Chapter 8

Wildland Fire Shelter Entrapments, Deployments, and Fatalities

Chapter 8—Wildland Fire Shelter Entrapments, Deployments, and Fatalities

8.1 General

The following information is specific for wildland fire shelter entrapments, deployments, and fatalities. The investigation process and development of the factual and management evaluation sections need to follow procedures already established in this guide.

8.2 Scope and Purpose

Wildland firefighters are members of a relatively small community and operate under a concept of total interagency mobilization that moves firefighters across the country as easily as rural departments move across county lines. Because of this mobility, information about specific fire-related accidents or incidents and the lessons learned from these situations must be disseminated to all firefighters quickly and thoroughly. Most wildland fire agencies that experience a burnover or fatality conduct an investigation to review the circumstances of the incident. Such a review can provide important insights and recommendations to improve wildland fire safety.

8.3 Wildland Fire Shelter Entrapments, Deployments, and Fatalities Protocol

In a wildland fire environment:

- A deployment refers to the use of a fire shelter.

- "An entrapment is a situation where personnel are unexpectedly caught in a fire-behavior-related, life-threatening position where planned escape routes or safety zones are absent, inadequate, or have been compromised. An entrapment may or may not include deployment of a fire shelter for its intended purpose." (*Investigating Wildland Fire Entrapments: 2000 Edition*, 0051–2869–MTDC)
  —All motorized fire equipment vehicles (such as engines) involved in a burnover will be considered an entrapment.
  —A fatality is any death that occurs in the line of fire duty.

A. Initial Response. The unit or incident management team that has experienced a fire entrapment, deployment, and/or fatality needs to take some immediate actions before the investigation team arrives. The fire entrapment/fatality first-response form needs to be completed and transmitted to the agency administrator and investigation team leader (exhibit 8–1).

Also, the unit or incident management team shall report preliminary information about a fire entrapment, deployment, and fatality associated with wildland fire operations on the wildland fire fatality and entrapment initial report form (NFES No. 0869). This form must be forwarded to the agency administrator and the National Interagency Coordination Center within 24 hours of the fire-related accident or incident (exhibit 8–2).

B. Team Composition. As soon as a fire entrapment, deployment, and/or fatality occurs, the agency having jurisdiction establishes an investigation team for the incident.

A chief investigator is assigned from the lead agency on whose land the entrapment occurred or whose firefighters were involved. The memorandum of understanding between the United States Departments of the Interior and Agriculture documents the assignment (exhibit 8–3). In cases where two jurisdictions are involved, dual chief investigators may be named. Other individuals normally assigned to a fire-related investigation in addition to the regular team members are:

- Fire operations expert
- Fire behavior analyst (with experience in the fuel type where the incident occurred)
- Fire weather meteorologist from the United States Department of Commerce National Oceanic and Atmospheric Administration's Fire Weather Service
- Fire equipment specialist from the Missoula Technology and Development Center
- Technical (professional) photographer
- Fire information officer

These team members should be selected from outside the region/forest unit where the accident or incident occurred.

C. Notification. As soon as an entrapment, deployment, and/or fatality are verified, the local unit dispatcher should make the following contacts:

1. Forest Service law enforcement personnel should be requested to help secure the site.

2. In the case of a fatality, notify the county sheriff who will notify the coroner/medical examiner.

3. Other notifications that should take place are:

- National Interagency Coordination Center.
- Higher level headquarters (region, station, and area safety managers).
- United States Department of Labor Occupational Safety and Health Administration. (Notification within 8 hours for all fatalities and hospitalizations of three or more employees.)
- Other agencies and individuals as required by incident response plans.

D. Activities at the Accident Site. When a fatality occurs during a fire-related accident, the victim should not be moved without specific permission of the county sheriff or coroner/medical examiner. Injured persons should receive emergency medical treatment and be taken to a medical facility as soon as possible.

Tools, vehicles, personal equipment, personal protective equipment (including fire shelters), and other associated items should be left where they are until the chief investigator clears them for removal. Law enforcement personnel should secure the site from outside disturbance and from unauthorized visits by the media. Information gathered at the site of an entrapment is often critical in reconstructing the events that occurred and for identifying lessons that can be learned to avoid similar accidents in the future.

Review the fire entrapment/fatality first-response form for additional steps to be taken before the investigation team arrives (exhibit 8–1).

E. Investigation Elements.
- Fire behavior
- Environmental factors
- Incident management
- Control mechanisms
- Personnel profiles of those involved
- Equipment

Exhibit 8–4 shows the entrapment investigation elements matrix. It is designed as a checklist to assist team members involved in entrapment investigations in identifying elements involved in the accident/incident event. It is not designed to be used as a report format.

F. Investigation Team Activities.

- Once the investigation team arrives, the team undertakes the following tasks at the direction of the Chief Investigator:
- Photograph the entire scene before any items are removed. Specific areas requiring photographic documentation include overviews of the accident or incident scene from the air. Aerial photographs show critical factors such as fuel types and burn patterns that may have contributed to the accident or incident. When photographing from helicopters, avoid disturbing the site with rotor downwash.

- Include general area photographs of the scene from the ground and large-format closeups of damage to personal protective equipment and other firefighting equipment. Laying a new yellow Nomex shirt and green Nomex trousers where an individual was burned over helps to show conditions as they were found.

- Prepare a detailed site diagram showing the specific location of individuals, equipment, roads, structures, and other important features. Small accident or incident scenes can be mapped using a compass and the pacing method from known landmarks or control points. At accident or incident scenes covering more than a $^{3}/_{8}$-mile area, Global Positioning System (GPS) locations may be useful. A detailed site diagram is an essential part of the final investigation report.

- After the visual review has been completed, individual items of personal protective clothing and other equipment should be collected, tagged to indicate who used them, and taken to the investigation team headquarters. These items should be protected and secured in the same manner as evidence.

- Natural terrain features at accident or incident scenes can provide valuable information. Slope, aspect, drainage, fuel type, fuel loading, heat-set on grass and needles, and evidence of winds can help the investigator determine the events that led to the entrapment.

G. Analysis of Personal Protective Equipment. PPE should be inspected for compliance with Forest Service policies for mandatory and optional equipment for wildfires. It should also be inspected to determine the manufacturer and whether the equipment was constructed in accordance with accepted standards. The National Fire Protection Association (NFPA) 1977 compliance label is a good indicator of compliance.

Clothing subjected to radiant heat or direct flame should be compared with industry examples to show temperature ranges in the deployment, entrapment, or fatality. Comparing the condition of burned equipment with the design standard can often help determine the survivability of a fire-related accident.

