NAVAL AEROMEDICAL OFFICER

AIRCRAFT MISHAP INVESTIGATION REFERENCE GUIDE

Naval Safety Command, Aeromedical Division

In Conjunction With

Dedicated Aerospace Medicine Professionals

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NAVAL AEROMEDICAL OFFICER
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INTRODUCTION

Aircraft mishap investigation, identification of causal and contributory factors and the subsequent mitigation of these factors are the linchpins of Naval Aviation Safety. Aviation mishaps have trended downward over recent history. However, due to resource constraints, extended conflict involvement and a rising number of threats to our nation's interests, the need to utilize aviators and aircraft safely and effectively, while minimizing loss, has never been greater.

Aircraft mishap investigation is difficult, time-consuming and stressful, but also rewarding when we recognize the contributions we make, lead to improvements in aviation safety. Your contribution as the Aeromedical Officer (AMO) to a thorough mishap investigation is vital to determine the cascading events causal to a mishap and to recommend corrective actions to prevent recurrence. For the purposes of this mishap guide, AMO refers to any aeromedically designated officer (FS, APA, AOP, AEP, etc.) and is not meant to be explicitly exclusive or inclusive.

Historical data has shown that human error, by itself or in combination with other factors, is present in at least 80% of aircraft mishaps and therefore, remains the single greatest hazard in aviation. The current DoD Human Factors Analysis and Classification System (HFACS) provides the accident investigator with a template that aids in organizing the investigation while providing a detailed analysis of human error for post-hoc mishap data analysis, thus revealing previously unidentified trends and hazards. Adoption of this joint system provides a common language among services for mishap investigation.

As a member of an Aviation Mishap Board (AMB), the AMO is responsible for doing an exhaustive investigation in an area most likely to yield results: the medical and human-factors portion. Past investigations have shown that human factors are not limited to just pilot error. Human factors extend to aircraft maintainers, air-traffic controllers, squadron chain of command, air wing, TYCOM and can continue to the CNO. The role of an investigating AMO is not limited solely to an in-depth analysis of the individuals directly involved in the mishap; it must include all individuals and events that, through careful analysis, identify the entire mishap chain.

The professionalism and conduct of an AMO during the mishap investigation will be directly observed by senior officers and peers in both the aviation and medical communities while having the potential to leave an indelible mark on the naval service. Your performance as part of an AMB, perhaps more than any other single task you accomplish on active duty, may influence the perceived competence, capability and value you provide as a naval officer and AMO. During the investigation, an AMO should demonstrate the same dedication to ethics as well as objectivity and confidentiality that is expected within their respective professional field. If, by their efforts as a mishap investigator, an AMO helps prevent one Class A aviation mishap in a 20-year naval career, they may have saved the U.S. Navy more than their entire career pay and, more importantly, potentially preserved a life. While an AMO may never have absolute proof that they prevented a mishap, they must always do their very best to prevent damage, injury, or death.

Developing and maintaining sharp mishap investigation skills is difficult, since most AMOs investigate mishaps infrequently. Consequently, it is easy to commit errors due to lack of experience and the rapid pace of the mishap investigation. As many mishaps occur at inconvenient times, preparedness is paramount. This reference was compiled to help the AMO avoid some of the common pitfalls encountered in these infrequent but often stressful situations.

The AMO is both the human factors and medical expert for the AMB. It is incumbent on the AMO to prepare for this role and be able to provide on-scene guidance to protect the team from biological, chemical, physical and environmental hazards. To this point, we have included several sections discussing biological and material hazards encountered during an investigation. However, some

hazards are not covered in this text. We recommend that you work with your local fire and rescue teams and industrial hygiene professionals to better identify and prepare for the specific/unique hazards that your squadron's aircraft may present at the mishap site.

This reference is an adjunct to formal instructions that govern mishap investigation and is not meant to supplant other official references that address aeromedical aspects of mishap investigation. Use this guide as a ready reference in the field to make sure that your data retrieval is complete and that you preserve perishable evidence. It also may serve as a source for obtaining additional assistance.

ACKNOWLEDGMENTS

This is the eighth edition of the mishap investigation pocket reference. This edition is a result of a collaborative effort between contributors throughout Naval Aerospace Medicine and supporting organizations. The goal of this edition is to provide a comprehensive resource of vital aeromedical mishap investigation information to all members of the Aviation Mishap Board and supporting elements.

NOTE: For those with a DOD command access card (CAC), the most recent electronic version is available online via the Naval Safety Command's Aeromedical Division CAC-enabled website at: https://intelshare.intelink.gov/sites/nsc/Pages/aeromedical.aspx

NOTE: See Appendix E: Common Acronyms and Abbreviations Used in Naval Aviation for a list of mishap guide acronyms.

NOTE: Send corrections or feedback, with section and page number to:
NAVSAFECOM_CODE14_AEROMED@navy.mil

BACKGROUND INFORMATION & DEFINITIONS

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This section will provide the investigator with background information concerning duties and responsibilities for members of the medical department followed by basic definitions and information concerning the Naval Aviation Safety Programs (OPNAVINST 3750.6 series).

The goal of all Aviation Safety programs is to identify and report hazards, then implement controls to eliminate them. This section defines the term hazard and provides guidance to the AMO for reporting hazards that fall into the aeromedical realm.

NAVAL AVIATION SAFETY PROGRAMS, OPNAVINST 3750.6 SERIES INSTRUCTIONS TO THE MEDICAL DEPARTMENT

NOTE: Items are summarized from OPNAVINST 3750.6 series with the intent to provide a general introduction/overview and are not aeromedically comprehensive. Direct reference to OPNAVINST 3750.6 series is recommended for detailed guidance.

1. The Chief, Bureau of Medicine and Surgery (BUMED) shall:
    a. Advise and assist in support of medical investigations into naval aviation mishaps and hazards.
    b. Coordinate with the Armed Forces Medical Examiner System (AFMES) and Defense Health Agency (DHA) to ensure pathology services for aviation mishaps as directed by this manual.
    c. Train AMOs thoroughly in medical pre-mishap planning, medical investigation of aviation mishaps and their role as members of Aviation Mishap Boards (AMBs).
    d. Coordinate with DHA to provide timely and complete medical services from properly trained and designated AMOs.
2. Navy Medicine shall:
    a. Train their staff members in the general medical and administrative requirements of this guide.
    b. Prepare and keep current a pre-mishap plan and have ready both personnel and material to support the Naval Aviation Safety Program.
    c. Train AMOs and prepare them fully for assignment to an AMB.
    d. When requested, provide an AMO for appointment as an AMB member. If local medical facilities cannot provide, the controlling custodian will.
    e. Provide facilities, material and personnel support for the immediate treatment and subsequent aeromedical evaluation of individuals from any branch of the Armed Services involved in an aircraft mishap.

3. AMOs shall:

NOTE: In this section, AMO refers to specifically Flight Surgeon or Aeromedical Physician Assistant.

a. Be thoroughly trained in medical pre-mishap planning, medical investigation of aviation mishaps and their role as members of AMBs.

b. Be appointed in writing and participate fully in Human Factors Councils and Boards as well as Aviation Safety Councils.

c. Be appointed in writing as a standing member of the squadron's AMB.

d. Participate in pre-mishap planning for the squadron and military treatment facility.

e. Participate fully in the investigation and reporting of physiological hazards, human factor hazards or any other hazard with aeromedical implications.

f. When requested, immediately perform physical examinations and laboratory studies on individuals involved in an aviation mishap from any military service.

g. Participate in all salvage efforts whenever recovery may include human remains.

h. Participate fully in assigned mishap investigations and all deliberations of the AMB.

i. Provide the senior AMB member an Aeromedical Analysis for all investigations where an AMB is assembled unless exempted by the NAVSAFECOM Aeromedical Division.

NOTE: AMB duties take precedence over all others. Any request for medical assistance from an AMB must be treated as a priority and handled in an efficient manner.

BASIC DEFINITIONS

NOTE: These definitions are summarized from OPNAVINST 3750.6 series with the intent to provide a general overview, however, some provisions, limitations, notes and/or qualifying conditions have been excluded for brevity. Direct reference to OPNAVINST 3750.6 series is recommended if applying definitions to a specific mishap.

1. The Naval Aviation Safety Programs

a. The purpose of the Naval Aviation Safety Program is to preserve lives and enhance the well-being of its members by protecting the equipment and material they need to accomplish their mission. The Naval Aviation Safety Program supports every aspect of naval aviation. Safety practices influence combat readiness. Fleet personnel will discover naval aviation safety knowledge and practices may be applied to other areas of Department of the Navy (DON) personnel life. The Naval Aviation Safety Program may, therefore, yield benefits and preserve resources far beyond its intended scope.

The Naval Aviation Safety Program succeeds by preventing damage and injury. Potential causes of damage and injury are termed hazards. The objective of the Naval Aviation Safety Program is to support established SMSs or SMPs to maximize mission effectiveness through the elimination or control of hazards, thus managing risk to an acceptable level and thereby preventing mishaps.

2. Hazards

   a. A hazard is a potential cause of damage, injury/illness/death, or mission degradation that either has occurred or has the potential to occur. In OPNAVINST 3750.6 series, the term hazard is used in both senses.

   b. Most mishaps result from a combination of two or more causal factors. Without one of them there would be no mishap. All causal factors are viewed as playing equal roles in causing a particular mishap. No attempt should be made to rank causal factors as “direct," "primary," "principle," etc. Hazards vary according to the severity of damage and/or injury/illness they are expected to cause and the probability of that severity.

   c. The same logic that applies to mishap causal factors also applies to the causal factors of damage and injury identified while performing a mishap investigation.

   d. Causal factors are almost always considered as "under human control.” Thus, as defined, almost all hazards can be eliminated and all associated mishaps can be prevented. By this logic, environmental (weather) conditions are rarely causal to mishaps. Only NAVSAFECOM can approve “environmental” or “other” causal factors.

3. Intent for Flight

   a. Intent for flight for DOD aircraft is a prerequisite for the classification of a naval aircraft mishap as a Flight Mishap (FM) or Flight Related Mishap (FRM).

   b. Intent for flight exists for fixed wing aircraft when the aircraft or UAV's brakes are released (not for taxi purposes), or takeoff power is applied to begin an authorized flight. For catapult takeoffs, flight begins at first motion of the catapult after the pilot has signaled readiness for launch. For UAV rocket-assisted takeoff (RATO), flight begins at the first sign of RATO bottle ignition. For UAV pneumatic launches, flight begins at first sign of pneumatic launcher motion after the pilot has signaled readiness for launch.

   c. Intent for flight exists for skid and wheel configured helicopters, tiltrotor and vertical takeoff and landing (VTOL) aircraft when takeoff power is applied, including during hover taxi.

   d. Intent for flight continues until:

      (1) The fixed wing aircraft or UAV taxies clear of the runway or landing area.

      (2) The helicopter, or (VTOL), flight ends when the aircraft has alighted at the termination of the flight and the landing gear supports the aircraft weight. Touch-and-go or stop-and-go landings are not terminations of flight.

      (3) UAV flights end in a net or when captured by another recovery system.

4. Naval Aircraft Mishap

   a. A naval aircraft mishap is an unplanned event or series of events, directly involving naval aircraft or UAVs which result in any of the following: damage to DoD property; work-related illness to DoD personnel; injury to on or off-duty DoD military personnel; injury to on-duty DoD civilian personnel; damage to public or private property; or illness or injury to non-DoD personnel, caused by DoD activities.

b. Exceptions to the definition:

(1) Intentional or expected damage to DoD equipment, property, aircraft, or UAVs, incurred during authorized developmental testing or combat training, because of direct enemy action (DEA incidents), or normal residual damage as a result of a missile launch.

(2) Intentional, controlled jettison or release, during flight, of canopies, cargo, doors, drag chutes, hatches, life rafts, auxiliary fuel tanks, missiles, drones, rockets, conventional munitions, streamed or towed airborne mine countermeasure equipment, dipper or streamed sonar systems and externally carried equipment not essential to flight when there is no injury, no reportable damage to the aircraft or other property and when the reason for the jettison is not a malfunction. Costs associated with environmental cleanup are costed regardless if the jettison was intentional or not.

(3) Replacement of component parts due to wear and tear, when the component fails without human factors associated with the failure and when all damage is confined to the component part. This exemption only applies to items that are normally used until they fail or until predetermined wear limits are reached. Only NAVSAFECOM can approve a wear and tear exception.

(4) Property damage, death, or injury as a result of vandalism, riots, civil disorders, sabotage, terrorist activities, or criminal acts such as arson. Negligence, whether criminal or not, is not considered a mishap exception because the damage or injury was not the intended outcome.

(5) Foreign Object Damage (FOD) to aircraft, air- breathing missiles, or drone engines discovered during scheduled engine disassembly at an intermediate or depot level maintenance facility.

(6) Occupational or work-related illnesses caused by repeated exposure (of more than one day's duration) to environmental factors associated with the work environment. Report these illnesses per the OPNAVINST 5102.1 series or MCO 5100.29 series.

(7) An injury sustained during a planned aircraft egress (such as parachute jump or rappelling) if the aircraft or aircrew did not contribute to the injury.

(8) Damage to an aircraft when it is being handled as a commodity or cargo.

(9) Aircraft inducted into depot-level maintenance.

(10) Contractor injury mishaps in which the contractor is not under the direct supervision of DoD personnel. Contractor mishaps which damage DoD property must be reported as a mishap based on the established mishap thresholds.

c. The term "naval aircraft" or "UAV" refers to those aircraft or Group 3-5 UAVs of the U.S. Navy, U.S. Naval Reserve, U.S. Marine Corps and U.S. Marine Corps Reserve for which the naval aircraft accounting system requires accountability.

d. Although a naval aviation mishap signals a failure in the Naval Aviation Safety Program and the Naval SMS, it is not too late to prevent a mishap recurrence. This is why naval aviation investigates aviation mishaps with such vigor. All naval aviation safety investigations are conducted solely for safety purposes.

e. The Naval Safety Command normally assigns a mishap to the reporting custodian and the controlling custodian whose aircraft is involved in the mishap, without consideration for causal factors. The reporting custodian becomes the accounting organization and is responsible for

investigating and reporting the mishap. In any case where the accountability for a naval aircraft mishap is unclear, the Commander, Naval Safety Command, will make a final determination.

5. Damage and Injury. Mishap damage and injury is divided into two categories. The first results from the immediate causes of the mishap. The second entails avoidable or additional damage or injury from factors not associated with the immediate causes of the mishap. If the total severity of damage and injury meets the minimum established mishap severity criteria, that event is called a mishap. (See Mishap Classification).

   For example, a helicopter loses tail rotor authority and makes a theoretically survivable low impact crash (the mishap) but is quickly consumed in fire (other damage) because of non-crashworthy fuel cells. The fire burns the crew (other injury) because they were not wearing the proper flame-resistant flight suits. Although there was only one mishap, there are three identified causes of damage and injury (hazards). Under the Naval Aviation Safety Program, all of them must be addressed.

NOTE: The terms "reportable" and "recordable" injury are taken directly from the OPNAVINST 5102.1 series

   a. Injury Defined

      (1) A reportable injury is any bodily harm such as a cut, fracture, burn, or poisoning received while directly involved with naval aircraft, so long as these injuries (which are updated until the final endorsement message has been sent) result from a single or one-day exposure to an external force, toxic substance, or physical agent and result in a:

         (a) Fatality, regardless of the time between injury and death.

         (b) Permanent total disability.

         (c) Permanent partial disability.

         (d) Lost workday injuries– defined as causing the loss of one or more workdays (not including the day of injury). Days of light duty or temporary grounding from flight status do not constitute lost workdays.

         (e) Light or limited duty.

         (f) First aid injuries or greater.

      (2) For mishap reporting purposes the defined injury classifications are; fatal injury, permanent total disability, permanent partial disability, lost workday injury, recordable injury, lost at sea and missing/unknown.

   b. Injury Classification

      (1) Fatal Injury: An injury that results in death from a mishap or the complications arising there from, regardless of the length of time between the mishap and subsequent death.

      (2) Permanent Total Disability: Any nonfatal injury or illness which, in the opinion of competent medical authority, permanently or totally incapacitates someone to the extent they cannot pursue any gainful occupation and results in a medical discharge or civilian equivalent. The amputation of, or the loss of use, of both hands, both feet, both eyes or a combination of any of those body parts resulting from a single mishap constitutes a permanent total disability.

(3) Permanent Partial Disability: An injury or illness which does not result in death or permanent total disability, but, in the opinion of competent medical authority, results in permanent impairment through loss of the use of any part of the body with the following exceptions:

(g) Teeth

(h) Fingernails or toenails

(i) Tips of fingers or toes without bone involvement

(j) Disfigurement

(k) Inguinal hernia

(l) Sprains or strains that do not cause permanent loss of motion

(4) Lost Workday Injury: An injury, which does not result in death, permanent total disability or permanent partial disability, but results in one or more lost workdays, not including the day of injury. Lost workday injuries are further divided into major lost workday injury (10 or more lost workdays) and minor lost workday injury (one to nine lost workdays). A major lost workday injury requires at least a Class C mishap report and a standard AMB, including the AMO. A minor lost workday injury meets the definition for a Class C mishap as well; however, the AMB may consist of one person (usually the squadron Aviation Safety Officer (ASO)) as directed by the reporting custodian. If a mishap meets Class C criteria as a result of $60,000 or more property damage and not injury, then a standard AMB is required, regardless of the number of lost workdays.

(5) Recordable Injury: An injury receiving at least first aid treatment or those involving loss of consciousness, days away from work (not including the day or shift it occurred), light or limited duty for military personnel, restricted work or job transfer for on-duty Navy and Marine Corps civilian employees or fractured/cracked bones or teeth.

Per OPNAVINST 3750.6 series, first aid is generally when individuals are treated and released: observation or counseling, diagnostic procedures, including X-ray and blood tests, over-the-counter medications at over-the-counter strength, tetanus booster shot, cleaning, flushing or soaking wounds, wound coverings, including suture substitutes such as butterfly bandages/sterile strips, hot or cold treatment, non-rigid support such as ace, non-rigid back belts, etc., temporary immobilization for transport purposes, drilling of nail to relieve subungual hematoma, eye patches, foreign body removal from eye using only irrigation or swab, simple skin removal, finger guards and massages). When applied by a medical professional, medical adhesives/gels, i.e., DermaBond, constitute greater than first aid treatment.

(6) Lost at Sea *

(7) Missing/Unknown *

**Lost at sea and missing/unknown injuries equate to fatality for mishap severity level classification.*

MISHAP CLASSIFICATION

NOTE: Cost thresholds for mishap severity classification may be adjusted upward over time.

MISHAP SEVERITY CLASSES

Class A:

A naval aircraft is destroyed or missing or,

The total cost of damage to property or aircraft or UAVs is $2,500,000 or greater or,

A fatality occurs or there is an injury that results in permanent total disability from the direct involvement of naval aircraft or UAV.

Class B:

The total cost of damage to property or aircraft or UAVs is $600,000 or more, but less than $2,500,000 or,

An injury that results in permanent partial disability or,

Hospitalization of three or more personnel for inpatient care (excludes admissions for observation, diagnostic reasons, or administrative purposes that were treated and released).

Class C:

The total cost of damage to property or aircraft or UAVs is $60,000 or more, but less than $600,000 or,

A nonfatal injury that results in 1 or more days away from work, not including the day or shift of injury.

Class D:

The total cost of damage to property or aircraft or UAVs is $25,000 or more, but less than $60,000 or,

A recordable injury requiring treatment greater than first aid or that is not otherwise classified as a Class A, B, or C mishap (e.g. loss of consciousness, light or limited duty for military personnel, restricted work or job transfer for on-duty Navy and Marine Corps civilian employees or fractured/cracked bones or teeth).

For purposes of Class D mishap reporting, this would include injuries with up to one day (the day or shift of the injury only) away from work. Any additional days away from work would constitute at least a Lost Workday Injury as previously defined and represent at a minimum a Class C mishap. Class D also includes treatment with ground level oxygen for Physiological Events.

Class E:

The total cost of damage to property or aircraft or UAVs is greater than $0, but less than $25,000 or,

A reportable injury requiring only first aid treatment or that is not otherwise characterized as a Class A – D per above.

Class E mishap reports, like Hazard Reports, are not privileged.

NOTE: See OPNAVINST 3750.6 series for additional details and guidance regarding injury definitions, lost/restricted work definitions, duty status definitions, mishap classes and application to investigations.

Hazard:

Any occurrence in which the total cost of property or aircraft or UAV damage is less than $1 and,

There are no injuries and,

The event is not an aviation mishap. Report these events as hazards.

Hazard Reports, like Class E mishap reports, are not privileged.

MISHAP SUBCATEGORIES

Flight Mishap (FM):

This category encompasses those mishaps when there is intent for flight and reportable damage to a DoD aircraft or the loss of a manned DoD aircraft.

Flight Related Mishap (FRM):

Those mishaps when there is intent for flight and no reportable damage to the aircraft itself, but the mishap involves a fatality, reportable injury, or reportable property damage.

Aircraft Ground Mishap (AGM):

Those mishaps in which the intent for flight did not exist that result in reportable damage to an aircraft, or death or injury involving an aircraft.

PRIVILEGED INFORMATION

1. All naval aircraft mishap investigations are conducted solely for safety purposes. The success of the Naval Aviation Safety Programs depends on the submission of complete, open and forthright information and opinions concerning safety matters.
2. Information provided under a promise of confidentiality, or information, which would not have been discovered but for the promise of confidentiality, is privileged information. The deliberative analyses, conclusions and recommendations of the AMB are privileged. Also privileged is information directly calculated by the AMB or developed specifically by/for the AMB, if disclosing that information would reveal the AMB's deliberative process. Privileged information will be used for safety purposes only.
3. Photographs of a sensitive nature such as autopsy photographs or other photographs of the deceased and those photographs staged by the AMB that reveal its deliberative process are privileged. All other photographs are non-privileged. However, captions and markings placed on photographs that are indicative of the AMB's deliberative process are privileged. The captions and markings only, not the unmarked photographs, are privileged.
4. Endorsements of SIRs are privileged.
5. The Naval Safety Command determines the privileged or non-privileged status of all information contained in the SIR. All questions concerning privilege should be directed to the Naval Safety Command.

6. The purposes of employing Privileged Information directives are to:

a. Overcome any reluctance to reveal complete and candid information pertaining to the circumstances surrounding a mishap.

b. Encourage AMBs, Single Investigating Officer (SIO)s and endorsers of aircraft SIRs to provide complete, open and forthright information, opinions and recommendations regarding a mishap.

7. The purposes for which privileged safety information shall not be used are listed in OPNAVINST 3750.6 series and on the "Advice to Witnesses (Promise of Confidentiality)" form. Privileged information shall not be used:

   a. In any determination affecting the interests of an individual making a statement under a promise of confidentiality.

   b. As evidence or to obtain evidence in determining misconduct or line-of-duty determination.

   c. As evidence to determine the susceptibility of personnel to discipline.

   d. As evidence in claims on behalf of the government.

   e. As evidence to determine the liability of the government for property damage caused by a mishap.

   f. As evidence before administrative bodies, such as Field Naval Aviator/Naval Flight Officer Evaluation Boards (USN), Field Flight Performance Boards (USMC), or administrative separation boards.

   g. In any other punitive or administrative action taken by the Department of the Navy.

   h. In any other investigation or report other than aviation mishap safety investigations report.

   i. As evidence in any court, civilian or military, or as evidence before, or as any part of, a JAGMAN investigation report.

8. The rationale for having privileged information is as follows: If aircraft mishap investigators were unable to give an assurance of confidentiality, or if their promises were hollow, then input from witnesses, AMB members, endorsers and others might be incomplete or false. To continue the revelation, development and submission of privileged information in aircraft safety investigation reports and endorsements, faith must be kept with the assurances of the limited use to be made of this information. Should privileged information be used for any purpose other than safety, credibility of future assurances would be lost.

9. In addition, it should be noted that:

   a. Witnesses shall not provide statements to AMBs while under oath. Requiring them to do so is prohibited.

   b. The AMB witness shall be advised, in writing (OPNAV 3750/16), of the purposes for which their statement is being provided and the limited use to be made of the statement.

   c. AMB members shall not, nor may they be requested to, divulge their own opinion or any information, which they arrived at, or to which they became privy, in their capacity as a member of an AMB.

   d. The exercise of command influence to edit, modify, or in any-way censor the content of SIRs is contrary to the spirit of the program and is prohibited.

10. Any individual having knowledge of the content of an aircraft SIR is prohibited from releasing that information, except per OPNAVINST 3750.6 series. Should any individual be contacted either formally or informally for such information, immediately contact the Naval Safety Command for guidance. This includes requests made under the Freedom of Information Act (FOIA).

NOTE: Unauthorized disclosure of privileged information is a criminal offense punishable under Article 92, Uniform Code of Military Justice (UCMJ) and DON Civilian Resources Manual, subchapter 752.

NOTE: Class E mishap reports and hazard reports are by instruction not privileged. Involved personnel and witnesses should not be offered privilege if the damage and injury result in these classifications.

NOTE: OPNAV 3750/16 must be signed and uploaded as part of the permanent mishap record in RMI for legal to officially recognize privilege as having been granted as part of a mishap investigation.

HAZARD REPORTING

The primary mode for hazard and mishap reporting is via the Risk Management Information (RMI) website, located at https://afsas.safety.af.mil/.

1. A hazard is a potential cause of damage or injury that is generally under human control. A near miss is an undesired event that, under slightly different circumstances, would have resulted in personal harm, property damage, or undesired loss of resources. The Naval Aviation Safety Program identifies and eliminates hazards before they result in mishaps. If this were completely successful, which it isn't, there would rarely be mishaps. Therefore, the following paragraphs explain how to detect and report hazards before a mishap occurs.

