U.S. Department
of Transportation
**Federal Aviation**
**Administration**

# Advisory Circular

**Subject:** Part 450 Mishap Plan – Reporting, Response, and Investigation Requirements

**Date:** August 12, 2021 **AC No:** 450.173-1
**Initiated By:** AST-1

This Advisory Circular (AC) provides guidance for developing a mishap plan and complying with title 14 Code of Federal Regulations (14 CFR) § 450.173, *Mishap Plan – Reporting, Response, and Investigation Requirements*.

The Federal Aviation Administration (FAA) considers this AC an accepted means of compliance for complying with the regulatory requirements of § 450.173. It presents one, but not the only, acceptable means of compliance with the associated regulatory requirements. The contents of this document do not have the force and effect of law and are not meant to bind the public in any way. The document is intended only to provide clarity to the public regarding existing requirements under the law or agency policies.

You may submit suggestions for improving this AC using the Advisory Circular Feedback form at the end of this AC.

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## 1 PURPOSE.

1.1 This Advisory Circular (AC) provides guidance and an acceptable method, but not the only method, for developing a mishap plan under title 14 CFR § 450.173. This AC includes recommendations based on lessons learned from past mishaps and insights gained from reviews of mishap plan submittals. This AC does not constitute a regulation and does not contain requirements, but is intended to assist applicants in obtaining commercial space authorizations and operating in compliance with commercial space regulations.

1.2 Section 450.173 states that an operator must report, respond to, and investigate mishaps, as defined in § 401.7, using a written plan that meets the requirements of this section. An operator must:

- Document responsibilities for personnel assigned to report and investigate mishaps;
- Document the roles and responsibilities of the launch operator and any site operator for reporting, responding to, and investigating mishaps during ground activities at the site;
- Immediately notify the FAA Washington Operations Center of a mishap that involves a fatality or serious injury in accordance with § 450.173(c)(1).
- Notify the FAA Washington Operations Center of a mishap that does not involve a fatality or serious injury within 24 hours in accordance with § 450.173(c)(2).
- Submit a written preliminary report to the FAA Office of Commercial Space Transportation within five days of any mishap in accordance with § 450.173(c)(3).
- Activate emergency response services, maintain hazard areas to protect the public, and preserve data and physical evidence following a mishap in accordance with § 450.173(d).
- Investigate root causes and report investigation results of a mishap in accordance with § 450.173(e).
- Identify and implement preventative measures to avoid recurrence of a mishap in accordance with § 450.173(f).
- Maintain records associated with a mishap in accordance with § 450.219(b).

1.3 **Level of Imperatives**.

This AC presents one, but not the only, acceptable means of compliance with the associated regulatory requirements. The FAA will consider other means of compliance that an applicant may elect to present. Throughout this document, the word “must” characterizes statements that directly flow from regulatory text and therefore reflect regulatory mandates. The word “should” describes a requirement if electing to use this means of compliance; variation from these requirements is possible, but must be justified and approved as an alternative means of compliance. The word “may” describes variations or alternatives allowed within the accepted means of compliance

set forth in this AC. In general, these alternative approaches can be used only under certain situations that do not compromise safety.

## 2 APPLICABILITY.

2.1 The guidance in this AC is for launch and reentry vehicle applicants and operators, experimental permittees, and site operators required to comply with 14 CFR part 450. The guidance in this AC is for those seeking a launch or reentry vehicle operator license, and any licensed operator seeking to renew or modify an existing vehicle operator license.

2.2 The material in this AC is advisory in nature and does not constitute a regulation. This guidance is not legally binding in its own right, and the FAA will not rely upon this guidance as a separate basis for affirmative enforcement action or other administrative penalty. Conformity with this guidance document (as distinct from existing statutes and regulations) is voluntary only, and nonconformity will not affect rights and obligations under existing statutes and regulations. This AC describes acceptable means, but not the only means, for demonstrating compliance with the applicable regulations. The FAA will consider other means of compliance that an applicant may elect to present.

2.3 The material in this AC does not change or create any additional regulatory requirements, nor does it authorize changes to, or deviations from, existing regulatory requirements.

## 3 APPLICABLE REGULATIONS AND RELATED DOCUMENTS.

### 3.1 Related Statute.

- 51 U.S.C. Subtitle V, Chapter 509.

### 3.2 Related Regulations.

The following regulations from title 14 of the CFR must be accounted for when showing compliance with § 450.173. The full text of these regulations can be downloaded from the U.S. Government Printing Office e-CFR. A paper copy can be ordered from the Government Printing Office, Superintendent of Documents, Attn: New Orders, P.O. Box 371954, Pittsburgh, PA, 15250-7954.

- Section 401.7, *Definitions*.
- Section 420.59, *Mishap plan*.
- Section 420.61, *Records*.
- Section 437.41, *Mishap plan*.
- Section 437.87, *Records*.
- Section 450.147(a)(4), *Mishap response*.

- Section 450.155(a)(3), *Readiness*.
- Section 450.173, *Mishap Plan – Reporting, Response, and Investigation Requirements*.
- Section 450.189(e), *Emergency Procedures*.
- Section 450.219, *Records*.

3.3 **Related FAA Documents.**

FAA documents (are available through the FAA website, http://www.faa.gov).

- AC 437.73-1, *Anomaly Reporting and Corrective Action for a Reusable Suborbital Rocket Operating Under an Experimental Permit*, dated April 20, 2007.
- FAA Order 8020.11D, *Aircraft Accident and Incident Notification, Investigation, and Reporting*, dated May 10, 2018.

3.4 **Related Documents**.

3.4.1 Department of Transportation (DOT), Pipeline and Hazardous Materials Safety Administration (PHMSA), *Emergency Response Guidebook*, http://www.phmsa.dot.gov/hazmat/erg/emergency-response-guidebook-erg.

3.4.2 National Aeronautics and Space Administration (NASA) NPR 8621.1D, *NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping*, effective July 6, 2020, https://nodis3.gsfc.nasa.gov/displayDir.cfm?t=NPR&c=8621&s=1C.

3.4.3 National Transportation Safety Board (NTSB), *Aviation Investigation Manual Major Team Investigations*, dated November 2002, https://www.ntsb.gov.

## 4 DEFINITION OF TERMS.

For this AC, the terms and definitions from § 401.7, and this list, apply.

4.1 **Preventative Measure.**

An action taken to prevent or eliminate the technical and organizational root causes of a mishap in order to avoid a recurrence of the event.

4.2 **Root Cause.**

An event or condition, primarily associated with organizational factors, that resulted in the occurrence of a mishap, which if eliminated or modified, would have prevented the mishap from occurring. Typically, multiple causes contribute to a mishap.

## 5 OVERVIEW OF MISHAP PLAN.

Section 450.173 requires an operator to report, respond to, and investigate mishaps as defined in § 401.7, using a written mishap plan that meets the requirements of § 450.173.

### 5.1 **Mishap Plan Submittal**.

To satisfy the regulatory requirements of § 450.173, an applicant must submit a written mishap plan, or other written means, containing processes and procedures for reporting, responding to, and investigating a mishap in accordance with § 450.173(b) through (g). The processes and procedures outlined in an applicant's mishap plan should contain sufficient detail to allow for FAA evaluation and approval, and for the applicant to implement the plan in the event of a mishap. Simply stating that an item complies with a regulatory requirement is insufficient to demonstrate compliance.