EXHIBIT 8–1

Fire Entrapment/Fatality First-Response Form

	PERSON RESPONSIBLE	DATE/TIME ASSIGNED
AT THE SCENE		
1. ***Have law enforcement personnel isolate the scene.*** Night or day, involve your law enforcement personnel so that they can help preserve all evidence.		
2. Once the injured have been treated, retrieve their PPE and line gear. The equipment specialists need to examine all PPE to determine its performance and to help calculate fire intensities, heat loads, and so forth.		
3. All entrapped persons, those uninjured, and others directly involved must be removed from the incident. However, keep them isolated from the media—do not begin interviews!		
4. In the event of fatalities, notify the county sheriff. If possible, leave the bodies in place until investigators arrive. If remains are removed before the investigation team arrives, ensure that photos are taken. Do not process exposed film in uncontrolled facilities.		
5. Initiate an airspace restriction (FAR 91.137).		
6. Restrict any low-level helicopter flights over the area. Rotor downwash may disturb or cover evidence.		
7. Instruct all persons at the incident that their photos and notes (weather observations, times, and so forth) may be needed.		
8. Contact a critical-incident stress debriefing team.		
INJURED PERSONS		
1. Assign a person to act as liaison with the hospital. This person should perform this important function full time through the first critical days. Avoid assigning someone with collateral duties that would interfere with the duties of hospital liaison.		
2. Secure the PPE of persons who were injured. In the past, fire shirts, fire pants, and boots have been disposed of by hospital personnel. It is important that these items be preserved.		
3. Protect the victims' privacy. They have just suffered acute mental and/or physical trauma, and they and their families should not be subjected to intense outside scrutiny.		
AT THE OFFICE		
1. Secure dispatch logs and radio tapes.		
2. If an incident command team is managing the fire, consider ordering a replacement team.		
3. Notify your agency line officer and the National Interagency Coordination Center.		
4. Assign a local fire information officer to handle initial media contacts.		
5. Order a Type III helicopter for photography and transportation of the investigation team.		
6. Assign a local agency person to act as liaison to the investigation team.		
7. Prepare a list of names, organizations, and telephone numbers of all persons involved in the incident, and those who may offer witness statements (such as pilots, dispatchers, line officers, and civilian observers).		
8. Obtain topographic maps, planimetric maps, and aerial photos of the area for the investigation team.		
9. Arrange for an initial meeting room/team headquarters that can be secured.		
10. Assemble relevant paperwork, such as weather observations, forecasts, fire training and qualifications records, mobilization plans, time records of those involved, and so forth.		

Exhibit 8–1

Exhibit 8–1—Fire entrapment/fatality first-response form.

EXHIBIT 8–2

Wildland Fire Fatality and Entrapment
INITIAL REPORT

Complete this report for fire-related entrapment and/or fatalities. Timely reporting of wildland-related entrapments or fatalities is necessary for the rapid dissemination of accurate information to the fire management community. It will also allow fire safety and equipment specialists to quickly respond to these events as appropriate. This initial report does not replace agency reporting or investigative responsibilities, policies, or procedures. Immediately notify the National Interagency Coordination Center (NICC). Submit this written report within 24 hours—**even if some data are missing**—to the address given below.

NICC—National Interagency Fire Center
3833 South Development Ave.
Boise, ID 83705-5354

Phone: 208–387–5400
Fax: 208–387–5414

NICC Intelligence Section
E-mail: *nicc_intel@nifc.blm.gov*

Submitted by:_____ Position:_____

Agency:_____ Location:_____

Phone:_____ E-mail:_____

Exhibit 8–2

1. General Information

- Date of event_____ Time_____
- Number of personnel involved_____
- Number of: Injuries_____ Fatalities_____
- Fire name, location, agency, etc.

_____

_____

_____

_____

2. Fatalities

- Type of accident:
  - ❑ Aircraft
  - ❑ Vehicle
  - ❑ Natural (lightning, tornado, etc.)
  - ❑ Smoke
  - ❑ Medical (heart, stroke, heat, etc.)
  - ❑ Entrapment
  - ❑ Struck by falling object
  - ❑ Other
- Where fatality/entrapment occurred:
  - ❑ Fire site
  - ❑ In transit
  - ❑ Incident base
  - ❑ Other

Note: In the event of fatality(s), do not release name(s) until next of kin are notified.

- Employing agency_____
- Unit name_____
- Address_____
- For further information, contact_____

  Home unit address_____

  Phone_____

Exhibit 8–2—Wildland fire fatality and entrapment initial report.

EXHIBIT 8–2 (continued)

3. Fire-Related Information

- Fuel model_____
- Temperature_____ RH_____ Wind_____mph
- Topography_____
  _____ Slope_____%
- Fire size at the time of the incident/accident___acres
- Incident management type at the time of the incident/ accident (circle one): 1 2 3 4 5
- Urban/wildland intermix? ❑ Yes ❑ No
- Cause of fire: ❑ Natural ❑ Incendiary ❑ Accidental ❑ Unknown

4. Entrapment Information

A situation where personnel are unexpectedly caught in a fire-behavior-related, life-threatening position where escape routes or safety zones are absent, inadequate, or have been compromised. An entrapment may or may not include deployment of a fire shelter. Note: Engine and dozer burnovers also constitute entrapments.

- Brief description of the accident_____

_____

_____

_____

_____

_____

_____

_____

Entrapment Description

- Person trapped ❑ With fire shelter ❑ Without fire shelter
- Burns/smoke injuries incurred while in fire shelter ❑ Yes ❑ No
- Burns/smoke injuries incurred while escaping entrapment ❑ Yes ❑ No
- Burns/smoke injuries incurred while fighting fire ❑ Yes ❑ No
- Fire shelter performed satisfactorily ❑ Yes ❑ No
- Fire shelter was available, but not used ❑ Yes ❑ No

Personal Protective Equipment Used

Fire shelter	❑ Yes	❑ No
Protective pants	❑ Yes	❑ No
Protective shirt	❑ Yes	❑ No
Face/neck protection	❑ Yes	❑ No
Gloves	❑ Yes	❑ No
Hardhat	❑ Yes	❑ No
Boots	❑ Yes	❑ No
Goggles	❑ Yes	❑ No

NFES No. 0869 (Revised 2/01) PMS No. 405-1

Exhibit 8–2—Wildland fire fatality and entrapment initial report *(continued)*.

EXHIBIT 8–3

MEMORANDUM OF UNDERSTANDING

Between the United States Department of the Interior and the United States Department of Agriculture

I. Purpose. This Memorandum of Understanding establishes the basis for interagency investigation of serious fire-related accidents.

II. Introduction. If the causal factors of a serious fire-related accident are identified, effective corrective actions to prevent a recurrence can be taken. Interagency investigations add perspective and enhance the mix of skills and knowledge on the investigation team. Interagency investigations are especially important where there are common management and corrective action issues.

III. Policy. Interagency investigations will be conducted whenever a serious fire-related accident occurs on a USDA Forest Service managed fire, Department of the Interior managed fire, or a jointly managed fire. Aircraft accidents occurring during wildland fire operations will be investigated by the National Transportation Safety Board, the USDA Forest Service, and the Department of the Interior in accordance with established laws and agreements.

IV. Definitions.

A. *Serious Fire-Related Accidents*. Accidents occurring to personnel participating in wildland fire suppression or prescribed burning operations, or to personnel working in direct support of those activities, which result in one or more fatalities or the hospitalization of three or more personnel.