2. Each individual has an obligation to others in Naval Aviation to report hazards. When a hazard has been detected, a Hazard Report (HAZREP) should be submitted. HAZREPs do not require a full AMB. However, the use of AMBs in the investigation and reporting of hazards is helpful in some cases and is at the discretion of the CO.

3. Purposes:

    a. To report a hazard and the remedial action taken, so others may take similar action.

    b. To report a hazard and recommend corrective action to others.

    c. To report a hazard so another organization may determine and take appropriate corrective action.

    d. To document a continuing hazard to establish risk severity and exposure.

4. Hazard Detection: Observing, identifying and analyzing hazards, conducting safety surveys and reviewing command plans, policies, procedures and instructions will aid in detecting hazards before a mishap occurs. Risk Management (RM), applied in the planning stages of an operation, should identify hazards at the earliest possible opportunity. Individuals or commands with direct, first-hand knowledge of the circumstances surrounding a potential problem are most effective in hazard detection and reporting.

5. Submission Criteria for a Hazard Report (HAZREP):

    a. General Submission Criteria: Submit a HAZREP whenever a hazard is detected or observed per OPNAVINST 3750.6 series.

b. Specific Submission Criteria: Certain types of HAZREPs require mandatory reporting and are identified and grouped based on the specific hazard. These have distinct submission criteria for each type. HAZREP types include:

(1) Electromagnetic Interference (EMI)

(2) Pilot Loss of Control In-Flight (PLOC)

(3) Wildlife (Bird/Animal) Strike (BASH)

(4) Near Midair Collision (NMAC)

(5) Ship-Related/Embarked Landing (SHIP/EMBLAND)

(6) Hazardous Air Traffic Report (HATR)

(7) Physiological Episode (PHYSEP)

(8) Physiological Event (PE)

(9) Laser Strikes (LSRST)

(10) Friendly Fire (FF)

(11) Controlled Movement Area Violation (CMAV)

(12) Near Controlled Flight Into Terrain (N-CFIT)

NOTE: Physiological Event and Physiological Episode HAZREPs are of particular importance to the AMO and are expounded upon below.

c. Related Aviation Reports: Incidents that are reported in other formats may require a HAZREP to assist in data analysis.

d. Submission by an AMB investigating a Mishap. During a mishap investigation, the AMB may find hazards that were not directly causal or contributory to the mishap, but were present, nevertheless. These should be submitted as factors or non-factors worthy of discussion (NFWOD). For severe hazards identified during the SIR, which require immediate attention (and may need correction throughout the fleet), promptly submit a Hazard Report.

6. Anonymous Hazard Reporting: Activities or individuals reluctant to identify themselves or their command should contact NAVSAFECOM to help generate a NAVSAFECOM released HAZREP.

7. HAZREPS and Class E mishap reports are for "general use" and must not contain privileged information.

8. DEADLINES: HAZREP deadlines vary:

a. HAZREPS that contain recommendations with a severe Risk Assessment Codes (RAC), RAC 1 or 2, should be submitted within 72 hours of detecting the hazard. Submit all other HAZREPS as soon as possible but no later than 30 days following detection of the hazard.

b. Air Traffic Control HAZREPS. (See OPNAVINST 3750.6 series for details.) Gather information from tape recordings of air traffic control (ATC) communications or radar video in a timely manner. ATC erases these tapes after 45 days unless investigators request otherwise.

PHYSIOLOGICAL EPISODE AND PHYSIOLOGICAL EVENT HAZREPS/MISHAPS

1. Physiological episodes (PHYSEP) and, most recently, physiological events (PE) are a primary focus of the AMO and the Naval Aviation Enterprise as potential hazards in the aviation environment. The AMO is often one of the initial members of the safety team notified of such occurrences. It is incumbent on these individuals to notify the rest of the safety team and be a part of the reporting and investigation of these occurrences. Depending on the degree of aircrew injury/treatment, a physiological episode or physiological event may be reported either as a HAZREP or a Mishap (Class A/B/C/D/E as applicable). The HAZREP format is outlined in the OPNAVINST 5102.1 series.

2. A physiological episode is when an injury, illness, or adverse physiological, psychological, pathological, or physical symptoms are experienced by aircraft occupants during powered ground operations, actual flight, or after flight. Qualifying conditions from the OPNAVINST 5102.1 series include:

   a. Hypoxia, proven or suspected

   b. Carbon monoxide poisoning or other toxic exposure (smoke/fumes in the cockpit)

   c. Decompression Illness (Decompression Sickness and Arterial Gas Embolism) because of evolved gas (bends, chokes, neurocirculatory collapse), or severe reaction to trapped gas resulting in incapacitation

   d. Hypo/hypercapnia (typically hyper/hypoventilation)

   e. Spatial Disorientation (SD) or distraction resulting in unusual attitude. (Excludes SD events occurring during White-out/Brown-out conditions or resulting in a MIDAIR or CFIT

   f. Loss of consciousness for any cause

   g. An unintentional rapid decompression, exposing personnel to cabin altitudes above FL 250, regardless of whether dysbarism or hypoxia occurs

   h. Autonomic response to physiological stress

   i. Other physiological, psychological, pathological or physical problems that manifest during or after actual flight

3. It is important to understand the distinction between PHYSEPs and PEs. Physiological Episodes have been identified and studied in Naval Aviation for decades and can occur in multiple circumstances, including but not limited to aircraft malfunction, pilot error, or intentional (necessary) emergency procedures resulting in aircrew symptoms.

   The term Physiological Event is used to describe the specific situation when aircraft occupants experience injury, illness, or adverse physiological, psychological, pathological, or physical symptoms during powered ground operations, actual flight, or after a flight AND these are attributed to a known or suspected aircraft and/or aircrew systems malfunction.

   A Physiological Event therefore is a subset of a Physiological Episode. All Physiological Episodes (including those that meet the criteria for a Physiological Event) should be reported in RMI as either a HAZREP or Mishap (depending on what severity criteria they meet). It must be emphasized that Physiological Events have additional reporting requirements (Evidence Data Sheets Parts A/B/C/D, slam stick data, lab data, Final Summary Report, etc.). See the PE Operating Guide, PE Clinical Practice Guidelines and other resources on the Naval Safety Command Aeromedical page for more specific details regarding Physiological Event reporting.

PRE-MISHAP PLANNING

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Pre-mishap planning is a critical step in safety planning for all aerospace medicine professionals who may be involved in aircraft mishap investigation. Planning with local fire and rescue agencies, hospitals, and other safety professionals can help decrease response times in the event of a mishap, thus increasing the probability of rescue for survivors. Additionally, this planning will provide insight into the hazards present at a mishap site and decrease the chance that responders may sustain acute or chronic injuries. An AMO's skills and insight are critical in the development of pre-mishap plans for all aviation units and facilities that support aviation operations. This section provides guidance for aeromedical topics important in pre-mishap planning.

AVIATION MISHAP BOARD

1. Each Naval Flight Mishap (FM), Flight-Related Mishap (FRM), and Aviation Ground Mishap (AGM) shall be investigated and reported in accordance with OPNAVINST 3750.6 series by an Aviation Mishap Board (AMB).
2. Precedence: Mishap investigation and reporting responsibilities of AMB members shall take precedence over all other duties.
3. Membership: As specified in OPNAVINST 3750.6 series, the commanding officer shall assign the following personnel at a minimum to the standing AMB:
    a. Flight Surgeon or Aerospace Medicine Physician (See OPNAVINST 3750.6 series for further guidance); collectively referred to as AMO in this Guide
    b. Aviation Safety Officer (ASO course graduate)
    c. Officer well-qualified in aircraft maintenance
    d. Officer well-qualified in aircraft operations
4. Standing Board:
    a. Each aircraft reporting custodian (squadron) maintains a standing AMB appointed in writing, to immediately assume the mishap investigation responsibilities of the AMB when a mishap occurs.
    b. Officers on exchange duty (other DoD services or foreign military) are authorized to serve on AMBs but may not be the senior member.
    c. Members shall maintain a thorough knowledge of Naval Aviation Safety Program (OPNAVINST 3750.6 series), NAVAIR support resources, the squadron's safety program, and the squadron's pre-mishap plan.
    d. The standing AMB may be replaced entirely, in part, or not at all, depending on member availability and operational requirements.

e. In cases where a unit Flight Surgeon is not assigned, a Flight Surgeon or APA from another command may be designated.

5. Required replacements for members of the Standing Board:

   a. Personnel who were directly involved in a mishap shall not serve on an AMB conducting an investigation of that mishap.

   b. For mishaps involving aircraft manned by an aircrew, at least one member of the AMB shall be a NATOPS-qualified pilot in the model aircraft involved in the mishap under investigation.

   c. A member who has a personal interest in a mishap, which might conflict with the objective and impartial performance of AMB duties, shall not serve on an AMB conducting an investigation of that mishap.

   d. Under no circumstances may an expected endorser of an SIR serve as a member of the AMB investigating that mishap.

   e. AMB members shall not be assigned as members to any other investigation (e.g., JAG) of the same mishap.

   f. The appointing authority, at the recommendation of the senior member, may make replacements and additions to the board.

   g. Individual board members whose expertise is not needed for a given mishap investigation may be excused from active participation (but not the AMB itself) at the prerogative of the senior member.

6. Senior Member:

   a. Shall be a Naval Aviator or Naval Flight Officer.

   b. Shall be senior to the pilot in command and mission commander involved in the mishap being investigated.

   c. On all Class A mishap investigations, the aircraft controlling custodian should appoint a senior member from a command not involved in the mishap – preferably from outside the expected endorsing chain.

   d. On all Class A mishap investigations, the senior member will be grade O5 or higher and a graduate of the ASO Course or Aviation Command Course or have other suitable training or qualifications approved by the aircraft controlling custodian.

7. Additional Members: In unusual or complex mishaps, the AMB may benefit from having officers with specific expertise as members. In such cases the senior member should request the appointing authority assign these additional members to the AMB (e.g., an Aerospace Physiologist, in the event of a suspected Physiologic Episode, Physiologic Event, or Aviation Life Support System (ALSS) concerns, or a Flight Deck Officer in the event of a significant event involving flight deck personnel).

8. Privilege: The privileged status of the information the AMB acquires is one of its most important tools in obtaining complete cooperation from witnesses and in determining the cause of the mishap. Each AMB member should understand that the information derived from his or her work is of a privileged nature and may be used only to improve safety within the Naval Aviation Enterprise.

AEROMEDICAL SAFETY OFFICER (AMSO)

1. The Aeromedical Safety Officer or AMSO can be located at the Wing (USN or USMC) or Group (USMC only) level. AMSOs are Aerospace and Operational Physiologists.
2. An AMSO should be included as an AMB member or technical advisor-to-the-board in Class A mishaps where physiologic episodes/physiologic events occur, emergency egress or bailout occurs, or ALSS equipment is involved. A board that does not utilize the AMSO is often creating additional work for its members and may overlook important physiologic or ALSS issues. At a minimum, an AMSO can aid in the following areas of expertise:
    a. Aviation Life Support Systems (this includes flight gear, ejection seats, NVGs, laser systems, parachutes, radios, rafts and water survival gear).
    b. Physiologic issues
    c. OPNAVINST 3710 / 3750 / 4790
    d. Aeromedical Analysis preparation
    e. Human Factors
    f. Assist with the Human Factors Engineering (HFE) investigation
    g. Augment the Flight Surgeon in their investigative efforts.

PRE-MISHAP PLANS

Thorough squadron and medical facility pre-mishap plans and regular pre-mishap drills will greatly improve the response to a mishap. The squadron and supporting medical facility must have their own written pre-mishap plan.

1. A good pre-mishap plan includes:
    a. Contingency arrangements with appropriate activities for:
        (1) Rescue
        (2) Firefighting
        (3) Explosive Ordnance Disposal
        (4) Logistic support
        (5) Site security
        (6) Photographic coverage
        (7) Medical support (military and civilian) that is compatible with the mass casualty plan and other pre-mishap plans
        (8) Coordination with PAO for the release of information and handling of news media
        (9) Coordination with area law enforcement officials and coroner offices
        (10) AMSO assistance

(11) Wreckage location, recovery, movement, preservation, reconstruction, disposal and release

(12) Notification of key personnel

b. AMB training/periodic drills of the pre-mishap plan (semi-annual drill per OPNAVINST 3750.6 series and quarterly AMB training per CNAF 5100.5A which is appropriate to the unit mission).

c. Contingencies for deployments/detachments.

d. Checklists to guide the actions of all cognizant personnel (SDO, CO, AMB members).

e. References to current OPNAVINST 3750.16C series for the contingency of FAA or NTSB involvement.

f. References to current OPNAVINST 3750.6 series, particularly in regard to the concept and application of privilege in a mishap investigation.

g. Reference to current written agreements concerning the retrieval of remains and jurisdiction of autopsies. (See Appendix T: Memorandum of Understanding with Local Civil Authorities.)

h. Policies for the collection of biological samples.

i. Coverage of aeromedical concerns, including the specific AMOs (by name and their alternate) designation in writing as a member of the AMB and a description of the AMOs responsibilities.

j. The listing of all other standing AMB members and outlines of their duties

k. A mishap investigation kit, with an accurate list of contents that highlights items with a short shelf life (see Aeromedical Mishap Investigation Kit below).

l. Description of the proper handling of post-mishap hazards: ordnance, ejection seats, liquid oxygen (LOX) bottles, canopy jettison cartridges, high-pressure tires, composite fiber materials, hydrazine (F-16s), etc.

m. Guidance with respect to the collection of adjunct data (e.g., logbooks, flight schedules, NATOPS jackets, medical and dental records, DAPA, FAP, mental health clinic records), including perishable data such as weather data, tower tapes, ATC and radar recordings.

n. For PEs, ensure completion of PE Operating Guide elements and Aeromedical Data Sheets by all aircrew.

2. In addition, as part of their pre-mishap planning the AMO should:

a. Be thoroughly familiar with the aircraft, life-support systems, squadron mission and fellow squadron members.

b. Be an active member of the squadron's AMB and be thoroughly familiar with the squadron pre-mishap plan.

c. Work with the Safety Officer to ensure adequate Personal Protective Equipment (PPE) supplies, planning and training for the AMB on hazards at mishap sites including:

(1) Biohazards

(2) Respiratory hazards including composite fibers

(a) Fit check AMB for respirators

(b) Obtain appropriate respirators

(3) Obtain MSDSs for known HAZMAT

(4) Environmental Hazards

(a) Heat/sun exposure

(b) Cold

(c) Disease vectors

(d) Noise

(e) Abrasion / laceration hazards

d. Periodically review the local medical facility's mass casualty plan and pre-mishap plan to ensure their adequacy and see that they are tested with regular drills.

e. Ensure that the local lab is prepared to handle post mishap lab collection efficiently (see Survivor Laboratory Specimen Collection / Working with AFMES section below).

f. Identify local key personnel (such as AMSO, IHO and Technical Representatives) and have their phone numbers on hand.

g. Identify the local coroner, determine jurisdiction and have important phone numbers and memoranda concerning jurisdiction on file. (See Appendix T: Memorandum of Understanding with Local Civil Authorities).

h. Have the names and phone numbers of key personnel at the Naval Safety Command and AFMES readily available. See Appendices A: Naval Safety Command Telephone Numbers, B: Important Telephone Numbers, C: AMSO Telephone Numbers and D:Important Local Telephone Numbers.

i. Identify nearest trauma and burn center, hyperbaric chamber and alternate facilities.

j. Review local airfield SAR and EMS procedures and equipment.

k. Provide required training to local airfield EMS personnel on:

(1) Protection of EMS from aircraft specific hazards at a mishap site.

(2) Treatment of ejection patients including consideration for spinal immobilization when appropriate.

l. Review medevac (air and ground) procedures and equipment.

m. Ensure that the team's immunizations are up to date and comply with applicable BUMED and DHA instructions.

n. Ensure you have a current passport depending on operational scope of responsibility (Civilian and/or Government).

o. Ensure the adequacy of the MTF aeromedical mishap investigation kit (see Aeromedical Mishap Investigation Kit section below).

p. Along with the Safety Officer, ensure squadron mishap investigation kit and pre-mishap plan are adequate, up-to-date and tested with regular drills.

q. Maintain a working knowledge of OPNAVINST 3750.6 series and the command's Safety Management System (SMS).

r. Consider above requirements when deployed.

BLOOD-BORNE PATHOGENS

1. During a mishap investigation, exposure to blood and bodily fluids is a possibility. The risk of bodily fluid exposure leading to infection by a bloodborne pathogen is an important concern for the team investigating a mishap site. The Occupational Safety and Health Act has addressed this hazard potential in 29 CFR 1910.1030 and names aircraft mishap investigators as being "occupationally exposed to bloodborne pathogens." The purpose of this regulation is to limit the occupational exposure to potentially infectious materials, which could lead to disease transmission and illness.
2. To comply with these federal guidelines the Navy updated BUMEDINST 6280.1 series - "Management of Regulated Medical Waste" instruction. This guide outlines who may be potentially exposed, as well as how to handle and how to package biohazardous materials.
3. The bloodborne pathogens of most concern include the Human Immunodeficiency Virus (HIV) and the Hepatitis B & C Viruses (HBV & HCV). Although HIV infection is the virus most feared, HBV is more infectious and poses a greater threat. This is exemplified by the fact that HIV survives in dried blood for less than 24 hours, whereas HBV can survive in a dried state for one or more weeks. In remote or extended on-scene mishap investigations, malaria, Dengue and Lyme disease as well as other community acquired infections may become the primary health concern for mishap-investigation personnel.
4. Four hazard control methods should be used to protect investigators and reclamation personnel from exposure to biohazards at the mishap site:
    a. Familiarity with potential on-scene hazards.
    b. Understand the risks of disease transmission and comply with protective practices.
    c. Investigation/reclamation techniques and instructions may evolve over time and you should be familiar with these BEFORE you get to the scene. Avoid habits that could lead to inadvertent contamination.
    d. Provide annual refresher training for mishap investigators and reclamation specialists.
5. Engineering Controls:
    a. Control entry into the mishap site by designating a biohazard area with a single entry/exit point.
    b. Establish a decontamination site at entry/exit point.
6. Work Practice Controls: (OSHA 29 CFR Part 1910.1030)
    a. Avoid moving or bending sharp metal with bare hands.
    b. Move fabric slowly to avoid aerosolizing pathogens and/or dust.
    c. Walk cautiously over mishap material to avoid slips or falls. Walk around, versus over, the mishap wreckage.
    d. Prohibit eating, drinking, or smoking in or near the mishap site.
    e. If acceptable to the engineering investigator, decontaminate aircraft evidence and non-disposable tools with a 10% bleach solution for at least 10 minutes. (Caution: This solution can be corrosive to metals, especially aluminum. Consider whether disinfecting will destroy mishap evidence).
    f. Wash hands with soap and water after removing personal protective equipment.

g. Cleanly package evidence in approved leak-proof shipping containers and label as biohazardous material for transportation.

7. Use of PPE (OSHA 29 CFR Part 1910.1030).

   a. Handle all mishap material with gloves. Wear leather outer gloves to prevent punctures and cuts to the skin.

   b. Wear Nitrile inner gloves to prevent fluid contact with the skin.

   c. Wear eye and face protection.

   d. Wear puncture-proof footwear, preferably waterproof and washable. Consider disposable over-boots.

   e. Wear disposable outer Biohazard suits (Hazmat suits). Tape wrists and ankles.

   f. Utilize proper procedures for donning and doffing PPE.

8. Pre-Mishap Planning.

   a. Protect yourself first - investigate second.

   b. Anticipate handling of biohazardous materials and plan accordingly. You and your mishap response team must ensure that a "hazardous control plan" which clearly identifies personnel duties and specific procedures for handling potentially infectious waste is part of the pre- mishap plan.

   c. Ensure mishap responders' immunizations are in compliance with applicable BUMED and DHA instructions.

   d. Initial and annual training for mishap investigators in the subjects of biohazards, protection and workplace practices. Make this topic part of the quarterly AMB training in accordance with COMNAVAIRFORINST 5100.5 series.

   e. Procure Biohazard suits, bags and labels for proper I.D. and to mark off hazardous areas. Many commercial companies sell these Hazmat items (see Aeromedical Mishap Investigation Kit section below).

   f. Do not mix personal equipment with mishap-investigation equipment.

   g. Have a bleach solution available to disinfect non-disposable investigation tools.

COMPOSITE-FIBER MATERIAL

1. Composite-fiber material is not something that should significantly alter a squadron's mishap response. Like many other substances in the mishap debris, it is to be understood and dealt with accordingly.

2. Technically, any non-homogenous material (e.g., plywood) could be called a composite material. However, in aviation the term has specific connotations. Advanced aviation composite structures consist of light, strong, stiff fibers, embedded in a "matrix" material. Composites offer two principal advantages: a significant reduction in aircraft weight and outstanding resistance to fatigue, which lowers the lifetime cost of aircraft. The structural properties of composites, such as stiffness and tensile strength, often exceed those of high-strength metals. However, the materials - although very strong - usually are quite brittle (they tend to shatter on impact).

3. The reinforcing fiber most used in aircraft structures is graphite, i.e., carbon. Bismalemide (BMI) and boron fibers (such as Kevlar) have seen some limited applications.

4. Epoxy is the matrix material that is used most. When epoxy burns it readily releases the reinforcing fibers. Even after the visible flames are out, "smoldering combustion" can continue if unburned epoxy remains.

5. Graphite (carbon) fibers liberated by burning are reduced in size from their original form. A small percentage of the total fibers liberated are of a respirable geometry that may be deposited deep in the alveoli and theoretically may pose a threat like that of asbestos. Currently no scientific data supports this theory. Results of studies to date seem to indicate that composite fibers pose no more danger than fibrous glass particles and involve only short-term skin, eye and respiratory irritations. However, their carcinogenic potential is unknown. Due to the potential hazard however, respiratory and skin-protection precautions are recommended by all services when working with burned composites (see paragraph 10).

6. The following naval aircraft (table 1) contain some composite material (with total composite material weight/percentage of structural weight in parenthesis).

TABLE 1. NAVAL AIRCRAFT: TOTAL COMPOSITE MATERIAL AND LOCATION

PLATFORM	COMPOSITE (Matrix, Fiber)	LOCATION
F/18 A-D	Epoxy/Graphite, Epoxy/Fiberglass, Epoxy, Kevlar, Cyanate Ester/Fiberglass	Throughout
F/A 18 EFG	Epoxy/Graphite, Epoxy/Fiberglass, Epoxy, Kevlar, Cyanate Ester/Fiberglass, Epoxy/Nickel Coated Acrylic/Nylon	Throughout
F404 & F414 engines	PMR-15 (Polyimide) Resin/Graphite	Outer Bypass Ducts
F-35	Epoxy/Graphite, Bismaleimide/Graphite	Throughout
C-130	Epoxy/Graphite	Radome, Props, Wing Trailing Edge, Sometimes Flaps
AV-8	Epoxy/Graphite, Epoxy/Fiberglass, Bismaleimide/Graphite	
P-8	Epoxy/Graphite, Epoxy/Fiberglass	Throughout
E-2/C-2	Epoxy/Fiberglass	Flight Controls, Radome
E-2D Rotodome	Epoxy/Fiberglass, Epoxy/Carbon	Throughout
MQ-4	Epoxy/Fiberglass, Epoxy/Graphite, Cyanate Ester/Quartz, Epoxy/Quartz	Throughout
MQ-8	Epoxy/Fiberglass, Possibly Epoxy/Graphite	Unknown Because of Limited Tech Data Rights
H-53E	Epoxy/Fiberglass, Epoxy/Graphite	Fiberglass in Blades and Engine Fairings, Fiberglass and Graphite in Sponsons
H-53K	Epoxy/Graphite, Epoxy/Fiberglass	Throughout
H-60	Epoxy/Titanium, Epoxy/Carbon, Epoxy/Fiberglass	Throughout
H-1	Epoxy/Aluminum, Epoxy/Fiberglass, Bismaleimide/Graphite	Throughout
V-22	Epoxy/Aluminum, Epoxy/Fiberglass, Bismaleimide/Graphite	Throughout, Bismaleimide/Graphite Only in Nacelles
T-45	Epoxy/Aluminum, Epoxy/Fiberglass	Throughout
T-34	Epoxy/Aluminum, Epoxy/Fiberglass	Throughout

T-6	Epoxy/Graphite, Epoxy/Fiberglass	Landing Gear Doors, Radome
TH-57	Epoxy/Aluminum	
OH-58	Epoxy/Aluminum	
F-5	Epoxy/Fiberglass, Epoxy/aluminum & Magnesium	Radome/Throughout
P-3	Polyester/Fiberglass, Epoxy/Fiberglass, Epoxy/Aluminum	Throughout
F-16	Epoxy/Graphite, Epoxy/Fiberglass	Throughout

7. Boron fibers pose only one major concern. When released from the epoxy matrix, whether by cutting, shattering or burning, the fiber becomes an extremely fine splinter. This splinter can easily be driven into the skin causing the same type of irritation as any metal or wood splinter. The best treatment is prevention: wear heavy leather gloves and use caution when handling broken parts with exposed fibers. Avoid walking through burned or damaged debris.
8. ASOs should determine if their aircraft contains composite fiber material and identify specific composite fiber components. Pre-mishap plan training should include identifying the location of composite fiber components and their proper handling, depending on the presence or absence of fire.
9. In mishaps where burned composite fibers have been released due to fire, the following precautions should be taken: Once fixative has contained composite fiber material, the use of NIOSH approved industrial dust masks, gloves, safety goggles and Tyvek coveralls are considered sufficient for work around the crash site where composite fiber material is not being stirred up.
    a. All unnecessary personnel should be prevented from approaching the crash site. Personnel should be restricted from the area downwind of the fire/crash site.
    b. While aircraft wreckage is still burning or smoking, only fire fighters and rescuers equipped with Self-Contained Breathing Apparatus (SCBA) will be in the immediate vicinity of the mishap until the fire chief advises the commander that the area is fire safe. Advanced firefighting techniques, equipment and protection may be required, although the specifics are beyond the scope of this section. The on-scene commander will determine who is authorized to enter the mishap site and when they may enter. Although proximity suits and SCBA should be adequate protection, fire fighters must be aware of the potential puncture/abrasion hazards associated with crash/fire-damaged composites.
    c. Once the fire is out and the wreckage has cooled, fire-damaged composite fibers should be sprayed down with a fixative, such as Polyacrylic Acid (PAA) (also known as B.F. Goodrich Carboset Xl-11). If not available, acrylic floor wax will serve as an acceptable substitute to contain the release of composite fiber material.
    d. One application of fixative does not permanently render the site "safe." Any time wreckage or dirt contaminated with burned composite material is moved, fibers can be liberated and repeat applications of fixative may be required.
    e. Personnel required to enter the mishap area should wear adequate protection. Personnel working with any burned composite materials or within 25 feet of such material should wear the following protective equipment:

(1) Respiratory Protection: Wear NIOSH approved full- face or half-mask respirators with dual cartridges for organic vapors (for protection from jet fuel) and for dust, mist and fumes (for airborne particulate fibers and other dust). All personnel must be fit tested and properly trained in the use of respirators. The use of full-face respirators is recommended because they will eliminate the need for safety goggles.