#### 5.1.1 Other Written Means.

In lieu of submitting a written mishap plan, an applicant may submit other written documentation to demonstrate compliance with § 450.173. Other written means may include, but are not limited to, the following:

- Checklists;
- Electronic procedures;
- Service contracts (i.e. range emergency service contracts); or
- Agreements (i.e. including Launch Site Operator agreements).

### 5.2 **Document Markings.**

#### 5.2.1 Proprietary Information.

If an applicant's mishap plan contains information considered proprietary, trade secrets, or competition sensitive, the FAA recommends marking the plan in accordance with 14 CFR § 413.9.

#### 5.2.2 Export Controlled Information.

If an applicant's plan contains technical data subject to International Traffic in Arms Regulations (ITAR), 22 CFR parts 120-130, the FAA recommends marking the plan accordingly.

### 5.3 **Document Applicability**.

To facilitate review of a mishap plan, the FAA recommends that applicants identify whether the mishap plan is applicable to a single launch vehicle type, configuration, location, or applicable to multiple vehicles and locations.

### 5.4 **Document History and Version Control**.

An applicant should include information regarding document's history and a version control table, similar to the example given in Table 1 of this AC, to record the details of document changes over time. Document history and version control tables allow

personnel accessing the mishap plan to verify the most current version, when it was last changed, what was changed, and who approved the change. This section of the mishap plan should also identify the individual, by title or position, who is responsible for the issuance and revision control of the mishap plan.

**Table 1 – Sample Version Control Table**

| Version | Description | Approval Authority | Approval Date |
|---|---|---|---|
| Revision history | Brief description of change | Printed name and title of individual approving change | Date revision is approved |

The applicant is responsible for ensuring the representations contained in the application are accurate for the entire term of the license. In accordance with § 450.211, once the FAA issues a license, the applicant must apply for a license modification if any of the following situations occur:

- The licensee proposes to conduct a launch or reentry in a manner not authorized by the license; or
- Any representation contained in the license application that is material to public health and safety or the safety of property is no longer accurate and complete or does not reflect the licensee's procedures governing the actual conduct of a launch or reentry.

Policy or procedural changes made to an approved mishap plan are material to public health and safety and require a license modification.

5.5 **List of Abbreviations and Acronyms**.

An applicant should include a list of all abbreviations and acronyms used in the mishap plan. Such a listing reduces confusion with like terms and those terms unique to a specific organization. The applicant should spell out the definition of each abbreviation/acronym at its first occurrence in a mishap plan.

5.6 **What Constitutes a Mishap?**

The FAA's mishap definition in § 401.7 describes nine events that would constitute a mishap. This section breaks down each of those descriptions in § 401.7, by providing further clarification and examples of events that would constitute a mishap. The occurrence of any of these events during the scope of licensed or permitted activities constitutes a mishap and must be reported to the FAA in accordance with § 450.173(c). Per § 401.7, a *Mishap* means any event, or series of events associated with a licensed or permitted activity resulting in any of the following:

1. A fatality or serious injury (as defined in 49 CFR 830.2);
    - Fatal Injury means any injury, which results in death within 30 days of the accident.
    - Serious Injury means any injury that:

- Requires hospitalization for more than 48 hours, commencing within seven days from the date of the injury was received;
- Results in a fracture of any bone (except simple fractures of fingers, toes, or nose);
- Causes severe hemorrhages, nerve, muscle, or tendon damage;
- Involves any internal organ; or
- Involves second- or third-degree burns, or any burns affecting more than five percent of the body surface.

2. A malfunction of a safety-critical system;
   - As defined in § 401.7: "Safety critical means essential to safe performance or operation. A safety-critical system, subsystem, component, condition, event, operation, process, or item, is one whose proper recognition, control, performance, or tolerance, is essential to ensuring public safety and the safety of property."
   - As noted in § 450.107(d)(2), an applicant must identify all safety-critical systems as part of their application. In addition, § 450.143(f)(1) requires an applicant to submit a list and description of each safety-critical system as part of its application.
   - The FAA considers the malfunction of any system identified as safety critical under § 450.107(d)(2) to constitute a mishap. For example, the FAA would consider the failure of a flight safety system to activate when commanded, following a violation of flight safety rules to be a malfunction of a safety-critical system.
3. A failure of the licensee's or permittee's safety organization, safety operations, or safety procedures;
   - "Failure of a safety organization" occurs when an operator fails to complete an action expected or required by the safety organization, or when the organization stops functioning normally, such that it creates a public safety risk.
   - For example, the FAA would consider an operator's failure to follow existing safety processes or procedures, thereby placing the public at risk, a failure of a safety organization, safety operation, or safety procedure. Additional examples include: (1) the failure of safety official (safety-critical personnel) to communicate a hold condition (safety process) upon a violation of launch commit criteria (safety procedures); (2) a safety official failing to report potential safety matters to the mission director; or (3) the failure of an organization to recognize and mitigate a hazard, resulting in a public safety risk.
4. High risk, as determined by the FAA, of causing a serious or fatal injury to any space flight participant, crew, government astronaut, or member of the public;

- With this criterion, the FAA intends to cover events akin to a near miss in the aviation industry. This approach is consistent with the United States Air Force and NASA practices.
- The FAA would consider any off-nominal event during pre-flight or flight operations that posed a high probability of fatality or serious injury to spaceflight participants, crew, government astronauts, or the public, to be "high risk."

5. Substantial damage, as determined by the FAA, to property not associated with licensed or permitted activity;
    - The FAA will determine, on a case-by-case basis, whether damage to property not associated with the licensed activity is "substantial damage." The FAA will base its determination on such factors as direct replacement cost, repair cost, and the property's intended use and functionality. When making a substantial damage determination, the FAA will include damage caused by debris impacts, toxic plumes, and fires ignited by the vehicle or its debris.
    - For example, The FAA would consider structural damage to public property exceeding 50 percent of its market value resulting from a failed launch attempt and subsequent post-impact fire to be substantial damage.

        **Note:** If an operator is unsure whether damage to public property is a reportable mishap, they should contact the FAA for further clarification.

6. Unplanned substantial damage, as determined by the FAA, to property associated with licensed or permitted activity;
    - The FAA will evaluate unplanned damage to property associated with a licensed or permitted activity on the same basis as damage to property not associated with the activity.
    - Unplanned damage examples may include a major repair or replacement of launch facilities due to an unsuccessful launch attempt, including processing facilities, launch pads, or propellant tanks, based on cost of repair, replacement, or loss of use. Similar to the NTSB's definition of "substantial damage" (49 CFR 830.2), the FAA may deem any damage that adversely affects the structural, performance, or flight characteristics of a launch or reentry vehicle which normally require major repair or replacement of the affected component, to be substantial.
    - In accordance with § 450.175(b), potential test-induced damages pre-coordinated with the FAA prior to licensed activities taking place are exempt from mishap classification.

        **Note:** The test-induced damage exemption applies only to licensed activities.

        **Note:** If an operator is unsure whether damage to property associated with a licensed or permitted activity is a reportable mishap, they should contact the FAA for further clarification.

