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OF THE AIR FORCE**

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Safety

**SPACE SAFETY
INVESTIGATIONS AND REPORTS**

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This manual provides additional guidance for investigating and reporting space mishaps to implement Air Force Instruction (AFI) 91-204, *Safety Investigations and Hazard Reporting*. This manual applies to all civilian employees and uniformed members of the Regular Air Force, Air Force Reserve, and Air National Guard.

The authorities to waive wing/unit level requirements in this publication are identified with a Tier ("T-0, T-1, T-2, T-3") number following the compliance statement. See AFI 33-360, *Publications and Forms Management*, for a description of the authorities associated with the Tier numbers. Submit requests for waivers through the chain of command to the appropriate Tier waiver approval authority, or alternately, to the publication OPR for non-tiered compliance items. Ensure all records created as a result of processes prescribed in this publication are maintained in accordance with Air Force Manual 33-363, *Management of Records*, and disposed of in accordance with the Air Force Records Disposition Schedule located in the Air Force Records Information Management System. This manual may be supplemented at any level, but all supplements that directly implement this publication must be routed to the AF Safety Center, Space Safety (AFSEC/SES) for coordination prior to certification and approval. Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, *Recommendation for Change of Publication*; route AF Forms 847 from the field through the appropriate functional chain of command to Headquarters Air Force Safety Center / Space Safety Division (HQ AFSEC/SES), 9700 G Avenue, SE, Building 24499, Kirtland AFB NM 87117-5670 or AFSEC.SES@us.af.mil.

SUMMARY OF CHANGES

This document has been substantially revised and needs to be completely reviewed. The rewrite of this manual was in response to the recent revision of AFI 91-204, changes desired by AFSEC and AF safety staffs at all levels, and to remove duplicative information with higher level guidance.

Chapter 1— PURPOSE AND OVERVIEW	4
1.1. Purpose of Space Safety Investigations and Reports.	4
1.2. Space Safety Events that Require Safety Investigations and Reports.	4
1.3. Space Safety Event Classifications.	5
1.4. Space Safety Mishap Costs.	6
Chapter 2— ROLES AND RESPONSIBILITIES	7
2.1. General.	7
2.2. HQ AFSEC/SES.	7
2.3. The Convening Authority.	7
2.4. Commanders of Air Force launch and/or range operations.	7
2.5. Unit Commanders.	7
2.6. Interim Safety Board President.	7
2.7. Joint/DoD/Non-DoD or other nations Space Safety Guidelines.	8
Chapter 3— DETERMINING INVESTIGATIVE RESPONSIBILITY	9
3.1. General.	9
3.2. Determining AF Space Mishap Ownership.	9
3.3. Determining Commercial Space Mishap Ownership.	9
Chapter 4— SPACE SAFETY INVESTIGATIONS	10
4.1. General.	10
4.2. Investigation Timelines.	10
4.3. Investigation Options.	10
4.4. Space Safety Investigation Board.....	11
4.5. Obtaining and Using Technical Assistance and Laboratory Analysis.	13
Chapter 5— REPORTS AND BRIEFINGS	15
5.1. General.	15

5.2. Classified Reporting.	15
Attachment 1— GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION	16

Chapter 1

PURPOSE AND OVERVIEW

1.1. Purpose of Space Safety Investigations and Reports. The sole purpose of safety investigations is to prevent future mishaps. This manual, in conjunction with AFI 91-204 directs procedures and provides space discipline-specific guidance to the investigation and reporting of United States Air Force (USAF) events in support of the Air Force Chief of Staff Safety Program. Follow this manual to determine space discipline-specific reporting criteria. This manual does not cover investigations to gather evidence for claims, litigation, disciplinary, or adverse administrative actions, or for purposes other than mishap prevention. For the purpose of this instruction, the term “Command” includes Major Commands (MAJCOMs), and MAJCOM-like entities (higher headquarters) to include the Air National Guard (ANG), Direct Reporting Units (DRUs), and Field Operating Agencies (FOAs).