(2) Eye Protection: Non-vented safety goggles that minimize particulate/fiber entry should be worn when a half-face respirator is used. Safety glasses with side shields are not recommended within the 25 ft boundary area of the mishap site.

(3) Skin Protection:

(a) Coveralls - Tyvek hooded coveralls are required (Tyvek suits coated with 1.25 mil polyethylene will provide additional protection against fuel and biohazards). The coveralls should have a zipper front, elastic sleeves, legs and drawstring hood. External booties will eliminate possible boot contamination and reduce dermal contact potential. They are recommended when available. Any openings or attachment points, especially at the ankles and wrists, should be sealed with duct-tape to keep out particulates.

(b) Gloves - Puncture resistant leather gloves should be worn at a minimum. Optimally, Nitrile gloves should be worn as an insert to the leather glove to protect against bloodborne pathogens, solvent residue and fuel spills. The installation industrial hygienist will determine any additional specific protection requirements. Caution: Do not wear Nitrile rubber gloves when handling burning or smoking composite materials.

(c) Boots - Steel-toed shoes/boots should be worn.

f. If personnel are breaking or cutting either burned or unburned composite parts, the same PPE requirements apply.

10. Once fixative has contained composite fiber material, the use of NIOSH approved industrial dust masks, gloves, safety goggles and Tyvek coveralls are considered sufficient for work around the crash site where composite fiber material is not being stirred up.

11. Burned composite fiber material that requires Engineering Investigation analysis should be treated with a fixative and wrapped in heavy-duty plastic wrap before packaging for shipping.

12. Composite material that is not required for investigation purposes or for which analysis is complete should be wrapped in plastic, labeled as DO NOT INCINERATE and disposed of at an approved hazardous material waste site.

13. All mishap-site personnel should ideally be provided with a suitable shower facility prior to going off duty. To remove composite fiber from the skin, sprinkle talcum power over the affected area and rub gently with a nylon stocking until the fiber is snagged.

14. The AMO assigned to the AMB should contact the nearest naval medical command Industrial Hygienist. The AMO, in turn, will be provided with the latest information and procedures concerning composite fiber hazard mitigation. The AMO should also review the references concerning composite material in the reference section of this guide.

15. Personnel involved in cleanup or handling of large quantities of wreckage should wear the same PPE as noted above for those entering a composite material mishap site that has not been treated with fixative.

AEROMEDICAL MISHAP INVESTIGATION KIT

1. An aeromedical mishap kit (table 2, 3 and 4) should be maintained at all Military Treatment Facilities that support flight operations. This includes ships that support high tempo flight operations. The AMOs/APAs should be responsible for inventory. The Aeromedical Mishap Investigation Kit should be compact, portable (should fit in a backpack) and ready for immediate use. The precise contents will depend on the geography, aircraft type and mission and should be designed for the worst-case scenario. The clinic kit is designed to augment the mishap kit kept by operational units.

TABLE 2. AEROMEDICAL MISHAP INVESTIGATION KIT, MEDICAL

MEDICAL/RECOVERY	REFERENCES/FORMS
Surgical Gloves & Masks	MTF Pre-Mishap Plan
Scissors, Forceps	Inventory of Kit with Expiration Dates
Scalpel & Blades	This Mishap Investigation Reference (Either Printed or Electronic)
Tissue Collection Kits (Min 4) *	Index Cards
Plastic Bags (Various Sizes)	Advice to Witness Forms (NAVSAFECOM CAC-Enabled Site)
Anti-Microbial Hand Soap	SF 523: Authorization for Autopsy
Anti-Microbial Towelettes or Hand Sanitizer	SF 600: Progress Notes
Body Bags & Liners – Due to Size Keep Separately from Portable Kit	Grounding Notices (Down Chits)
	OPNAVINST 3750.6 series with Appendices (Electronic Recommended)
	AFMES Forensic Toxicology Analysis Request Form (AFMES Website)
	Memorandum Notebook (Small)
	Aeromedical Questionnaires (Appendix J – Post-Mishap Aeromedical Questionnaire)
NOTE: Post-Mishap Tissue Collection Kit - 1 prepackaged bag for each person containing at least: 3 red tops, 2 purple tops, 2 gray tops, 1 urine cup, betadine swabs, sterile 2x2s, tourniquet, venipuncture syringe, needles, labels, lab chits, blood drawing instructions, 1 AFMES forensic toxicology analysis request form per patient.	

TABLE 3. AEROMEDICAL MISHAP INVESTIGATION KIT, ANALYSIS

ANALYSIS KIT	
Digital Audio Recording Device with Batteries*	Fresh & Spare Batteries *
Digital Camera 35 -105 Zoom/Macro, Optimally with Flash*	Lensatic Compass & Possibly Laser Range Finder.
Tags	Ruler (Clear Plastic)
Pens, Perm Markers, Paint Markers	Graph Paper (Polar, Grid)
Tape Measure (100 Feet Long)	** Red Flagged Wire Stakes
NOTE: DO NOT store batteries inside electronic equipment as they will leak and damage equipment. *NOTE: Role of 100 wire Surveyor's stakes available at hardware store for a few dollars.*	

TABLE 4. AEROMEDICAL MISHAP INVESTIGATION KIT, ADDITIONAL

OTHER ITEMS OFTEN USEFUL AT THE MISHAP SITE	
Medical Bag	First-Aid Kit
Rubber Bands, Zip Ties	Water - 5-Gallon Cooler
Fluid Sample Bottles	Purchase Forms (SF 44)
Air Navigation Plotter	Inspection Mirror
NATOPS Manual	Whiteboard & Markers
Aircraft Maintenance Manual	Magnifying Glass
Protractor	Calculator/Phone with Trig Functions
Calipers	Chem Lights
Dusting Brush	

2. The following list contains examples of PPE. Equip clinic mishap kits with sufficient stock to protect personnel for multiple days. Be prepared to reorder immediately for high casualty mishaps.

   NSN numbers for this equipment are subject to change and therefore not included. Verify with the supply officer which specific items are required in the kit.

TABLE 5. PERSONAL PROTECTIVE EQUIPMENT

PERSONAL PROTECTIVE EQUIPMENT (PPE)	
*Disposable Over Boots	Steel-Toed Hard Soled Boots
**NITRILE 6 Mil Long Cuff Gloves	Leather Gloves, Assorted Sizes
Biohazard Warning Signs	“Warning” Flagging Tape
Duct Tape	Ear Plugs
Safety Goggles – Fog Free (Use with Half-Mask Respirator)	Tyvek Disposable Coveralls with Hood & Booties (with Olefin Coating) (Canary Suit)
*** Chlorine Bleach Solution	Plastic Bucket & Basin for Disinfecting
Respirators (FIT CHECK REQUIRED)	Half/Full-Mask Small
Half/Full-Mask Medium	Half/Full-Mask Large
Dust Mask	Dust And Mist Filter/Organic Filter
NOTE: Disposable over boots may prevent biohazard contamination of shoes.	
NOTE: Nitrile gloves resist chemicals better than latex but must be worn under leather gloves when abrasion/puncture is possible.	
NOTE: Household chlorine bleach diluted 1:10 with clear water is recommended for disinfecting biohazard contaminated items.	

3. Each AMO should keep a small "go kit" of personal items. Consider the following items for a personal go kit:

TABLE 6. AMO GO KIT

PERSONAL ITEMS	
Water (Canteen)	Water Purification Tablets/Device
Pocketknife/Multi-Tool	Food (MREs/Food Bars)
Sunscreen	Insect Repellent
Hat with Brim/Sunglasses	Mints or Gum
Flashlight (Bulb, Batteries)	Poncho
Heavy Work Gloves	Toilet Paper
Passport/Immunization Record	Cell Phone & Charger
Notebook	Chap Stick
Vicks Vapor Rub	Clothes/Personal Items

POST-MISHAP DUTIES

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The role of all aeromedical professionals involved in the initial phase of a response to a mishap is to ensure the safe triage, treatment, movement and evacuation of casualties. Our first duty is to preserve life and prevent further harm. This must be done with the knowledge that a mishap site is a hazardous environment and safety on the site, as well as traveling to the location, is paramount. In addition to the care of the survivors we are responsible for gathering and preserving perishable evidence. This evidence includes interviews and examinations of survivors.

This section provides guidance concerning the many duties of an AMO post-mishap.

IMMEDIATE POST-MISHAP DUTIES OF THE AMO

1. Safety is paramount. Do not enter a mishap site to triage or treat until cleared by emergency first responders. Mishap sites are hazardous and we do not need additional victims.
2. The priority is the safe triage, treatment, movement and evacuation of casualties. Always strive to preserve life and to prevent further harm.
3. If fatalities occur, determine jurisdiction (see The Autopsy section in the Investigation Tools chapter and Appendix T: Memorandum of Understanding (MOU) with Local Civil Authorities). Bodies of deceased personnel should be covered and left where they are for the period required to take photographs or make sketches documenting their posture and relative position within the mishap site before the remains are moved (see Photography section in the Investigation Tools chapter). Do not move bodies until you are sure you have authority to do so from a local coroner or AFMES (see The Autopsy section in the Investigation Tools chapter and Appendix T: Memorandum of Understanding (MOU) with Local Civil Authorities). Call the AFMES and the local coroner early on. The Aeromedical Division at the Naval Safety Command is another resource for assistance if needed.
4. Draw appropriate labs from survivors. (See Lab Specimen Collection section below).
5. Do physical exams (see Post Mishap Physical Examination section below). The services have agreed that the first AMO to whom mishap victims are brought shall immediately perform examinations and laboratory procedures required by the AMO's service.
6. If possible, keep survivors separate until after conducting interviews.
7. Obtain an audio recorded or written statement from each member of the aircrew (and possibly air traffic controllers or plane captains, etc., as appropriate) recounting the mishap from brief to rescue as soon as reasonably possible. A separate, formal interview is generally performed by the AMB after the initial audio or written statement is obtained. (See Interviewing section in the

Investigation Tools chapter and Appendices H: Guide for Witness Statements and I: Guide for Aircrew Survivors Statements).

8. Distribute the post-mishap aeromedical questionnaires and the 72-hour/14-day history forms. See Appendices J: Post-Mishap Aeromedical Questionnaire and O: 72-Hour and 14-Day History.
9. Notify MTF commander of mishap if additional aeromedical resources or treatment capabilities may be required.
10. Impound ALSS flight equipment and medical/dental records as well as mental health, substance abuse (DAPA/SARP) and Family Advocacy Program (FAP) patient records when applicable. The Aeromedical Division at Naval Safety Command may be able to assist if questions arise regarding access to records.
11. Make appropriate aeromedical disposition for ALL aircrew directly involved with or affected by the mishap.
12. Notifying the next of kin is the duty of the Commanding Officer, typically working through the unit Casualty Assistance Calls Officer (CACO). Often a Chaplain and, if requested, an AMO accompanies the CO or CACO.

POST-MISHAP PHYSICAL EXAMINATION

1. Requirement: Immediately post mishap, a physical examination of all crewmembers and if indicated, passengers and anyone else who may have been a factor of the mishap, must be performed. All branches of the armed services have agreed that the first AMO to whom mishap victims are brought will immediately perform examinations and laboratory procedures required by the affected aircrew's service.
2. The exam should be as complete as the examinee's condition and other circumstances permit, with special emphasis on those areas that may be pertinent to mishap causal or contributory factors. Documentation can be made on Physical Examination Forms (DD2807 and DD2808), Chronological Record of Medical Care (EHR entry or SF 600), or a civilian / military emergency room treatment record. Attempts should be made to gather the following minimum information.
    a. History: A complete medical history is essential. Note all changes from the last recorded history and note if changes were present before, or because of, the mishap. Be sure to make note of any medical waivers, medications, herbal preparations, nutritional supplements or other alternative medicine modalities used. Have patient complete 72-hour/14-day history as soon as practical. See Appendix O:72-Hour and 14-Day History. A history of activities beyond the prior 72 hours extending out to 14 days is indicated for more extensive, long-term evaluations of fatigue. Fatigue-modeling software analysis (SAFTE-FAST) must be performed regardless of mishap class when fatigue is suspected or reasonably considered by the AMB unless specifically exempted by the NAVSAFECOM Aeromedical Division (Code 14). Fatigue-modeling software analysis must also be performed whenever RMI indicates fatigue should be considered as a factor. The USAF requires a 14-day history in addition to the 72-hour history for all mishaps.
    b. Physical examination:
        (1) Vital signs - complete, include height and weight (out of flight gear).
        (2) HEENT as complete as possible, include distant and near visual acuity with and without corrective lenses worn during the mishap (if possible). Audiograms if indicated.

(3) Cardiopulmonary exam - complete, ECG and CXR only if clinically indicated.

(4) Abdominal examination - complete.

(5) GU/Rectal - if clinically indicated.

(6) Spine and Extremities - do a complete exam, document all injuries and limitations in range of motion. (Note if they were pre-existing)

(7) Neurological Examination - required and should be as in-depth as possible.

c. Labs: See Survivor Laboratory Specimen Collection/Working with AFMES section below.

d. Radiography: Perform radiological studies as clinically indicated. After all ejections, bailouts and crashes with or without suspected back injuries, full spinal radiographs are required. If higher level imaging (CT/MRI) of a particular spinal segment is obtained, additional radiographs are not required.

3. Medical Photography: Ensure photographic documentation of all injuries is accomplished. Utilize a medical or base photographer if possible (see Photography section in the Investigation Tools chapter).

4. For all aircrew, review the last two flight physicals and waiver status. All waivers should be documented in the appropriate fields of RMI.

5. Submission: See separate guidance in the ASO RMI Operating Guide on the Naval Safety Command Aviation Division website for specific RMI upload requirements. Generally, all pertinent aeromedical documents shall be uploaded into the Exhibits section of RMI. Examples may include 72-hr/14-day history, SAFTE-FAST reports, autopsy reports, reports for any imaging abnormalities, or 2807/2808.

6. Make the appropriate aeromedical dispositions. Remember, the AMO's history and physical exam have priority over any other interviews.

SURVIVOR LABORATORY SPECIMEN COLLECTION / WORKING WITH AFMES

1. In all Class A and B mishaps and in Class C mishaps where human factors are involved, biological sampling should take place per OPNAVINST 3750.6 series and higher-level instructions. Immediately after a mishap, sufficient blood and urine should be taken for the evaluation of blood alcohol, carbon monoxide and urine drug screen.

   Additional labs such as Complete Metabolic Profile (CMP), Complete Blood Count (CBC) and urinalysis can be obtained as clinically indicated or to complete post-mishap physical requirements. Ensure chain of custody is maintained for toxicology samples submitted to AFMES for each individual using DHA Form 379/AFMES Form 18.

   Lab results are generally considered factual evidence and are not privileged information. There may be exceptions to this, for instance, when an aircrew member admits under privilege that they took an unauthorized medication such as zolpidem or dimenhydrinate. If the AMO then requests additional labs to assess these drug levels via AFMES, this information identifies the AMB's deliberative process and steps should be taken to preserve that result in a privileged status.

   The first option is to send a sample to AFMES with a unique identifier known only to the AMB under which results will be returned. The second option for samples already at AFMES is to request the additional testing via a memo where those able to receive results are specifically listed. Anyone

requesting access to those results and not listed on the memo will be declined. If requesting testing via these mechanisms, direct coordinating communication with AFMES is recommended. Results for each individual tested (once available) will be included in the AA and entered into the appropriate fields of RMI.

Specimen submission instructions (Toxicology Submission Guidelines) and chain of custody documentation (DHA Form 379/AFMES Form 18) may be found on the AFMES Division of Forensic Toxicology Website at: https://www.health.mil/Military-Health-Topics/Health-Readiness/AFMES/Forensic-Toxicology. Please verify current submission requirements directly from the website as these are updated regularly.

2. AFMES requests that the following minimum specimens be collected:

NO fatalities:

Blood:	14mL minimum, 20 mL optimal (NaF, gray top, 10 mL preferred tube size)
	4 ml minimum, 8 mL optimal (EDTA, purple top, 4mL preferred tube size)
Urine:	50 ml (no preservatives, polypropylene bottle)

WITH fatalities (obtained at autopsy):

Blood:	All available up to 100mL (indicate source/location)
Urine:	100 ml (no preservatives)
Bile:	All available
Vitreous:	All available
Liver:	100 grams
Brain:	100-200 grams
Kidney:	50 grams
Lung:	50 grams
Gastric:	50 grams

NOTE: DO NOT USE SST/CORVAC/TIGER TOP tubes (with a gel barrier) for blood collection. The gel barrier may absorb drugs and interfere with measurements.

3. However, as a practical guide, as soon as possible after a mishap collect from each of the aircrew (as well as anyone else who may have been a factor in the mishap) at least: 2 gray tops, 2 lavender (purple) tops, 100 ml urine.

NOTE: Prepare skin with betadine or soap and water. DO NOT USE ALCOHOL.

4. The JAG investigator will want the "objective" lab results and he/she is entitled to them, but you are not required to provide them yourself.

5. The actual number of substances examined in fatalities exceeds 35,000. Despite this impressive capability, substances are still missed because of their short half-life, limited tissue distribution, etc. However, the chances of recovery are substantially improved if the toxicology investigation is directed.

   Therefore, if there is a drug that you would like tested for, specify that on the DHA Form 379/AFMES Form 18 and call AFMES to discuss your request. These lab requests should be submitted as privileged (see section 1 above) if information obtained under privilege led to the request. AFMES

also recommends that a brief summary of the patient's health status and the mishap be enclosed. This information can help the toxicologist select special procedures to supplement the routine analysis.

6. Each specimen should be individually labeled with name, DoD# (preferred) or SS#, and collection date. Please ensure that whichever identifier is used for labeling of specimens(DoD # or SS#), that the same identifier is used on DHA Form 379/AFMES Form 18.

   Package blood and urine separately and do not freeze. Paperwork should be sealed in a separate plastic bag. Place specimens and paperwork for each case in another larger heat sealed or Ziploc plastic bag. Each large bag will only contain specimens from one individual (do not package more than one set of patient specimens in each bag).

   Ensure packaging is compliant with IATA Packing Instruction 650. The shipment MUST be sent via an express mail service such as FedEx®, DHL, U.S. Express/Priority Mail or U.S. Second-Day Mail. For insurance purposes, assign a monetary value of $100.00 or less for all diagnostic samples. Do not send package(s) by Registered or Certified mail, Air Freight, or "Return Receipt Requested" as this will cause significant delays in specimen delivery.

   Mailing Address:
   Division of Forensic Toxicology
   Armed Forces Medical Examiner System
   115 Purple Heart Drive
   Dover AFB, DE 19902

   Packages must be shipped so that they arrive at the AFMES Monday through Friday. Weekend deliveries are not accepted. YOU MUST label the outside of the package with (2) phrases: "Clinical/Diagnostic Specimens Enclosed" and, "Shipment complies with U.S. domestic and IATA international packaging regulations". Failure to submit a properly completed DHA Form 379/AFMES Form 18 for each sample will delay processing, may result in an incomplete analysis of the submitted specimens and may cause test results to be reported improperly.

NOTE: The term "Biohazard" should NOT be written on the outside of the package.

Division of Forensic Toxicology
Phone: (302) 346-8724 or 366-8724 (DSN)
Facsimile (FAX): (302) 346-8822 or 366-8822 (DSN)
Email: dha.dover.afmes.mbx.fortox@health.mil

7. Failure to submit a properly completed DHA Form 379/AFMES Form 18 for each sample will delay processing. May result in an incomplete analysis of the submitted specimens and may cause test results to be reported improperly.

8. Per SECNAVINST 5300.28 series, biological samples collected following an aircraft mishap are considered command directed tests and can be used for fitness for duty determination.

OTHER AMO DUTIES

1. Ascertain and document all injuries of crew, passengers and other personnel involved in the mishap.

2. Coordinate with AFMES, know autopsy jurisdiction, (see The Autopsy section in the Investigation Tools chapter and Appendix T: Memorandum of Understanding (MOU) with Local Civil Authorities) and help provide support for the AFMES team (such as helicopter transport to the mishap site,

assistance at the autopsy as needed, facilitating dental comparison efforts and arranging for dry ice if required).

3. Ensure all victims are free of firearms, pencil flares, smoke markers, or any other hazardous ordnance. You should work with EOD to facilitate this if applicable.
4. For fatalities, do NOT remove any flight gear (other than potentially dangerous items such as pencil flares or sidearms in coordination with EOD) if AFMES is performing the autopsy. If AFMES is not performing the autopsy, direct communication with them is recommended in advance to coordinate support to the local medical examiner and optimize data collection. Full body radiographic imaging both in and out of flight equipment (or whole-body CT if available) with emphasis on hands, feet, head and neck (AP and LAT if standard radiographs) will be obtained during the autopsy.

   Order special views whenever indicated (e.g., sinus series and obliques of the neck). See The Autopsy section in the Investigation Tools chapter. Ensure flight equipment is collected and shipment to MIST is coordinated following the autopsy.
5. Submit lab specimens etc., to AFMES as appropriate (see the Survivor Laboratory Specimen Collection/Working with AFMES section above and the Handling Fatalities Without AFMES Assistance section in the Investigative Tools chapter).
6. Collect the Post-Mishap Aeromedical Questionnaire form. See Appendix J: Post-Mishap Aeromedical Questionnaire. In the case of fatalities, the 72-hour and 14-day history must be constructed from friends, coworkers and family of the deceased. Time is of the essence in gathering this information but be respectful of the family. See Appendix O: 72-Hour and 14-Day History.
7. Maintain close follow-up with those involved to monitor any changes in their medical condition and to obtain further elaboration on the mishap events.
8. Be sensitive to the psychological trauma a mishap may inflict on all, including those participating in remains recovery; counsel or refer as appropriate.
9. Participate fully in the AMB investigation and in drafting the SIR (see the Aviation Mishap Board in Pre-Mishap Planning section above and the Safety Investigation Reports section in the Mishap Reporting chapter).
10. Complete the Aeromedical Analysis (AA) (see the Aeromedical Analysis section in the Mishap Reporting chapter and resources on the Naval Safety Command Aeromedical Division webpage).
11. Together with the ASO, submit the SIR, the AA and any other aeromedically relevant exhibits when complete into RMI. (See the ASO RMI Operating Guide on the NAVSAFECOM CAC-enabled website.)
12. Call NAVSAFECOM's Aeromedical Division as needed for additional assistance.

AMO DUTIES AT THE MISHAP SITE

In summary, the role of the AMO at the mishap site is that of a professional investigator as well as that of a preventive medicine specialist. We must strive to gather data without damaging items that may provide additional information about the cause of the mishap. In addition, we must ensure the health and well-being of all personnel in and around the mishap site. AMOs must inform AMB Senior Members of mishap site hazards and medical investigation status. This also applies to NAVSAFECOM investigators, if present, who own the crash site prior to them releasing the site to the Senior Member.

This section provides guidance on the duties of an AMO at the mishap site.

1. Safety: DO NOT enter the mishap site to triage or treat until cleared by crash rescue. Mishap sites are hazardous and we do not need additional victims.
2. Care of survivors is the first priority (see Immediate Post-Mishap Duties of the AMO section above).
3. The wreckage should be disturbed as little as possible in the process of removing survivors, but remember survivors come first.
4. Ensure that all compressed gas or pyrotechnic-actuated equipment (such as ejection seat cartridges, tip tank ejectors and all ammunition) have been rendered safe. Wait until cleared by EOD. If there is a fatality, ensure you work with EOD to remove pyrotechnic devices and firearms prior to moving the body. Do not remove any other flight equipment from the body before radiographic imaging is performed at the autopsy.
5. Work with the AMB and an Industrial Hygiene specialist as needed to ensure the members of the AMB and recovery team are protected from all identified HAZMAT including bloodborne pathogens, composite fiber respiratory hazards, abrasion/laceration hazards, petrochemical hazards and hydrazine to name a few (see Bloodborne Pathogens and Composite Fiber sections above).
6. Keep your hands in your pockets for the first walk-through.
7. Bodies of deceased personnel should be covered. (See Immediate Post-Mishap Duties of the AMO section above and The Autopsy section in the Investigation Tools chapter). Moving bodies across county and state lines without permission is almost always illegal. See Appendix T: Memorandum of Understanding (MOU) with Local Civil Authorities (CONUS).
8. Body parts and any identifying personal articles should be tagged to identify their exact location. See Appendix P: Search and Recovery of Remains.
9. As a rule, body fluids from fatalities should NOT be collected on-the-scene. The autopsy is the proper time and place for the collection of body fluids for lab testing.
10. All inquiries by the news media will be handled by the public affairs officer (PAO) or the senior member of the AMB only.
11. In remote sites the AMB AMO may be the only medical care available. Ensure that contingency plans are in place for prevention and treatment of medical conditions. The site should have basic first aid supplies and communications equipment to coordinate evacuation of injured personnel. Medevac contingencies should be planned.