B. *Co-Lead Investigations*. Team leaders from both Departments and team members from both Departments.

C. *Agency-Lead Investigations*. Single team leader and team members from both Departments.

V. Procedures. Interagency investigation teams will include personnel from both the Department of the Interior and the Department of Agriculture. Representatives of the Department of Labor, Occupational Safety and Health Administration will be invited to participate in these investigations, or will be given full support to conduct their own investigation.

A. *Co-Lead Investigations* will be conducted whenever:

1. A serious fire-related accident occurs on a USDA Forest Service/Department of the Interior jointly managed fire, or,

2. A serious fire-related accident involving USDA Forest Service personnel occurs on a Department of the Interior managed fire, or,

3. A serious fire-related accident involving Department of the Interior personnel occurs on a USDA Forest Service managed fire.

B. *Agency-Lead Investigations* will be conducted whenever only one agency is responsible for managing a fire, and a serious fire-related accident occurs affecting only personnel of that same agency. The agency responsible for managing the fire will lead the investigation.

VI. Timeframes. The report should be completed and a copy submitted to the appropriate Departmental Designated Safety and Health Official(s) within 45 calendar days of the accident.

VII. Training and Qualifications. Team leaders, investigators, and specialists will meet minimum training and qualification standards as jointly established by the Department of Agriculture, the Department of the Interior, and the National Wildfire Coordinating Group.

Wardell C. Townsend, Jr.
Assistant Secretary Operations
U.S. Department of Agriculture

Claudia P. Schecter
Director of Operations
U.S. Department of the Interior

10/26/95

Exhibit 8–3—Memorandum of understanding between the U.S. Departments of the Interior and Agriculture.

EXHIBIT 8–4

Entrapment Investigation Elements

	Did not contribute	Influenced	Significant contribution
FIRE BEHAVIOR			
Fuels			
Weather			
Topography			
Predicted v. observed			
ENVIRONMENTAL FACTORS			
Smoke			
Temperature			
Visibility			
Slope			
Other			
INCIDENT MANAGEMENT			
Incident objectives			
Strategy			
Tactics			
Safety briefings/major concerns			
Instructions given			
CONTROL MECHANISMS			
Span of control			
Communications			
Ongoing evaluations			
10 Standard Fire Orders/18 Watchout Situations			
PERSONNEL PROFILES OF THOSE INVOLVED			
Training/qualifications/physical fitness			
Length of operational period/fatigue			
Attitudes			
Leadership			
Experience levels			
EQUIPMENT			
Availability			
Performance/nonperformance			
Clothing and equipment			
Used for intended purpose?			

DO NOT SUBMIT THIS FORM WITH YOUR INITIAL REPORT!

Exhibit 8–4

Exhibit 8–4—Entrapment investigation elements.

Chapter 9

Aviation Investigations

Chapter 9—Aviation Investigations

9.1 Introduction

Aviation resources operate under the concept of total interagency mobilization that moves across agency boundaries. Because of this mobility, information about specific accidents or incidents and the lessons learned from these situations must be disseminated quickly and thoroughly.

9.2 Scope and Purpose

The National Transportation Safely Board (NTSB) has the responsibility to investigate all Forest Service aviation accidents.

The investigation process and report should follow procedures already established in this guide. Specific differences that apply to aviation mishaps (accidents and incidents with potential) are identified in this chapter.

9.3 National Transportation Safety Board Investigations

Working with the NTSB creates unique interagency working relationships due to differences in policies and procedures.

The NTSB will conduct the investigation in one of the following ways.

1. The NTSB investigator in charge (IIC) conducts the onsite investigation.

- When the IIC conducts the onsite investigation, the qualified technical investigator assists the IIC as requested in the collection of data to support the NTSB factual report.

2. The IIC delegates the onsite investigation to the Federal Aviation Administration (FAA).

- When the FAA conducts the onsite investigation, they do so with the full authority of the NTSB. The QTI will be the liaison with the FAA onsite investigator.

3. The IIC delegates the onsite investigation to the Forest Service.

- When neither the NTSB nor the FAA conduct the onsite investigation, the QTI will conduct the onsite investigation and provide all data collected to the IIC.

9.4 Forest Service Investigations

A. NTSB Led Investigations

The NTSB will appoint an investigator in charge (IIC) to perform the NTSB factual investigation. The investigation process and direction is under the authority of the IIC.

The Forest Service investigation team will conduct their investigation following the investigation guide procedures in this guide concurrent with the NTSB. The Forest Service QTI will be a member of the NTSB investigation and will be the liaison between the Forest Service and the NTSB.

The NTSB IIC will lead the factual investigation. NTSB investigations, whether conducted by the NTSB or its agent, shall have precedence over all other activities.

B. FAA Lead Investigations

All onsite investigations conducted by the FAA shall be accomplished in the same manner as the NTSB conducted investigations.

C. Forest Service Led Investigations

Forest Service accident investigation teams shall follow the procedures outlined in this guide.

9.5 Composition of the Investigation Team

Refer to chapter 1.5 for composition of the investigation team.

9.6 Forest Service Accident Investigation Report

A. The NTSB IIC will produce an official NTSB Factual Report. Due to the Forest Service requirement for a report within 45 days, a preliminary accident investigation report is produced that includes a factual section and a management evaluation section. The QTI will coordinate closely with the NTSB IIC to produce the Forest Service preliminary report for agency use, following the procedures established in chapter 6. This Forest Service preliminary report must be reviewed and approved for release by the NTSB IIC before going to the Accident Review Board (exhibit 9–1). The Forest Service preliminary report will remain preliminary until release of the NTSB Factual Report.

B. The NTSB is responsible for the factual investigation of all Forest Service aircraft accidents. The NTSB report is prepared using NTSB forms and format and may take up to 12 months to complete. When the NTSB Factual Report is released, the National Aviation Safety Center will evaluate and determine whether any significant factual findings differ with the Forest Service preliminary report. If significant differences are found, the national aviation safety manager may request, through the appropriate authorities, to reconvene the Accident Review Board.

C. The Forest Service preliminary factual section is used for developing the management evaluation section (exhibit 9–3).

9.7 Aviation Investigation Sequence

A. The aviation investigation sequence will follow the format established in chapter 1.7. The aviation investigation sequence is unique in that the QTI must collaborate closely with the NTSB IIC and the Forest Service team leader to ensure information sharing and release of information.

B. The QTI will attend all NTSB meetings and will brief the Forest Service team leader.

EXHIBIT 9–1

NTSB Transmittal Letter

To: NTSB IIC,_____(Name of person)_____

From:_____(Name)_____

Subject: **Review of Forest Service Draft Preliminary Accident Investigation Report**

Registration number:_____
Make and model:_____
Location:_____
Date:_____

The Forest Service has completed a draft preliminary aviation accident investigation report of the Forest Service accident that occurred on _____(date)_____. Our internal requirement is for this report to be completed within 45 calendar days of the accident occurrence. This report does not state a probable cause and remains a preliminary agency report until the NTSB issues their final report with a probable cause. Our report is for agency use in accident prevention.