1.2. Space Safety Events that Require Safety Investigations and Reports.

1.2.1. Investigate and report IAW AFI 91-204, permanent loss of mission capability or the following as safety events:

1.2.1.1. Damage to space systems over which the Air Force has development, procurement, operational and/or sustainment responsibility. **(T-1)**

1.2.1.2. Damage to Air Force space resources that result from government operations. **(T-1)**

1.2.1.3. Damage to Air Force space resources that result from contractor operations. **(T-0)**

1.2.1.4. Damage to Air Force space systems during pre-launch or launch on a commercially procured Federal Aviation Administration (FAA)-licensed launch system or service. **(T-1)**

1.2.1.5. Damage to space systems caused by natural phenomena or any other unknown causes within system design parameters. **(T-1)**

1.2.1.6. Damage to space vehicle in space due to collision, regardless of operational mission status, or regardless of cause of collision/impact. **(T-1)**

1.2.1.7. Injury, illness, and/or abnormal physiological episodes resulting from space system operations or space system processing. **(T-1)**

1.2.1.8. When there is a suspicion or it is known Air Force personnel or equipment contributed to a non-Department of Defense (DoD) launch mishap. **(T-1)**

1.2.1.9. The failure of Air Force launch and/or range operations, procedures, or processes to adequately protect the public or DoD operations from damage or injury (e.g., loading fuel, testing high-pressure equipment). **(T-1)**

1.2.1.10. Any unauthorized or unexpected creation of orbital debris larger than 5mm by an Air Force Space System. **(T-1)**

1.2.1.11. Failure to passivate a space vehicle as designed or intended. **(T-1)**

1.2.1.12. Inadvertent system actuation that results in damage, injury or creates potentially hazardous conditions. **(T-1)**

1.2.1.13. United States Government fly-back system that results in damage or injury, or a commercial fly-back system that causes damage to Air Force resources. **(T-1)**

1.2.1.14. Reentry of an Air Force space system (satellite, rocket body or debris) that results in damage, injury or does not execute its reentry maneuver as intended, or reentry of any space system that damages Air Force resources. **(T-1)**

1.2.2. For mishaps involving radioactive material, follow AFI 91-204. **(T-1)** If the radioactive material has a permit from the US Air Force Radioisotope Commission or a US Nuclear Regulatory Commission (NRC) license, also follow AFMAN 40-201, *Radioactive Materials (RAM) Management*. **(T-0)**

1.2.3. **Exception:** Do not report normal residual damage as the result of a space launch or pre-defined emergency response actions.

1.3. Space Safety Event Classifications. Classify mishaps IAW AFI 91-204, by total direct mishap cost, mission loss and the severity of injury/occupational illness, except as specified in the definitions below. Additional space discipline-specific mishap classification requirements are:

1.3.1. On-orbit. For operational systems (or systems transitioned to operations), classify space safety events prior to the end of design life based on the impact to mission capability (MC). A program's Capability Development Document or other operational capability requirements document defines the mission capability. The document should define the primary, secondary, and tertiary mission capabilities. Space systems may have more than one primary, secondary, or tertiary mission capability. **(T-1)**

1.3.1.1. Classify any failure to complete passivation and/or disposal as a Class C mishap. **(T-1)**

1.3.1.2. Classify any unauthorized creation of orbital debris, 5mm or larger, that involves an Air Force space system as a Class C mishap. **(T-1)**

1.3.1.3. Classify permanent loss of primary mission capability as a Class A mishap. **(T-1)**

1.3.1.4. Classify permanent degradation of primary or secondary mission capability or the permanent loss of secondary mission capability as a Class B mishap. **(T-1)**

1.3.1.5. Classify permanent loss or degradation of tertiary mission capability as a Class C mishap. **(T-1)**

1.3.2. Incidents. Space Safety staffs will report incidents in accordance with AFI 91-204. **(T-1)**

1.3.3. Hazards. Space Safety staffs will classify any space event deemed important to investigate/report for mishap prevention purposes, does not meet other space mishap classification reporting criteria, and does not result in injury or damage, as a hazard. **(T-1)** Hazard reports provide an expeditious way to disseminate valuable lessons learned and/or mishap prevention information. As a minimum, report the following in Air Force Safety Automated System (AFSAS):

1.3.3.1. A collision avoidance maneuver by an on-orbit Air Force spacecraft outside of its normal collision avoidance process.

1.3.3.2. Any loss or permanent degradation to an on-orbit asset due to design issues or human error, even if occurring after the component / payload / spacecraft design life.

1.3.3.3. Classify the unplanned loss of operational capability of an on-orbit spacecraft, at a minimum, as a hazard. Update mishap classification, as appropriate during anomaly resolution process following the guidance in **Chapter 5**.

1.4. Space Safety Mishap Costs. The DoD requires a determination of the total direct mishap cost in order to provide a factual basis for the allocation of resources in support of DoD mishap prevention programs. **(T-0)** Determine mishap costs IAW AFI 91-204. **(T-1)** On-orbit Costs. The orbital segment is a unique case as the actual hardware cannot be accessed or repaired (beyond software modification attempts), thus special considerations should be taken to determine appropriate mishap costs.

1.4.1. For destroyed or lost orbital space system with no item to exchange, use the unit flyaway cost as the mishap cost. Safety investigation board (SIB) should work with the system program office to determine unit flyaway costs.