RESOURCES

Armed Forces Medical Examiner System:
https://health.mil/Military-Health-Topics/Health-Readiness/AFMES

Forensic Toxicology Services can be provided by AFMES:
https://www.health.mil/Military-Health-Topics/Health-Readiness/AFMES/Forensic-Toxicology

Forensic Toxicology (Comm and DSN): (302) 346-8724 or 366-8724 (DSN)
Forensic Toxicology FAX: (302) 346-8822 or 366-8822 (DSN)
Email: dha.dover.afmes.mbx.fortox@health.mil

AFMES Frequently Asked Questions - Excellent resource for AMB members and family members in fatal mishaps:
https://health.mil/Reference-Center/Frequently-Asked-Questions/AFMES-Medical-Legal-Examinations

Naval Safety Command ASO RMI Operating Guide (under References/Guides):
https://intelshare.intelink.gov/sites/nsc/Pages/ASO.aspx

Naval Safety Command ASO Toolbox:
https://intelshare.intelink.gov/sites/nsc/Pages/ASO.aspx

INVESTIGATION TOOLS

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This section provides guidance to identify, gather and preserve perishable information. Some of the tools used are discussed in earlier sections.

WRECKAGE EVALUATION, RECOVERY AND PRESERVATION

1. Safety of the investigation and recovery team is paramount.
2. Before evaluating the wreckage site, ensure that fires are out and ordnance, ejection seats and Cartridge Actuated Devices (CADs) are disarmed, removed, or isolated by qualified personnel.
3. Ensure site security.
4. The first walk-around should be with hands in pockets. It is a reconnaissance. Carry easily identifiable flags to mark the location of only those important pieces of debris, etc., that you want to collect or further examine on your subsequent walkthrough(s).
5. Attempt to identify and recover the Flight Information Recorder (FIR) and all non-volatile memory devices (e.g., mission card, maintenance card) as soon as possible.
6. The wreckage should not be moved or disturbed for the first 24 hours unless to protect life or property, to facilitate essential military or civil activities, or to protect wreckage from loss or further damage. The purpose of the delay is to allow investigators to assess, plan, then proceed deliberately.
7. Work with the local specialists to identify and diminish potential hazards (biological, respiratory, dermal, etc.) from fuels, hydrazine, composite materials, etc.
8. Ensure personnel entering the mishap site are attired in appropriate PPE.
9. The senior member of the AMB normally controls the wreckage and real evidence unless a Naval Safety Command investigator (Code 90) has been assigned, in which case the investigator controls wreckage and real evidence.
10. Photograph extensively. (See photography section below)
11. The Naval Safety Command investigator or the maintenance member of the AMB will direct personnel to obtain perishable samples (fuel, oil, hydraulic fluid, etc.) early.
12. Major components (engines, ejection seats, hydraulic components, etc.) should not be dismantled in the field without either a Naval Safety Command investigator or a designated Cognizant Field Activity (CFA) engineer on site directing such disassembly.

These experts are required to ensure a quality engineering investigation. Typically, they will not open or remove components in the field as field disassembly runs a high risk of losing vital details. Doing so may disturb the context of the installed part and spoil the opportunity to conduct functional tests of the part as found.

For the majority of cases, disassembly is conducted at the Fleet Readiness Center (FRC) where the proper tools are located, laboratory facilities are available and the disassembly can be conducted and recorded accurately.

13. Utilize Appendix S: Human Factors Engineering Guide as a tool to investigate any element(s) of aircraft or personal gear design, as well as aircrew/passenger-related indicators that may suggest impairment of performance, error in decision-making or operation, or other such human-machine interaction variables.
14. Record the position of switches and instruments early and always be suspect of the switch position while analyzing the mishap evidence. Photographs are adequate for this purpose.
15. Tag and identify parts prior to moving them.
16. Make or obtain detailed wreckage diagrams. (See Diagrams of Wreckage.)
17. Do not reassemble broken pieces and never allow anything to touch the fracture surfaces of broken parts. Mating fracture surfaces risks altering (smearing) the texture of the fractures making subsequent examination difficult. Preserve the fracture surfaces unaltered for examination by a failure analyst.
18. If underwater, have the scene photographed or videotaped before bringing up the wreckage. This will generally be done by Navy divers or Supervisor of Salvage (SUPSALV).
19. Submerged wreckage should be removed as soon as reasonably possible and anticorrosion measures taken (rinse with fresh water, coat with light oil).
20. During aircraft recovery where human fragmentation occurred, a medical representative should be on site to manage disposition of remains that may be located as wreckage is moved. See section Handling Fatalities without AFMES Assistance below and Appendix P: Search and Recovery of Remains.
21. Examination of the damage, its extent and distribution at the crash site may reveal:
    a. Angle of incidence
    b. Speed
    c. Attitude
    d. In-flight fire versus ground fire
    e. In-flight structural failure
    f. Aircraft configuration and integrity at impact
    g. Engine operation
    h. Whether ejection occurred
22. The following may be evident from field examination or might require component shipment elsewhere for engineering investigation:
    a. Position of flight and engine controls at impact
    b. Instrument readings

c. Presence and type of contamination

d. Ejection attempted, sequence interruption and cause

e. Components operating at impact

f. Electrical sources of fire ignition

g. Type/source of combustible material

h. Temperature profile of heat-distressed items

i. Light bulb illumination at impact

j. Trim settings

k. Engine condition, or malfunction

l. Thrust (demanded versus actual)

m. Propeller pitch

n. Flight gear function and utilization

23. Composite fiber materials deserve special attention. See Composite Fiber Materials section in the Pre-Mishap Planning chapter.
24. Once all concurrent investigations (including the JAG investigation) have been completed, the senior member will release the wreckage and real evidence to the reporting custodian.

INTERVIEWING

A successful interview is one that elicits information from a witness sufficient for investigators to appreciate the event/subject as well as the witness did on beholding it (observer) or living it (involved in the sequence of events).

Avoid basing analysis or conclusions on a single interview. Various, seemingly unrelated, possibly contradictory contributions from multiple witnesses can reinforce or contradict other evidence the AMB acquires. Evaluation of the whole body of evidence must wait until later deliberations.

In the meantime, you will want to get witness contributions while they are fresh. An initial, separate recorded audio or written statement is generally obtained as soon as possible after the mishap which can be used to help direct the subsequent interview.

1. Whom to interview: In the broadest sense, anyone who might shed light on people, equipment and events culminating in the mishap. Usual subjects are:

   a. Aircrew, passengers.

   b. Air traffic controllers, plane captains, maintenance personnel, schedulers, operations, etc.

   c. Witnesses who might have seen/heard events leading to, during, or after the mishap. Local authorities and news media responding to the event might have witnesses' names. One witness might lead to another: ask them.

   d. Peers, friends and families of mishap personnel.

   e. Rescuers and other first-responders.

2. When to interview:

   a. Interview as soon as possible after the mishap, before memories fade or are shaped by witnesses conferring with others. Witnesses should be interviewed individually. Although you cannot hold them in isolation, neither should you create opportunities for them to confer (waiting room scenario).

   b. The board is small; witnesses can be many. Prioritize them according to their likely value and schedule accordingly.

   c. Follow-on interviews with select witnesses might be needed to confirm, clarify or elaborate.

3. Where to interview:

   a. An eyewitness is best interviewed at the spot where he/she viewed the mishap, to stimulate state dependent memory.

   b. If not there (for eyewitnesses) and for all others, a quiet and private place.

4. How to interview:

   a. Be prepared.

      (1) Plan the interview so it flows smoothly. A prepared list of questions may not be necessary, but areas of concern should be addressed. See Appendices H: Guide for Witness Statements and I: Guide for Aircrew Survivors Statements.

      (2) Read a witness' written statement if one has been provided. Be aware some people have limited writing ability.

      (3) Witnesses shall not provide information under oath.

      (4) Ideally, interviews would be one-on-one. Two-on-one, however, is typically most efficient and effective for the board (while one asks a question, the other can take notes). Many-on-one is distinctly uncomfortable for the witness and will likely inhibit him/her. If two-on-one, make sure the second party is sitting where the witness can see them, but inconspicuously placed.

   b. Have an audio recording device and omni-directional microphone (if needed) ready. Make sure the combination works ahead of time and load fresh storage media and batteries if applicable. Use it unobtrusively but tell the witness it will be used. Use a separate file for each major witness. Note at the beginning of each recording if the interview is privileged or non-privileged and that the witness/survivor understands the concept of privilege. If possible, utilize speech to text software to simplify transcription of recordings later.

NOTE: The interviewer should ensure security settings do not allow uploads to cloud locations upon recording privileged interviews on personal or command-provided electronic devices.

   c. Stage the interview.

      (1) Dress as you expect the witness to be dressed.

      (2) Arrange seating for conversation. Avoid a 'long, green table' setup. Sit level with the interviewee. Do not allow anything (desk, table, etc.) to come between you and the witness if possible. If a table is necessary, sit at the corner with the witness.

      (3) Make sure you will not be interrupted. Silence/leave cell phones out of the room. No knocks on the door.

(4) Have an aircraft model and a whiteboard. The witness may be able to demonstrate by manipulation or diagram what he/she lacks words to convey.

(5) Have coffee, water, etc. and offer them. Giving something instills trust and encourages the witness to talk freely.

d. Style.

(1) Your uniform, rank and official capacity are potentially intimidating. Allay discomfort, embarrassment, anxiety, or shyness on the part of the interviewee. Approach the interviewee as an equal, especially with junior enlisted. Consider calling the witness by first name or using other informal manners.

(2) Avoid jargon and terminology that may confuse or intimidate.

(3) Do not assist the witness with terminology. The statement should be in words the witness understands.

(4) Do not interrupt the witness.

(5) Observe non-verbal communication.

(6) Tolerate silence. Allow the interview to go as long as the witness needs.

5. Opening the interview.

a. Introduce yourself, shake hands. Be friendly, make eye contact.

b. State your function, the interview's purpose, who will hear the information and its confidentiality (if privileged).

c. Tell the witness why their input is important to the investigation.

d. Obtain sufficient identifying details (name, rank, position and telephone number) to ensure follow-up can be made easily.

e. Prior to beginning the interview, each witness should complete and sign one of the two “Advice to Witness” forms located on the Naval Safety Command website. If you feel that an offer of privilege will amplify the information available to the AMB, then make the offer of privilege and use the “(Promise of Confidentiality) Advice to Witness” form.

f. Ask for the witness' consent prior to using the audio recording device. If the witness objects, remove the recording device from the room or put the recorder/microphone aside, unused. If the witness consents, begin recording and put it out of the line of sight between you, so the witness is not distracted by its presence. With recording device running, state the date, name the personnel present at the proceeding, remark whether the interview is privileged and (if applicable) ask the witness if they understand the concept of privilege. Use a separate recorded file for each major witness.

6. Begin.

a. Start with questions the witness can answer easily (what you were doing when the incident occurred, vocation, familiarity with aviation, vantage point). The purpose is as much to allow the witness to become comfortable with talking as to elicit information.

b. If the recording device is running, concentrate on the witness, not your notes. If the device is not running, priority remains with keeping the witness engaged and talking. With two interviewers, one asks while the other takes note of highlights.

7. Narrative.

a. Use open-ended questions like, "What first drew your attention to the aircraft and what happened after that?"

b. Do not interrupt. Let the witness talk.

c. Reward the witness when he signifies his narrative is complete by expressing appreciation for his/her time and effort.

d. There is no requirement for repetition, but if you want to hear the narrative again or from one point to another, invite the witness to do so. Bear in mind: they may wonder if you were paying attention.

e. If you consider it helpful, you can play the audio recording for the witness to stimulate recall.

8. Questions.

a. After the narrative, specific questions are appropriate.

b. Pose questions at the witness' level of acquaintance, as indicated in the preceding narrative.

c. Questions become more specific as the interview progresses, be careful not to get ahead of the interviewee. As questions move from general toward specific, jeopardy of leading the witness increases.

d. Do not inform or educate the witness by providing detail or understanding that they did not bring to the interview. Recognition memory exceeds recall memory; recall might be enhanced if the proper recognition cues are provided. Those cues should be gleaned from the witness' own account, not provided by the interviewer. See the progression of follow-up questions below to elicit cues.

(1) General: So, "the helicopter began to spin?" Please describe that again with as much detail as you can recall.

(2) Less General: Now, "just as it began to spin, "what do you remember about this portion of the helicopter?" (pointing along the tail section of the model).

(3) Specific: So, about the moment the helicopter began to spin, can you remember anything about this area? (pointing to the tail rotor of the model).

(4) More Specific: Did you notice whether or not the tail rotor was spinning?

NOTE: The two general questions do not lead and the information revealed by them is more likely to be accurate. With the specific question the witness may feel pressure to remember "something" and may report details they did not observe. The more specific question is leading and can contaminate the memory of the witness. It should be avoided or held to the last.

e. Near the end of the interview, ask the witness to try to think of anything they might have missed or would like to add. Ensure mishap pilot/aircrew has thoroughly covered their egress and recovery. This could help give clues to the cause of an injury and/or provide data for crashworthy capabilities of seating and flight gear.

f. The closing question should be, "What do you think caused this mishap?" This question, when the witness is most comfortable with you, might give clues as to their biases.

9. Points to consider:

a. Establishing a witness' credibility is important, but do not be overbearing in trying to do so. Avoid antagonism in the interview.

b. Immediately after the interview, write down your impressions, thoughts and concerns. Note your assessment of the witness' credibility.

c. Transcribed witness statements do not have to be signed. A participating board member may attest to its accuracy as a record.

d. A witness might regard the interview as a forum to voice opinions or grievances unrelated to the mishap. Do not engage a witness on moral or legal responsibility of the crew, Navy, or government. Steer the witness back to observations related to the mishap. This is an interview, not a free-ranging discussion; your purpose is to determine cause so similar events can be prevented.

e. Exaggeration can color an interview after a witness has repeated the story several times (fish story analogy). A witness might inflate or temper their account as a result of peer pressure, or in response to the interviewer's style (how questions are posed, nonverbal cues as answers are received). Witnesses tend to fill in blanks in their observations/memory after they have had time to apply logic or to adopt details from others.

f. A witness' location (vantage point) might explain differences from others' accounts.

g. A witness downwind of a mishap may hear sounds inaudible to an observer upwind.

(1) Sound deflected by walls or buildings may cause the witness to erroneously report direction, origin, or dynamic level.

(2) Background noise at a vantage point might mask sounds noted by observers elsewhere.

h. A witness looking toward the sun sees a silhouette, while a witness whose back is to the sun may note color and other detail.

i. A witness can confuse the sensory inputs of seeing the fireball of the crash and hearing the explosion of the crash. This confusion may make them think there was an inflight fire when there was not.

j. A witness can transpose the observed order of events or recall significant details but places them out of sequence (e.g., a distant witness beholds crash/flash/boom and reports boom/flash/crash).

PHOTOGRAPHY

Photos record evidence and are later employed for analysis and to illustrate reports. Digital photography is now the primary means of photo documentation. Plain film photography is not necessary.

1. Privilege and Photography.

a. A photograph which records the as-found condition of an object or scene is real evidence, factual and non-privileged. The same is true if a scene is viewed from another angle or if an object is

subsequently rolled/turned to expose its various sides (bear in mind, any movement of evidence alters the “as-found” condition. The same applies to subsequent views of aircraft and component disassembly, all the way down to microscopy and SEM (scanning electron microscope). As-found or as-revealed = real evidence.

b. Placement of a known object (ruler) or label ('north,' 'left wing,' '#1 engine') in the view for scale, clarity, or orientation does not make a photo privileged.

c. Captioning or marks which are speculative or reflect AMB deliberative process will make a photo privileged.

d. A photo staged or arranged to illustrate a hypothetical condition or association is speculative on the Board's part and privileged. There is no prohibition on taking such photos. Simply observe that speculative content is not real evidence and requires limits on distribution.

e. Photos of injuries, fatalities and autopsy photos are sensitive information and are not for general distribution; these are usually included only as part of the Aeromedical Analysis (AA). These photographs should be treated the same as privileged content in terms of security and distribution. Include only those photos which illustrate injuries relevant to findings or analysis discussed in the AA or SIR.

f. An AA is a privileged document as a whole. Consequently, photos within an AA are privileged, regardless of the image. Privileged and sensitive photos uploaded to the Exhibits section of RMI need to be appropriately marked and located.

g. Pilot’s Landing Aid Television (PLAT) / Integrated Launch and Recovery Television System (ILARTS) recordings of flight deck operations are initially classified Confidential. Classify them as secret if they reveal a serious deficiency in aircraft or carrier operations that would degrade the ability of the fleet to perform its mission. Contact, NAVSAFECOM, Deputy Director, Aviation Safety Programs (Code 10A) who will review PLAT/ILARTS tapes for declassification. Do not upload PLAT/ILARTS Tapes to RMI until an unclassified determination is made.

h. The AMB should have custody of all digital photographs related to the mishap and should monitor/control their distribution. In the age of digital photography, caution must be taken to ensure photos are shared and transmitted only as necessary. Be sure to check that privileged or sensitive photos are not automatically uploaded into the cloud or any other data storage services.

2. Who shoots?

a. The A Team. When possible, use an experienced photographer (Navy or Marine combat photographer). The product is superior and the division of labor takes a load off the AMB.

(1) The photographer is an adjunct to accompany you and shoot as you direct; he/she is not an investigator or mind-reader.

(2) Tell them what objects/features are of interest. Give them a name for what they are shooting (they keep a log but might not know an object's nomenclature). Ask for a wide shot to precede each detail/close-up shot.

b. The B Team. Anyone can point-and-click. Amateur photography beats none at all. Mishap site conditions are subject to change with time, weather and human activity. Do not forego timely photography for professional photography.

3. What to shoot:

   a. Short answer - Just about everything. Longer answer follows: An investigation is occasioned by a mystery. A crash scene and evidence on it will change with each passing day, due to exposure to elements, vegetation recovery and human activity. Until the investigation is far along (weeks after the event), many things are of equal interest and their (original) conditions must be documented before changes occur.

   b. Bottom line: photograph anything for which the location, condition, number (or another descriptor) is curious.

4. How to shoot:

   a. Number and identify pictures in a log as they are taken, noting location or subject. If privileged or sensitive, it.

   b. Overshoot and under-print.

   c. Use color imaging, not black and white.

   d. Consider using a small white board (or notepad, or index card) to write captions on and place it in the foreground of pictures as they are taken.

   e. Use flash for fill-in (light in dark places) but avoid night photography unless you have auto-focus capability.

   f. Use/place recognizable objects in the scene as size references when possible. In wide shots, the presence of a person may be sufficient. In close-ups, a hand or portion of a ruler works well.

   g. Consider taking photographs of a witness as they demonstrate what was seen (using an aircraft model). Likewise, a photo of an eyewitness at their vantage point shows field-of-view.

   h. Although hundreds of photos may be taken, your report should include only those needed to illuminate the evidence for a reader.

5. Equipment:

   a. Digital Photography

      (1) Higher image resolution is better

      (2) Zoom/macro capability

      (3) Flash

      (4) Universal/non-proprietary image format (e.g., .JPEG)

      (5) Frequently backup to enduring media such as a computer/external hard drive or other non-cloud location.

   b. Conventional (film) photography: In a pinch you may obtain a disposable camera enroute to the crash site.

   c. Miscellaneous supplies:

      (1) Spare batteries/charger

      (2) Ruler (6-12 inch)

(3) Notebook/pad (for photo log and captioning shots)

6. Scene coverage (ground):

   a. Show enough background to provide orientation. Several pictures in a sweeping sequence can provide panoramic orientation. A wide shot, medium shot and close-up may encompass the scene, if you have sufficient elevation over the site. Otherwise, shoot the big picture from four compass points.

   b. Bodies and ALSS (multiple views) in position before moving (the former are sensitive, but not privileged). Photograph large body part specimens close-up and in relation to the majority of the

      wreckage or mishap scene. Be sure the numbered tag is showing. See Appendix P: Search and Recovery of Remains.

   c. Several views of major wreckage and parts

   d. Detailed views of selected components:

      (1) Cockpit: instruments, switches, breakers, controls.

      (2) Flight control surfaces, actuators.

      (3) Engine(s): inlet, discharge, accessories, connections.

      (4) Fuselage skin: soot pattern, deformation, rupture.

      (5) Equipment with curious damage.

   e. Ground scars, gouges and impact marks; include tree/obstacle strikes (if any) before ground impact.

   f. View from the vantage point of each eyewitness.

7. Aerial coverage (usually by helicopter or drone):

   a. Overall area (will aid diagramming, plotting wreckage).

   b. Views from flight path into crash site.

   c. Consider retracing the flight path using a video camera (same time of day if possible).

8. Survivor coverage:

   a. Multiple views in full flight equipment; close-up of damage to flight equipment.

   b. Views of injuries out of equipment; close-ups, if helpful.

   c. Views of survivor reenacting the mishap.

9. Special Photography

   a. Ultraviolet and Infrared Photography:

      (1) Special lighting (UV) and color filters (#12 yellow) might reveal features not visible to the eye.

      (2) Infrared photography has been used for:

         (a) Wreckage in heavy foliage, or shallow water.

(b) Identification of ground scars, tree strikes.

(c) Fuel, oil spill patterns

(3) These might require special equipment.

b. Photo Micrographs:

(1) Ultra-close-up pictures with high magnification. Typical documentation for scientific examinations.

c. Stereo Photography:

(1) If three-dimensional depth is important.

10. Autopsy coverage: In most fatal mishaps, photographs of the deceased will be taken at the time of autopsy. And in most mishap scenarios, the AMO will not be photographing the body by him/herself. However, the AMO should ensure that appropriate photo documentation occurs. Depending on the circumstances of the mishap, the deceased's body may or may not have ALSS gear fully or partially removed, either for extraction or resuscitation purposes. It is incumbent on the AMO to ensure that the ALSS gear is preserved and photographed if removed from the body. If photography of the deceased does occur at the mishap site, the AMO should ensure that photographs are taken in ALSS gear and that the gear remains on the body for transport to the morgue. Photography should include all the following when feasible:

a. Total body photographs from all directions before removing flight equipment.

b. Close-up views of damage to flight equipment and associated injuries (with and without a ruler).

c. Close-up views of all exposed skin while in flight equipment (with and without a ruler).

d. Total nude-body photographs from all directions.

e. Close-ups of all wounds, anomalies and other findings.

f. Other views as indicated.

g. Photos of radiographic imaging may be considered if particularly relevant.

h. Autopsy photographs are to be held by the AMO member only and shared only when they are the subjects of AMB deliberations.

i. Autopsy photographs are sensitive and not for routine distribution.

j. Autopsy photographs and photos of victims that demonstrate useful information relevant to the Aeromedical Analysis should be uploaded into the Medical Analysis exhibit section. Only in the case of AFMES not being directly involved in the autopsy will AFMES need copies of the photographs sent to them along with the autopsy report. Contact AFMES directly to coordinate submission.

DIAGRAMS OF WRECKAGE

Diagrams are helpful in many mishap investigations and are necessary for those without survivors, witnesses, or with suspected structural failure, in-flight break-up, or with midair collisions.

1. Use appropriate technology for the scale of the task. If distances are short, use a tape measure. If distances are great, use GPS.

2. There are multiple ways to depict wreckage distribution. Use one suited to the context of the site and wreckage.

   a. Polar Diagrams are suited for mishaps in which the primary velocity vector is vertical and thus the wreckage scatter pattern is roughly concentric around the main impact point. Use the main impact point as the center and trace out, using a compass and tape measure (or walking wheel) to measure direction and distances. Use polar graph paper if possible.

   b. A Linear Diagram or Tear Drop Diagram is a variation of a polar diagram and is most effective if the scatter pattern falls along the main flight path vector.

   c. Grid Diagrams are most effective if the scatter pattern is widely dispersed (multiple ground impacts, midair collision, in-flight breakup). Establish a line along the flight path vector and a baseline perpendicular to this line prior to the first impact point. Trace out from the flight path line, parallel to the baseline, at 25- to 50-foot intervals.

3. On diagrams, consider including the following:

NOTE: to the extent any of these are deductive, the document becomes privileged.

   a. Date and time of mishap

   b. Type aircraft and registration number

   c. Magnetic north

   d. Point of initial contact

   e. Flight path vector

   f. Safety equipment

   g. Scale and elevation

   h. Significant aircraft parts

   i. Ejection seats

   j. Crew locations

   k. Ground fire limit

   l. Ground markings

   m. Witness location

   n. GPS registration of salient points

      (1) Impact point

      (2) Furthest wreckage cast

      (3) Major components

   o. Prevailing wind velocity and direction at mishap

   p. Direction of the sun at mishap

   q. Phase of the moon at mishap

   r. Degree of moon above the horizon at mishap

s. Direction of the moon at mishap

t. Direction to nearest airport

u. Direction to nearest town

v. Direction to nearest landmark

w. Direction to nearest navigational aid

4. Aids to site diagramming:

   a. Enlisting assistance from Seabees or public works surveyors in making diagrams

   b. Using terrain contour (cross section) diagrams if these might aid in investigation and evaluation (e.g., for sites with vertical development)

   c. Using aerial photography

   d. Using sketches. See Appendices P: Search and Recovery of Remains and R: Solving Crash Force Problems.