As a party member to your investigation, I am asking for your review of the attached accident report that we have completed for release to our agency personnel and interagency partners for accident prevention purposes. With your approval we would like to post these on the Internet so that we may share the lessons learned with our personnel and interagency partners as soon as possible. If there is anything you feel is not releasable, please provide your remarks in the comments section of the attached form and return a signed copy at your earliest opportunity.

(QTI signature)

NTSB IIC review of Forest Service draft preliminary accident investigation report.

Comments:_____
_____
_____
_____
_____
_____
_____

Release of report(s) approved with the comments listed above.

Date:_____

NTSB IIC

Exhibit 9–1

Exhibit 9–1—NTSB transmittal letter.

EXHIBIT 9–2

Aviation Human Factors Analysis

Sensory and Perceptual Factors

• Misjudgment of distance, clearance, altitude, speed, and so forth.

• False perception caused by visual illusion. Conditions that impair visual performance:
  —Featureless terrain (such as a desert, dry lake, water, or snow).
  —Darkness and poor visibility.
  —Smoke and changing smoke patterns.
  —"Black-hole" effect.
  —No horizon or false horizon (unreliable visual attitude reference).
  —Mountainous terrain or sloping runway.
  —Helicopter-rotor downwash effects.
  —Anomalous light effects that cause flicker vertigo.
  —Low contrast of objects to background or poor illumination.
  —View into bright sunlight or moonlight.
  —Shadows.
  —Whiteout (such as rotor downwash in snow).

• False perception because of inner-ear (vestibular) disturbance. Types:
  —Spinning sensation caused by inner ear over stimulation (coriolis).
  —Gravity-induced false sensation of a pitch-up (somatogravic).
  —False sensation of rotation (somatogyral).

• Spatial disorientation and vertigo. Types:
  —Unrecognized loss of attitudinal awareness.
  —Recognized vertigo.
  —Incapacitating (such as vestibular-ocular decoupling induced by rapid acceleration and deceleration forces).

• Conditions that affect sense of body position or aircraft attitude:
  —Loss of visual cues and attitude reference. (especially with no natural horizon).
  —Acceleration (G-forces).
  —Adverse medical condition or physiological condition (alcohol and drug effects, hangover, dehydration, fatigue, and so forth).
  —Moving head up and down, looking in and out to change radios, making notes in a low-level environment while banking, accelerating, climbing, and descending.

• Loss of situational awareness. Types:
  —Geographic disorientation at low level in similar terrain, frequently in adverse conditions.
  —Geographic disorientation (such as deviation from route, operation outside chart limits, loss of position awareness).
  —General loss of situational awareness (such as failure to perceive hazardous condition).
  —Erroneous situational assessment (misinterpretation of situation or condition).
  —Failure to predict or anticipate changing conditions.
  —False hypothesis confirmation bias (persistent false perception or misconception of situation).

• Attention failure (such as failure to monitor or respond when correct information is available). Types:
  —Failure to visually scan outside the aircraft for terrain and other aircraft.
  —Omission of checklist items, standard calls, or crew challenge.
  —Failure to monitor flight progress or to maintain instrument scan.
  —Failure to respond to communication or warning.
  —Control-action error:
    • Failure to set, move, or reset control switch (lapse).
    • Unintentional activation of control switch (slip).
    • Control-substitution error (slip).
    • Control-reversal error (slip).
    • Control-adjustment or precision error (slip).

• Conditions that affect attention and situational awareness:
  —Inattention (focus on information unrelated to flight-deck tasks or flying).
  —Channelization, fixation (psychological narrowing of perception).
  —Distraction (preoccupation with internal [mental] event or with external event).
  —Task overload due to aircraft systems.
  —Task overload due to aircraft systems mission factors.
  —Cognitive workload (problem-solving concentration or information overload).
  —Habit influence or interference.
  —Excessive flight crew stress or fatigue.
  —Excessive mission tasking or workload.
  —Inadequate briefing or flight preparation.
  —Inadequate training or experience for mission.
  —Miscommunication (such as during transition to new aircraft).

(Continued)

Exhibit 9–2—Aviation human factors analysis.

EXHIBIT 9–2 (continued)

Aviation Human Factors Analysis

—Adverse meteorological conditions.
—Tactical-situation overload or display-information overload.
—Inadequate flight crew motivation or inadequate flight vigilance.
—Inadequate flightdeck design (control or display location or data format).

Medical and Physiological

• Carbon monoxide poisoning.

• Self-medication (without medical advice or against medical advice).

• Motion sickness.

• Incompatible physical capabilities.

• Overexertion while off duty.

• Influence of drugs or alcohol.

• Cold or flu (or other known illness).

• Excessive personal stress or fatigue.

• Inadequate nutrition (such as omitted meals).

• G-induced loss of consciousness or G-induced illusion.

• Hypoxia.

• Heat.

• Cold.

• Stress induced by heightened state of alertness.

• Affects of smoke.

• Dehydration.

• Other medical or physiological condition. Conditions that may cause adverse medical or physiological state:
—Mission tasking or job fatigue (such as being on duty more than 14 hours, performing late-night or early morning operations).
—Cumulative fatigue (such as excessive physical or mental workload, circadian disruption, or sleep loss).
—Cumulative effects of personal or occupational stress (beyond stress-coping limit).
—Emergency flight condition or workload transition (from normal operation to emergency operation).
—Medical or physiological preconditions (health and fitness, hangover, dehydration, and so forth).

Knowledge and Skill

• Inadequate knowledge of systems, procedures, and so forth (knowledge-based errors). Types:
—Knowledge-based.
—Inadequate knowledge of systems, procedures.
—Use of improper procedure.
—Ill-structured decisions.
—Failure in problem solving.

• Inadequate flight control and airmanship, or inadequate accuracy and precision of flight maneuvering (skill-based error). Types:
—Breakdown in visual scan.
—Failure to see and avoid.
—Poor flight control and airmanship.
—Over or under reacting.
—Over or under controlling.
—Inadequate experience for complexity of mission.
—Improper takeoff technique.
—Improper landing technique.

• Misuse of procedures or incorrect performance of flight-deck tasks (rule-based error), such as:
—Failure to perform required procedure.
—Use of wrong procedure or rule(s).
—Failure to conduct step(s) in prescribed sequence.
—Failure to complete performance computations for flight.

• Conditions that lead to inadequate operational performance:
—Lack or variation of standards.
—Loss of situational awareness in varying environment.
—Performance below required proficiency standards or currency standards.
—Inadequate performance or documented flight-aptitude deficiencies.
—Limited flight hours (total or type).

(Continued)

Exhibit 9–2

Exhibit 9–2—Aviation human factors analysis.

EXHIBIT 9–2 (continued)

Aviation Human Factors Analysis

—Inadequate essential training for specific task(s).
—Inadequate recent experience or inadequate experience in flight condition (such as instrument flight rules, night, weather).
—Transition (learning new aircraft system).
—Lack of sensory input.
—Limited reaction time.