7. Unplanned permanent loss of a launch or reentry vehicle during licensed activity or permitted activity;

    - Under this criterion, the FAA intends to capture other events that may have future public safety implications.
    - For example, an authorized activity may result in the complete loss of a licensed or permitted vehicle in a remote and unpopulated area. Although the loss may not have resulted in fatalities, serious injuries, or public property damage on this occasion, it is important to find the root cause of the mishap. Failure to identify the cause of the mishap and implement corrective actions may endanger public safety during a future mission.
    - As noted above, in accordance with § 450.175(b), potential test-induced damages pre-coordinated with the FAA prior to licensed activities taking place are exempt from mishap classification.

        **Note:** The test-induced damage exemption applies only to licensed activities.

8. The impact of hazardous debris outside the planned landing site or designated hazard area; or

    - As defined in § 401.7, hazardous debris means any object or substance capable of causing a casualty or loss of functionality to a critical asset. Hazardous debris includes inert debris and explosive debris such as an intact vehicle, vehicle fragments, any detached vehicle component whether intact or in fragments, payload, and any planned jettison bodies.
    - This criterion applies to the impact of hazardous debris outside the planned landing site or hazard area. The occurrence of debris outside the hazard area that does not meet the definition of "hazardous debris" in § 401.7 is not a mishap, provided the anomalous event did not otherwise satisfy the remaining mishap definition criteria.

9. Failure to complete a launch or reentry as planned as reported in § 450.213(b).

    - The pre-flight reporting requirements of § 450.213(b)(2) requires a licensee to submit planned mission information, including the vehicle, launch site, planned flight path, staging and impact locations, each payload delivery point, intended reentry or landing sites including any contingency abort location, and the location of any disposed launch or reentry vehicle stage or component that is deorbited.
    - The failure to complete a launch or reentry as planned, as identified in the pre-flight report, constitutes a mishap. This criterion more accurately reflects the scope of activities that the FAA deems to be a mishap.

5.7 **Incorporating Mishap Terms**.

An applicant should incorporate the definition of a "mishap" under § 401.7, including the definitions of "fatal injury" and "serious injury" from 49 CFR 830.2,[1] into the mishap plan to aid in determining if a mishap occurred and the resulting reporting requirements.

5.8 **Reference Document Section**.

When applicable, the applicant should incorporate a reference document section in the mishap plan. This section should identify all applicable reference documents or implemented plans in response to a commercial space transportation mishap. As stated in AC 413.5-1, an applicant may provide the necessary evidence of compliance (such as data, plans, and other supporting documentation) by creating new documents that address the regulations specifically or by utilizing existing company documents with specific references to applicable sections. A copy of all referenced documents used to satisfy a mishap plan requirement should be included with the mishap plan submittal. Examples may include:

- Agreements providing for emergency response services necessary to satisfy the requirements of § 450.173,
- Emergency first responder vehicle hazard guidance,
- Mishap response checklists, and
- Points of contact list.

[1] Mishap, as defined in § 401.7, cites 49 CFR 830.2 "fatal injury" and "serious injury" definitions.

## 6 READINESS TO IMPLEMENT THE MISHAP PLAN.

In accordance with § 450.155(a)(3), an operator must document and implement procedures to assess readiness to proceed with the flight of a launch or reentry vehicle, including readiness to implement the mishap plan required by § 450.173.

### 6.1 Mishap Preparedness.

An applicant should rehearse the procedures documented in the mishap plan to ensure safety-critical personnel, procedures, equipment, and services are prepared to implement the operator's plan. Rehearsal and review of those procedures will help operators assess the effectiveness of their mishap plan and identify deficiencies such as issues related to response, notification, public safety, or preservation of perishable mishap data. When assessing preparedness, operators should consider:

- Training for safety-critical personnel, including operator and emergency response personnel;
- Coordination of emergency response services with Federal Range or licensed launch or reentry site;
- Exercises (e.g. mishap simulations, table top exercises, full-scale exercises);
- Equipment availability (e.g. video/photographic equipment, including hand-held and overhead aerial-based), protective equipment, etc.);
- Supplies (e.g. go-kit items, evidence tags, notebooks, batteries, log books, etc.);
- Funding (e.g. travel, consultants, analyses, etc.);
- Debris storage locations; and
- Known requirements/special support equipment (e.g. cranes for large pieces of debris, transport equipment, etc.).

## 7 RESPONSIBILITIES.

In accordance with § 450.173(b), an operator's mishap plan must document responsibilities for personnel assigned to implement the requirements of § 450.173, including any personnel retained to conduct or participate in an investigation. The mishap plan must also document the allocation of roles and responsibilities between the operator's organization and any launch or reentry site operator for reporting, responding to, and investigating any mishap during ground activities at the site, per § 450.173(b)(3). In addition, per § 450.157, the mishap plan should document lines of communications between the operator's organization and launch or reentry site operator. Applicants should describe roles and responsibilities using positions or titles, rather than information that are subject to change (e.g. names of staff).

7.1 **Delegating and Sharing of Responsibilities**.

A mishap plan should identify each individual's roles and responsibilities within the applicant's organization, Federal Range, or a launch or reentry site operator. The mishap plan should document each individual's authority and define lines of communication. The delegation of roles and responsibilities may be shared between the applicant's organization and site operator, subject to mutual agreement. For a mishap occurring with a vehicle on a launch site, the vehicle operator may conduct the primary investigation with support from the launch site operator.

7.1.1 Roles and Responsibilities.

When documenting roles and responsibilities, an operator should consider who is responsible for:

- Providing notification to the FAA Washington Operations Center;
- Drafting and submitting the five-day preliminary mishap report required under § 450.173(c)(3);
- Activating emergency response services, including, but not limited to, fire department, emergency medical services, or other services to address known hazards;
- Coordinating with external stakeholders (e.g. Federal Range, payload customers, etc.);
- Coordinating with public affairs;
- Evacuating and accounting for personnel;
- Maintaining hazard area surveillance;
- Securing the mishap site;
- Securing data and physical evidence;
- Documenting debris;
- Implementing your mishap plan;
- Conducting the investigation;
- Reporting investigation results to the FAA; and
- Identifying and implementing preventative measures.

7.1.2 Using Checklists.

There are numerous benefits to using checklists during a mishap. Checklists serve as a reminder of steps to complete when carrying out assigned tasks, ensure consistency, and reduce the likelihood of failure or omission of a critical step. Mishaps can occur at unexpected times, and even the most well trained personnel can forget the order of tasks they should complete. For these reasons, a mishap plan should incorporate the use of checklists for personnel responsible for implementing the mishap plan. See Appendix A of this AC for a notification example.

## 8 MISHAP REPORTING REQUIREMENTS.

Under § 450.173(c), an operator is required to notify the FAA Washington Operations Center in the event of a mishap. Based on the severity of the mishap, notification is either required immediately or within 24 hours of the event, as described below. Additionally, an operator is required to submit a preliminary written report to the FAA Office of Commercial Space Transportation within five days of any mishap.

Note: If an operator is unsure whether an anomalous event meets the criteria of a reportable mishap, they should contact the FAA for further clarification.