AVIATION LIFE SUPPORT SYSTEMS (ALSS) INVESTIGATION ASSISTANCE & MISHAP INVESTIGATION SUPPORT TEAM (MIST)

1. ALSS investigation is complex because it involves interfaces between personal flight equipment, life support systems, escape systems and survival equipment. Each of the preceding is a separate technical area, supported by engineering and technical personnel at scattered locations. A mishap investigation usually requires concurrent attendance by several engineers/technicians to consider the combined systems as a committee. A Naval Aerospace Physiologist can coordinate this for you and is a great asset to have at the mishap site due to their expertise in flight gear and human systems interaction.
2. Naval Air Systems Command's (NAVAIRSYSCOM) systematic approach to examining ALSS in aircraft mishaps is called the Mishap Investigation Support Team (MIST). MIST (led by an onsite coordinator) will provide factual data to the concurrent investigations (AMB, JAGMAN) concerning the operation of the total egress system including factors that might have contributed to injury or fatality of aircrew. The MIST will provide a human factor engineering (HFE) evaluation and report of the ALSS. This report is non-privileged and is included as an attachment to the SIR. For further information on HFE without MIST team assistance, see Appendix S: Human Factors Engineering Investigation.
3. Mishap data from MIST investigations has proven essential to saving lives and provided the Naval Air Systems Team with information on ALSS involved in mishaps for inclusion in their database, for trend analysis and to justify improvements.
4. MIST involvement in a mishap investigation is recommended if the aircrew experienced problems with ALSS resulting in serious injury or fatality. ALSS includes ejection and crashworthy seats, parachutes, propulsion systems, night vision devices, radios and personal flight equipment. Even if no known problems were experienced with the ALSS, MIST involvement can at times find problems with ALSS which did not result in injury or death. These can demonstrate issues with ALSS that could lead to separate HAZREP reporting and possibly other issues in these systems fleet wide. For example, despite a successful ejection and PLF, the drogue chute may fail, which might signal a depot level error, suggesting a problem with various chutes packed by a certain individual.

The Naval Safety Command Mishap Investigator detailed to a mishap investigation will contact the MIST coordinator for assistance. If a Naval Safety Command investigator does not attend and MIST assistance is needed, contact the Naval Safety Command Code Aeromedical Division or the MIST Coordinator at 301-609-0236.

5. Instructions for disposition of ALSS equipment are in OPNAVINST 3750.6 series. For additional clarification contact the Naval Safety Command.

FIRE INVESTIGATION

Due to the complexity of fire evaluations with aircraft mishaps, this portion of the investigation is generally directed by Naval Safety Command investigators and FST engineers. The following information is retained to help provide a brief foundation of knowledge regarding the basic concepts for fire analysis.

1. Clues to the origin, progress and cause of fire can be gleaned from deliberate examination of wreckage. The task is made difficult by destruction of some parts because of fire. Key questions are:
    a. Was there an in-flight fire?
    b. Was there a ground or post-impact fire?
    c. Where did the fire start; what ignition and fuel sources were available at the location?
2. To start a fire, three conditions must exist: combustible material, oxidizer and ignition. To sustain the fire, ignition must be continuous or there must be enough heat to constitute a continuous ignition.
3. Flammable liquids (fuel, oil, hydraulic) burn as vapor. A mist (e.g., pressurized fluid escaping from a small orifice) behaves as a vapor, so it is possible to have fire conditions at temperatures lower than a liquid's flash (vapor) point. See Appendix K: Fire Temperature Estimations.
4. Sources of ignition can include:
    a. Hot surfaces (e.g., engine components, overheated equipment, bleed air duct, auxiliary power units, in-flight galley)
    b. Electrical arc (short, static discharge, lightning)
    c. Friction spark
5. Note the wreckage distribution for missing parts. Parts may have been burned off and may be lying along the flight path. If so, these would give evidence of fire inflight.
6. Note the state of fire extinguisher bottles and condition of fire detectors.
7. Note metal fractures that have been subjected to heat. Parts that fail at elevated temperatures leave clues that a structural engineer or metallurgist will recognize.
8. Note the status of self-locking nuts held by nylon that may have melted away.
9. Safety wire should remain following a normal ground fire.
10. If an inflight fire is contained within the aircraft, it may be indistinguishable from a post-impact fire. A fire which burns through the structure/skin gains exposure to the slipstream.

This creates two effects:

a. It can increase the intensity of the fire. Inflight fires can burn in excess of 3000º F due to ram air replacing oxygen depleted in combustion. If melted components have a melting point above those typical in ground fire, inflight fire should be suspected. Temperature of ground fires is about 1600º to 2000º F. See Appendix K: Fire Temperature Estimations.

b. It will develop a fire pattern which flows with the slipstream. Molten metal from an inflight fire will be splattered by the slipstream and found distal to the fire source; metal liquefied by ground fire will drip with gravity and puddle. An inflight fire's soot pattern follows the airflow, which is usually the slipstream. The soot pattern of a ground fire usually flows upward and with the surface wind. (Soot does not adhere to surfaces hotter than 700ºF).

11. More on soot or char:

a. Soot on fractured/torn edges indicates deposit after fracture.

b. Scratches, scuffs and smears in soot/charred paint indicate damage after soot deposit/heat damage.

c. Shadowing effect reveals airflow direction. Soot traveling with airflow deposits on the upstream side and flanks of an object; the lee side will be clean. This applies all the way down to items as small as rivet heads.

12. Wreckage buried at impact (crater content) should not be exposed to post-impact fire; evidence of fire damage would indicate inflight fire.

13. Sometimes, the extent of aircraft destruction or the wide scatter at the site complicates appreciation of a soot pattern in the field. This is compounded when there has been a subsequent ground fire. Wreckage layout (two- or three-dimensional) is helpful to evaluate signs of fire.

THE AUTOPSY

1. Each fatal mishap should have three "autopsies:"

- Of the man/woman (victim)
- Of the machine (aircraft)
- Of the mission

Only the AMO participates fully in all three.

2. The AMO plays a critical role in jurisdictional issues. The Navy has jurisdiction of the victims' bodies when the event occurs on property that is under exclusive federal jurisdiction (paragraph 3.b. below). However, many bases fall under concurrent jurisdiction, some fall under local jurisdiction and others may have areas that fall under different jurisdictions within the same base. The AMO should establish a working relationship with the local authorities, explore and discuss the options and preferably reach a formal pre-mishap agreement regarding the jurisdictional issues. The base Judge Advocate as well as the Armed Forces Medical Examiner (AFME) can assist the AMO with jurisdiction issues.

3. Federal Law (10 U.S. Code 1471 (1999)) gives the Armed Forces Medical Examiner System the authority to authorize postmortem examinations subject to the following considerations:

a. If the jurisdiction is concurrent or exclusively civilian, then the local coroner or medical examiner will have primary jurisdiction. He or she may:

(1) Retain jurisdiction and perform the autopsy. See section Handling Fatalities Without AFMES Assistance below and Appendix T: Memorandum of Understanding (MOU) with Local Civil Authorities.

(2) Retain jurisdiction and request that a representative of the Armed Forces Medical Examiner System perform the autopsy under his/her jurisdiction (in military aircraft mishaps the AFMES will nearly always agree to do so).

(3) Release jurisdiction to the Navy, thereby making jurisdiction essentially federal as the AFMES has secondary jurisdiction over all active-duty deaths (paragraph 3.b. below). In these cases, the AFMES will authorize the autopsy.

(4) Retain jurisdiction but not perform an autopsy. In these cases, the AFMES can authorize an autopsy after the body is released (under secondary jurisdiction). While the authority of the AFMES is subject to the exercise of primary jurisdiction by the state or local government, it is not limited in those cases where the investigation is incomplete (e.g., an autopsy was not performed by the local coroner or medical examiner).

b. For exclusively federal jurisdiction, the AFMES has the authority to order the autopsy. The Commanding Officer may alternatively sign the autopsy authorization form (SF 523), but this is unnecessary if the AFMES is engaged.

4. The Armed Forces Medical Examiner at the Armed Forces Medical Examiner System (AFMES) will, whenever possible, conduct the autopsies on military aircraft mishap fatalities. Requests for their assistance are formally made by the appointing authority to the controlling custodian. However, when such a request is obviously forthcoming, it helps if the AMO calls the Armed Forces Medical Examiner as soon as possible so they can "grease the skids." AFMES will not launch a team until they are confident the team will have access to the bodies (determine jurisdiction in advance).

The Armed Forces Medical Examiner System
115 Purple Heart Drive
Dover Air Force Base, DE 19902

Email: dha.dover.afmes.mbx.information@health.mil
https://www.health.mil/Military-Health-Topics/Health-Readiness/AFMES
DSN: 366-8648
Phone: 1-302-346-8648 (General Number)
1-302-346-8648 (Forensic Toxicology)
1-202-409-6811 (On-call Death Investigator)
Fax: 1-302-346-8819

5. The AFMES representative acts as the direct representative of the CNO and controls medical evidence. To correlate injury patterns and aircraft surfaces and damage, the AFMES representative may visit the mishap site and inspect the wreckage (they often need helicopter support, which the AMO should help coordinate). An MOU is planned to formalize AFMES access to privileged information, however, as of the date of publication this does not exist.

6. Prior to departing from the area, the AFMES team will debrief the AMB or sometimes just the AMO. They will often initially provide a verbal preliminary autopsy report with the major injuries and give a cause of death and method of primary identification. When all medical evidence is gathered and analyzed (typically after 45-60 days), a final autopsy report, which describes the injuries in detail

and includes the results of ancillary studies such as toxicology and DNA analyses, will be sent to the AMB. This report may cover the following areas of concern:

- Survivability
- Injury analysis
- Preexisting disease
- Toxicology analysis
- Personal and life support equipment
- Restraint and egress systems

7. On occasion, a local pathologist, either civilian or military, will conduct the autopsies (with advice from AFMES either directly by telephone or through the AMO; see section below Handling Fatalities without AFMES Assistance). The AMO should assist the pathologist in the autopsies and be prepared to lead the inquiry along appropriate lines to obtain the required aeromedical information.
8. Under no circumstances should the AMO conduct an autopsy without the benefit of an on-scene pathologist. See section Handling Fatalities without AFMES Assistance below.
9. Resist pressure to release remains before a site search is complete. See Appendix P: Search and Recovery of Remains.
10. If dissociated remains are found late in the investigation (after the autopsy or funeral), the AMO should take possession of them and call the AFMES to determine if they are of use in the investigation. If they are, the AFMES will direct their shipment or disposition. If they are not, it is the AMO's responsibility to contact the Navy's Decedent Affairs Office and work with them to arrange disposition. See Decedent Affairs section below.
11. The objectives of the autopsy of aircraft mishap victims can be summarized in a series of questions:
    - Who died?
    - What was the cause of death?
    - What was the manner of death?
    - What was the nature and sequence of traumatic events?
    - What specific interactions between victim and aircraft structures or components resulted in fatal injuries?
    - If the victim(s) survived the decelerative forces of the crash, why did they fail to escape from the lethal post-crash environment?
    - When in-flight egress systems are available, why did the victim(s) fail to escape?
    - To what feature of the mishap or of the aircraft can the escape of the survivors be attributed?
    - What role, if any, did the victim(s) play in causing the crash?
    - Who was flying the aircraft?
    - Was the pilot incapacitated?
    - Were there physiological or medical causal or contributory factors in the mishap? Would any modification of the aircraft or of its equipment have improved the chances of survival of those killed, or reduced the severity of injury to the survivors?

- Would the incorporation of such a modification have any detrimental effects?

The first three questions are addressed during every medicolegal autopsy since the answers are required for issuance of a death certificate. The remaining questions define the basic subject area of aviation pathology.

12. A distinction is made between the cause of death and manner of death:
    a. Cause of death: The disease, injury, or injuries that resulted in the death.
    b. Manner of death: The circumstances under which the death occurred. These are categorized as:
        (1) Homicide
        (2) Suicide
        (3) Accidental
        (4) Natural
    c. In some cases,
        (1) Undetermined
13. Criteria for identification of remains:
    a. Positive (Scientific):
        (1) Fingerprints
        (2) Footprints
        (3) Dental comparison
        (4) DNA
        (5) X-ray comparison
    b. Presumptive:
        (1) Visual
        (2) Personal effects
        (3) Scars
        (4) Tattoos
        (5) Flight manifest

NOTE: Identification should be based on at least one and preferably two, positive (Scientific) methods as delineated above.

14. Following the autopsy, the prompt release of the remains for preparation and shipment is of major importance. However, resist pressure to release remains identified by less than optimal (presumptive) means.

DEATH CERTIFICATES

1. Death Certificates for fatalities that occur in areas of civilian jurisdiction are typically signed by the local coroner or medical examiner, even if the investigation of the death has been turned over to the military. Military investigators will pass pertinent information to the local medical examiner to assist with completion of the death certificate.
2. If the fatality occurs in an area of military jurisdiction, a physician from the AFMES or a military physician deemed by the AFMES will sign the death certificate.
3. The death certificate cannot be signed until positive identification of the victim has been completed. While this seems simple enough, the command or their seniors, may exert pressure on the investigating team to make a declaration of death based on the "reasonable man theory," i.e., "We are only missing one plane," or "We saw him get into the cockpit," etc.

   Respectfully resist such attempts. Identification can usually be made within a week, even in cases of total body fragmentation or charred and/or comingled remains.

DECEDENT AFFAIRS

1. In the unfortunate event of a fatality, the AMO's responsibilities extend beyond identification and recovery of remains. Once the recovery phase is over, disposition of the remains commences. Just as in the hospital, discharge planning begins at admission. Getting the proper agencies or offices involved early in the investigation may help you avoid preventable problems.
2. The Navy's Mortuary Branch at NPC (PERS-00C) is responsible for managing arrangements following the death of a Service member. They will generally be contacted by AFMES and coordination of remains will be through that communication. There are very few situations where the AMO will need to reach out to the Mortuary Branch directly. If needed, their contact information is as follows:

Active-Duty Death Inquiries
Monday thru Friday 0730 - 1600 CST
Toll free - 1-866-787-0081 (Group Ring)
After hours, weekends and holidays:
(901) 634-9279 (Navy Casualty Duty Phone)

All Other Mortuary-related Issues (including Burial-at-Sea, pending claims, etc.)
Monday thru Friday 0730 - 1600 CST
Toll free - 1-866-787-0081 (Group Ring)
EMAIL FOR ALL MORTUARY ISSUES: mill_NAVMORT.fct@navy.mil
https://www.mynavyhr.navy.mil/Support-Services/Casualty/Mortuary-Services/

3. The Navy Mortuary Office in Millington, TN can assist the command in the following areas:
   a. Securing a funeral home near the mishap site to assist with preparation of the remains.
   b. Arranging for re-association of any unused tissue samples from AFMES.
   c. Coordinating transportation of the remains from the medical examiner's (ME) office to the local funeral home.
   d. Coordinating transportation of the prepared remains from the local funeral home to the funeral home selected by the Primary Next of Kin (PNOK), if necessary.

(1) The remains are typically accompanied by an escort, which the mishap squadron should provide.

(2) Navy Mortuary Branch will also put the command in contact with the Casualty Affairs Office 1-800-368-3202 or 901-634-9279 (after hours). They will request that the command fax a death certificate to them.

HANDLING FATALITIES WITHOUT AFMES ASSISTANCE

1. Mishap: It is possible that a mishap with fatalities will not have the benefit of on-scene AFMES assistance. However, the AFMES will review all fatal military aircraft mishaps, even when an onsite investigation team is not dispatched. The following is a guide for the AMO to use in coordination with civilian local medical examiners (and AFMES by phone if possible) to collect as much useful data as possible to send to AFMES.

2. Recovery of Remains: In the absence of the AFMES, the local coroner is responsible for recovery and disposition of remains; the AMO can provide additional support. An in-depth discussion of this topic is available in Appendix P: Search and Recovery of Remains. Remember, if AFMES is not on scene, they are available by phone for consultation. During pre-mishap planning an MOU with local authorities will facilitate recovery and investigation. See Appendix T: Memorandum of Understanding (MOU) with Local Civil Authorities.

3. Autopsy: It is imperative in military aircraft accidents that an autopsy be performed on each of the fatally injured crewmembers. Should the local medical examiner or coroner elect not to perform an autopsy, inform the AFMES of this fact at once so that they can assist in negotiations with local authorities. If the local pathologist performs the autopsy, the AMO should be present. It is in this circumstance that the AMO functions as the eyes and ears of the aviation pathologist, garnering the pertinent information which will allow the later reconstruction and interpretation of injury patterns. The section on injury analysis below lists the types of injuries that should be sought.

4. Radiology: Radiologic examination of remains is essential to a complete evaluation of an aircraft mishap fatality. Therefore, total body x-rays (and/or whole-body CT if available) should be performed on each case. Initial x-rays should be taken with the body “as is,” prior to removal of flight gear. This will allow for identification of personal effects that may have been missed on initial examination or determining the location of any potential hazards (explosives, etc.) prior to excessive handling of the body. Should any injured areas be incompletely visualized, radiographs of these areas can be performed after the clothing and flight gear have been removed.

5. Autopsy Safety: It should be axiomatic that universal precautions with respect to biohazards be followed at all times when handling bodies. However, it is also important to remember that the flight gear may contain items that present significant hazards to autopsy personnel. Pencil flares can produce serious injury. More importantly, any firearms carried by the aircrew should be identified. Should these items have been exposed to fire, their explosive characteristics may have been altered and handling may be extremely dangerous. It is often helpful to have an EOD specialist present during examination of flight gear.

6. Toxicology: Prompt collection of body tissues and fluids for toxicological and other examinations is essential so that they may be protected from contamination, physical and chemical change. However, as a rule, these specimens should not be collected on-scene.

   NO ONE, under any circumstances, should attempt collection of body fluids by needle puncture if an autopsy is to be performed. Such attempts may result in contaminated and uninterpretable

specimens. Before collecting tissue specimens, the investigator must ensure that the bodies, or fragments thereof, are properly identified, especially if more than one fatality is involved.

If no fluids or organs can be recovered, several hundred grams each of muscle, fat and red bone marrow can be submitted. In severe crush injuries and even in some cases of fragmentation of the body, the gallbladder will often remain intact permitting bile collection. Remember that even in the most severely fragmented cases, valuable information often can be obtained from only a few milligrams of blood or tissue. If in doubt, submit as much tissue as practical.

Whether submitting tissue fragments recovered from the mishap scene or during autopsy, the following tissue and fluid samples are recommended:

- Blood: All available up to 100 ml (Indicate source: heart blood vs. peripheral)
- Urine: 100 ml (no preservatives)
- Bile: All available
- Vitreous: All available
- Liver: 100 gm
- Brain: 100-200 gm
- Kidney: 50 gm
- Lung: 50 gm
- Stomach: 50 gm
- Muscle/fat/bone marrow: 100 grams
- Spleen: (especially if blood is unavailable) 100 gm

7. Packaging and Preservation: Urine and blood specimens should be collected into the appropriately labeled polyethylene bottle (urine) or glass vial (blood). Bodily fluids, other than blood, should be placed in screw-cap polyethylene containers labeled with the following information: sample type, decedent's name, autopsy number, SSN or DoD ID and collection date. Permanent markers are very useful for this purpose. Care must be taken to avoid contaminating specimens with solvents that may be found in some inks, formalin-fixed tissue, alcohol, disinfectants or deodorants. Make sure each tissue sample is packaged separately and individually.

    - Chemical fixatives, such as formalin, embalming fluids, etc., cause interference with toxicological analyses; do not submit fixed tissues for toxicological analysis.
    - Freezing with dry ice is the method of choice for preserving tissue. It is imperative that each specimen and its accompanying paperwork are all individually packaged to prevent cross contamination upon thawing.
    - A large Ziploc plastic bag should be used to keep all specimens and forms from a specific individual together. Frozen tissue(s) and body fluid(s) must be packed in an insulated shipping container large enough to hold the specimens plus a quantity of dry ice approximately 3 times the weight of the specimens. When using dry ice in shipping containers, use containers that allow CO2 gas from melting dry ice to escape (Dry ice must not be placed in thermos bottles). Glass, fluid containers, or tissue bags should not be allowed to come in direct contact with the dry ice.

It is important that a properly filled-out DHA Form 379/AFMES Form 18 is submitted with each accident fatality (AFMES website link, see Post-Mishap Duties, Resources). It is also very helpful to

the AFMES forensic pathologists and toxicologists if a brief summary of the victim's health status, including any known medications taken and a brief summary of the mishap, including a site description and the condition of the body when recovered, are enclosed. Forward this along with the whole-body radiographs and any other relevant paperwork (in its own polyethylene bag), to AFMES.

8. Shipment: Important things to remember:

   a. All primary containers should be wrapped with sufficient absorbent material to contain any leakage and then placed in a secondary container (a polyethylene plastic bag) and again heat-sealed. A third, large polyethylene bag may now be used to keep the specimens from one individual together. The frozen tissue and body fluids must now be packed in an insulated shipping container large enough to hold the specimens plus a quantity of dry ice approximately 3 times the weight of the specimens.

   b. The frozen specimens and dry ice should not be packed in containers that seal to the extent that gas is not permitted to escape; gas pressure within a sealed container presents a potential hazard and could cause the container to burst. Dry ice must not be placed in a thermos bottle or similar container.

   c. Do not place fluid containers in direct contact with the dry ice; the freezing fluid may crack the container.

   d. Place organ tissue closest to the dry ice.

   e. The shipment must be made by overnight delivery service (e.g., FedEx). This is the only method rapid enough to deliver the specimens to the AFMES as quickly as is necessary to preserve them in their frozen state. Overseas shipments are complicated and specimens are often sent to the nearest military pathologist who, in turn, should work with AFMES. It is crucial that you pack the specimens with the utmost care, in sturdy containers that are properly labeled, with the correct paperwork.

9. Addressing the Shipment:

   a. The outside of the package must contain the following two phrases: "Clinical/Diagnostic Specimens Enclosed" and, "Shipment complies with US Domestic and IATA international packaging regulations."

   b. Also, the word "biohazard" should not appear anywhere on the outside of the package.

   c. Packages must be shipped so that they arrive at the AFMES Monday through Friday. Weekend deliveries are not accepted.

   d. The package should be addressed to:

Division of Forensic Toxicology
Armed Forces Medical Examiner System
Building 115 Purple Heart Drive
Dover Air Force Base, DE 19902

10. AFMES Notification/Telephone Numbers: 1-302-346- 8648 (General Number), or on-call death investigator: 1-202-409-6811.

11. Notification: Notifying AFMES that specimens are about to be shipped contributes immeasurably to expeditious handling of the shipment. The message or phone call should include as much of the

following information as possible:

a. Aircraft mishap material

b. Patient(s) name, rank, DOD number

c. Method of shipment (air express/air freight)

d. Name of area airport to receive shipment

e. Name of airline

f. Flight number

g. GBL/Airbill number

h. Contributor's name

i. Departure time and date

j. Arrival time and date

k. Brief description of contents

l. Chain of custody

m. Additional information, if required

12. Recommendation: If undertaking a fatality evaluation without direct AFMES assistance, recommend verifying the currency of the above information directly before proceeding. Information about the AFMES Forensic Toxicology Branch can be obtained at their website:

https://www.health.mil/Military-Health-Topics/Health-Readiness/AFMES/Forensic-Toxicology

Email: dha.dover.afmes.mbx.fortox@health.mil
DSN: 366-8648
Phone: 1-302-346-8648
Fax: 1-302-346-8822

MISHAP INVESTIGATION TIPS

1. Safety is paramount. There has already been a mishap; do not have another while investigating the first.
2. Clues to the causes of the mishap are available from the first day; many deteriorate with time. Do not delay an investigation awaiting better conditions.
3. Avoid building a theory on a scrap of information. Look for multiple indicators – have at least two facts, ideally three, before forming a conclusion.
4. Learn as much as possible from the wreckage at the crash site before moving anything.
5. Do not rely on memory to retain your observations. Make notes, take photos and use an audio recorder.
6. Do not take shortcuts; you may unknowingly destroy clues.

7. Keep an open mind. Premature investment in a particular scenario/conclusion may taint evidence collection by steering the pursuit to that which supports the preconception.

8. Do not focus on one cause; a mishap is usually the convergence of multiple conditions (hazards).

9. Component or structural failures generally result from:

    a. Inadequate design strength.

    b. Excessive loading.

    c. Loss of strength through wear, fatigue or corrosion.

10. Direction of flight can be inferred from the axis of wreckage distribution, fuel splash, ground scars and dirt throw. A fire pattern on ground is less reliable: it might start with a fuel splash, but is likely to wander according to surface wind, availability of dry foliage, or combustible fluids flowing with the slope.

11. Do not improve (wash, clean or brush off) dirty items before examination.

12. Do not alter positions of control dials, switches or mechanisms until readings/positions are recorded - photograph them.

13. Nuts and fittings can lose torque as a result of impact shock or (in fire) heat. They are unlikely to spin off as a result of either.

14. Hangar layout (wreckage display) is essential to a thorough investigation.

15. The heaviest items (e.g., generators, batteries, engines, etc.) often travel the greatest distances and will indicate the direction of flight.