1.4.2. For the loss of secondary and/or tertiary mission systems, determine the portion of the unit flyaway cost attributable to the failed mission system(s) and use that as the mishap cost.

1.4.3. For permanent partial mission degradation, including mishaps which negatively affect mission service life, the SIB should consult with the systems program office and operator(s) to determine mission degradation percentage and multiply it by the unit flyaway cost to determine the cost of the mishap.

Chapter 2

ROLES AND RESPONSIBILITIES

2.1. General. Follow guidance in AFI 91-204 with the space-specific additions of this chapter.

2.2. HQ AFSEC/SES. For non-DoD launches from Air Force launch facilities and/or ranges, HQ AFSEC/SES will ensure investigation and reporting agreements allow the Air Force to participate at least as an observer on Federal Aviation Administration (FAA), National Aeronautics and Space Administration (NASA) and/or National Transportation Safety Board (NTSB)-led investigation boards. **(T-1)** This participation includes gathering information to put into AFSAS for future mishap prevention purposes.

2.3. The Convening Authority. The Convening Authority will forward to HQ AFSEC/SES as quickly as is practical, all time-critical safety information discovered by a SIB related to any relevant civil space vehicle and commercial space equipment. HQ AFSEC/SES will forward all such non-privileged information contributing to the promotion of space safety to the FAA, NASA, and NTSB for appropriate action. **(T-1)**

2.4. Commanders of Air Force launch and/or range operations.

2.4.1. Prior to each United States Government operation (e.g., launch, fly-back, reentry), commanders of Air Force launch facilities, and/or ranges will:

2.4.1.1. Identify and notify organizations that have investigative responsibility in the event of a mishap. **(T-1)**

2.4.1.2. Identify an interim safety board (ISB) president. **(T-3)**

2.4.2. Launch Facility and/or Range Commanders will notify the Federal Aviation Administration Office of Commercial Space Transportation when a mishap occurs involving a licensed commercial space system at Air Force launch facilities and/or ranges. **(T-1)**

2.5. Unit Commanders.

2.5.1. The nearest Wing Commander, Host Wing Commander or Command Post of the first Air Force organization to become aware of a space safety event will notify the organization with control authority over the affected space system. **(T-1)**

2.5.2. For high-risk activities with significant mishap potential, the Unit Commander shall identify an ISB president prior to conducting the activity. **(T-3)**

2.6. Interim Safety Board President.

2.6.1. If the ISB president interfaces with non-Air Force organizations, use existing Memorandums of Agreement (MOA) or Memorandums of Understanding (MOU) to address organizational roles and responsibilities in the event of a mishap.

2.6.2. The ISB president follows existing agreements, when applicable, with respect to wreckage and evidence belonging to non-Air Force organizations.

2.6.3. Provide a hand-off briefing to SIB or single investigating officer (SIO) that marks the end of the ISB(s) involvement in the investigation. Hand-off briefing will review ISB actions accomplished to date and will review updated site hazard information. **(T-1)**

2.6.4. At a minimum, an ISB will stand up after a declaration of a Class A or B mishap IAW AFI 91-204. **(T-1)**

2.6.5. The ISB is not responsible for determining mishap cause(s). The sole purpose of the ISB is to gather, preserve and protect evidence. The ISB investigation is normally limited to determining what evidence exists. The ISB only analyzes evidence when it will perish prior to arrival of the SIB and with Convening Authority or SIB president's permission. **(T-1)**

2.7. Joint/DoD/Non-DoD or other nations Space Safety Guidelines. All participating organizations within a mission partnership should establish MOA or MOU outlining each organization's responsibilities and requirements with regard to Space Safety Investigations and Reports. This includes organizations operating in a joint environment or with non-DoD agencies. It is the responsibility of organizations participating in a mission partnership to determine the lead agency and to agree upon proper approval authorities.

Chapter 3

DETERMINING INVESTIGATIVE RESPONSIBILITY

3.1. General. The AF assigns investigative responsibilities to the MAJCOM experiencing operational loss of an assigned/owned asset and/or the procuring MAJCOM whose system or service resulted in unintended damage/injury. The mishap owner has investigative responsibility for the mishap. **(T-1)**

3.2. Determining AF Space Mishap Ownership.

3.2.1. For satellites, assign mishap ownership to the MAJCOM with satellite control authority (SCA). **(T-1)**

3.2.1.1. SCA for an on-orbit space system, or the debris from it, does not end until:

3.2.1.1.1. Reentry and touchdown on Earth.

3.2.1.1.2. Transfer of responsibility to another agency.

3.2.1.1.3. After completion of system ejection after an Earth-escape trajectory as part of the end-of-life process (e.g., SCA does not end for space systems in a disposal orbit).

