	ORGANIZATION
DSP	SPACEAF
DMSP	SPACEAF in coordination with the National Polar-Orbiting Operational Environment Satellite System (NPOESS) Integrated Program Office (IPO)
GPS	SPACEAF

3. Disposal Criteria. SATCOM System Experts (SSE's), or their equivalent for non-SATCOM systems, will coordinate with sustainment and satellite operations activities, components or agencies with secondary payloads on the bus, and develop specific criteria for satellite disposal. USSPACECOM components and agencies will forward the criteria to USSPACECOM/J3 (and J6 for SATCOM systems) for review and approval. The disposal criteria will include the minimum acceptable levels of bus support to the payloads, payload capability and capacity (primary and secondary), vehicle command/control capability, vehicle power capacity, fuel requirements for disposal maneuver, and any other disposal maneuver requirements.

4. Standard Operations. As part of standard operations, SATCOM System Experts (SSE's), or their equivalent, will monitor satellite capability criteria. Once a satellite has been designated non-mission capable per the established criteria and/or is demonstrating potential disposal capability problems, the organization will forward a disposal recommendation as described below. At a minimum, the recommendation will include the disposal criteria that are being met and projected date of disposal. Standard disposal recommendations should be sent three months in advance of the anticipated disposal date.

4.1. Military Satellite Communications (MILSATCOM) Disposal Recommendation. SATCOM System Experts (SSE's) will forward the satellite disposal recommendation to USSPACECOM/J6. USSPACECOM/J3/J6 will then coordinate with other government agencies to determine any

requirements for, and the feasibility of, potential alternate use. USSPACECOM will then consolidate these requirements, and make a recommendation to Joint Staff/J6 on the satellite's disposition. Once final approval is received, USSPACECOM/J3 will direct disposal action. The SSE will develop and provide a plan of action and timeline for disposal/transfer to include end-of-life testing requirements, Test and Checkout (TACO), and disposal orbit parameters to USSPACECOM/J6/Global SATCOM Support Center (GSSC). A final status report will be released by the SATCOM Operational Manager (SOM) to the SATCOM community (i.e., CINCs, Joint Program Offices, USSPACECOM components, etc.). If the satellite is recommended for continued use by another agency, then the operations/maintenance/support and final disposal plan will be coordinated with the Joint Staff J3/J6.

4.2. Non-MILSATCOM Disposal Recommendation. The organization with satellite system responsibility will submit their disposal recommendation to USSPACECOM/J3, who will make the determination for final disposition. Once approval has been granted, the responsible organization will develop and provide a plan of action and timeline for disposal to include end-of-life testing requirements, TACO, and disposal orbit parameters to USSPACECOM/J3.

4.3. Emergency Situation. In the case of an emergency where it is believed that there is less than 30 days to react, the decision process for the safe disposal of a satellite must be expedited. The Satellite Control Authority (SCA)/system operator will make a telephone request, followed by message, for disposal to the SATCOM System Experts (SSE), or their equivalent for non-SATCOM systems. The SATCOM System Experts (SSE), or their equivalent, will coordinate via phone and message with USSPACECOM/J6 for MILSATCOM systems or USSPACECOM/J3 for non-MILSATCOM systems. USSPACECOM/J3/J6 will coordinate the disposal recommendation.

4.4. Maneuver Vector Screening. The component will ensure planned disposal vectors and orbit parameters are submitted to Cheyenne Mountain Operations Center (CMOC), J3SY Combat Analysis Branch before disposal for approval of reentry locations and/or orbital safety screening for possible conflicts. USSPACECOM/J3 will resolve any conflicts concerning reentry locations and/or orbital safety screening. After disposal maneuvers have been completed, the component will ensure that the final vectors are provided to CMOC. If the satellite fails to reach proper disposal orbit, the Space Control Center (SCC) will conduct conjunction analysis. If there is a possible conflict with a manned space vehicle or other objects, continue routine conjunction analysis. Notify the Space Operations Center (SPOC) and other space partners of all conjunctions associated with disposal operations.

5. Post Mission Disposal. Satellites should be disposed of by one of the following methods. Because of fuel gauging uncertainties near the end of mission, a disposal plan should use a maneuver strategy that most reduces the risk of leaving the satellite near a high-value orbit. The disposal region perigee and apogee altitudes listed below should prevent lunar and solar perturbations from causing these satellites to interfere with high-value operational orbits. Programs whose current design capabilities are unable to meet the guidelines listed in paragraphs 5.1.-5.6., will optimize disposal actions based on the published design capabilities.

5.1. Atmospheric Reentry. Maneuver the satellite to an orbit in which, using conservative projections for solar activity and other perturbations, atmospheric drag will cause atmospheric reentry within 25 years after completion of mission. If atmospheric reentry is performed by a planned deorbit, it will be planned such that any remaining portions of the satellite will impact the earth only in non-populated, preferably oceanic, areas.

5.2. Between Low Earth Orbit (LEO) and Medium Earth Orbit (MEO)/Semisynchronous.

Maneuver the satellite to an orbit with perigee altitude above 2,000 km and apogee altitude below 19,700 km.

5.3. Between Medium Earth Orbit (MEO)/Semisynchronous and Geosynchronous Earth Orbit (GEO). Maneuver the satellite to an orbit with perigee altitude above 20,700 km and apogee altitude below 35,300 km.