16. The location of witnesses is significant. The exact spot from which a witness makes an observation may explain differences from the accounts of other witnesses in the crash vicinity.

    a. A witness downwind of a mishap may often hear sounds inaudible to the upwind observer.

    b. Sound is deflected by walls or buildings and may cause the witness to erroneously report direction, sound origin, or dynamic level.

    c. Background noise level at the point of observation may account for a witness missing significant sounds noted by other observers.

    d. The witness looking toward the sun sees only a silhouette, while the witness whose back is toward the sun may note color and other details.

17. Peers and the power of suggestion may influence a witness located in a group.

18. Witnesses often confuse the sensory inputs of seeing the fireball of the crash and hearing the explosion of the crash. This confusion may make them think there was an inflight fire when there was not.

19. Another common witness failing is "transposition." The witness reports all the facts but places them out of sequence with the actual occurrence.

20. Angle of impact may be determined by the flight path through obstacles prior to the point of ground contact or by geometry of the crater. Do not confuse this angle with the aircraft attitude at impact.

21. If molten metal deposits are found on the hot section components, a minimum operating temperature can be determined based on the melting point of the metal deposits. See Appendix K: Fire Temperature Estimations.
22. Never put broken parts back together again.
23. You need not work in isolation. Use resources. Naval Aerospace Physiologists and the MIST team are experts in flight gear and human factors. They can be of great assistance at the mishap site and as a technical expert for the board. Call the Naval Safety Command with questions.
24. Guidelines for working in committee:
    a. Brainstorm to generate as many ideas as possible.
    b. Utilize the HFACS template as a guide for evaluating all levels of events leading to the mishap.
    c. No new idea should be considered too far out.
    d. An idea is not personal property. Using or building upon other's ideas is to be supported.
    e. Constructive criticism.
25. Mishap factors are like dominoes. Your goal is to identify all the dominoes and make recommendations to prevent the cascade of mishap events from recurring.

MISHAP REPORTING

SECTIONS

SAFETY INVESTIGATION REPORTS 65
AEROMEDICAL ANALYSIS 70

Following analysis of all evidence gathered from a mishap, the AMB prepares a complete report called the Safety Investigation Report (SIR). The Aeromedical Officer (AMO) is instrumental in assisting with the preparation of the SIR. The AMO submits an Aeromedical Analysis (AA) to the senior member of the AMB, which becomes privileged evidence. All causal or contributory factors identified in the AA must be addressed by the AMB in the SIR. The AMB does not have to agree with the findings of the AA but must address and accept or reject the causal and contributory factors.

In both reports, all findings must be evidence-based and a copy of that evidence must be submitted with the report. Examples of evidence include witness statements, engineering investigations, laboratory studies, AMB analysis of wreckage and photographs that reveal information thought to be causal or contributory to the mishap.

SAFETY INVESTIGATION REPORTS

All reporting is done through RMI via https://afsas.safety.af.mil/. Specific procedures and policies for reporting in RMI are contained within the ASO's RMI Operating Guide published by the Naval Safety Command.

1. Safety Investigation Reports (SIRs) shall be submitted for all naval aircraft mishaps. The reporting custodian of a naval aircraft mishap is responsible for investigating and reporting the mishap. No other investigation relieves the requirement for a mishap investigation. All naval aircraft mishap investigations are conducted solely for safety purposes. Aviation related safety incidents that do not meet the criteria for an aviation mishap should be investigated and reported using a HAZREP.
2. An SIR should not be confused with a Preliminary Message (PM) which is the official format for initially reporting the occurrence of a mishap and the basic facts surrounding the event. The PM must not contain privileged information.
3. The purpose of the SIR is to report hazards that were causes of the given mishap or were causes of damage or injury occurring during the given mishap and to provide a means for submitting recommendations to eliminate those hazards. Causal and contributory factors of a mishap and causal and contributory factors of injury and damage occurring during a mishap can be two different matters. Both are the subjects of aircraft mishap investigations. Factors without which the mishap does not occur are termed Causal Factors. Factors that are non-causal but contributory in that they influence the probability or severity of the mishap occurring are termed Factors.
4. There is not necessarily a correlation between the severity of a mishap and the potential for damage and injury inherent in the hazards detected during investigation of that mishap. The investigative effort should therefore not be tailored to the severity of the mishap; rather it should be tailored to identify the hazards associated with the mishap. AMBs must assign risk assessment codes (RACs) to each hazard they wish to eliminate. Each recommendation listed in the SIR is assigned a RAC. See Appendix L: Risk Assessment Codes (RAC) for further information.

5. Although all information is submitted in RMI, the result of that process is the reorganization of information into a final product called the SIR. The elements of an SIR are:

    a. Sections 1-3: These sections contain general information, date/time and location for the event.

    b. Section 4: Titled “Narrative”, this portion of the SIR contains several important components including the Sequence of Events providing an overall narrative for the mishap and the Investigation Conclusions providing a bottom-line takeaway message from the AMB.

    c. Section 5: This section contains the Primary Findings which constitute the factual lines of evidence for the SIR. No analysis is contained within the Findings section. Primary Findings have a direct impact on the event and may or may not be causal.

    d. Section 6: This section contains amplifying Background Information for the mishap event.

    e. Section 7: Factors for the mishap are discussed in this section. This includes information such as whether the factor was determined to be causal to the mishap as well as HFACS assigned to each factor. Factors which are determined not to be causal or contributory but pose a hazard to aviation will be reported as a NFWOD. NFWODs do not have associated HFACS.

    f. Section 8: Primary Recommendations are described in this section along with associated findings as well as a Risk Assessment Code (RAC) for each.

    g. Sections 9: Other Findings of Significance (OFS) are detailed in this section. These are findings determined not to support a causal factor or factor but are noteworthy findings of the AMB that deserve additional attention or characterization as they might have a broader safety impact to naval aviation.

    h. Section 10: Other Recommendations of Significance (ORS) are detailed in this section. These are recommendations stemming from OFS, along with their associated RAC code that have broader safety implications to naval aviation.

    i. Section 11: Referenced Reports

    j. Section 12: Personnel Information

    k. Section 13: Objects Information

    l. Sections 14: Event Cost

    m. Section 15: Safety Investigation Board Personnel

    n. Section 16: Glossary of Acronyms

6. The SIR is the final product of a deliberate pattern of deductive reasoning. The conceptual outline of this process is as follows:

    a. What the AMB knows (Gathering evidence and determining findings)

    b. Reasoning and deductions of the AMB (Rejected and accepted causal factors)

    c. Solutions of the AMB (Recommendations)

7. What the AMB knows (Gathering evidence and determining findings): Initially, the AMB is focused on collecting as much information about the mishap as possible. Examples can include conducting witness interviews, securing ATC recordings, post-mishap physical exams, reviewing video tapes, or consulting technical experts among many other avenues.

Once gathered, the AMB must then assess this information to determine findings which are single events, conditions, or data points important in the mishap. These are the lines of evidence for the mishap and form the foundation on which subsequent AMB analysis, conclusions and recommendations are based. Primary causal findings are those which directly resulted in the event.

8. Put another way if this finding did not occur the event would not happen. Non-causal findings are those that contributed to an event or were a subsequent result of the event. Other findings of significance are those identified thru the process of the investigation but were completely independent of the event occurring. Each line of evidence containing privileged information will be prefaced with a "(P)."

9. Reasoning and deductions of the AMB (Rejected and accepted causal factors): Once the lines of evidence and findings are established, the AMB must then analyze this information to determine what caused or contributed to the event. They must discuss everything possible that could have caused or contributed to the outcome, excluding those things too remote and then systematically investigate those possibilities that remain. They must phrase each of those remaining possibilities appropriately and then, based on the evidence, determine which they accept and which they reject.

   Factors generally fall into two categories: 1) Human factors and 2) Material factors. All causal or contributory factors identified in the Aeromedical Analysis must be addressed in the SIR. Each must then be categorized as one of the following in the SIR:

   a. Causal Factors: These factors caused the event to occur. If you remove this factor from the event, the event does not or cannot occur. An example would be an improperly installed part directly leading to a failure which causes a mishap.

   b. Factors: These factors directly contributed to the eventuality or severity of the final outcome but were not causal. An example would be an improperly executed procedure following a mishap resulting in additional damage or injury.

   c. Non-factors: These factors are items that were investigated and ruled out. Non-factors should be standalone, succinct statements that require no further explanation. An example would be adverse weather conditions initially considered by the AMB but subsequently determined not to be a factor after thorough investigation.

   d. Non-Factors Worthy of Discussion (NFWOD): These represent areas uncovered during the investigation that were not factors in the event but should be fixed, areas that were investigated and ruled out as factors but require discussion to provide context, or areas that may be considered an interest item to the convening authority. An example of a NFWOD would be improper function of an ejection seat survival kit item that was incidentally discovered after the event but should be fixed.

10. Solutions of the AMB (recommendations): The end goal of the AMB process is to identify effective ways to prevent or mitigate future mishaps and/or injury. Recommendations are reasonable solutions to eliminate identified hazards; or, if the hazard cannot be eliminated, to mitigate the hazard's potential consequences. Primary recommendations are associated to primary findings while other recommendations of significance are associated to other findings of significance.

    Recommendations that do not serve to eliminate the hazards identified in the mishap shall not be included. Recommendations should be self-explanatory, practical, specific and actionable. Ideally, each causal and contributory factor (hazard) should have at least one corresponding recommendation.

Recommendations under consideration may be evaluated by the question: "If the recommended action had been taken prior to this mishap, would the hazard(s) have been eliminated and the mishap (or damage and injury) prevented?"

The board should do its best to make specific and definitive recommendations and, whenever possible, include drafts of proposed changes in the recommendation so all concerned may know exactly what is intended. All recommendations should have a defined scope and responsible individual.

a. Examples of ineffective recommendations:

(1) All squadrons review SOP.

(2) All squadrons adhere to NATOPS procedures.

b. Generally, bad "buzz" words should be avoided: review, comply, ensure, reemphasize. These words do not lead to measurable change. Also useless are terms such as all pilots, all aircraft and all squadrons. In addressing everyone, you reach no one.

c. Good recommendations:

(1) NAVAIRSYSCOM, fund research into the development of crashworthy crew seats in the UH-1N in the next fiscal year.

(2) CO HMLA-969, submit the following proposed NATOPS change within 10 calendar days: draft of NATOPS change.

d. Determining which agency is the Office of Primary Responsibility (OPR), responsible for a particular function, is not always a simple matter and may require some diligent research. Should an AMB err, the first knowledgeable endorser should correct the recommendation. AMBs can always contact NAVSAFECOM for assistance.

e. The AMB should also resist being too specific. For example, a "Jones-built" part may be the needed replacement for the broken "Smith-built" part. However, the board should not presume to recommend the "Jones-built" part. The AMB should only recommend installation of a part with suitable characteristics to solve the problem and possibly refer to the "Jones-built" part as an example.

f. Finally, the AMB should not let presumptions about the budget or bureaucracy prevent it from making a recommendation.

11. Internal command distribution of SIRs is limited to those who require knowledge of the report for safety purposes.

12. To avoid any association with disciplinary action, reports of JAG Manual investigations, Naval Aviator/Naval Flight Officer Evaluation Board reports (for USN) and Field Flight Performance Board reports (for USMC) shall not be appended to nor made a part of any SIR. Nor may an SIR, or any part of one, be used in any of these investigations or appended to their reports.

13. The exercise of command influence to edit, modify, or in any way censor the content of SIRs is contrary to the spirit of the Naval Aviation Safety Program and is prohibited. Seniors may comment in an endorsement to the report during the RMI Memorandum of Final Evaluation (MOFE) process.

14. SIRs shall be submitted within 30 calendar days following the mishap. In the case of missing aircraft, the SIR shall be submitted within 30 calendar days after completion of the organized

search. The appointing authority may request an extension from the controlling custodian assigned as the convening authority.

15. Frequently the Naval Safety Command will send a specially trained mishap investigator to assist the AMB. There will be complete cooperation and unrestricted exchange of information between the AMB and the investigator. The investigator will control all real evidence.

    a. Types of mishaps that normally require the aid of a Naval Safety Command investigator are:

        (1) Class A mishaps where wreckage is available.

        (2) In-flight structural failure.

        (3) In-flight fire from unknown source.

        (4) Midair collision.

        (5) Mishaps where nothing is known of the causes and there are no surviving crew members ("smoking hole").

        (6) Deep-water recovery attempts.

        (7) Recurring hazard reports.

    b. When a Naval Safety Command/AFMES medical investigator is on the scene, they may control medical evidence, including remains.

16. For the investigation of interagency, intercomponent, NATO, or any multiple aircraft mishap, refer to OPNAVINST 3750.6 series and NATO STANAG 3531.

17. Regardless of the degree of a member's active participation in an investigation, each AMB member should review the completed report prior to its release. However, the AMB is not a democracy and the SIR need not be voted on or cosigned. In the final analysis, it is the work and the responsibility of the senior member.

18. Once the completed SIR message is quality checked by NAVSAFECOM staff and released, it enters the RMI MOFE process. Unlike prior systems, the report does not route sequentially through the endorsing chain from the reporting custodian to the convening authority. Rather, the report becomes available to all endorsers concurrently during the 45-day MOFE process. During this process, endorsers have the opportunity to review the SIR, concur or non-concur with key elements, offer restatements and then provide comments which will become formally attached to the SIR.

    Endorsements to SIRs are privileged. Once the SIR is completed, endorsers may conclude that an investigation is incomplete or an SIR or HAZREP is inadequate and recommend the reopening the investigation. The requestor must clearly specify the areas of concern or deficiencies to the AMB or SIO. Only Naval Safety Command has the authority to reconvene the AMB.

19. The Naval Safety Command monitors recommendations emanating from mishap investigations through the Mishap and Hazard Recommendation portions of RMI until each is closed.

AEROMEDICAL ANALYSIS

NOTE: A Sample Aeromedical Analysis can be found via the Naval Safety Command website on the Aeromedical Division CAC-enabled webpage at: https://intelshare.intelink.gov/sites/NAVSAFECOM/Page s/aeromedical.aspx

1. Submission Criteria: Per OPNAVINST 3750.6 series, the AMO must complete a comprehensive Aeromedical Analysis (AA) for all investigations where an AMB is assembled unless exempted by NAVSAFECOM Aeromedical Division. An AA should be submitted for all mishaps with suspected contributing human factors, personnel injuries or pertinent medical findings and attempts to eject, bail out, or otherwise emergency egress the aircraft.

   It is a rare aircraft mishap that does not have a human factor component. Human factors do not stop at the level of the pilot; they extend to the maintainers, Air Traffic Controllers, Squadron chain of command through the Airwing to the TYCOM and above. The role of the investigating AMO is not only to prepare an in-depth analysis of the individuals directly involved in the mishap, but also to expose the macroscopic picture that reveals all the events in the mishap chain.

   The AA is the privileged report by the AMB AMO that addresses aeromedical causes, conclusions and recommendations. The AA documents the aeromedical conditions the AMO has determined to be pertinent to the mishap. These conditions include all human factors contributing to the mishap, injuries, or other damage. It shall include all aircrew, maintenance, facilities and supervisory factors.

   Any aeromedical causal or contributory factor discovered during the investigation must be brought to the attention of the AMB and addressed in the SIR. However, there is no guarantee the AMB will accept it as a causal or contributory factor in the SIR. It is acceptable for the AA and SIR to disagree on occasion, so long as the SIR addresses the aeromedical issue. There may also be aeromedical conditions present which did not contribute to the mishap. List these in the designated subsection of the AA's conclusions. The AA and other portions of the SIR are complementary and expected to overlap.

   A separately written AA (utilizing the format in the referenced sample, available at the link above or contained as Appendix U) is recommended, particularly for more extensive AMB investigations such as those typical for Class A or B mishaps. This document can then be uploaded into RMI as a privileged exhibit and referred to in appropriate RMI fields.

   If not separately written and uploaded as a privileged exhibit, the AA content can be entered into the narrative fields provided at the end of the Person Page. If this approach is taken, the AMO must still provide an independent and comprehensive HFACS assessment and aeromedical recommendations to the AMB. While the AA content should be tailored to the circumstances and complexity of the mishap, in general all content that would normally be included in a separately written AA should be included in the narrative fields if entered only in RMI.

   A separately written AA is recommended (as opposed to entering all information in RMI narrative fields) because it results in a more cohesive, logical and understandable product. It is also easier to identify the specific findings, conclusions and recommendations of the AMO when presented in this format.

   The format for the AA should follow the outline below with underlined material repeated verbatim:

   a. Review of Events: This section contains two subsections: 1) Mishap Overview and 2) Aircrew Profile.

The mishap overview subsection is a chronological review of the mishap beginning with any preexisting aeromedical conditions and closing with the survivors coming under appropriate medical care. It should stand on its own merit and is written towards a non-medical audience. The reader should be able to understand this section without referring to the SIR message or other documents. The aircrew profile subsection should include a brief medical and psychological profile of everyone involved. The AMO may review sensitive, personal or speculative topics as pertinent in this section.

While not a comprehensive list, they should comment on these areas for each person involved in the mishap:

- 72-hour history/14-day history and fatigue modeling software analysis (if applicable)
- Physiology training
- Prior aviation training, performance and aviation motivational factors
- Flight physicals (pre-and post-mishap exams)
- Physical qualification waivers
- Life stressors
- Relationships with co-workers, family and friends
- Acute medical problems (including injuries sustained in the mishap, brief treatment summary and prognosis if known)
- Chronic medical problems
- Current medication and supplement use
- Post-mishap biological samples/results
- Autopsy and post-mortem lab studies
- Escape or egress/survival episodes
- SAR effort
- Initial stabilization and transport of those injured

Upload documents that support the information presented in this section in the Exhibits section of RMI as enclosures to the AA. See section 2. Enclosures to the AA below.

b. Aeromedical Discussion and Conclusions. In this section AMOs shall list and justify all the aeromedical conditions that were causal or contributory to the mishap using the DoD Human Factors Analysis and Classification System (DoD HFACS).

List all aeromedical conditions that were causal factors of the mishap in subsection 2a. List all maintenance conditions that were causal factors of the mishap in subsection 2b. In subsection 2c, list all aeromedical conditions that were causal of additional damage or injury. List all aeromedical conditions that were present but not causal to either the mishap or of additional damage or injury in subsection 2d. Section 2d could include Non-Factors (Rejected) that warrant being addressed specifically or Non-Factors Worthy of Discussion (NFWOD).

NOTE: The official causal and contributory factors of the mishap are defined by the detailed causal and contributory factors (who/what/why) found in the SIR. The DoD HFACS analysis is a tool that facilitates the organization of an in-depth human factors analysis. The more general categories of causal and contributory factors found in the DoD HFACS analysis help the AMB determine the detailed causal factors.

The DoD HFACS analysis should therefore be consistent with the detailed causal factors in the SIR. At the end of the Aeromedical Discussion and Conclusions sections, the mishap sequence of

events can be included showing the direct chain of causal factors with their associated HFACS category.

c. Aeromedical Recommendations: This section is similar to Section 8 of the SIR. Based on aeromedical conclusions, make your recommendations to prevent accepted causal factors from recurring and to prevent or limit the severity of additional damage or injury. Key each recommendation to the appropriate conclusion and address them to the most appropriate action agency for change. Like SIR recommendations, aeromedical recommendations should be based on a factor causal to the mishap or factors causal to additional injury and should be specific and definitive. Recommendations addressing items listed in Section 2d above can also be included here.

2. Enclosures to the AA: For specific aeromedical RMI exhibit upload guidance, see the ASO RMI Operating Guide provided by the Naval Safety Command or Appendix V: RMI Mishap Requirements and Guidance for Flight Surgeons. As general guidance, hold supporting documents to a minimum, but include the following enclosures if pertinent:

   a. You must include a chronological account of activities for the past 72 hours on everyone involved. Per OPNAVINST 3750.6 series, fatigue modeling software analysis must be performed for all mishaps when fatigue is suspected or reasonably considered by the AMB as a factor. It will also be performed when RMI, after fatigue data input, recommends further analysis for fatigue as a possible factor. In these evaluations, a 14-day history should be obtained if possible to facilitate optimal modeling accuracy. When performed, the fatigue modeling analysis must be included in the AA or as an enclosure.

   b. Post-mishap history and physical examination(s) along with copies of the past two physical examinations and BUPERS waiver letters for all involved aircrew.

   c. Any medical record extracts you need to clarify or support the AA.

   d. Relevant photographs depicting aeromedical or physiologic evidence that support findings in the AA.

   e. Post-mishap toxicology evaluation results.

   f. Sensitive content such as photographs of deceased members or mental health records should be uploaded directly into RMI utilizing the appropriate guidance for marking. Exhibits of a sensitive nature should be considered privileged and uploaded accordingly.

   g. Ensure that any other documents that will clarify or support the AA are uploaded appropriately in RMI.

   h. Submit reports via RMI: https://afsas.safety.af.mil/

3. No AA Required: If the AMB feels that they have the rare mishap that has absolutely no human factor at any level, the AMO should communicate early and directly with the Aeromedical Division of the Naval Safety Command to discuss the mishap. The Naval Safety Command has the authority to require an AA.

4. After proofreading the AA, submit it to the AMB senior member for consideration in deliberations. All factors concluded to be causal or contributory in the AA must be addressed by the AMB in the SIR. These factors do not have to be accepted by the AMB, but a thorough discussion of reasons for rejection should be documented in the SIR.

5. The AA in its entirety is privileged.

NAVAL AEROMEDICAL OFFICER

AIRCRAFT MISHAP INVESTIGATION REFERENCE GUIDE

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APPENDIX A: NAVAL SAFETY COMMAND TELEPHONE NUMBERS

NAVSAFECOM	EXT
Quarterdeck: DSN 564-3520 Commercial (757) 444-3520	
Aircraft Mishap Investigation Group Ring	7890/7234
Aircraft Maintenance and Material Group Ring	7812
Aircraft Operations Group Ring	7811
Weapons Systems Safety Group Ring	7813
Aeromedical Division Group Ring	7814
****Mishap Telephone Report Submission ****	7208 DSN 564-3520
SDO Cell Phone	(757) 353-7937
SDO Office	7017
OPNAVINST 3750.6 series Inquiries	7226
Legal	6055
Shore Safety Programs	7820
Afloat Safety – Surface Ship Group Ring	7831
Afloat Safety – Submarine Group Ring	7833
Expeditionary Safety Group Ring	7840

APPENDIX B: IMPORTANT TELEPHONE NUMBERS

Armed Forces Medical Examiner System	Comm	(302) 346-8648
	DSN	366-8648
Reporting a Death after hours	Comm	(202) 409-6811
Forensic Toxicology	Comm DSN Fax	(302) 346-8648 366-8648 (302) 346-8822
Naval Air Warfare Center	Comm	(301) 609-0236
Mishap Investigation Support Team (MIST)		
Hammer Ace*	Normal hours	(478) 222-5785
*Air Force Communications Assistance Team	After hours	(478) 327-2612
Naval Aerospace Medical Institute	Comm	(850) 452-XXXX
	DSN	459-XXXX
Officer in Charge (OIC)		8051
OIC FAX		8320
Academics		2458
Academics FAX		2357
Administration		2314
ENT		3256
Hyperbaric Medicine		3409/4815
Hyperbaric Medicine Duty Phone		850-449-4629
Internal Medicine		3069
Neurology		2839
Ophthalmology		3222/6896
Physical Examinations		2933/2934/2935
Physical Quals Division		8645/2447
Psychiatry		2783
RAM Program Director		3154
Naval Medical Research Unit - Dayton	DSN	(312) 798-3872
	Comm	(937) 938-3872
Bureau of Medicine & Surgery	DSN	761-XXXX
N35 - Aerospace Medicine	Comm	(703) 681-9323

Aerospace Physiologist	Comm	(703) 681-9284
NAVAVSCOLSCOM	DSN	459-3181
ASO School, Pensacola, Fl	Comm	(850) 452-3181
Naval Air Warfare Center WD	DSN	437- 2201
	Comm	(760) 939-2201
Naval Experimental Diving Unit	DSN	436-XXXX
NEDU, Panama City, FL	Comm	(850) 230-XXXX
Administration		3100/3204
Medical Department		3235
Navy Decedent Affairs Office		(901) 874-2307/6714
	Duty:	(901) 634-9279
Air Force Safety Center (PAO)	Comm	(505) 846-2098
Hyperbaric Hotline (Brooks AFB)	Comm	(210) 539-8000
After Hours/Duty		(210) 916-2500 - 2,1
Army Combat Readiness Center (Safety Center)	DSN	558-XXXX
	Comm	(334) 255-XXXX
USASC Aeromedical Division		2763
Safety Center Main Number		9360
Coast Guard Aviation Safety	Comm	(251) 441-6864
Federal Aviation Administration		
Federal Air Surgeon	Comm	(202) 267-3537
Civil Aeromedical Institute (CAMI)	Comm	(405) 954-1000
National Transportation Safety Board	Com	(202) 314-6000
Aviation Medicine		6020