Mission Factors

• Failure of dispatch to provide correct critical information (such as frequencies, location, other aircraft).

• Poor communication with other resources (such as ground personnel or other aircraft).

• Inadequate or faulty supervision from supervisory tactical aircraft.

• Inadequate or faulty supervision of tactical aircraft by ground personnel.

• Lack or variation of standards.

• Nonparticipant or noncommunicative aircraft onscene.

• Loss of situational awareness in varying environment.

• Change of plans or tactics (change of teams on incidents).

• Unanticipated change of radio frequencies.

• Intentional deviation from procedures.

• Unintentional deviation from procedures.

• Performance below required or current proficiency standards.

• Inadequate performance or documented flight-aptitude deficiencies.

• Limited flight hours (total or type).

• Inadequate essential training for specific task(s).

• Inadequate recent experience or inadequate experience in flight condition (such as instrument flight rules, night, weather).

• Transition (learning new aircraft system).

• Inadequate knowledge of tactical situation.

• Lack of sensory input.

• Limited reaction time. Conditions that lead to inadequate special-use mission performance:
—Smoke.
—Wind shifts.
—Changes in fire behavior.
—Low visibility.
—Turbulence.
—Unexpected or nonparticipant aircraft.
—Mission intensity.
—Mission creep (scope of the mission increases).
—Mission urgency.
—Failure to recognize deteriorating conditions.
—Time compression.
—Diversion to new incidents.
—Excessive communication demands.
—Past mission success was based on high-risk behavior.

Personality and Safety Attitude

• Overconfidence in flying ability.

• Excessive motivation to achieve mission.

• Reckless operation.

• Anger or frustration on the job.

• Stress-coping failure (such as anger).

• Overly assertive or nonassertive.

• Inadequate confidence to perform tasks or activities.

• Acquiescence to social pressure (from organization or peers) to operate in hazardous situation or condition.

(Continued)

Exhibit 9–2—Aviation human factors analysis.

EXHIBIT 9–2 (continued)

Aviation Human Factors Analysis

- Failure to report or act upon incidents of misconduct.
- Tolerance of unsafe acts and behaviors.
- Poor flight preparation.

Judgment and Risk Decision

- Acceptance of a high-risk situation or mission.
- Misjudgment of mission risks (complacency).
- Failure to monitor flight progress or conditions (complacency).
- Use of incorrect task priorities.
- Intentional deviation from safe procedure (imprudence).
- Intentional violation of standard operating procedure or regulation. Types:
  - —Violation of orders, regulations, SOP.
  - —Crew rest requirements.
  - —Inadequate training.
  - —Violation of agency policy or contract.
  - —Failure to comply with departmental manuals.
  - —Night training or special mission with PAX.
  - —VFR filing in marginal weather conditions.
  - —Failure to use radar advisories from ATC.
  - —PIC knowingly accepted noncurrent crew.
  - —Performance of unauthorized acrobatic maneuver.
  - —Scud running (avoiding a weather pattern).
  - —Failure to obtain valid weather brief.
  - —Acceptance of unnecessary hazard.
  - —Not current or qualified for mission.
- Intentional disregard of warning (by human or aircraft system).
- Noncompliance with personal limits.
- Noncompliance with published aircraft limits.
- Noncompliance with prescribed mission profile or parameters.
- Acquiescence to social pressure (from organization or peers). Conditions leading to poor safety attitude and risky judgment:
  - —History of taking high risks (personality-driven).
  - —Pattern of overconfidence (aggrandized self-image).
  - —Personal denial of wrongdoing.
  - —Documented history of marginal performance or failure.
  - —Excessive motivation (did not know limits).
  - —Reputation as a reckless pilot.
  - —Failure to cope with life stress (anger or frustration).
  - —Overly assertive or nonassertive (interpersonal style).
  - —Influenced by inadequate organizational climate or safety culture (such as lack of adequate supervision).

Communication and Crew Coordination

- Inadequate mission plan or brief or preflight.
- Inadequate or wrong mission information conveyed to flight crew (dispatch errors).
- Failure to communicate plan or intentions.
- Failure to use standard or accepted terminology.
- Failure to work as a team.
- Inability or failure to contact and coordinate with other aircraft or ground personnel.
- Inadequate understanding of communication or failure to acknowledge communication.
- Interpersonal conflict or crew argument during flight. Conditions leading to inadequate communication or coordination:
  - —Inadequate training in communication or crew coordination.
  - —Inadequate standard operating procedures for use of crew resources.
  - —Inadequate support from organization for crew-coordination doctrine.
  - —Failure of organizational safety culture to support crew resource management.
- Internal communication on aircraft:
  - —Inadequate crew coordination (challenge, cross-check).
  - —Intentional withholding, by a crewmember, of vital safety data.
  - —Failure of the pilot-in-command to lead or delegate.

(Continued)

Exhibit 9–2

Exhibit 9–2—Aviation human factors analysis.

EXHIBIT 9–2 (continued)

Aviation Human Factors Analysis

—Failure of the pilot-in-command to use all available resources.

System Design and Operation

- Use of wrong switch, lever, or control.
- Misinterpretation of instrument indication.
- Inability to reach or see control.
- Inability to see or interpret instrument or indicator.
- Failure to respond to warning.
- Selection or use of incorrect avionics system-operating mode (mode confusion).
- Overreliance on automated system (automation complacency). Conditions that contribute to design-induced flight crew errors:
  - —Inadequate primary aircraft control or display arrangement.
  - —Inadequate primary display data or data format.
  - —Incompatible flightdeck control or display activation, or aircraft-response mapping.
  - —Inadequate hazard advisory or warning display.
  - —Inadequate flight deck design (controls or displays outside crew vision or reach).
  - —Inadequate human-computer-display interface or usability (error-prone design).
  - —Inadequate system instructions or documentation.
  - —Inadequate aviation-system support or facilities. (navigation aids, airport, air traffic control).
  - —Nonstandard flightdeck layouts that may cause confusion.
  - —Inappropriate type or level of automation, or excessive mode complexity.
  - —Maintaining current skills in operating multiple aircraft.

Supervisory and Organizational

- Failure to adhere to rules and regulations.
- Inappropriate scheduling or crew assignment.
- Failure to monitor crew rest or duty requirements.
- Failure to establish adequate standards.
- Failure to provide adequate briefing for mission.
- Inadequate training.
- Lack of professional guidance.
- Failure to support or poor support of flight crews.
- Failure to monitor compliance with standards.
- Failure to monitor crew training or qualifications.
- Failure to identify or remove a known high-risk pilot.
- Failure to correct inappropriate behavior.
- Failure to correct a safety hazard.
- Failure to establish or monitor quality standards.
- Failure of standards, either poorly written, highly interpretable, or conflicting.
- Risk outweighs benefit.
- Poor crew pairing.
- Excessive mission tasking or workload.
- Intentional violation of a standard or regulation.
- Failure to perceive or to assess mission risks correctly, with respect to:
  - —Unseen or unrecognized hazards.
  - —Environmental hazards or operating conditions.
  - —Mission tasking and flight crew skill level.
  - —Aircraft and equipment limitations.
- Conditions leading to supervisory failures:
  - —Excessive operations or organizational workload (imposed by the organization or imposed by organizational chain of command).
  - —Inadequate organizational safety culture.
  - —Supervisor is over-tasked.
  - —Supervisor is untrained.
  - —Inattention to safety management (inadequate safety supervision).