### 8.1 Immediate Notifications.

In the event of a mishap involving a fatality or serious injury, operators must immediately notify the FAA's Washington Operations Center (WOC) of the event in accordance with § 450.173(c)(1). The FAA's WOC operates 24 hours per day and seven days per week. The immediate notification required by § 450.173(c)(1) should not hamper the activation of emergency response activities. When notifying the WOC, the operator should provide their name and telephone number. The mishap plan should include the following WOC contact information:

**FAA Washington Operations Center**

Phone: (202) 267-3333 or toll-free at (800) 322-3804

Email: 9-awa-ash-woc@faa.gov

Fax: (202) 267-5289

**Note:** Providing mishap notifications to FAA personnel on-site (e.g. Commercial Space Transportation Safety Inspector) following a mishap does not satisfy the notification requirements of § 450.173(c) and does not remove the need to comply with all Part 450 reporting requirements.

**Note:** Below is an example of notification language that could be incorporated into a mishap plan to ensure compliance with § 450.173(c)(1).

*In the event of a mishap involving a fatality or serious injury, [title of responsible position] will provide an immediate verbal notification to the FAA Washington Operations Center at (800) 322-3804. When making the immediate notification, [responsible position] will provide the information contained in § 450.173(c)(3) to the extent known at the time. However, the lack of information known should not delay the immediate notification. [Responsible position] will complete all required notifications per [procedure, checklist, plan step, etc.].*

8.2 **24-Hour Notifications**.

In the event of a mishap not involving a fatality or serious injury,[2] the operator must provide notification to the FAA WOC within 24-hours of the event (see contact information above) in accordance with § 450.173(c)(2). The FAA recommends notifying the FAA WOC as soon as possible following the mishap. The operator may use the five-day written preliminary report information provided below in paragraph 8.3 of this AC as a guideline when reporting the notification. The operator should provide this information to the extent known at the time of notification. The lack of information should not delay the required 24-hour notification. If information is unknown, the operator may report it as such.

8.3 **Five-Day Written Preliminary Report**.

Within five days of a mishap, the operator must submit a written preliminary report to the FAA's Office of Commercial Space Transportation in accordance with § 450.173(c)(3). The five-day report is a follow-up requirement designed to supplement the initial mishap notification once more detailed information is known. Following a mishap, the assigned FAA Mishap Response Coordinator (MRC) will contact the designated operator point of contact (POC). The FAA MRC will be the primary POC for all mishap-related information submittals, including the five-day report. The preliminary report must include the information required under § 450.173(c)(3), as shown below.

**Note:** The FAA recognizes the preliminary and sensitive nature of data contained in the five-day report and will treat the information appropriately. The operator should mark reports containing proprietary or information subject to ITAR accordingly.

8.3.1 Date and Time of the Mishap.

Section 450.173(c)(3)(i) first requires the preliminary report to identify the date and time of the mishap. The FAA recommends that operators use the Coordinated Universal Time (UTC) standard to report the date and time of the mishap. UTC is the time standard commonly used worldwide.

8.3.2 Description of the Mishap and Sequence of Events.

The preliminary report must include a description of the mishap and sequence of events leading up to it, to the extent known, under § 450.173(c)(3)(ii). The operator should write the description in a narrative form to aid in excluding speculative information.

8.3.3 Intended and Actual Locations.

Per § 450.173(c)(3)(iii), the operator must include the intended and actual location of the launch or reentry or other landing on Earth. For established locations, such as federal launch ranges or FAA-licensed launch sites, operators should include site names and locations. For non-established locations, operators should provide location

[2] See paragraphs (2) through (9) of the definition of "mishap" in § 401.7.

coordinates, nearest city, etc. A common choice of coordinates is latitude, longitude, and elevation.

8.3.4 Hazardous Debris Impact Points.

In accordance with § 450.173(c)(3)(iv), an operator must identify the location or coordinates of hazardous debris impact points, including those outside a planned landing site or designated hazard area, so that the FAA can assess potential public safety risks. If actual data on impact location does not exist or cannot be visually verified, an analysis can be provided. An acceptable means of analysis can be a propagation of the expected debris field based on the last known state vector or last known instantaneous impact point of the vehicle.

8.3.5 Identification of the Vehicle.

Per § 450.173(c)(3)(v), an operator must identify the vehicle involved in the mishap. This section should include the name and general description of the launch or reentry vehicle involved.

8.3.6 Identification of any Payload.

Per § 450.173(c)(3)(vi), an operator must identify any payload. The identification should include the name and general description of any payload, including primary and secondary payloads. The FAA recommends identifying all payloads' ownership, including any foreign ownership.

8.3.7 Number and General Description of any Fatalities or Injuries.

Per § 450.173(c)(3)(vii), an operator must provide the number and general description of all known injuries (fatality, serious injuries, minor injuries), including injuries to public and anyone involved with the launch or reentry activity.

8.3.8 Description and Estimated Cost of any Property Damage.

Per § 450.173(c)(3)(viii), an operator must provide a description and estimated cost of any property damage. This includes known damages to property associated with the activity, such as a payload, a launch or reentry vehicle, a facility involved with the activity, government property involved with the activity, or and any property not associated with the activity (e.g. public property). These damages should be based on the cost to repair or replace what was damaged as a result of a mishap. The "substantial damage" threshold to property in paragraphs (5) and (6) of the definition of mishap in § 401.7 still applies to a vehicle, payload, or property regardless of an operator's intent to actually repair or replace damages incurred (i.e. expendable stages, last flight of an experimental vehicle, single use vehicles are still subject to the "substantial damage" threshold).

8.3.9 Identification of Hazardous Materials.

Section 450.173(c)(3)(ix) requires an operator to identify all hazardous materials, as defined by § 401.7, involved in the event, whether on the vehicle, any payload, or on the ground. Operators should include the name and quantity of hazardous materials involved in the event. As listed under the Safety Precautions section of the PHSMA Emergency Response Guidebook, sources an operator may use to identify hazardous materials involved in a mishap may include:

- Placards,
- Container labels,
- Shipping documents,
- Rail car and road trailer identification charts,
- Safety Data Sheets, and
- Knowledge of persons on scene, such as emergency first responders.

8.3.10 Actions Taken to Contain the Consequences of the Event.

Section 450.173(c)(3)(x) requires an operator to identify any actions taken by anyone, including emergency response activities (fire, medical, law enforcement, etc.), to contain the consequences of the event (e.g. steps taken to secure the mishap site, any movement, or recovery of debris, etc.).

8.3.11 Weather Conditions at the Time of the Event.

Section 450.173(c)(3)(xi) requires an operator to describe the weather conditions at the time of the event. An operator can include local forecast information, range weather reports, weather balloon data, or other means of accurately reporting weather data.

8.3.12 Potential Consequences for other Similar Vehicles, Systems, or Operations.

Lastly, in accordance with § 450.173(c)(3)(xii) an operator must identify factors that may affect the safe operation of vehicles, systems, or operations of a similar type. Given that some commercially purchased hardware/software is common across operators, or proprietary hardware/software may be common within an operator’s vehicle fleet, this information could prevent mishaps due to similar failures of a common system or component, including ground and range systems.

## 9 EMERGENCY RESPONSE REQUIREMENTS.

In accordance with § 450.173(d)(1), an operator must activate emergency response services as necessary to protect property and public safety. An operator must also maintain hazard area surveillance and clearance as necessary to protect public safety, pursuant to § 450.173(d)(2). Lastly, an operator must contain and minimize the consequences of a mishap, preserve data and physical evidence, and implement agreements with government authorities and emergency response services as necessary under § 450.173(d)(3)–(5).