APPENDIX C: AEROMEDICAL SAFETY OFFICER TELEPHONE NUMBERS

BILLET	COMM (DSN)
AMSO 1st MAW (Japan)	(315-645-3888)
AMSO 2nd MAW, Cherry Point, NC	(252) 466-4376
AMSO 3RD MAW, Miramar, CA	(858) 307-1817
AMSO 4th MAW, New Orleans, LA	(504) 697-7757
AMSO CNAF SAFETY, North Island, CA	(619) 545-4137
AMSO NAVAL SAFETY COMMAND	(757) 444-3250
AMSO TESTWINGLANT	(301) 342-3424
AMSO CVW-5 (Japan)	(315-255-1804)
AMSO JSFWINGPAC, Lemoore, CA	(559) 998-2664
AMSO STRIKEFIGHTWINGLANT, Norfolk, VA	(757) 443-9628
AMSO ACCLOGWINGPAC, Norfolk, VA	(757) 447-0619
AMSO VAQWINGPAC, Whidbey Island, WA	(360) 257-3083
AMSO HMX 1, Quantico, VA	(571) 494-4933
AMSO HQMC	(703) 604-4367
AMSO MAWTS-1 ADT&E	(928) 269-3652
AMSO MAG 11, Miramar, CA	(858) 307-1394
AMSO MAG 12, Iwakuni (Japan)	(315-255-7553)
AMSO MAG 13, Yuma, AZ	(928) 269-4179
AMSO MAG 14, Cherry Point, NC	(252) 466-2629
AMSO MAG 16, Miramar, CA	(858) 307-1976
AMSO MAG 24, Kaneohe Bay, HI	(808) 257-3156
AMSO MAG 26, Jacksonville, FL	(910) 449-7182
AMSO MAG 29, New River, NC	(910) 449-7559
AMSO MAG 31, Beaufort, SC	(843) 228-7951
AMSO MAG 36 (Japan)	(315-636-3022)
AMSO MAG 39, Camp Pendleton, CA	(315) 636-3319
AMSO MAWTS 1 DOSS	(928-) 269-3652
AMSO NAWDC Safety	(775) 426-3681
AMSO NAWDC CSEL PM	(775) 426-2849

AMSO STRKFIGHTWINGPAC, Lemoore, CA	(559) 988-1028
AMSO CNATRA, Corpus Christi, TX	(361) 961-2377
AMSO TRAWING 1 Meridian, MS	(559) 998-3202
AMSO TRAWING 2, Kingsville, TX	(361) 516-6249
AMSO TRAWING 4, Corpus Christi, TX	(361) 961-0126
AMSO TRAWING 5, Whiting, FL	(850) 623-7926
AMSO TRAWING 6, Pensacola, FL	(850) 452-3110
AMSO HSCWINGPAC	(619) 545-4933
AMSO HSMWINGPAC	(619) 545-5038
AMSO HSCWINGLANT	(757) 444-8618
AMSO HSMWINGLANT	(904) 270-6137
AMSO CPRW-10	(360) 257-0357

APPENDIX D: IMPORTANT LOCAL TELEPHONE NUMBERS

POSITION, NAME	PHONE NUMBER
CO	
XO	
Squadron Duty Officer	
Senior Member AMB	
Safety Member AMB	
Maintenance Member AMB	
Operations Member AMB	
Other Member AMB	
Safety Command Rep	
AMSO	
Aviation Survival Training Center	
ATC/TOWER	
Tech Rep	
Tech Rep	
Photographer	
Civilian Coroner	
Military Pathologist	
Clinic	
Hospital	
Emergency Room	
SAR	
Medevac	
Ambulance	
Paraloft	
Public Works/Seabees	
Security	

APPENDIX E: COMMON ACRONYMS AND ABBREVIATIONS USED IN NAVAL AVIATION

AA	Aeromedical Analysis or Aeronautically Adaptable
A/C	Aircraft
ACC	Aircraft Controlling Custodian or Aircrew Coordination
ACFT	Aircraft
ACLS	Advanced Cardiac Life Support
ACM	Air Combat Maneuvering
ACT	Aircrew Coordination Training
ADB	Aircraft Discrepancy Book
ADF	Automatic Direction Finder
ADMAT	Administrative-Material [Inspection]
AEP	Aeromedical Experimental Psychologist
AEPS	Aircrew Escape Propulsion System
AEROMED	Aeromedical or Aeromedicine
AFCS	Adaptive (or Automatic) Flight-Control System
AFFF	Aircraft Fire Fighting Foam
AFMES	Armed Forces Medical Examiner System
AFR	Aircraft Flight Record
AFU	All Fouled-Up
AGL	Above Ground Level
AGM	Aircraft Ground Mishap or Air-to-Ground Missile
AIMD	Aircraft Intermediate Maintenance Department
AIR BOSS	Air Department Head
ALF	Auxiliary Landing Field
ALSE	Aviation Life Support Equipment (ALSE)
ALSS	Aviation Life Support Systems (ALSS)
ALT	Altimeter or Attitude
AM	Amplitude Modification or Amendment
AMAL	Authorized Medical Allowance list
AMB	Aviation Mishap Board
AME	Aviation Medical Examiner
AMO	Aeromedical Officer or Aircraft Maintenance Officer
AMSO	Aeromedical Safety Officer
ANSI	American National Standards Institute
AO	Air Observer or Administration Officer
AOA	Angle of Attack
AOC (S)	Aviation Officer Candidate (School)
AOM	All Officers Meeting
AOP	Aeromedical Operational Physiologist
ANVIS	Aviator's Night Vision Imaging System
APA	Aeromedical Physician Assistant

APP	Auxiliary Power Plant
APU	Auxiliary Power Unit
ASAP	As Soon As Possible
ASO	Aviation Safety Officer
ASTC	Aviation Survival Training Center
ASW	Anti-Submarine Warfare
ATC	Air Traffic Controller
ATK	Attack
ATLS	Advanced Trauma Life Support
AUTOVON	Automatic Voice Network (AV)
AV	Automatic Voice Network (AUTOVON)
AWOL	Absent Without Leave
BAL/BAC	Blood Alcohol Level/Content
BASH	Wildlife (Bird/Animal) Strike
BN	Bombardier Navigator
BUMED	Bureau of Medicine and Surgery
BUNO	Bureau Number
CATSEYE	Tactical Air Night Vision Goggle System
CAD	Cartridge Actuated Device or Collective Address Designator
CAG	Carrier Air Group
CAMI	Civil Aeromedical Institute
CAT	Catapult or Computed Axial Tomography
CB	Construction Battalion (Sea Bee)
CBC	Complete Blood Count
CBR	Chemical-Biological- (or Bacteriological-) Radiological
CC	Chief Complaint
CDO	Command Duty Officer
CE	Close Encounter or Common Era
CFA	Cognizant Field Activity
CFIT	Controlled Flight Into Terrain
CG	Commanding General or Coast Guard or Center of Gravity
CINC	Commander-in-Chief
CMC	Commandant of the Marine Corps
CMAV	Controlled Movement Area Violation
CNATRA	Chief of Naval Air Training
CNO	Chief of Naval Operations
CO	Commanding Officer or Carbon Monoxide
COD	Carrier-On-Board-Delivery
COHGB	Carboxyhemoglobin
COM	Command (er)
COMM	Communication or Commercial
CONUS	Continental United States

CQ	Carrier Qualification
CREEP	Container, Restraints, Environment, Energy Absorption, Post-Crash Factors
CRM	Crew Resource Management
CRT	Cathode-Ray Tube
CT	Computed Tomography
CV	Aircraft Carrier
CVW	Carrier Air Wing
CXR	Chest X-Ray
CY	Calendar Year
DAPA	Drug and Alcohol Program Advisor
DC	Dental Corps
DCI	Decompression Illness
DDX	Differential Diagnosis
DEA	Direct Enemy Action
DET	Detachment
DHA	Defense Health Agency
DIACA	Duty Involving Actual Control of Aircraft
DIF	Duty Involving Flying
DIFDEN	Duty in a Flying Status not Involving Flying
DIFOPS	Duty in a Flying Status Involving Operational or Training Flights
DMO	Diving Medical Officer
DO	Duty Officer or Doctor of Osteopathy
DoD	Department of Defense
DOA	Date Of Admission or Dead on Arrival
DOB	Date Of Birth
DSS	Department of Safety and Standardization
DVA	Distance Visual Acuity
DX	Diagnosis
EAF	Expeditionary Airfield
EAPS	Engine Air Particle Separator
EBL	Estimated Blood Loss
ECG	Electrocardiogram (EKG)
ECP	Engineering Change Proposal
EDTA	Edentate Disodium (a preservative)
EKG	Electrocardiogram (ECG)
(E) ENT	(Eye), Ear, Nose and Throat
EI	Engineering Investigation
EMS	Emergency Medical System (Service)
EMI	Electromagnetic Interference
EOD	Explosive Ordnance Disposal
EOM (I)	Extraocular Movements (Intact)
EPTE	Existed Prior To Enlistment

ETA	Estimated Time of Arrival
ETOH	Ethanol or Ethyl Alcohol or Alcohol
EWO	Electronic Warfare Officer
FAA	Federal Aviation Administration
FAILSAFE	Fleet Air Introduction Liaison Survival Aircrew Flight Equipment
FAIR	Fleet Air
FAP	Family Advocacy Program
FAR	Flight Aptitude Rating or Federal Aviation Regulation
FASO	Field Aviation Supply Office
FAX	Facsimile
FBG	Fasting Blood Glucose (FBS)
FBS	Fasting Blood Sugar (FBG)
FBW	Fly-by-Wire
FCF	Functional Check Flight
FF	Friendly Fire
FFPB	Field Flight Performance Board (USMC)
FH	Flight Hour
FIT	Fighter
FLIR	Forward-Looking Infrared Radar
FLT	Flight or Fleet
FM	Flight Mishap or Frequency Modulation
FMC	Full Mission Capable
FMF	Fleet Marine Force
FNAEB	Field Naval Aviator Evaluation Board
FNFOEB	Field Naval Flight Officer Evaluation Board
FNG	Funny New Guy
FOD	Foreign Object Damage
FOUO	For Official Use Only
FPC	Flight Purpose Code or Force Preservation Council (USMC)
FPO	Fleet Post Office
FRAMP	Fleet Readiness (or Replacement) Aviation Maintenance Personnel
FREDS	Flight Readiness Evaluation Data System
FRM	Flight Related Mishap
FRS	Fleet Replacement Squadron
FS	Flight Surgeon
FSR	Flight Surgeon's Report
FY	Fiscal Year
FYI	For Your Information
G	Gravity (unit) or Newtonian constant of Gravitation or Gram or Grain
GATOR	Navigation Officer
G-LOC	G-Induced loss of Consciousness
GMO	General Medical Officer

GM (A) T	Greenwich Mean (or Meridian) (Astronomical) Time
GPS	Global Positioning System
GQ	General Quarters
GRU	Group
GUN BOSS	Weapons Officer
GS	Ground Speed
GSE	Ground Support Equipment
H	Helicopter or Rotary Wing
HALO	High-Altitude, Low-Opening (parachuting technique)
HATR	Hazardous Air Traffic Report
HAZMAT	Hazardous Material (HM)
HAZREP	Hazard Report (HR)
HC	Helicopter Combat Support Squadron
HCT	Hematocrit
HEED	Helicopter Emergency Egress (escape) Device
HEELS	Helicopter Emergency Egress (escape) Lighting System
HEL (O)	Helicopter
HFACS	Human Factors Analysis and Classification System
HGB	Hemoglobin
HIGE	Hover In Ground Effect
HM	Hazardous Material (HAZMAT) or Helicopter Mine Countermeasures Squadron
HMH	Marine Heavy Helicopter Squadron
HMLA	Marine Light Attack Helicopter Squadron
HMLAT	Marine Light Attack Helicopter Training Squadron
HMM	Marine Medium Helicopter Squadron
HOGE	Hover Out of Ground Effect
H&P	History and Physical
HQ	Headquarters
HS	Helicopter Anti-Submarine Squadron
HSC	Helicopter Sea Combat Squadron
HSM	Helicopter Maritime Strike
HT	Helicopter Training Squadron
HUD	Heads-Up Display
HX	History or Helicopter Air Test and Evaluation Squadron
IAS	Indicated Air Speed
IAW	In Accordance With
ICD	International Classification of Diseases
IFR	Instrument Flight Rules (or Requirement) or In-Flight Refueling
IG	Inspector General
IHO	Industrial Hygiene Officer
IMC	Instrument Meteorological Conditions
IMA	Intermediate Maintenance Activity

INVS	Integrated Night Vision System
IO	Intelligence Officer
IR	Infrared
IRAC	Interim Rapid Action Change
IROK	Inflate, Release, Oxygen, Koch fittings
JAG	Judge Advocate General
JO	Junior Officer
JOPA	Junior Officer Protection (Protective) Association
JPEG	Joint Photographic Experts Group
KIAS	Knots Indicated Airspeed
LAMPS	Light Airborne Multi-Purpose System (Helicopter)
LANT	Atlantic Fleet or Atlantic
LASER	Light Amplification by Stimulated Emission of Radiation
LBFS	Local Board of Flight Surgeons
LDO	Limited Duty Officer
LIMDU	Limited Duty
LOC	Loss of Consciousness or Level of Consciousness
LOX	Liquid Oxygen
LPA	Life Preserver Assembly
LPU	Life Preserver Unit
LSRST	Laser Strikes
LSO	Landing Safety Officer
LZ	Landing Zone
MAF	Maintenance Action Form or Marine Amphibious Force
MAG	Marine Aircraft Group
MASH	Mobile Army Surgical Hospital
MAU	Marine Amphibious Unit
MAW	Marine Aircraft Wing
MC	Mission Capable or Medical Corps or Marine Corps
MCAF	Marine Corps Air Facility
MCAS	Marine Corps Air Station
MCCRES	Marine Corps Combat Readiness Evaluation System
MD	Doctor of Medicine (Medical Doctor) or Medical Department
MEDEVAC	Medical Evacuation
ME	Medical Examiner
MH	Man hours
MHRS	Man hours
MI (M) / MIM	Maintenance Instruction (Manual)
SIR	Safety Investigation Report
MISREC	Mishap Report Recommendation
MISTRAC	Mishap and Hazard Recommendation Tracking Program
MIST	Mishap Investigation Support Team

MMART	Mobile Medical Augmentation Readiness Team
MMTF	Military Medical Treatment Facility
MO	Maintenance Officer or Medical Officer or Modus Operandi
MOFE	Memorandum of Final Evaluation
MOU	Memorandum of Understanding
MR	Material Report or Mishap Report
MRE	Meals, Ready to Eat
MRI	Magnetic Resonance Imaging
MSC	Medical Service Corps
MSDS	Material Safety Data Sheet
MSL	Mean Sea Level
NA	Naval Aviator or Naval Air or North American or Not Applicable or Not Authorized
NAA	Not Aeronautically Adaptable
NACES	Naval Aircrew Common Ejection Seat
NACA	National Advisory Committee on Aeronautics
NADEP	Naval Aviation Depot
NADC	Naval Air Development Center
NAEC	Naval Air Engineering Center
NAESU	Naval Aviation Engineering Support Unit
NAF	Naval Air Facility
NAMI	Naval Aerospace Medical Institute
NAMP	Naval Aviation Maintenance Program
NAMRU-D	Naval Medical Research Unit - Dayton
NAPTP	Naval Aviation Physiology Training Program
NARF	Naval Air Rework Facility
NAS	Naval Air Station
NATC	Naval Air Test Center
NATOPS	Naval Air Training & Operating Procedures Standardization
NAV	Navy
NAVAIRSYSCOM	Naval Air Systems Command
NAVPERSCOM	Naval Personnel Command
NAVOSH	Navy Occupational Safety and Health
NAVPRO	Naval Plant Representative Office
NAVSAFECOM	Naval Safety Command
NAWSTP	Naval Aviation Water Survival Training Program
NBC	Nuclear, Biological and Chemical
NCO (IC)	Non-Commissioned Officer (-In-Charge)
N-CFIT	Near Controlled Flight Into Terrain
NETC	Naval Educational Training Center
NFWOD	Non-Factor Worthy of Discussion
NIOSH	National Institute for Occupational Safety & Health
NCIS	Naval Criminal Investigative Service or Not in Stock (Store)

NK (D) A / NKDA	No Known (Drug) Allergies
NPGS	Naval Postgraduate School [Monterey, CA]
NMAC	Near Midair Collision
NMC	Not Mission Capable or Naval Medical Center
NMRTC	Navy Medicine Readiness and Training Command
NMRTU	Naval Medicine Readiness and Training Unit
NMTSC	Navy Medicine Training Support Command
NOK	Next of Kin
NORVA	Norfolk, VA
NOTAL/NOTAM	Notice To All/Notice to Airmen
NPQ	Not Physically Qualified
NS	Naval Station
NAVSAFECOM	Naval Safety Command
NSIH	No Significant Interval History
NSN	National Stock Number
NTSB	National Transportation Safety Board
OAT	Outside Air Temperature
OBE	Overcome By Events
OBOGS	On Board Oxygen Generation System
OFC	OPTAR Fund Codes
OFS	Other Findings of Significance
OIC	Officer-In-Charge
OOD	Officer of the Day (or Deck)
OPNAV	Office of the Chief of Naval Operations
OPNAVINST	Office of Chief of Naval Operational Instruction
OPREP	Operation (al) Report
OPS	Operations
OPTAR	Operational Targeting (funding)
ORS	Other Recommendations of Significance
OSHA	Occupational Safety & Health Administration
PAA	Polyacrylic Acid
PAC	Pacific Fleet or Pacific
PAD	Propellant Actuated Device
PAO	Public Affairs Office(r)
PAT	Patrol
PAX	Passenger(s) or Patuxent
PCL	Pocket Checklist
PE	Physical Examination or Physiological Event
PERRLA	Pupils Equal, Round, Reactive to Light & Accommodation
PID	Personnel Injury/Death (report)
PLAT	Pilot Landing Aid Television
PLOCI	Pilot Loss of Control In-Flight

PLT	Pilot
PM	Preliminary Message
PMC	Partial Mission Capable
PMO	Provost Marshall's Office
POC	Point of Contact or Privately-Owned Conveyance
POD	Plan of the Day
PPE	Personal Protective Equipment
PQ	Physically Qualified
PR	Parachute Rigger or Pocket Reference
PRN	As Needed (Pro Re Nata)
PY	Pack-Year (cigarettes)
QA	Quality Assurance
RAC	Risk Assessment Code
RAD	Release from Active Duty or Radar or Radical
RADALT	Radar Altimeter
RAG	Replacement Air Group (FRS new term)
RAMEC	Rapid-Action Minor Engineering Change
RAT	Ram Air Turbine
RBC	Red Blood Cell
REC	Recommendation
RF	Radio Frequency
RIA	Radio-Immuno Assay
RIO	Radar Intercept Officer
RMI	Risk Management Information
RON	Squadron or Remain Over Night
ROS	Review Of Systems
RSSK	Rigid Seat Survival Kit
RX	Treatment or Prescription
SAR	Search and Rescue or Sea-Air Rescue
SAT	Satisfactory or Satellite
SBFS	Special Board of Flight Surgeons
SCBA	Self- Contained Breathing Apparatus
SDO	Squadron (or Staff) Duty Officer
SD	Spatial Disorientation
SEAWARS	Sea Water Activated Release System
SEM	Scanning Electron Microscope
SERE	Survival, Evasion, Resistance and Escape
SERGRAD	Selectively Retained Graduate
SF	Standard Form
SIO	Single Investigating Officer
SG	Specific Gravity or Service Group or Surgeon General
SITREP	Situation Report

SIR	Safety Investigation Report
SMA(C)	Sequential Multiple Analyzer (with Computer)
SMO	Senior Medical Officer
SMS	Safety Management System
SNA	Student Naval Aviator
SNFS	Student Naval Flight Surgeon
SOAP	Subjective, Objective, Assessment and Plan
SOF (A) /SOFA	Status of Forces (Agreement)
SOP	Standard Operating Procedure
SOS	Save Our Ship (Souls) or Same Old Stuff
SPRINT	Special Psychiatric Rapid Intervention (Team)
SQDN	Squadron
SRFS	Senior Regional Flight Surgeon
SUSNFS	Society of US Naval Flight Surgeons
SX	Symptoms
SWMO	Surface Warfare Medical Officer
TAC	Tactical
TACAN	Tactical Air Navigation
TAD	Temporary Additional Duty
TAS	True Air Speed
TDY	Temporary Duty
TFOA	Things Falling Off Aircraft
TNTC	Too Numerous to Count
T/O	Take-off
TOA	Time Of Arrival
TRA	Training
TYCOM	Type Commander
UA	Unauthorized Absentee (or Absence) or Urinalysis
UAV	Unmanned Aerial Vehicle
UCMJ	Uniformed Code of Military Justice
UIC	Unit Identification Code
UMO	Undersea Medical Officer
UV	Ultraviolet
V	Fixed Wing
VA	Fixed Wing Attack (Strike) Squadron
VAQ	Fixed Wing Electronic Warfare Squadron
VAW	Carrier Airborne Command and Control Squadron
VERTREP	Vertical Replenishment
VF	Fixed Wing Fighter Squadron
VFA	Fixed Wing Fighter Attack (Strike) Squadron
VIDS	Visual Information Display System
VMA	Marine Attack Squadron

VMAQ	Marine Tactical Electronic Warfare Squadron
VMAT	Marine Attack Training Squadron
VMC	Visual Meteorological Conditions
VMFA	Marine Fighter Attack Squadron
VMFAT	Marine Fighter Attack Training Squadron
VMFT	Marine Fighter Training Squadron
VMGR	Marine Aerial Refueler Transport Squadron
VMM	Marine Medium Tiltrotor Squadron
VMMT	Marine Medium Tiltrotor Training Squadron
VMR	Marine Transport Squadron
VMU	Marine Unmanned Aerial Vehicle Squadron
VMX	Marine Operational Test and Evaluation Squadron
VP	Fixed Wing Patrol Squadron
VPU	Fixed Wing Special Projects Squadron
VQ	Fixed Wing Fleet Air Reconnaissance Squadron
VR	Fixed Wing Fleet Logistics Support Squadron
VTOL	Vertical Take Off and Landing
VRC	Fleet Logistics Support Squadron
VRM	Fleet Logistics Multi-Mission Squadron
VT	Fixed Wing Training Squadron
VTOL	Vertical Take-Off and Landing
VUP	Fixed Wing Unmanned Patrol Squadron
VX	Fixed Wing Test and Evaluation Squadron
WATS	Wide Area Telephone Service
WBC	White Blood Cell
WBGT	Wet Bulb Globe Temperature
XO	Executive Officer

APPENDIX F: REPORT TIME LIMITS

REPORTS	REFERENCE	TIME LIMIT	AMO INPUT
OPREP-3 phone	OPNAV 3100.6	15 Min	-
NAVSAFECOM phone (Class A)	OPNAV 3750.6S	60 Min	+/-
OPREP-3 (Message Report)	OPNAV 3100.6	Per OPNAV 3100.6 series	-
PM (Preliminary Message - Class A, B & C. RMI)	OPNAV 3750.6S	24 Hrs	+/-
Amended PM (RMI)	OPNAV 3750.6S	As required	+/-
PE Notification Email	PE Operating Guide	96 hours (see note)	+/-
OSHA Report (On-duty government civilian fatality)	OPNAV 3750.6S	8 hours	+/-
SIR & AA	OPNAV 3750.6S	30 Cal Days	+
Endorsements	OPNAV 3750.6S	45 Days	-
HAZREP	OPNAV 3750.6S	30 Cal Days	+/-
HAZREP (RAC severe)	OPNAV 3750.6S	72 Hrs	+/-
Casualty Report	MILPERSMAN 1770-030	4 Hrs (no > than 12)	+/-
JAG	JAG Manual	30 Cal Days	-

NOTE: For reporting requirements regarding mishaps in a combat zone, see OPNAVINST 3750.6 series.

NOTE: For PEs involving Foreign National aircrew, a preliminary email notification is required within 4 hours. See PE Operating Guide for additional details.

APPENDIX G: FEDERAL STOCK # FOR PATHOLOGY SPECIMENS

ITEM	FEDERAL STOCK ITEM NUMBER
Bag, Polyethylene, Flat Heat Seal Closure	
3X5"	8105 - 00 - 579 – 9286
4X6"	8105 - 00 - 680 – 0503
5XI2 "	8105 - 00 - 702 – 7177
6X7"	8105 - 00 - 579 – 9285
18X48"	8105 - 00 - 702 – 7178
20X40"	8105 - 00 - 299 – 8532
24X24"	8105 - 00 - 200 – 0195
Box, Pathological, Shipping, Insulated	
2 cu ft	8115 - 00 - 226 – 1199
5 cu ft	8115 - 00 - 965 – 2300
Box, Plastic, Insulated, Meat, Dairy Products and Laboratory	
	8115 - 00 - 682 – 6525
Corrugated Mailing Carton for above (8115 - 00 - 682 - 6525)	
	8115 - 00 - 183 – 9490

APPENDIX H: GUIDE FOR WITNESSES STATEMENT

1. Ask witness to review and sign Advice to Witness Statement (select either privileged or non-privileged version as appropriate) https://intelshare.intelink.gov/sites/nsc/Pages/AviIn.aspx
2. Instructions to Witness.
   a. Please dictate (or write) a statement of the sequence of events, including all details you recall. Record the interview on an audio recording device if able.
   b. Try to keep the statements in chronological order, but feel free to add any significant information you may recall even if out of sequence.
   c. Include your best estimate of all times and time intervals.
   d. Think over your statement before beginning and then if dictating, do so in your normal conversational tone.
   e. Make special effort to describe exact observations of important details such as:
      - Please state name, rank, title, occupation, address, flight experience, phone number and email.
      - Witness location and activity when mishap was observed.
      - Time of day and weather conditions.
      - Smoke and fire: source or location, color.
      - Inflight signs of aircraft damage.
      - Unusual or abnormal flight characteristic.
      - Normal or abnormal engine noises.
      - All details of any observed ejection or bailout attempts.
      - Attitude of aircraft on descent.