3.2.1.2. For satellites that are non-mission capable, or have reached end-of-life, the last organization with SCA maintains authority for the purposes of mishap reporting and investigation.

3.2.2. For non-FAA licensed launch vehicles, including upper stages, assign ownership of the mishap to the MAJCOM acquiring the launch vehicle or launch service, unless an agreement is in place specifying transfer of ownership to another agency. **(T-1)**

3.3. Determining Commercial Space Mishap Ownership.

3.3.1. The FAA, NTSB, and/or the commercial vendor may investigate space mishaps within US jurisdiction, depending on the circumstances. If the FAA or NTSB leads such an investigation, it is implicit the FAA or NTSB will retain custody of evidence for the duration of the investigation whether referring to physical or intellectual (e.g., witness accounts).

3.3.2. Contact AFSEC/SES in reference to established MOA/MOU between the AF, NTSB & FAA to determine appropriate actions.

Chapter 4

SPACE SAFETY INVESTIGATIONS

4.1. General. Conduct investigations to determine the cause of the event through the deliberative process of evidence gathering and root cause analysis to provide sound recommendations with the sole purpose of preventing future mishaps.

4.2. Investigation Timelines.

4.2.1. For any mission impacting unresolved orbital anomalies extending past 72 hours, notify the command safety office. The clock begins at the onset of an anomaly. If subsequent anomalies occur, the clock will not reset for each new anomaly. Track orbital anomalies as hazards. Upon notification, the Convening Authority safety office shall observe the anomaly resolution process and transition to a safety investigation when/if enough information exists to classify the anomaly (hazard) as a mishap (Class A-E). The Convening Authority may delegate to another safety office for initial anomaly status reporting. **(T-2)**

4.2.2. Complete space safety investigations within 90 days for Class A and B mishaps and 45 days for Class C, D, and E mishaps. **(T-1)**

4.2.3. Due to the complexity of the data recovery and engineering analysis process, space mishaps might require longer timeframes. If circumstances prevent meeting a timeline, the SIB president/SIO may request an extension from the Convening Authority. The SIB/SIO annotates the extension and approval by the Convening Authority in each status message.

4.3. Investigation Options.

4.3.1. The Convening Authority can support investigation and reporting of space safety events using a program/operation anomaly resolution process for analyzing technical data and other fact-based information. Follow guidance in AFI 91-204 for the handling of any privileged information.

4.3.2. At a minimum, AF safety investigations must have a SIO appointed. A space mishap single investigating officer should be a space professional and graduate of formal Air Force safety training and mishap investigation courses. **(T-1)**

4.3.3. Use of Non-Air Force Investigations. While the Air Force is always responsible for determining the cause of Air Force mishaps, in certain situations the Air Force may accept the results of a non-Air Force investigation to satisfy Air Force mishap prevention requirements as directed by the Convening Authority. The FAA or NTSB, or the space system owner will usually investigate commercial space mishaps. When possible, the Air Force should make use of these investigations and limit duplicative investigations. However, the Air Force always retains the right to conduct a separate Air Force safety investigation.

4.3.3.1. When the Air Force participates in an investigation led by other governmental entities, the Air Force will protect all investigation data, information, documents, or other material as prescribed by the investigating agency. **(T-0)** The Air Force will not disclose this information in any manner without the written consent of the Investigator-in-Charge. **(T-0)** In addition, the Air Force will refer any Freedom of Information Act request, subpoena, or other request for such information to the FAA, NASA, and/or NTSB for resolution. **(T-0)**

4.3.3.2. The Air Force will observe all investigations related to the mishap IAW this document, the applicable MOA or MOU, and/or reference guidance for interagency coordination. Air Force observers will contact the appropriate MAJCOM Safety office or AFSEC/SES for guidance on current agreements with the FAA, NASA, and/or NTSB, and the responsible commercial entity. **(T-1)**

4.3.3.3. The Air Force's observer reports to the Convening Authority on the adequacy of the investigation, the validity of the conclusions, and advises on whether the conclusions satisfy Air Force's mishap prevention needs. **(T-1)**

4.3.3.4. Based on the Air Force observer's assessment on the adequacy of the non-Air Force investigation report, the Air Force Convening Authority may accept it with a cover letter from the Air Force observer stating acceptance of findings and submit as the Air Force final report. The Air Force observer will ensure the prepared report and cover letter contain only non-privileged information. Alternately, the Convening Authority may appoint an additional SIO to evaluate the report and deliver an Air Force mishap report. In this case, the Air Force report shall include the non-Air Force report. **(T-1)**

4.3.3.5. If the Air Force Convening Authority determines that the investigation does not satisfy the Air Force's mishap prevention needs, the Air Force may conduct its own investigation within the terms of applicable contracts and MOAs/MOUs.