### 9.1 Activation of Emergency Response Services.

In accordance with § 450.173(d)(1), the mishap plan must contain procedures to ensure activation of emergency response services necessary to protect the public and property following a mishap. These procedures must address the evacuation and rescue of members of the public, taking into consideration debris dispersions, toxic plumes, and extinguishing fires in accordance with § 450.173(d)(1)(i) and (ii). As noted in paragraph 9.6 of this AC, an operator launching from a Federal launch site need not execute and implement agreements to provide emergency response services if the Federal site already has the necessary coordination in place to satisfy the requirements of § 450.173.

#### 9.1.1 Identify Stakeholders.

In accordance with § 450.173(b)(3), an operator must identify all stakeholders who may play a role, or have a stake in responding to an emergency. For example, employees are likely to be the first people aware of an emergency. They should know who to notify in the event of an emergency, how to secure a scene safely, when and where to evacuate, and be able to render basic first aid to coworkers, if needed. All parties involved in emergency response procedures should receive appropriate training relevant to their roles and any vehicle/site specific hazards they may encounter, including environmental hazards. This includes, but is not limited to, the following stakeholders:

- Vehicle operations personnel,
- Payload owners/operators,
- Launch or reentry site personnel,
- Fire department,
- Emergency medical services, and
- Members of the affected public.

#### 9.1.2 Coordinating with Local Emergency First Responders.

Prior to the start of launch operations, an operator should coordinate with federal, state, and local authorities, and emergency first responders to familiarize them with their operations and any launch vehicle or site-specific hazards. The operator should use local emergency responders that are familiar with the area and terrain potentially associated with responding to a mishap. Pre-coordination and cooperation with these entities is critical to the general safety of all parties involved, as well as the public and

property, in responding to an emergency. Pre-coordination also helps ensure the availability of appropriate emergency and personal protective equipment based on the operation's vehicle(s) or site hazards. Operators should ensure that responding fire departments are familiar with and equipped to respond to the specific hazards of their vehicle(s) or launch or reentry site.

9.1.3 Coordination in Rural Areas.

Many launch operations take place in remote areas far from large population centers. An on-pad explosion of a fully fueled launch vehicle could easily overwhelm a local volunteer fire department. In addition, local fire departments may not have the specialized equipment necessary to deal with unique hazards associated with such an event, such as hypergolic propellants. In such cases, it may be necessary to pre-position specialized assets nearby, or coordinate with a larger fire department further away that is equipped to handle hazardous materials. Pre-coordination also provides an opportunity to determine the level of support operator personnel will provide to first responders. Once the initial fire is contained, it may be necessary to enter the debris field to extinguish small, localized fires. Operator personnel having technical expertise with ordnance can help contain hazards by accompanying fire fighters to identify and mark unexploded ordnance and other potential hazards necessary to avoid injury.

9.1.4 Examples of Vehicle and Operational Hazards include:

- Vehicle composites,
- Propellants,
- Oxidizers,
- Pressure vessels,
- Unexploded ordnance,
- Oxygen systems, and
- Batteries.

9.1.5 First Responders Guide.

In support of emergency response activities and recovery operations, an operator should develop a quick reference guide for rapid dissemination to first responders, including those outside the local area who may not be aware of the hazards associated with the launch vehicle. In addition to the hazards listed above, contents of such a guide may include:

- The quantity and location of specific hazards (i.e. parachute mortars, hypergolic propellants, destruct charges, etc.),
- Recommended standoff distances,
- Appropriate personal protective equipment (PPE), and
- Launch operator point of contact information.

9.1.6 Emergency Response Guidebook (ERG).

The ERG is a joint publication prepared by Transport Canada, the U.S. Department of Transportation, and the Secretariat of Communications and Transport of Mexico. The ERG, as revised, is intended for use by first responders during the initial phase of a transportation incident involving dangerous goods or hazardous materials. Basic safety recommendations include approaching and securing the scene, identifying hazards, assessing the situation, obtaining help, and response. The ERG includes a numerical and alphabetical listing of hazardous materials that can be used to identify the associated GUIDE number and safety recommendations related to the material in question. Table 2 of this AC identifies the GUIDE number for liquid oxygen.

**Table 2 – ERG Alphabetical Example**

| **Name** | **GUIDE No.** | **ID No.** |
|---|---|---|
| Oxygen, refrigerated liquid (cryogenic liquid) | 122 | 1073 |

9.1.6.1 In the example above, GUIDE No. 122 refers to "Gases – Oxidizing, Including Refrigerated Liquids." This section identifies potential hazards associated with oxidizing gases; public safety considerations including, protective clothing and evacuation; emergency response procedures in the event of a fire, spill, or leak, and first aid considerations.

9.1.6.2 A digital copy of the ERG is available for download from the U.S. Department of Transportation, Pipeline, and Hazardous Materials Safety Administration's website at: https://www.phmsa.dot.gov/hazmat/erg/emergency-response-guidebook-erg.

9.1.7 Evacuating and Rescuing the Public.

In accordance with § 450.173(d)(1)(i), the mishap plan must contain procedures for evacuating and rescuing members of the public, taking into account debris dispersions, toxic plumes, and far-field blast overpressure or distance focusing overpressure (DFO). An operator should determine the needed actions in coordination with local emergency responders, based on the information available. In some cases, the best option may be evacuation. In others, sheltering-in-place may be best. For further considerations, refer to the "Protective Action Decision Factors to Consider" section of the ERG.

**Note:** In preparing for potential evacuation or other emergency measures to prevent harm to the public, operators can also look to their toxic hazard release analyses prepared in accordance with §§ 450.139 and 450.187. These sections require operators to account for operational constraints and emergency procedures, such as evacuation plans or other constraints needed to protect the public from the effects of a toxic release from a vehicle or any of its components or payloads.

9.1.8 Extinguishing Fires.

The mishap plan must, in accordance with § 450.173(d)(1)(ii), contain procedures for controlling and extinguishing fires caused by licensed activities. As noted earlier, the allocation of roles and responsibilities shared between a launch operator and a site operator or federal range, including emergency response services, must be documented in the mishap plan or by other written means in accordance with § 450.173(b)(3). Under § 450.173(d)(5), operators may implement agreements with government authorities and emergency response services, as necessary, to satisfy the requirements of this section.

9.2 **Hazard Area Surveillance and Clearance**.

In the event of mishap, in accordance with § 450.173(d)(2), the operator must maintain existing hazard area surveillance and clearance as necessary to protect public safety (e.g., through use of Notices to Mariners (NOTMAR) and Notices to Airmen (NOTAM), roadblocks, or facility access). All personnel assigned to maintain hazard area surveillance and clearance should know their role and actions to take following a mishap. These procedures can include:

- Holding current clearance areas up until hazards are contained;
- Adding surveillance or reducing hazard area surveillance based on the location and impact of the mishap; and expanding or reducing personnel as needed for different mishap scenarios.

9.3 **Restricting Hazard Area until Debris Collection is Complete**.