(Continued)

Exhibit 9–2—Aviation human factors analysis.

EXHIBIT 9–2 (continued)

Aviation Human Factors Analysis

—Inadequate work standards or low performance expectations.
—Inadequate or poor example set by supervisors.
—Inadequate safety commitment or emphasis by supervisors.
—Organization lacks an adequate system for monitoring and correcting hazardous conditions.
—Supervisors do not promote and reward safe behavior or quickly correct unsafe behaviors.
—Organization lacks adequate policies and procedures to ensure high quality work performance.
—Organization had inadequate job qualification standards or a training program.
—Organization lacks internal communication.
—Organization has no system or an inadequate one for management of high-risk pilots.
—Organization lacks adequate process or procedures for operational risk management.
—Organization provide inadequate aeromedical or human factors training.
—Organization lacks sufficient involvement of medical and occupational health specialists.
—Organization has not established or enforced acceptable medical or health standards.

Maintenance

- Procedures.
  —Unwritten.
  —Unclear, undefined, or vague.
  —Not followed.

- Records.
  —Discrepancies entered—but not deferred to—or resolved.
  —Entries not recorded or not recorded in correct book(s).
  —Improper entries or unauthorized signature or number.
  —Falsification of entries.

- Publications, manuals, guides.
  —Not current.
  —Not used for the procedure.
  —Incorrect manual or guide used for procedure.
  —Not available.

- Training.
  —Not trained on procedure.
  —Training not documented.
  —Falsified.
  —Not current.

- Personnel.
  —Improperly licensed.
  —Insufficient (staffing).
  —Improper or insufficient oversight.
  —Insufficiently rested.

- Management.
  —Nonexistent.
  —Ineffective.
  —Understaffed.
  —Ineffective organization of assigned personnel.
  —Insufficiently trained.

- Quality Assurance.
  —Nonexistent.
  —Insufficient training.
  —Ineffective.
  —Not used.

- Inspection Guides.
  —Unavailable.
  —Procedures not followed.
  —Insufficient.
  —Not current.
  —Not approved.
  —Not signed off.
  —Falsified.
  —Unapproved signature or number.

- FAA 337s.
  —Not completed for major repair or alteration.
  —Incomplete.
  —Not turned into the Federal Aviation Administration.
  —Not with records or flight manual.
  —Not being complied with (inspection or procedure or limitations).
  —Falsified (improper signature or number).
  —Instructions for Continued Airworthiness (ICAs).
  —Nonexistent.
  —Not followed.
  —Insufficient.

- Tools or Equipment.
  —Improper use or procedure.
  —Not calibrated.
  —Not trained for the special equipment or tool.
  —Not used.
  —No tool control program.

Exhibit 9–2

Exhibit 9–2—Aviation human factors analysis.

EXHIBIT 9–3

Aviation Accident Investigation Template

General

This template is designed to serve as a checklist for the writer of the report. Delete portions that do not apply to the accident under investigation. Review chapter 6 of the Accident Investigation Guide.

Do not identify involved personnel by name in the narrative. Identify involved personnel by their position. Involved personnel are individuals:

- Who had an active role in the accident
- Who were injured in the accident
- Whose actions or inactions initiated or sustained the accident sequence

---

Photographs, maps, illustrations, exhibits, and so forth, will be referenced in the section where applicable and properly identified as figure 1, figure 2, and so on.

Photographs should be taken before the accident scene (wreckage) is disturbed. General views of the scene from several different directions is recommended. The location and direction of each photo should be recorded. The following kinds of items should be photographed.

- Aircraft site
- Instruments
- Controls in cockpit
- Radio settings
- Fuel valve setting
- Switch locations
- Control surface positions
- Suspicious bends or breaks
- Vegetation strike points
- Propeller blades showing pitch positions
- Engine control positions in cockpit and engine
- Fire damage
- Ground impact marks
- Seats and seat belts
- Approach paths
- Terrain and obstacles, if relevant
- Photographic documentation of crash sequence
- Aerial pictures documenting the site and wreckage orientation

Location maps (include as appropriate)

- General location map
- Profile of flight/probable path of flight
- Diagram/sketches of the airport layout/helibase
- Accident scene or aerial photo identifying important features
- Suppression plan and initial action plan
- Shelter deployment location diagram
- Fire progress maps

Physical Evidence

- Analysis reports from any aircraft components

Records

Factual data and documents used to substantiate facts involving the accident. Witness statements and interviews shall be signed. If telephone and transcribed statements cannot be signed due to witness' condition, timing, or availability, insert a statement by the investigator or interviewer attesting to the time and date of the interview, followed by the investigator's or interviewer's signature. These records should not be part of the factual section or the management evaluation section. These records shall reside in an official case file. They may be used by the ARB for their deliberations. Examples of records are witness statements and interviews, training records, licenses, and aircraft and pilot cards.

You must delete these general pages and the checklist items as you fill in the sections and proceed through the report. Do not address items that do not apply.

(Continued)

Exhibit 9–3—Aviation accident investigation template.

EXHIBIT 9–3 (continued)

United States Department of Agriculture
Forest Service

THIS DOCUMENT CONTAINS MATERIALS FOR INTERNAL AGENCY USE ONLY AND MAY NOT BE RELEASED UNDER THE FREEDOM OF INFORMATION ACT WITHOUT OFFICE OF GENERAL COUNSEL REVIEW

Draft Preliminary Aircraft Accident Investigation Report

(Type of accident)
(Unit, location)
(Region/station/area/institute)
(City, State)
(Date of accident or incident)

Mount 4- by 6-inch photo here.

DRAFT – FOR OFFICIAL USE ONLY Copy _____of_____

This report will remain preliminary until the NTSB releases the final report.

(Continued)

Exhibit 9–3

Exhibit 9–3—Aviation accident investigation template.

EXHIBIT 9–3 (continued)

Preliminary Aircraft Accident Investigation Report

Accident: (Aircraft tail number, make, and model, and accident type)

_____

_____

Location: (Unit and location where accident occurred)

_____

Date: (Date of accident)_____

Signatures:

_____
Investigation team leader: (Name, title, and location of home unit)

_____
Qualified technical investigator: (Name, title, and location of home unit)

Investigation team members: (Names, titles, and locations of home units)

_____

_____

_____

_____

_____

Investigation technical consultants: (Names, titles, and locations of home units)

_____

_____

_____

_____

_____

(Continued)

Exhibit 9–3—Aviation accident investigation template.