4.3.3.6. When a non-Air Force organization's report exists that fulfills the requirements of an Air Force final report, the Convening Authority may use it as the official final investigation report. Complete a report in AFSAS and include the non-Air Force organization's report.

4.3.4. Use of Air Force Observers on Non-Air Force Investigations. Outside agencies such as the FAA, NASA, and/or NTSB may allow Air Force personnel to participate as official observers to investigations led by these agencies. Reference AFPAM 91-206, *Participation in Military or Civil Aircraft or Space Safety Investigations*, for further guidance on participation in interagency investigations.

4.3.4.1. Observers are not formal Air Force safety investigators and cannot offer promises of confidentiality per AFI 91-204.

4.3.4.2. Air Force observers may participate but may not interfere with the observed investigation.

4.3.4.3. Air Force observers may not observe multiple investigations simultaneously nor may they participate in any other investigations while still acting in an observer status. Observers may transition from an Air Force observer to an Air Force Safety Investigation Board to provide the SIB with continuity; however, once transferred, may no longer serve as an Air Force observer or transfer back to observer status. **(T-1)**

4.4. Space Safety Investigation Board

4.4.1. The Convening Authority may tailor the following personnel requirements, limitations, and restrictions for Primary, Secondary and Conditional SIB members as appropriate for space mishaps:

4.4.2. Primary Members. Primary members determine the SIBs results, including factors, findings, causes, and recommendations. Primary members sign the investigation authentication page and may submit Minority Reports when they do not concur with the SIBs results in whole or in part.

4.4.2.1. Primary members will include a SIB president and/or an IO/SIO. (T-1) Air Force Safety Center (AFSEC) representatives and investigating officers are optional.

4.4.2.1.1. Board President. The board president is responsible for all activities of the SIB, is the deciding vote if disagreement within the SIB occurs and is the final decision authority, and reports directly to the Convening Authority. The board president should coordinate site access requirements directly with the Incident Commander or local site Commander. The board president should be a space professional and graduate of the Air Force Board President Course.

4.4.2.1.2. Investigating Officer. The investigating officer is responsible for the daily SIB activities, the investigation, and preparing of reports and messages. The investigating officer directs and coordinates activities of other board members and works with the AFSEC Representative (if assigned) to “manage” the SIB.

4.4.2.1.3. Single Investigating Officer. Performs duties as described above for the BP and IO.

4.4.2.1.4. AFSEC representative. HQ AFSEC/SES has the option to provide a representative or advisor to the SIB for Class A mishaps, and complex Class B mishaps, as determined by AFSEC/SES and Convening Authority.

4.4.2.1.4.1. The representative acts as the investigation process expert to guide SIB procedures and analysis efforts, conducts refresher training on SIB procedures, coordinates technical assistance resources, and should be the single point of contact with AFSEC for the duration of the investigation.

4.4.2.1.4.2. Consider an on-site representative to the SIB as a primary member; if telephonically supporting the SIB, the representative is not a primary member but is a consultant to the SIB.

4.4.3. Secondary members. The Convening Authority may select secondary SIB members at his/her discretion. Secondary members provide expertise or assistance to the SIB. Secondary members may participate in all SIB deliberations, but do not sign the authentication page and are not permitted to submit Minority Reports. The SIB president determines the extent of the secondary member involvement in the SIB. Secondary members may include a recorder, an officer or non-commissioned officer familiar with administrative procedures and experienced in the use of typical office computer software, may manage the work center, control access and handle filing and security. Also, the secondary member may assist with report preparation and distribution.

4.4.4. Conditional members. Board president(s) may request these members from the Convening Authority as either Primary or Secondary members. If their area of expertise relates to a factor that was integrally involved in initiating or sustaining the mishap sequence, consider giving these individuals Primary Member status. Conditional members may include:

4.4.4.1. MAJCOM representative. The MAJCOM representative acts as the investigation process expert to guide SIB procedures and analysis efforts. Limit the representative role to providing basic information on the operational and organizational details and practices to help the SIB determine who to interview, mishap organization hierarchy, etc. Consider this individual an expert on local procedures, local command relationships, organizational structure, and unit specific qualities.

4.4.4.2. Space Operations representative. The space operations representative analyzes operations factors to include: qualifications, proficiency, training, communications, crew actions throughout mishap sequence, mission-specific concerns, performance data, all operations-related publications, and crew stressors. The space operations representative should be qualified or previously qualified, in the operational use of the space system involved in the mishap.