In the event of a mishap that results in debris impacts on land, operator personnel or other emergency responders should be prepared to maintain, expand, or establish a new ground hazard area(s) until all fires are extinguished, and the extent of any remaining hazards can be verified. Access to the launch pad and immediate surrounding area could remain restricted for several days while debris documentation and collection occurs, or while any relevant ground system evidence is collected, such as commodity samples. Based on the volume and duration of airspace where an aircraft hazard is predicted, such as an in-flight break up scenario, it may be necessary to maintain an existing NOTAM beyond the original effective period. Similarly, floating debris that presents a hazard to marine navigation may require the existing NOTMAR to be extended or expanded if the debris floats away.

9.4 **Containing and Minimizing the Consequences of an Event**.

In accordance with § 450.173(d)(3), an operator is responsible for containing and minimizing the consequences of a mishap caused by its activities, to include securing impact areas to ensure no members of the public enter, safely disposing of hazardous materials, and controlling hazards at the site or impact area.

9.4.1 Site Security.

Methods of securing a site include roadblocks, checkpoints, fenced or roped off areas, and utilization of and cooperation with local authorities to protect the public from entering potentially hazardous areas.

9.4.2 Disposal of Hazardous Materials.

In accordance with § 450.173(d)(3)(ii), the mishap plan must include procedures for proper disposal of hazardous materials, including contaminated water and soil, as applicable. Prior to disposal, contaminated material should be isolated or stored in a separate, secured location. Hazardous debris must be disposed of in accordance with applicable safety and environmental requirements. Operators may not dispose of debris associated with a mishap until the FAA notifies the operator that the debris no longer needs to be retained in accordance with § 450.219(b).

9.4.3 Controlling Access to a Mishap Site.

Ensure that only authorized personnel can access a mishap site. Examples include:

- Setting up a perimeter with temporary fencing or caution tape.
- Access control to the temporary hazard location.
- Establishing a single point of entry and egress.
- Central sign in/out location to account for all personnel.
- Coordination and cooperation with local authorities and emergency first responders.

9.4.4 Safing and Securing the Mishap Site.

In an effort to contain and minimize the consequences of the mishap and maintain site integrity for investigation, the operator should safe and secure a mishap site as soon as possible. Safing refers to the steps necessary to identify and remove hazards from the mishap site following documentation. The mishap plan should prioritize the removal of debris presenting a public safety hazard, including debris affecting marine/navigable waterways, public roads, public gathering areas, facilities, etc. Based on the mishap location, it may also be advisable to establish a local hotline to allow members of the public to report debris locations for further collection (e.g., debris washing up on a beach). The mishap plan should include procedures for accomplishing these tasks in coordination with local first responders and/or law enforcement. In the event of a federal investigation, the operator should coordinate these efforts with the lead investigative authority. The mishap plan procedures should:

- Identify who is responsible for identifying and mitigating hazards;
- Identify who is responsible for securing the mishap site;
- Include a process for accessing the mishap site (i.e., who is authorized and when, training and personnel protection equipment requirements, etc.); and
- Include guidance on the treatment of debris, etc.

9.5 **Preserving Data and Physical Evidence**.

In accordance with § 450.173(d)(4), the mishap plan must contain procedures for collecting and preserving data and physical evidence. The mishap plan should also identify the individual(s) responsible for collecting and preserving data and physical evidence, and ensure that these individuals have sufficient technical knowledge and familiarity with the vehicle to identify and locate major vehicle systems, components,

and hazards. The mishap plan should also establish a location for securing data and physical evidence, as well as methods of maintaining a chain of custody, logging evidence, controlling access, and other means to safeguard integrity of data and physical evidence. Hazardous debris, such as unexploded ordnance, should be stored in a separate, secured facility, with access restricted to appropriately trained and certified personnel. As noted in AC 437.73-1, to assist in determining root cause and corrective actions or preventative measures, the FAA recommends collecting, cataloging, and retaining all data related to the mishap. This data can include, but is not limited to, the following:

- Analysis and test results,
- Change control documents,
- Contracts,
- Correspondence,
- Debris,
- Design drawings and specifications,
- Environmental factors (workplace environment, weather conditions),
- Equipment history logs,
- Inspection and Maintenance records,
- Policies, procedures, and work logs
- Training documentation,
- Vehicle close out photographs,
- Vehicle telemetry,
- Vendor manuals,
- Voice and video recordings, and
- Witness statements.

9.5.1 Treatment of Debris.

In general, an operator should not move or disturb debris without prior approval from the investigative authority, except to remove injured or trapped persons, to protect the wreckage from further damage, or to protect the public from injury. Prior to moving debris, the debris should be fully documented (measured, photographed, etc.), and location recorded for investigative purposes to the extent possible without hindering efforts to protect public safety in accordance with § 450.173(d)(4).

**Note:** As noted in the Streamlined Launch and Reentry Licensing Requirements Notice of Proposed Rulemaking, the FAA considers debris to be a physical record of the mishap's occurrence. Section 450.219(b) requires operators to maintain records, including debris, associated with a mishap until the FAA advises the licensee that the records need not be retained.

9.5.2 Documenting Physical Evidence.

When possible, the operator should systematically document, collect, protect, and preserve physical evidence. Operators should collect evidence in a manner that permits future evaluation of how and why the mishap occurred. The mishap plan should consider the following:

9.5.2.1 Site Documentation – Using sketches and maps to document the overall scene and position of debris. Geotagged photos are especially beneficial when documenting a site and debris distribution.

9.5.2.2 Cataloging Debris – Document individual debris components, including physical location (coordinates), debris dimensions, weight, and general description of the item. Operators should document this information in a centralized evidence log.

9.5.2.3 Photographing Debris – Photography is a valuable tool for documenting the overall mishap site, location of individual debris relative to the overall site, configuration, and condition. When photographing debris, the FAA recommends using GPS-equipped cameras. Bring sufficient memory cards and at least one spare set of batteries. Rulers or items of a known physical size should be included in close-up pictures to show scale and perspective. For each group of photographs, an overall photograph showing positions relative to a known point, such as a land feature, diagram reference point, or building should be included. A photograph log should be used to record the photograph number, content, type, and location. Location information could include either coordinates (latitude and longitude), or the direction and distance to a prominent feature, such as the launch pad or impact crater. See Table 3 of this AC.

**Note:** Refer to the "Initial Photography" section of FAA Order 8020.11D, as revised, for additional considerations when photographing a mishap site.

**Table 3 – Sample Photo Log**

| Photo # | Content | Type | Location |
|---|---|---|---|
| 001 | Debris field | Overview (O) | 123.45N, 17.32W |
| 002 | Stage 1 skin fragment | Close Up (C) | NW, 150’ |

9.5.2.4 Debris Handling – An operator should thoroughly document debris before handling it. When handling debris, never try to fit pieces back together. Touching fracture surfaces, especially to each other, destroys evidence of the fracture type. The type of fracture could be the only evidence of the vehicle’s failure mode.

- Movement of debris due to emergency first responder activities should be recorded. Talk to first responders to determine what may have been moved and ask for any documentation (photographs or video) they may have documenting debris movement. Also, in the event debris was cut during rescue efforts, record all cuts.
- Debris should only be handled by trained and qualified personnel having the proper personal protective equipment required based on known site hazards. Refer to FAA Order 8020.11, as revised, for more information on the handling of wreckage (debris) and precautions that should be taken into consideration.