EXHIBIT 9–3 (continued)

Table of Contents

(Continued)

Exhibit 9–3—Aviation accident investigation template.

EXHIBIT 9–3 (continued)

Preliminary Factual Section

Executive Summary

Briefly describe the mission being performed and the event that occurred to initiate the accident investigation. It normally should not exceed one page.

Narrative

Mission

1. Describe the mission events leading up to the accident.

2. Include brief statement describing the weather, terrain, obstacles, and other operational information concerning the mission.

3. Indicate who communicated with and/or observed the mission, including those who witnessed the accident.

4. List the personnel involved.
A. Describe the seating location in the aircraft.
B. List the capacity of each crewmember or passenger.

5. Identify the make, model, and serial number of each aircraft.

6. Describe the aircraft configuration and loading.

7. Identify who authorized (ordered) the flight.

8. Identify who dispatched and provided flight following for the aircraft.

9. Identify who provided operation control of the aircraft other than the pilot. (For example; the forest or district dispatcher, the Incident Commander, the District Ranger, or the regional office).

Accident Chronology/Sequence of Events

10. Using a timeline, describe each significant event prior to the accident, including discovery, rescue, and recovery.

11. Include a brief statement describing the weather, terrain, obstacles, and other operational information concerning the mission.

12. Indicate who communicated with and/or observed the mission including those who witnessed the accident.

Crash Sequence/Accident Response

13. Describe the flight regime of the aircraft during the final moments of flight, detailing each evolution, until the aircraft comes to a complete and final resting position and all personnel have exited the aircraft.

14. Include all external factors involved in the accident scenario such as fire, blade strikes, seat belt integrity, component separation, and wreckage movement.

15. Provide a disintegration sequence from the first point of impact, or inflight separation.

16. Describe briefly the actions taken concerning:
A. Crash rescue efforts/body removal, and so forth.
B. Accident plan availability and utilization.

17. Describe briefly the problems encountered concerning:
A. Communication.
B. Availability of personnel/equipment.
C. Transportation and other resources.
D. Interagency cooperation.

Injury and Damage Descriptions

18. Personnel.
A. Briefly describe all personnel injuries.
B. List expected time of hospitalization/treatment.

19. Aircraft.
A. Describe essential damage to the aircraft.
B. State whether damage was minor, substantial, demolished or burned.
C. State whether the accident was survivable and whether the cabin retained structural integrity.
D. Photographic documentation.
E. Other.

20. Accident site
A. Describe accident site and damage.

21. Omit details or circumstances that are unrelated to the accident.

(Continued)

Exhibit 9–3—Aviation accident investigation template.

EXHIBIT 9–3 (continued)

Preliminary Factual Section

Operational History

22. Operation Base.
- A. Briefly describe the operation base supporting the mission.
- B. Include only information that is related to the mission and accident.
- C. Describe the appearance, accessibility, location, suitability, organization, and management of the facility, including deficiencies.
- D. Describe communication between the facility and dispatch including aircraft communications.
- E. Describe the safety measures for the base, including the condition and suitability of equipment.
- F. Equipment inspection currency.
- G. Accident planning and response.

23. Aircraft and pilot.
- A. Discuss the following concerning the aircraft.
  - Maintenance history.
  - Inspections and approval.
  - Mission loading.
- B. Discuss contractor performance.
- C. Discuss the following items concerning the pilot.
  - Performance and habits.
  - Manifesting and records management.
  - Establish a 24-hour history (longer if necessary).
  - Inspection and approval.
  - Document last days off and flight and duty limitations compliance.

24. Organizational structure and management relationships.
- A. Prepare an organizational structure chart for the personnel involved in the accident and identify relationships to the mission flown. Discuss supervision and staffing levels if relevant.
- B. Identify the agency person who was in operational command of the mission. Establish why and how this individual was selected.
- C. Identify the individuals both inside and outside the organization who were in a position to exercise some form of control over the mission, including accident prevention (i.e., dispatcher, district ranger, helicopter manager, forest aviation officer, and so forth).
- D. Discuss the relationships as they are relevant to the investigation.

25. Aircraft dispatching and aircraft management.
- A. Discuss the communications involved in the mission.
  - When was the mission ordered?
  - How was it controlled?
  - Was there a flight plan?
  - Were communications recorded? Timely?
- B. Discuss accident response.
  - Timeliness.
  - Availability of personnel and equipment.
- C. Discuss use of checklists (crash/rescue, risk analysis, pilot and aircraft, and so forth).
- D. Does the forest aviation plan address these issues? Is it adequate? Current? Utilized?

26. Operational inspections and followup.
- A. List the contract inspections performed on the pilot and aircraft since award.
- B. Document and discuss operations inspections performed on mission personnel.

27. Physical environment.
- A. Discuss the effects of altitude, temperature, terrain, weather, and turbulence on the accident mission.
- B. Discuss the accident mission in relation to other missions performed by the pilot or unit.
  - Was the mission more difficult than normal?
  - Were environmental factors considered ? By pilot, crew, or dispatching?
  - Was management involved in the decision process?
- C. What was the workload on the pilot and crew? Was this taken into consideration by managers and at what levels?
- D. Was the departure and arrival base or site suitable for the mission undertaken?

Compliance With Directives

28. Operational procedures.
- A. Were standard procedures followed?
  - Pilot proficiency/currency.
  - Weight and balance/manifests.
  - Load calculations/manifest.
  - Aircraft and preflight checklists.
  - Power trend checks.
  - Go/no-go checklists.
  - Personal protective equipment, PPE, (worn/used).
  - Pilot and aircraft approvals.
  - Flight following.
  - Passenger controls (exposure to hazards).

(Continued)

Exhibit 9–3

Exhibit 9–3—Aviation accident investigation template.

EXHIBIT 9–3 (continued)

Preliminary Factual Section

- Flight and duty limitations.
- Contracting.
- Airport guides.
- Minimum altitudes.
- Safety briefings.
- Other.

B. Identify and discuss special mission procedures as they are related to the accident.

29. Training and Qualifications

A. The purpose of this section is to evaluate the training and qualifications of personnel including supervisors involved or directly associated with the accident.

B. Identify and discuss specific violations of established policy.

30. Records management.

A. Identify and discuss whether directives, operational guides, contracts, manifest, and so forth, were readily available and properly utilized by personnel associated with the accident. Were they current?

B. Other records to consider:

- Timesheets and overtime records.
- Dispatching logs and communications records.
- Forest aviation plan, fire plan, and so forth.
- Daily diaries.
- Other ICS forms, and so forth.

31. Accident prevention opportunities.

A. Attitudes and performance

- Discuss attitudes of personnel involved in the accident and their peers concerning:
  —Use of PPE.
  —Records management.
  —Training guide and handbook compliance.
  —Pilot and contractor performance.
  —Past operational practices.
  —Weather, terrain, and fire behavior predictions.
  —Safety practices and standard orders.
  —Management oversight.