4.4.4.3. Space Materiel or Acquisition representative. Representatives act as the technical expert on all phases of the acquisition life cycle, to include development, production and manufacturing, deployment, acquisition logistics, configuration and data management, contracting, engineering, program control, system safety, quality assurance, and test and evaluation.

4.4.4.4. Weather or Space Environmental representative. A representative can be used if weather or space environment is a suspect or a known factor in the mishap. Representative is a subject matter expert on analyzing, and forecasting meteorological, solar, astrophysical, geophysical and atmospheric weather conditions.

4.4.4.5. Medical Officer. Officers analyze medical data to evaluate medical histories, records, laboratory, radiologic, and pathology reports. Furthermore, determines the cause(s) and mechanisms of injuries or death. A separate human factors member may assist the medical officer. For mishaps involving potential human error, the medical member must be a flight surgeon and a graduate of the USAF School of Aerospace Medicine mishap investigation course. **(T-1)**

4.4.4.6. Many different types of subject matter experts are available to SIBs. These experts and advisors can come from depots, industry, civilian organizations, other government organization, and laboratories.

4.4.5. Non-Members. It is common for SIB(s) to use a number of other personnel in supporting roles. This can include personnel who assist in wreckage and evidence recovery, transcriptions, administrative personnel, observers from another service/agency and others. These personnel are not members of the SIB. Use of non-members is at the discretion of the SIB president.

4.5. Obtaining and Using Technical Assistance and Laboratory Analysis. Investigations requiring technical assistance follow guidance IAW AFI 91-204.

4.5.1. For space mishaps, the Engineering Analysis Group conducts a technical examination of mishap data. It provides important fact-based (non- privileged) analysis to the SIB and assures the release of this fact-based information as soon as possible to the Commercial Space Industry.

4.5.2. The SIB will pass fact-based mishap data to the Engineering Analysis Group. The Engineering Analysis Group will pass the results of its engineering analysis to the SIB as soon as it is available. **(T-1)**

4.5.3. If the Engineering Analysis Group's engineering analysis is classified and/or contains proprietary information, the information owner must clearly mark and control appropriately. **(T-0)**

Chapter 5

REPORTS AND BRIEFINGS

5.1. General. Safety reporting will be via the AFSAS, use the following URL: <https://afsas.safety.af.mil/> If AFSAS is not available, contact HQ AFSEC/SES for transmission alternatives at AFSEC.SES@us.af.mil. Once the safety investigation is complete, and the formal report and the final message are concluded, a briefing will normally be provided to the Convening Authority. Space mishaps involving fatalities, or other mishaps when requested, require a briefing to the Chief of Staff of the Air Force and Secretary of the Air Force. HQ AF Safety Issues Division (AF/SEI) will be the focal point for scheduling all briefings to the Chief of Staff of the Air Force and Secretary of the Air Force and will coordinate with HQ AFSEC/SES. **(T-1)**

5.2. Classified Reporting.

5.2.1. Space mishap messages and safety reports are subject to limited distribution and must be handled appropriately. **(T-0)**

5.2.2. Make every effort to keep investigative reports and briefings unclassified to ensure the widest dissemination possible. Report the unclassified portion of the report (i.e., one-liner, date, time, location, investigating officer, and objects) using AFSAS. Do not input DoD Unclassified Controlled Nuclear Information (DCNI) into AFSAS.

5.2.2.1. For further guidance on reporting classified mishaps, contact AFSEC/SES.

5.2.2.2. Mark classified pages in messages, reports, or other safety documents with the proper security classification marking from the appropriate Security Classification Guide and AFI 16-1404, *Air Force Information Security Program*.

JOHN T. RAUCH, Major General, USAF
Chief of Safety

Attachment 1**GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

AFI 91-204, *Safety Investigation and Hazard Reporting*, 27 April 2018

AFI 40-201, *Radioactive Materials Management*, 29 March 2019

AFPAM 91-206, *Participation in Military or Civil Aircraft or Space Safety Investigations*, 26 April 2019