9.5.2.5 Tagging Debris – The operator should tag and document all recovered debris. The operator should use tags with strings to identify parts and avoid tags with metal wires as they may damage the debris further. If containers are used to store debris, ensure they are soft compared to the debris being stored or that the debris is sufficiently protected (i.e. wrapped in bubble wrap). You can use plastic bags or bins for small pieces of metal and some composites. If debris is chemically contaminated, ensure storage containers and wrapping materials are compatible with chemical contamination (e.g., hypergols). When tagging debris, you should include the following:

- Debris catalog number,
- Photo number(s),
- Part name or unique identifier,
- Part or serial number, if known, and
- Recovery location (Geotagged photos may eliminate this need).

9.5.2.6 Additional Documentation – Further considerations to ensure a mishap site is fully documented include:

- Obtain names and contact information of critical personnel on-scene,
- Obtain photos or other documentation of the mishap site from first responders such as fire department, law enforcement, and rescue personnel,
- Collect contact information from all witnesses and first responders for interviews or statements, and
- Collect video evidence.

**Note:** See FAA Order 8020.11, as revised for additional considerations.

9.6 **Implementing Agreements**.

In accordance with § 450.147(a)(4), the operator is responsible for entering into agreements with government authorities and emergency response providers, as necessary, to satisfy the requirements of § 450.173. Section 450.173(d)(5) requires operators to implement agreements with governments and emergency responders as necessary to satisfy § 450.173. This can include, but is not limited to:

- Emergency medical and fire services,
- Local law enforcement,
- Federal launch range/installation emergency response services, and
- Local city or county emergency operation centers.

**Note:** Section 450.173(d)(5) requires an operator to implement agreements with government authorities and emergency responders "as necessary" to satisfy the requirements of § 450.173. An operator that launches from a Federal launch or reentry site, or licensed launch or reentry site is not required to execute agreements with local authorities if their launch or reentry site use agreement, as required by § 450.147(a)(1), has the necessary coordination in place to satisfy the requirements of § 450.173.

## 10 MISHAP INVESTIGATION REQUIREMENTS.

Under § 450.173(e), in the event of a mishap, the operator must investigate the root cause of the mishap and report the investigation results to the FAA.

### 10.1 Investigation Procedures.

The operator's mishap plan should clearly document the procedures for investigating the root cause of a mishap and for reporting results to the FAA. As noted earlier, in accordance with § 450.173(b), the mishap plan must clearly delineate responsibilities of personnel assigned to conduct an investigation and anyone retained to conduct, or participate in, any mishap investigation. The mishap plan procedures should include, but are not limited to, the following:

- Composition of the mishap investigation team, to include investigation team lead and minimum team members. These procedures should include provisions to expand the team membership based on additional expertise to support the investigation, as required.
- Coordination with industry and government stakeholders to ensure the proper level of support for the investigation.
- Documented method for determining root cause of the event, including what happened, how it happened, and why it happened. Root cause should extend beyond the technical cause of the event and include organizational root causes (e.g., insufficient training for employees, decreased safety culture, overlooked employee safety concerns, etc.).
- Documented description of the investigative review process, including the review and approval of data packages supporting root cause and corrective action determinations. Procedures should also address the recording of any dissenting opinions.
- Detail/explanation on how applicable supporting analysis will be performed (i.e., methodology, tools, criteria or standards, etc.).
- Provide for periodic updates to the FAA during the course of an investigation, on a schedule as mutually agreed upon between the operator and the FAA.

### 10.2 Root Cause Analysis.

The root cause is the fundamental reason or underlying cause that, if eliminated, would mean the mishap would not have occurred. The root cause differs from the proximate or direct cause, which is the immediate cause of the problem leading to a mishap. For example, a loose fuel line, resulting in a fuel leak would be the proximate cause of an inflight fire. However, the failure of a technician to torque and safety wire the fuel line b-nut may be a root cause of the problem.

10.2.1 A mishap may have multiple root causes. To identify a root cause, it is necessary to look beyond the direct cause, to perform a root cause analysis and understand potential organizational deficiencies as well the technical issue. In the example provided in paragraph 10.2 of this AC, a root cause analysis may determine that the technician did not follow existing procedures. Similarly, it may determine that the procedures were inadequate, or that the organization did not employ the standard of independent verification or quality assurance to check the technician's work after installation. Factors contributing to the problem could include inadequate training, personnel changes, or a simple distraction during a critical step.

10.2.2 A root cause analysis should include the following steps at a minimum.

- Scope of the Investigation – an operator should identify the bounds of the investigation including timeframe of the occurrence, systems that had the ability to contribute to the event, and any accepted risk items or issues related to those systems.
- Event Timeline – an operator should identify a general timeline of the operations leading up to and during the occurrence.
- Root Cause Analysis Process – an operator should define a process for its investigation. This should include the investigation methodology (e.g., fault tree, fishbone, video analysis, etc.), integration between engineering investigation teams, presentation of determinations made by engineering investigation teams to the investigation board, and board member voting or decision-making processes.
- Causal Factor Process – an operator should have an iterative process to continue investigating areas of concerns until finding a true root cause (e.g., the "5-whys"). This most typically ends at an organizational root cause linked to design, operations, or both.
- Identify and Implement Preventive Measures – an operator should identify and implement preventive measures on future and existing vehicles to ensure that the mishap does not recur such that public safety is not impacted.
- Preventative Measures Follow-Up – an operator's plan should include a process for following up to verify the implementation and effectiveness of preventative measures. This follow-up should ensure preventative measures remain adequate and did not result in or introduce an unintended consequence.

10.3 **Reporting Investigation Results to the FAA**.

The purpose of a mishap investigation report is to clearly and concisely document and convey the results of the investigation. The final, signed mishap investigation report must be submitted for FAA review, in accordance with § 450.173(e)(2). The FAA recommends use of the NASA mishap report format, as documented in NASA Procedural Requirements (NPR 8621.1, as revised), which includes the following sections:

- Section 1: Signature pages, list of consultants, and executive summary.
- Section 2: Narrative description and facts (what, when, where, and how).

- Section 3: Type of data gathered and data analysis (timeline; analytical techniques used; fault tree, or similar graphical representation).
- Section 4: Findings (and evidence on which those findings are based, proximate and root causes, and contributing factors).
- Section 5: Recommendations (preventative measures and corrective actions to avoid a recurrence of the event).
- Section 6: Minority report, if applicable.

**Note:** The final mishap report should contain all applicable document markings (Proprietary, International Traffic in Arms Regulations (ITAR)) necessary to restrict its release in accordance with 14 CFR 413.9, as appropriate.

**Note:** The executive summary should include a publically releasable description of the mishap, findings, and preventative measures or corrective actions.

10.4 **FAA and National Transportation Safety Board (NTSB) Investigations**.

Based on the severity and consequences of the event, the FAA or NTSB may initiate an investigation to determine root or probable cause and make recommendations for avoiding a recurrence of the event. In the event of a Federal investigation, the operator will be a participant/party to the investigation. However, the operator may conduct a concurrent investigation in accordance with their approved mishap plan provided it does not interfere with the Federal investigation.

**Note:** In accordance with § 450.209(a), a licensee must allow access by, and cooperate with, Federal officers or employees or other individuals authorized by the FAA to observe any of its activities, or any of its contractors' or subcontractors' activities, associated with the conduct of a licensed launch or reentry. In addition, per § 450.13, issuance of a vehicle operator license does not relieve a licensee of its obligation to comply with all applicable requirements of law or regulation that may apply to its activities.