5.4. Above Geosynchronous Earth Orbit (GEO). Maneuver the satellite to an orbit with perigee altitude above 36,100 km.

5.5. Heliocentric, Earth-escape. Maneuver to remove the satellite from Earth orbit, into a heliocentric orbit.

5.6. Direct retrieval. Retrieve the satellite and remove it from orbit as soon as practical after mission completion.

6. Safing. Properly safing the payloads and the bus is a critical step in the disposal process. This process will assist in the elimination of stored energy from the satellite and limit the probability of post mission explosion spreading more debris. Safing procedures to be considered vary with each system, but may include burning all residual fuel to depletion and leaving fuel lines with valves open; disabling all battery charging systems; leaving batteries in a permanent discharge state; venting all pressurized systems; removing power from control moment gyroscopes; disabling transmitters; deactivating range safety systems; depleting all volatile liquids; or stabilizing the spacecraft in a neutral thermal flight mode.

7. Review. This policy directive will be reviewed at least every 3 years to ensure the most current guidance is provided.

RALPH E. EBERHART, General, USAF
Commander in Chief

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

Presidential Decision Directive (PDD) NSC-49/NSTC-8, *National Space Policy*

Department of Defense Directive 3100.10, *Space Policy*

United States Space Command Instruction (UI) 13-4, *Minimization and Mitigation of Space Debris*

NASA Safety Standard 1740

National Reconnaissance Office Instruction (NROI) 82-3, *Satellite Debris Mitigation-End of Life*

Chairman of the Joint Chiefs of Staff, CJCSI 6250.01, *Satellite Communications*

Terms

Apogee—The point of a satellite's greatest distance from Earth and minimum velocity.

Combatant Command (COCOM)—Non-transferable command authority established by title 10, United States Code, Section 164, exercised only by commanders of unified combatant commands. COCOM is the authority of a Combatant Commander, to perform those functions of command over assigned forces involving organizing and employing commands and forces, assigning tasks, designating objectives, and giving authoritative direction over all aspects of military operations, joint training, and logistics necessary to accomplish the mission assigned to the command. COCOM provides full authority to organize and employ commands and forces as the CINC considers necessary to accomplish assigned missions.

Military Satellite Communications (MILSATCOM)—The satellite communications resources that are owned and operated by DOD primarily in the government frequency bands. USCINCSpace COCOM systems include, but are not limited to, Defense Satellite Communications System (DSCS), Fleet Satellite (FLTSAT), UHF Follow-on (UFO), and Milstar.

Perigee—The point of a satellite's closest approach to Earth and greatest velocity.

SATCOM System Expert (SSE)—The component or designated organization responsible for providing the technical planning and functions in support of the operational management of a specific SATCOM constellation.

Satellite Control Authority (SCA)—The authority to provide Telemetry, Tracking and Commanding (TT&C) of the satellite's bus and to provide control and management of the satellite's payload. Authority is inherent in the Operational Control (OPCON) of a satellite or can be delegated in part or entirely to another organization.

Secondary Payloads—Those payloads placed on a satellite that provide a different capability than its primary payload. The secondary capability of a satellite system is taken into consideration when making a decision to dispose of a satellite.

USSPACECOM Components—The three service components of USSPACECOM are U.S. Army Space Command (USARSPACECOM), Naval Space Command (NAVSPACECOM), and 14th Air Force (SPACEAF). 14th Air Force, Vandenberg AFB, California, which falls under the administrative control

of Air Force Space Command (AFSPC), Peterson AFB, Colorado, is dual hatted as SPACEAF and operates as USSPACECOM's functional component.

Attachment 2**METRICS TO MEASURE COMPLIANCE WITH POLICY**

A2.1. The purpose of metrics is to identify the established goals or standards based on our customers needs and measure how well we meet the standards based on our customers feedback. The key metrics in the disposal process are satellites that are placed within disposal regions for present satellite systems and incorporation of disposal capabilities for future systems. These metrics will be reviewed and revised every 3 years, or as needed.

A2.2. Execute Satellite Placement into a Disposal Orbit. This metric measures the number of satellites placed into a proper disposal region after having been declared non-mission capable or subsystem disposal criteria are met. The goal is to place all non-mission capable satellites into a specified disposal region.

A2.2.1. Customer: Primary-USSPACECOM; secondary-DOD, National and commercial users.

A2.2.2. Goal and source: 100 percent insertion to proper disposal region, determined by Cheyenne Mountain Operations Center (CMOC).

A2.2.3. Data source: Organization with satellite system responsibility and CMOC.

A2.2.4. Calculation method: Percentage determined by dividing the number of satellites reaching a disposal region by the total number of satellites being disposed of (not to include those satellites undergoing end-of-life testing prior to disposal).

A2.3. Satellite Programs Planning for Disposal Capabilities. This metric compares the number of new satellite programs being developed with the number of these programs that incorporate a disposal capability into the system that meets the requirements of this directive. As long as a satellite has the capability to meet the disposal criteria upon launch, this requirement is being met.

A2.3.1. Customer: Primary-USSPACECOM; secondary-DOD, National and commercial users.

A2.3.2. Goal and source: 100 percent of future satellite programs being developed incorporate satellite disposal capabilities, as determined by System Program Offices (SPOs).

A2.3.3. Data source: Space and Missile Command (SMC) SPOs.

A2.3.4. Calculation method: Percentage determined by dividing the number of new programs that incorporate a disposal capability by the number of new satellite programs.