AFI 16-1404, *Air Force Information Security Program*, 29 May 2015

Title 14, Code of Federal Regulations, Part 415, *Launch License*

Adopted Forms

AF Form 847, *Recommendation for Change of Publication*

Abbreviations and Acronyms

AF—Air Force

AF/SE—Air Force Chief of Safety

AF/SEI—HQ AF Safety Issues Division

AFI—Air Force Instruction

AFMAN—Air Force Manual

AFPAM—Air Force Pamphlet

AFSAS—Air Force Safety Automated System

HQ AFSEC/SES—Headquarters Air Force Safety Center, Space Safety Division

ANG—Air National Guard

CA—Convening Authority

CFR—Code of Federal Regulations

DCNI—DoD Unclassified Controlled Nuclear Information

DoD—Department of Defense

DRU—Direct Reporting Unit

EAG—Engineering Analysis Group

FAA—Federal Aviation Administration

FOA—Field Operating Agency

HQ—Headquarters

IAW—In Accordance With

ICBM—Intercontinental Ballistic Missile

ISB—Interim Safety Board
MAJCOM—Major Command
MC—Mission Capability
MOA—Memorandum of Agreement
MOU—Memorandum of Understanding
NASA—National Aeronautics and Space Administration
NRC—Nuclear Regulatory Commission
NTSB—National Transportation Safety Board
OI—Operating Instruction
OPR—Office of Primary Responsibility
RAM—Radioactive Materials Management
RegAF—Regular Air Force
SCA—Satellite Control Authority
SIB—Safety Investigation Board
SIO—Single Investigating Officer
TO—Technical Order
USAF—United States Air Force

Terms

Air Force Launch—Any space launch operation with significant oversight or insight by the Air Force and not subject to licensing requirements of Title 14 CFR, Part 415, *Launch License*, current edition. The Air Force may or may not be the space system owner.

Anomaly—Unexpected events that may or may not result in damage, injury, or mission impact, but do not reach the level of a reportable mishap.

Anomaly Resolution Process—Process used to resolve a spacecraft anomaly. The operating/testing organization (squadron or equivalent level) typically conduct this process to resolve a spacecraft anomaly.

Class A Mishap—A mishap resulting in one or more of the following:

1. Direct mishap cost totaling \$2,000,000 or more.
2. A fatality or permanent total disability.
3. Destruction of a DoD aircraft.
4. Permanent loss of primary mission capability of an AF space vehicle.

Class B Mishap—A mishap resulting in one or more of the following:

1. Direct mishap cost totaling \$500,000 or more but less than \$2,000,000. 2. A permanent partial disability. 3. Inpatient hospitalization of three or more personnel. This does not include individuals hospitalized for observation, diagnostic, or administrative purposes that were treated and released. 4. Permanent degradation of primary or secondary mission capability of a space vehicle or the permanent loss of secondary mission capability of a space vehicle.

Class C Mishap—A mishap resulting in one or more of the following:

1. Direct mishap cost totaling \$50,000 or more but less than \$500,000. 2. Any injury or occupational illness that causes loss of one or more days away from work not including the day or shift it occurred. When determining if the mishap is a Lost Time Case, you must count the number of days the employee was unable to work as a result of the injury or illness, regardless of whether the person was scheduled to work on those days. Weekend days, holidays, vacation days, or other days off are included in the total number of days, if the employee would not have been able to work on those days. 3. An occupational injury or illness resulting in permanent change of job. 4. Permanent loss or degradation of tertiary mission capability of a space vehicle.

Class D Mishap—An on-duty mishap resulting in one or more of the following:

1. Direct mishap cost totaling \$20,000 or more but less than \$50,000. 2. A recordable injury cost or illness not otherwise classified as a Class A, B, or C mishap. 3. Any work—related mishap resulting in a recordable injury or illness not otherwise classified as a Class A, B, or C mishap. These are cases where, because of injury or occupational illness, the employee only works partial days, has restricted duties (does not include medical restriction from flying or special operational duties by AF Form 2992) or was transferred to another job, required medical treatment greater than first aid, or experienced loss of consciousness (does not include G-loss of consciousness). In addition, a significant injury (e.g. fractured/cracked bone, punctured eardrum, any laser eye injury) or occupational illness (e.g. occupational cancer (mesothelioma), chronic irreversible disease (beryllium disease)) diagnosed by a physician or other licensed health care professional must be reported even if it does not result in death, days away from work, restricted work, job transfer, medical treatment greater than first aid, or loss of consciousness.

Class E Mishap—A work-related mishap that falls below Class D criteria. Most Class E mishap reporting is voluntary; however see discipline-specific safety manuals for a list of events requiring mandatory reporting.

Collision Avoidance—A process to prevent collisions between on-orbit tracked objects or to prevent collisions between on-orbit tracked objects and launched vehicles (including spent stages)/payloads by determining and implementing courses of action through careful analysis of validated conjunction assessments and satellite health and mission requirements. The process includes establishing launch wait periods in either the launch window or spacecraft maneuvering using validated conjunction assessments and accounts for uncertainties in spatial dispersions, arrival time of orbiting objects and/or the launch vehicle/payload, and modeling accuracy.