10.5 **Press Conferences and Press Releases**.

All operator press conferences and press releases related to a commercial space transportation mishap should be coordinated with the FAA. Press conference coordination should take place with enough advanced notification to allow for FAA participation as required. Press releases should be coordinated with the FAA's Office of Communication prior to release.

10.6 **Release of Investigative Information**.

In the event of a Federal investigation, the release of investigative information should be coordinated with the lead investigative agency.

10.6.1 FAA Investigations.

In the event of an FAA investigation, the FAA's Office of Communications is responsible for the release of information to the public. All operator press releases should be coordinated with the FAA's Office of Communication in coordination with the Office of Commercial Space Transportation prior to release.

10.6.2 NTSB Investigations.

In the event of an NTSB investigation, the release of information to the public must be coordinated with the NTSB Investigator in Charge (IIC) in accordance with 49 CFR § 831.13(c). Refer to 49 CFR § 831.13, Provision and dissemination of investigative information, for more details.

## 11 PREVENTATIVE MEASURES.

In accordance with § 450.173(f), an operator must identify and implement preventative measures for avoiding the recurrence of a mishap, following the determination of root cause and contributing factors. Corrective actions should not only address technical root causes, but also any organizational root causes. Unless otherwise approved by the FAA, in accordance with § 450.173(f), an operator must implement preventative measures prior to the next flight. Operators often identify several preventative measures. For example, in the event of a mishap involving an in-flight fire, preventative measures could include revising existing procedures to include inspection steps to verify the installation of safety wire on all fuel line b-nuts or requiring additional training for personnel. The mishap plan should take into consideration the following:

- Process for identifying and approving preventative measures and corrective actions,
- Process for validating that proposed preventative measures and corrective actions are correct, complete, and feasible,
- Process and timeline for implementing preventative measures and corrective actions, and
- Process for implementing and verifying preventative measures and corrective actions are effective.

## 12 MISHAP RECORDS.

### 12.1 Records Retention.

Under 14 CFR § 450.173(g), operators are required to maintain all records associated with a mishap in accordance with § 450.219(b). Section 450.219(b) requires an operator to preserve all records related to an event that meets paragraph (1) through (5), or (8) of the definition of mishap, as defined in § 401.7. An operator must retain and make available to Federal officials for inspection or copying all records covered by § 450.219(b) until completion of any Federal investigation and notification from the FAA that the records need not be retained.

**Note:** Licensed launch site operators and experimental permittees are required to retain records in accordance with §§ 420.61 and 437.87, respectively.

### 12.2 Debris Disposal.

Although the FAA considers debris to be a physical record of a mishap occurrence, the FAA does not expect operators to retain debris for more than three years following the completion of a mishap investigation. Section 450.219(b) requires operators to maintain records, including debris, associated with a mishap until the FAA advises the licensee that the records need not be retained. Hazardous debris must be disposed of in accordance with applicable safety and environmental requirements.

### 12.3 Incorporating Recordkeeping into the Mishap Plan.

The FAA recommends incorporating the records requirements of § 450.219 into the mishap plan to ensure all required records and physical evidence are properly maintained. For any mishap that occurs that meets paragraphs (1) through (5), and (8) of § 401.7, an operator must preserve all records related to the event in accordance with § 450.219(b). Operators shall retain the records until any Federal investigation is complete and the FAA advises the licensee that the records can be disposed.

## 13 APPLICATION REQUIREMENTS.

Under § 450.173(h), an applicant must submit a plan or other written means satisfying these requirements of this section. A plan developed in accordance with this AC satisfies the requirements of 14 CFR § 450.173.

**Note:** In addition to a mishap plan, per § 450.189(e), an operator must have general emergency procedures that apply to any emergencies not covered by the mishap plan of § 450.173 that may create a hazard to the public.

## Appendix A. Sample Mishap Notification Checklist Template.

<table>
<tr><td colspan="3">[Insert position responsible for completing tasks] Mishap Notification Checklist</td></tr>
<tr><td colspan="2">In the event of a mishap…</td><td>Notify the FAA Washington Operation Center</td></tr>
<tr><td>1. Involving a fatality or serious injury</td><td>Immediately</td><td rowspan="2">Phone: (202) 267-3333<br>Toll-free: (800) 322-3804<br>Email: 9-awa-ash-woc@faa.gov<br>Fax: (202) 267-5289</td></tr>
<tr><td>2. Not involving a fatality or serious injury</td><td>Within 24-hours</td></tr>
<tr><td colspan="2">Submit a preliminary written report including the following information, as applicable, to…</td><td>FAA Office of Commercial Space Transportation</td></tr>
<tr><td colspan="2">(i) Date and time of the mishap;<br>(ii) Description of the mishap and sequence of events leading to the mishap, to the extent known;<br>(iii) Intended and actual location of the launch or reentry or other landing on Earth;<br>(iv) Hazardous debris impact points, including those outside a planned landing site or designated hazard area;<br>(v) Identification of the vehicle;<br>(vi) Identification of any payload;<br>(vii) Number and general description of any fatalities or injuries;<br>(viii) Description and estimated costs of any property damage;<br>(ix) Identification of hazardous materials, as defined in § 401.7 of this chapter, involved in the event, whether on the vehicle, any payload, or on the ground;<br>(x) Action taken by any person to contain the consequences of the event;<br>(xi) Weather conditions at the time of the event; and<br>(xii) Potential consequences for other similar vehicles, systems, or operations.</td><td>Within five days of the mishap to the assigned FAA Mishap Response Coordinator.<br>800 Independence Avenue SW<br>Washington, DC 20591<br>202-267-7793<br>202-267-5450 (fax)</td></tr>
<tr><td colspan="3">Note: The lack of information known should not delay the immediate notification.</td></tr>
</table>

OMB Control Number: 2120-0746
(Expiration Date: 08/31/2023)

# Advisory Circular Feedback Form

**Paperwork Reduction Act Burden Statement:** A federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection of information displays a currently valid OMB Control Number. The OMB Control Number for this information collection is 2120-0746. Public reporting for this collection of information is estimated to be approximately 5 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. All responses to this collection of information are voluntary to obtain or retain benefits per 14 CFR 77. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to: Information Collection Clearance Officer, Federal Aviation Administration, 10101 Hillwood Parkway, Fort Worth, TX 76177-1524.

If you find an error in this AC, have recommendations for improving it, or have suggestions for new items/subjects to be added, you may let us know by (1) emailing this form to ASTApplications@faa.gov, or (2) faxing it to (202) 267-5450.

Subject: (insert AC title/number here) Date: Click here to enter text.

*Please check all appropriate line items:*

☐ An error (procedural or typographical) has been noted in paragraph Click here to enter text. on page Click here to enter text..

☐ Recommend paragraph Click here to enter text. on page Click here to enter text. be changed as follows:

Click here to enter text.

☐ In a future change to this AC, please cover the following subject:
*(Briefly describe what you want added.)*

Click here to enter text.

☐ Other comments:

Click here to enter text.

☐ I would like to discuss the above. Please contact me.

Submitted by: _____ Date: _____