32. Incident reports. The purpose of this section is to determine whether 5700–14s, SAFECOMs, safety documents, and other operational information is routinely completed and submitted. Establish the following:

A. History of submission by the unit/individual. Determine whether any are related to the accident being investigated. If relevant include a listing of reports and actions taken to correct at the field and Forest level.

B. Who reviews these documents on the unit? What is done about problems identified? Determine timeliness of submission including review.

C. Were other unit incident reports reviewed and discussed by the individuals involved in the accident? Is a file available?

D. Are other unit reports or safety alerts available and used?

33. Mission risk factors.

A. Determine whether a risk analysis has been performed and by whom. Is it current and applicable to the accident mission? Who was involved; management, pilot, crew, incident commander?

B. Determine whether risk determination is a consideration in mission planning. How frequent? Supervision and oversight?

C. Establish what part the risk analysis played in the accident mission.

34. Safety emphasis. The objective of this section is to determine the safety emphasis at each level of the organization as it applies to this accident.

A. Who provides emphasis on safety?

B. How is it provided? Accountability?

C. What is the frequency of briefings?

D. When was the last safety briefing held?

E. Do the district ranger, fire management officer, forest fire staff, forest aviation officer, and others participate?

Findings

35. Develop findings from supporting data. Findings are the conclusions of the accident investigation team based on the facts, weight of evidence, professional knowledge, and good judgment. Each finding should, where possible, be supported by two or more facts from the investigation.

A. Divide the listing of findings into sections by subject matter. For example:

- People
  —Pilot
  —Personnel
  —Management
- Equipment
  —Aircraft
  —Fuel Truck

(Continued)

Exhibit 9–3

Exhibit 9–3—Aviation accident investigation template.

EXHIBIT 9–3 (continued)

Preliminary Factual Section

- Environment
  —Weather
  —Terrain

Sample findings:

• The accident/incident was partially survivable due to the limited cabin structural damage and absence of fire following the accident (page xxx).

• The flight crewmembers were properly certified and inspected (page xxx).

• The load calculation and passenger manifest were properly completed and accurately depicted conditions at the destination helispot (page xxx).

• Dispatch had not received a position report or contact for more than 30 minutes, and no attempt had been made during this period to contact the aircraft or firefighters (page xxx).

• The Forest Aviation Officer (or FMO) position had been vacant for 6 months, and no assignments had been made to another individual to perform this task (page xxx).

• Three 5700-14's, SAFECOM's reports had been prepared on the pilot in the 12 days prior to the accident (page xxx-xxx).

• The last entry in the suppression crewmember's training record was dated 21 months prior to the accident. No helicopter training was provided in 2000 (page xxx).

Causal and Contributing Factors

36. Causal factor definition:
A. Any behavior, acts, or omission that starts or sustains an accident/incident occurrence. These can occur individually or in combination. An event(s) which sustain the occurrence sequence but were normal to the situation as it developed are not causal factors.
B. Base the causal factor(s) on the findings. Although all the findings are significant, not all of them relate to the cause of the accident.
C. Reference which findings were used to determine each causal factor.

37. Contributing factor definition:
A. Any behavior, act, or omission, which contributes to—but does not directly cause—an accident/incident occurrence.
B. Management actions, failures, and behavior frequently contribute to an accident scenario, but by themselves do not cause the accident to happen. These actions meet this definition of contributing factor.
C. Reference which findings were used to determine each contributing factor.

Appendixes

38. Appendixes. Appendixes can be used as reference information in the report. They should not be part of the case file. Examples of appendixes are:
A. Weather reports/summaries.
B. Aviation Human Factors Classification Analysis (HFACS).
C. PPE analysis.
D. Teardown analysis.
E. Equipment analysis.
F. NTSB Form 6120 1/2.

(Continued)

Exhibit 9–3

Exhibit 9–3—Aviation accident investigation template.

EXHIBIT 9–3 (continued)

Preliminary Management Evaluation Section

Preliminary Recommendations

Recommendations

Recommendations suggest measures that management may take to prevent similar accidents. They must be reasonable, feasible, and relate to the causal factors of the accident. All recommendations must allow for a definite solution to the problem. Every causal factor should have recommendations for future prevention or mitigation, although exceptions may occur. Upon completion of the report, preliminary recommendations will be developed. This last step culminates in the investigation report and represents the purpose for which the investigation was conducted. Considerable effort should be expended to ensure that the Accident Review Board (ARB) develops quality recommendations for further review and action. Number the recommendations consecutively.

Recommendation number 1:
Recommendation number 2:
Recommendation number 3:

Case File

The accident investigation case file has two components: the accident investigation report (factual section and management evaluation section), and the supporting docu-mentation and equipment that are not in the investigation report. Cassette tapes, photos not used or unfit for distribution, witness statements, and documents that may be too large, should not be included in the investigation report. They should be kept in the case file and only referenced in the accident investigation report to support the team's findings.

The Washington Office, Office of Safety and Occupational Health is the office of record for all Chief's level investigations. The office of record for delegated Chief's level investigations is the safety office of the region or station delegated responsibility to conduct the investigation. However, a copy of the accident investigation report will be forwarded to the Washington Office, Office of Safety and Occupational Health.

Case files will be maintained for the time period required by Forest Service records management rules or FOIA rules as appropriate and then destroyed, except one copy of the accident investigation report that will be kept permanently.

Examples of records that would go in the case file are:

1. Witness statements and interviews.

2. Contract and equipment records.
- A. Applicable portions of contracts and equipment records. Include contract number and date signed. Identify the contracting officer and contraction officer's representative (COR).
- B. COR diary or records.
- C. Rental equipment (as necessary and relevant).

3. Aircraft records.
- A. FS aircraft inspection records.
- B. Discrepancy sheets and FS data cards.
- C. Aircraft log sheets relevant to the accident.
- D. Power check forms.
- E. Load calculation forms.
- F. Load manifests and weight and balance forms.

4. Pilot records.
- A. Federal Aviation Administration (FAA) certificates.
- B. Medical certificates.
- C. Electrocardiogram (EKG).
- D. FS application and check-ride forms.
- E. Pilot approval card and date.
- F. Pilot training and flight time records.
- G. Medical injury report.
- H. Autopsy (relevant portions only).
- I. Death certificates.
- J. Previous 24-hour history.
- K. Pilot safety briefing and contract briefing.

5. Personnel records.
- A. Aircraft crewmembers, helitack, and suppression personnel.
  - Training and qualification records
  - Medical records of injured personnel
  - Other related records
  - Pay records (as needed)

(Continued)

Exhibit 9–3—Aviation accident investigation template.

EXHIBIT 9–3 (continued)

Preliminary Factual Section

6. Weather and terrain description.
A. Accident site.
B. Flight service station, FS fire weather, lookout reports, and so forth.
C. Fire behavior, predicted and actual.
D. Other.

7. Communications record.
A. Radio and dispatch logs.
B. Tapes and other communication records.

8. NTSB Records.
A. Transmittal letter.
B. Preliminary accident report.

9. Other.

Exhibit 9–3—Aviation accident investigation template.