Engineering Analysis Group (EAG)—An independent group of contractor personnel, Air Force representatives, and other experts established to assist the Safety Investigation Board and Space Accident Investigation Board in analyzing the technical data from a space mishap investigation. The Engineering Analysis Group may recommend to the Safety Investigation Board President and the Space Accident Investigation Board President that certain non-privileged evidence and equipment be released in order that space launches may continue.

Event—A broad term used to describe an occurrence, a series of occurrences, or a condition which has implications for the safety community. Events include Mishap, Nuclear Surety, Incident, Hazard, and Safety Study.

Ground-Based Space System—Ground-based space systems include unique space support equipment as well as space-related systems that do not directly support launch operations or on-orbit satellite operations. Examples include warning, surveillance, and offensive/defensive space control systems such as the Space Surveillance Network, the Rapid Attack Identification, Detection and Reporting System (RAIDRS), and the Integrated Tactical Warning and Attack Assessment (ITW/AA) system.

Hazard—Any real or potential condition that can cause injury, damage, or occupational illness.

Incident—A planned or unplanned occurrence or series of occurrences resulting in injury or damage that does not meet Mishap or Nuclear Surety reporting criteria.

Investigator-In-Charge—A person charged, on the basis of his or her qualification, with the responsibility for the organization, conduct, and control of an investigation.

Launch Vehicle—Any means of transportation used to place an object into Earth orbit or deep space, including ballistic missiles.

Mishap—An unplanned occurrence, or series of occurrences, that results in damage to Department of Defense (DoD) property; occupational illness to DoD personnel; injury to on- or off-duty DoD military personnel; injury to on-duty DoD civilian personnel; or damage to public or private property, or injury or illness to non-DoD personnel, caused by DoD activities. Mishaps are classified by total direct mishap cost and the severity of injury/occupational illness.

Mission Capability (MC)—This term encompasses the purpose and functions of the space system (e.g., sensors, transponders, etc.) throughout its intended system mean mission duration (e.g., the expected life of the space vehicle).

Mission Capability Loss—Temporary or permanent loss of the purpose and/or function of the space system at any point during its intended system mean mission duration.

Operational Capability Requirements Document—A document that specifies the operational requirements for a system.

Orbital Space System(s)—Term used to describe the hardware and activities associated with the design, development, testing and operation of any man-made object to achieve an altitude and velocity sufficient to complete one revolution of the Earth. The lower the altitude, the shorter the orbital period.

Passivation—The process of removing stored energy that could result in an explosion or deflagration from a space system at end-of-life. This includes electrical, mechanical, chemical, or nuclear energy.

Permanent Loss—The permanent loss of a space system to the extent that one or more of its purposes, functions, or components have become inoperable and unrepairable. The system is has come to the end of its life, regardless of its projected lifespan.

Satellite Control Authority (SCA)—The authority to plan, schedule, and perform satellite commanding.

Space Anomaly—An on-orbit malfunction of a space system, or a deviation from what is consistent with normal operations. May utilize the anomaly resolution process when initially investigating an anomaly. A space anomaly may or may not result in damage, injury, or mission impact that reaches the level of a reportable mishap. A space anomaly may be a reportable event.

Space Systems—Any system supporting space operations or support. Space system is a generic term encompassing all ground, space and link segment systems and their components. All the devices and organizations forming the space network are space systems. These consist of: launch vehicles; launch ranges; launch and range support equipment and systems; spacecraft; ground and airborne stations; and data links among spacecraft, mission, and user terminals.

Space Vehicle—A vehicle which orbits or travels beyond the earth's atmosphere or a system for lifting other space vehicles into orbit. Examples of space vehicles include boosters (i.e., launch vehicles, etc.), spacecraft (e.g., satellites, orbiters, payloads, etc.) and reusable spacecraft. Do not consider Intercontinental Ballistic Missiles (ICBMs) space vehicles.

Spacecraft—A space vehicle designed to operate in space and launched by a booster. The term includes satellites, orbiters and payloads, and their associated subsystems. This includes manned objects in space. This term can also refer to the object while it is still on the ground. This does NOT include launch vehicle components separated from the spacecraft.

Unit Flyaway Costs—Costs to produce a usable end item of military hardware, originally associated with aircraft. Includes the cost of creating the basic unit, that is, the Work Breakdown Structure elements of prime mission equipment (e.g., propulsion equipment, electronics, armament, etc.), system engineering, program management, system test and evaluation, warranties, engineering changes, nonrecurring start-up production costs, and other installed Government-Furnished Equipment. "Rollaway costs" and "sailaway costs" are analogous to "flyaway costs" for vehicles and ships, respectively.