APPENDIX I: GUIDE FOR AIRCREW SURVIVORS STATEMENTS/INTERVIEW

1. Ask individual to review and sign Advice to Witness Statement (select either privileged or non-privileged version as appropriate) https://intelshare.intelink.gov/sites/nsc/Pages/AviIn.aspx
2. Have survivor provide a detailed chronological account of the mishap from flight planning to rescue. Record the interview on an audio recording device if able.
3. Utilize the following outline for the interview.
   - Dictate (or write) a statement of the sequence of events, your actions and reactions up to the time following rescue.
   - Include all times or time intervals and other numerical data (airspeed, attitude, etc.) that you can recall and give your best estimate for those that you cannot recall specifically.
   - Take your time and try to keep the statement in chronological order, but if you recall something significant after you have gone past a particular phase go ahead and dictate it.
   - While dictating, try to review mentally each phase of the flight before dictating that sequence of events.
   - Read entire outline first, then begin dictating and remember to dictate time or time intervals in each phase.

   a. State your name, rank, title, date, squadron, ship and mishap aircraft and contact phone number.

   b. Pre-Flight:

      (1) Flight planning, brief, weather and mission

      (2) Weight and balance

      (3) Filing of flight plan

      (4) NVD pre-flight?

      (5) Dry suit requirements?

      (6) Aircraft discrepancy book review/signing for aircraft.

   c. Pre-Taxi, Taxi, Takeoff:

      (1) Man-up, number of occupants, their location and duties.

      (2) Engine startup, control checks.

      (3) Taxi and takeoff:

         - Cockpit environment (hot/cold).
         - How long were you in the cockpit prior to launch?

   d. Inflight:

      (1) What was your location in the aircraft and duties?

      (2) Significant events during flight.

   e. The Mishap:

(1) What was (were) the first sign(s) of trouble (i.e., noise, vibration, smoke, fire, gauges, switches, caution panel, loss of control, etc.)?

(2) At start of mishap what were your altitudes (AGL, MSL, pressure altitude within the cabin) and how long at that altitude; airspeed, heading, attitude; were NVDs worn; cloud conditions, weather, horizon?

(3) If in formation: lead, wing or other (explain), model of other aircraft (if involved).

(4) Who was at controls? Sequence of actions and their effects.

f. Descent/Landing:

(1) What were your rate of descent, airspeed, attitude, heading?

g. Impact/Ejection:

(1) What were your actions while preparing for impact/ejection?

h. Egress: Escape/Bail Out/Ejection:

(1) Communications prior to egress: describe.

(2) Escape phase:

- Ground / water egress
- Were there delays? Why?
- Were there difficulties, obstructions, or injuries?
- Which exit was used?
- What was the order of escape?

i. Ejection/bail out phase:

(1) Were there delays? Why? How long?

(2) Describe aircraft parameters at escape – (airspeed, altitude, descent rate, AOA, attitude, pitch, yaw, role, heading, etc.).

(3) For bailout: was the parachute actuated manually, automatically, or other?

(4) How was ejection initiated and by whom?

- Describe your body position at ejection.
- Ejection injuries.
- Seat-man separation.
- Opening shock, parachute canopy condition.
- Helmet, mask.
- Sequence of IROK procedures.

j. Parachute Descent/Landing:

(1) While descending and before landing indicate what you did and in what order.

(2) Landing – HABD/SEBD, LPU or other equipment used; direction facing upon landing.

- What was the terrain/sea state?
- Landing injuries

- Parachute drag? For how long and how far?
- SEAWARS, canopy deflation pockets. After landing indicate what you did and in what order.

k. List any prior ejection/bailout/parachute experience.

l. Terrain and weather conditions of crash/landing site.

m. Cockpit/cabin conditions after impact.

n. Survival/Rescue:

(1) Survival phase, ALSS equipment used:

- Difficulties?
- How long in the water? In the raft?
- Weather.
- Terrain at survival/rescue site.

(2) Rescue phase – means of location.

- Retrieval problems.
- Did you assist in your own rescue?
- Means of transport to medical.

(3) Did physiology, egress and survival training (or lack of training) contribute to any injury, rescue, or survival problem?

(4) Describe what you think caused the mishap and any factors that aggravated the conditions present in the mishap. What could be done to prevent the mishap from happening again?

APPENDIX J: POST-MISHAP AEROMEDICAL QUESTIONNAIRE

NOTE: This questionnaire is intended to compliment a separately written, detailed description of the mishaps events as well as a separate 72-hour history and 14-day sleep/work history. Dedicated Part A-D data sheets should be utilized instead for any mishaps potentially representing Physiological Events. All applicable use restrictions and safeguards should be utilized if privilege is offered in completing this questionnaire.

POST-MISHAP AEROMEDICAL QUESTIONNAIRE

Name:	DOD ID:
Rank:	Today's date:
Age/DOB:	Dominant hand:
Mishap date and time:	BUNO:
Mishap location:	Crew function:
Squadron:	Total flight hours:
Aircraft model:	Hours in type:

Describe any recent or long-standing medical problems:

Do you have a medical waiver? Is so, please list?

Did you experience any adverse physiological symptoms (headache, confusion, mental fogginess, difficulty breathing, visual changes, sensory changes, pain/discomfort, etc) during the mishap?

If yes, describe in detail the symptoms, severity, onset and (if applicable) resolution:

Describe impact on flight or performance:

Describe food intake (what, when, how much) on the day prior to and of the mishap:

Describe any fluid intake (what, when, how much) on the day prior to and day of the mishap as well as last urine output time/amount:

List any alcohol intake (what, when, how much) within the last week:

Have you taken any medications, vitamins, or supplements within the last 30 days?

What, when, how much and why?

Do you use tobacco or nicotine products?

What kind, how much and for how long?

Rate your level of fatigue (1 – no fatigue, 10 – extreme fatigue) both before and during the mishap event:

If fatigue was present during the mishap, describe any contributing factors:

When was your last leave?

How many days?

What type of leave was it and how was it spent?

When did you last exercise before the flight:

Typical exercise regimen?

How long have you been doing the regimen?

When was your last flight before the mishap event?

Have you ever been involved in a mishap before?

Give the date and describe the incident(s):

Describe any aircrew or aircraft life support systems abnormalities or dysfunction:

Total years of formal education and degree:

Are you currently experiencing any significant life stressors (relationships/family, financial, command/work, education, etc)?

Do you have any mental health concerns?

Describe any other factors that affected your personal performance leading up to or during the mishap event?

List any other factors relevant to the mishap:

APPENDIX K: FIRE TEMPERATURE ESTIMATIONS

Often, on-scene estimation of fire temperatures can assist in locating fire source and mishap cause. Lab analysis will give accurate temperature ranges, but the heat intensity can be approximated by referring to the following chart.

FLASH POINT AND AUTO IGNITION TEMPERATURES OF AIRCRAFT FLUID

FLUID	FLASH POINT (°F)	AUTO IGNITION TEMP. (°F)
AvGas (Any grade)	-45	830
JP-4, Jet B	-10	430
JP-5	145	460
JP-7	150	460
Jet A, Jet AI	120	460
JP-8	110	460
Lubricating Oil		
Mil-L-7808	435	730
Hydraulic Fluids		
Mil-H-5606B	195	435
Mil-H-83282	400	625
Skydrol l500 B4	320	945
Hydrazine	126	518

NOTE: Temperatures are approximate and depend on test method and conditions.

TEMPERATURE	TEST RESULTS
500°F	Neoprene rubber blisters
500°F	Cadmium plating starts to discolor
700°F	Silicone rubber blisters
1100°F	Titanium metal has a high affinity for gases when heated and a scale will begin to form. This scale increases thickness with time at temperature.
1200°F	Glass cloth fuses and fiberglass melts.
1400-1600°F	Glass softens.
Typical aircraft zinc chromate paints	
400°F	Softens
450°F	Starts to tan
500°F	Turns brown
600°F	Dark brown

700°F	Blackens
800-850°F	Blisters
900-950°F	Burns off
MELTING POINT	METAL
428°F	Selenium
449°F	Tin
609°F	Cadmium
621°F	Lead
935-1165°F	Aluminum
1175-1250°F	Aluminum Alloys
1202-1250°F	Magnesium Alloys
1600-2000°F	Brass
1760°F	Silver
1981-2000°F	Copper
2273°F	Manganese
2605°F	Silicon
2651°F	Nickel
2802°F	Iron
2550-2740°F	Stainless Steel
2820-3000°F	Titanium Alloys
3000-3100°F	Titanium
3430°F	Chromium
4760°F	Molybdenum
6170°F	Tungsten
Ground Fires	1600-2000°F
Inflight Fires	3000°F

Stainless steel discolors from tan to light blue, to dark blue, to gray with increasing temperature. Aircraft aluminum often develops a "broomstraw" appearance if exposed to an in-flight fire.

APPENDIX L: RISK ASSESSMENT CODES (RAC)

Risk assessment is the process of determining the level of risk associated with hazards that have been identified. A Risk Assessment Matrix is used to obtain a measure of the level of risk in terms of severity and probability, expressed as a Risk Assessment Code (RAC).

A RAC is an estimation of overall risk severity potential of an identified hazard. Five matrix-derived codes are used to quantify the risk of aircraft and property damage or personnel injury should that hazard strike again.

1. Hazard Severity Category:

- Loss of the ability to accomplish the mission. Death or permanent total disability. Loss of mission-critical system or equipment. Major facility damage. Severe environmental damage. Mission-critical security failure. Unacceptable collateral damage (i.e., Class A level damage).
- Significantly degraded mission capability or unit readiness. Permanent partial disability or severe injury or illness. Extensive damage to equipment or systems. Significant damage to property or the environment. Security failure. Significant collateral damage. (i.e., Class B level damage).
- Degraded mission capability or unit readiness. Minor damage to equipment, systems, property, or the environment. Minor injury or illness (i.e., Class C or D level damage).
- Little or no adverse impact on mission capability or unit readiness. Minimal threat to personnel, safety, or health. Slight equipment or systems damage, but fully functional and serviceable. Little or no property or environmental damage.

2. Mishap Probability Subcategory:

- Likely to occur immediately. Continuously experienced by an individual item or person, or continuously over a service life for an inventory of items or group. (One or more times within the next year).
- Probably will occur in time. Expected to occur frequently to an individual item or person, or continuously over a service life for an inventory of items or group.
- Possible to occur in time. Expected to occur several times to an individual item or person; or frequently over a service life for an inventory of items or group.
- Unlikely to occur. Unlikely to occur, but possible in the service life for any inventory of items, or group.

Risk Assessment Code - The RAC is an expression of overall risk, combining the elements of hazard severity and mishap probability. As defined in the matrix below, the RAC is expressed as a single Arabic number that can be used to help determine hazard abatement priorities.

This is the matrix used in several OPNAV instructions addressing risk management.

HAZARD SEVERITY	MISHAP PROBABILITY			
	A	B	C	D
I	1	1	2	4
II	1	2	3	4

III	2	3	4	5
IV	4	4	5	5

3. RAC Definitions:
   - Critical Risk - 1
   - Serious Risk - 2
   - Moderate Risk - 3
   - Minor Risk - 4
   - Negligible Risk - 5
4. A further breakdown of RACs is necessary for the Navy Safety Management System. A RAC of 1 or 2 is considered a severe hazard while a RAC of 3, 4, or 5 is considered routine.
   - Severe hazards receive priority by COMNAVAIRSYSCOM when allocating resources for corrective actions and require endorsements up to the action agency.
   - COMNAVSAFECOM tracks all mishap hazards until the corrective actions are complete.

APPENDIX M: ALSS COGNIZANT FIELD ACTIVITIES

An engineering investigation (EI) will be conducted on Aviation Life Support Systems (ALSS) Equipment utilized in a mishap or recovered in an investigation.

ITEM	ADDRESS
Ejection seats	Aircraft CFAs
Cartridge Actuated Devices (CADS)	NSWC-IH Indian Head, MD
Propellant Actuated Devices (PADS)	
All Parachute Systems and related hardware	NAWC-WD China Lake, CA
Ejection seat drogue parachute assemblies	
PCU Series integrated parachute restraint harnesses	
Sea Water Activated Releases Systems	
Anti-G garments	NAWC-AD Patuxent River, MD
Flight clothing	
Helmets	
Oxygen equipment	
Inflatable survival equipment	
Restraints (fixed seats)	
Rigid seat survival kits	
Crashworthy Seats	
Restraints (crashworthy seats)	
Restraints (mobile aircrew)	
Survival and rescue equipment	
Night vision devices (NVDs)	
Survival Avionics	NAWC-AD Indianapolis, IN
Pyrotechnic devices (flares)	NSWC, Crane IN

APPENDIX N: EJECTION DEFINITIONS AND TERMINOLOGY

1. Ejection System: A system (i.e., ejection seat, extraction system, electronic sequencer, crew module) designed to forcefully separate the crewmember from the aircraft and return him/her to the earth's surface.

2. Ejection Episode: A sequence of events beginning with the ejection attempt and ending after landing.

   The episode normally consists of three phases:

   a. Ejection phase: begins with initiation and ends with seat separation and/or parachute deployment.

   b. Descent phase: from parachute deployment until contact with the earth's surface.

   c. Landing phase: from initial contact with the earth's surface until free of parachute and stabilized in a survival situation.

3. Ejection: Completion of action by the aircrew member to initiate the ejection system (pulling handle) regardless of outcome, such as sequence being interrupted by ground impact or system malfunction.

   A successful ejection will result in the seat/man/module clearing the aircraft. If the sequence is interrupted before the seat/man/ module clears the airframe (such as impact of the aircraft with the ground or a subsystem component failure) the event will be termed an unsuccessful ejection.

   a. Inadvertent Ejection: Inadvertent initiation (mechanical or human) of the ejection system during normal operations associated with flight by any stimulus other than impact or thermal forces. Inadvertent ejections will include initiation through human error, foreign objects or malfunctions. For example, if a foreign object results in an ejection on the ground and the crewmember is fatally injured due to the lack of time required for completion of the sequence, it will be considered a fatal ejection. Inadvertent initiation of an ejection system by a ground crewman during maintenance operations will not be considered an ejection.

   b. If the determination can be made that the ejection system was initiated by abnormal means, such as violent impact with the ground or another vehicle in flight that renders the system ineffective as a lifesaving device, it will not be considered an ejection. This also includes initiation of the system by fire.

4. Survived: Any ejection wherein no fatality occurred from any phase of the ejection episode (ejection, seat separation, parachute deployment and parachute landing).

   a. The terms "successful / unsuccessful" shall be disassociated from ejection survivability to avoid possible confusion or misunderstanding concerning system performance. The term "survived / did not survive [fatal]" will be used.

5. Not Survived: Any ejection wherein subject received injuries during the ejection episode that resulted in a fatality within a thirty-day period.

6. Termination of the ejection episode after stabilization of the escapee on the earth's surface implies that all actions necessary to begin the survival phase have been accomplished. For example, if the escapee lands in the water and cannot free himself from his parachute and subsequently drowns, it will be considered an ejection fatality.

If, on the other hand, he clears the parachute only to encounter a situation after boarding the life raft that results in his demise, then it will not be considered an ejection fatality, but will be considered to have occurred during the survival phase. Inability to collapse the parachute in a high wind landing, regardless of the circumstances, resulting in the individual's being dragged to death will be considered an ejection fatality.

7. Examples of other conditions that would not be categorized as ejection fatalities include cold/heat exposure and injuries incurred during the survival phase that subsequently prove fatal.

1. The Flight Surgeon shall submit a 72-hour history form as an enclosure to the aeromedical analysis for each aircrew member and for other persons who may have contributed to the mishap. Per OPNAVINST 3750.6 series, fatigue modeling software analysis must be performed for all mishaps when fatigue is suspected or reasonably considered by the AMB regardless of class unless specifically exempted by NAVSAFECOM Aeromedical Division, Code 14. It is also required when, following fatigue data input, RMI indicates fatigue should be analyzed further as a possible factor. In these mishaps, a 14-day history will also be obtained, if possible, to facilitate optimal modeling. These forms may be privileged and are submitted as exhibits in RMI. If fatigue modeling analysis utilized privileged input or represents AMB/SIO deliberation, the results will be considered privileged.
2. This history should begin 72 hours prior to the time of the mishap and proceed in a chronological order. Among important items to consider are: (1) exact content of meals (if known), (2) alcohol consumption, (3) sleep periods, (4) stressful situations of any nature, (5) significant events and (6) medications/drugs. Items listed should be accompanied by time of occurrence (if known). Provide comments concerning any deviation from normal habit patterns.

    An example is provided:

72 HOUR HISTORY	
Sunday, 14 Oct 2000 (Wake-up one day before mishap day)	
0500	Woke up, ran 8 1/2 miles.
0900	Showered, breakfast with family, 1 Bloody Mary, 3 cups of coffee, 2 waffles with butter and syrup.
0930	Read Sunday paper.
1030	Dressed for church.
1100	Left to go to church with family.
1330	Lunch at hamburger joint, 1 quarter-pound cheeseburger, fries and large diet coke.
1400	Took kids to zoo. Fell off elephant ride and bruised left ribs.
1600	Returned home, watched football on TV, had 4 beers.
1900	Supper at home, spaghetti and meat sauce, 1 glass of Chianti, salad, 2 slices garlic bread.
2000	Call from mother, father had heart attack, in hospital, condition - stable.
2100	Took 800 mg Motrin for bruised rib.
2200	1 wine cooler, went to bed.
2400	Awakened by baby crying, helped wife with child.
0130	To sleep.

3. 14-Day History: The 14-day history is useful in determining habit patterns and addressing longer-term fatigue issues. In the event the 72-hr history raises concerns about possible fatigue or as a default when no informed assessment can be made immediately after a mishap, a 14-day history should be obtained. This is not as detailed as the 72-hour history and focused primarily on sleep. This history is required for all mishaps involving Air Force personnel.
    a. Circadian Rhythm. Where had the pilot traveled within the past 14 days? What had their duty schedule been like? Their sleep/wake cycle?

b. Estimate the number of hours slept in the 7 days (14 days if possible) leading up to the mishap.

c. Describe the crewmember's alcohol consumption pattern over the 7 days leading to the mishap.

d. Any significant health, social, emotional, financial, duty or vacation events in the past 14 days?

APPENDIX P: SEARCH AND RECOVERY OF REMAINS

Search and recovery of human remains can expose team members to potential biological hazards. Ensuring safety for those involved is of paramount importance.

1. Mishaps associated with fatalities should incorporate subject matter experts such as AFMES whenever feasible.
2. Teams must wear appropriate PPE (see Blood-Borne Pathogens section) and be IAW BUMEDINST 6230 series for immunizations.
3. Search and recovery team safety is paramount. It cannot be emphasized strongly enough that crash scenes present a multitude of hazards to investigative and recovery personnel. In addition to hazardous materials and biohazards, unexploded ordnance and survival equipment (pencil flares and day/night flares) can present significant dangers. The presence of HAZMAT and EOD (Explosive Ordnance Disposal) specialists can prove invaluable and the AMO should not hesitate to request their assistance.
4. Search Phase:
    a. The AMO should brief team members on what to look for.
    b. A rough sketch should be annotated, as remains are located.
    c. The search for remains should be extended well beyond the perimeters of aircraft wreckage.
    d. Use a parallel or contour search pattern.
    e. One team member can systematically search a 2-linear foot area to the left and right (4-linear feet). A team of 25 members moving abreast can cover about 100-linear feet.
    f. Team movement is under the command of the team leader, who is positioned in the center (2 flankers may assist).
    g. When remains are encountered the team leader is alerted, the team is halted and a stake, with streamers attached, is set. Remains are not to be disturbed at this time.
    h. When the search line completes its first leg, the team uses a pivoting movement to reposition for a second leg etc. When completed, a similar search will be made 90 degrees to the first.
    i. Remains may be hidden beneath wreckage. Things to consider:
        (1) Use instructions in the form of handouts for the team members.
        (2) Use search dogs to assist in finding hidden remains.
        (3) If remains are found in an ejection seat, ensure the seat is safe prior to any manipulation.
5. Recovery Phase:
    a. The recovery team composition and mission execution should be guided by consultation with subject matters such as AFMES whenever possible. A team leader should be identified and a photographer incorporated.
    b. Diagrams are time-consuming, but essential. As the staked remains are located, the following actions should be taken:

(1) Each fragment or body must be tagged, staked, photographed and plotted on the remains location sketch. The position within the wreckage of each portion of remains should be diagrammed. This can be done by hand drawing or by having the surveyors document the position of each fragment using GPS, if available.

(2) The tag and stake numbers must match and the numbered tag should show in the photographs.

(3) The most common designation system used is the “X” system, where each body and fragment are given a unique “X” number, starting with X-1, X-2, etc.

(4) Three tags will be required for each remains: one for the specimen, one for its pouch and one for the stake. For large fragments or for bodies, it is helpful to attach a tag to both the body and to the outside of the body bag or other container.

(5) Unassociated remains and personal belongings should not be commingled.

(6) Be sure to examine the soil beneath bodies for teeth, personal effects, etc. The soil beneath badly fragmented bodies can be sifted through wire mesh to recover small fragments or personal effects.

6. Storage of remains:

a. Local medical facilities should be able to provide refrigerated storage of remains.

b. In instances of large numbers of fatalities, potentially exceeding the capacity of the local hospital, consider renting a refrigerated semi-trailer. Ensure the trailer has a metal floor to facilitate cleaning at the mishap's conclusion.

7. Hidden remains:

a. Inevitable in mishaps resulting in fragmentation of individuals. Remains will be found as wreckage is moved, after the medical team has left the site.

b. If the possibility of hidden remains exists, make arrangements for a medical representative to be on site with the wreckage reclamation team as wreckage is moved.

c. Have the representative contact you for disposition.

APPENDIX Q: LIST OF WITNESSES

Name:

Phone Numbers:

Home: Work:

Address:

Email:

Remarks:

2. Name:

Phone Numbers:

Home: Work:

Email:

Address:

Remarks:

3. Name:

Phone Numbers:

Home: Work:

Email:

Address:

Remarks:

4. Name:

Phone Numbers:

Home: Work:

Email:

Address

Remarks:

APPENDIX R: SOLVING CRASH FORCE PROBLEMS

1. Reconstruct the crash sequence:
   a. Identify the Initial, Principal and Secondary Impacts.
   b. Determine the Stopping Distance – look for:
      (1) Structural Collapse.
      (2) Gouge Marks.
2. A method of solving crash force problems:
   a. Sketch known quantities (draw the picture). These are often estimates obtained from eyewitnesses, radar tapes and aviator statements.
   b. Determine the airspeed along the flight path, with consideration for altitude and winds. You are trying to determine the ground speed at impact. This will be the hypotenuse for your calculations. Again, this is often an estimate.
   c. Convert known quantities to standard units.
      (1) Distances to Feet.
      (2) Velocities to Feet Per Second (fps).
         (a) MPH x 1.46 = fps.
         (b) KTS x 1.69 = fps.
         (c) FPM ÷ 60.0 = fps.
   d. Determine the magnitude of the velocity components.
      (1) Parallel to the impact surface = Vh.
      (2) Perpendicular to impact surface = Vv.
   e. Determine stopping distances from direct measurements:
      (1) Parallel to the impact surface = Sv (Skid marks + Longitudinal crush of aircraft).
      (2) Perpendicular to impact surface = Sv (Crater depth + aircraft vertical crush).
   f. Determine Acceleration Components - choose "best guess" deceleration pulse shape.

Example - Rectangular Pulse

Parallel to the surface	Gh =	$\frac{Horizontal\ V^2}{64.4\ x\ S_h}$
Perpendicular to the surface	Gv =	$\frac{Vertical\ V^2}{64.4\ x\ S_v}$

Example - Triangular Pulse:

Parallel to the surface	Gh =	$\frac{Horizontal\ V^2}{32.2\ x\ S_h}$
Perpendicular to the surface	Gv =	$\frac{Vertical\ V^2}{32.2\ x\ S_v}$

g. Determine resultant acceleration magnitude and direction with respect to the impact surface (the Crash Force Resultant) using a vector analysis of Gh and Gv.

h. Determine direction of resultant acceleration with respect to aircraft axes using the Crash Force Angle:

(1) Crash Force Angle = Resultant Angle + Pitch Angle -Terrain Angle

(2) And determine the resultant forces experienced by the occupant's dependent on the orientation of the occupants in the aircraft.

APPENDIX S: HUMAN FACTORS ENGINEERING INVESTIGATION

1. Introduction.

   Whether investigating a civil, commercial, or military aircraft mishap, one critical component of that investigation must be to assess the extent to which Human Factors Engineering (HFE) may have played a role in contributing to the mishap.

   Specifically, the investigator should look for any element(s) of aircraft or personal gear design, as well as aircrew/passenger related indicators, that suggest impairment of performance, error in decision-making or operation, or other such human-machine interactive variable. While some of this information will be determined during later off-site briefings and engineering analyses, it is critical that the AMO obtain timely (that is, undisturbed) on-site evidence as soon as possible after the mishap.

   a. The ability to accomplish the HFE analysis will rely on the intact state of the aircraft and condition of the crew/passengers. If the aircraft is severely damaged or destroyed, the HFE analysis will be limited. If the aircraft is partially or slightly damaged, access to certain portions of the vehicle may still be possible and the HFE analysis more extensive. In the event of fatalities, it may be possible to obtain some HFE data from the remains; however, in more severe mishaps where damage to the remains is extensive, this may not always be the case.

   b. By the time the investigator arrives at the mishap site, survivors will usually have already been taken to a local medical facility and therefore may not immediately be available for interviews. Although survivors may possess information that may implicate human engineering in the cause of the mishap, such critical information will usually be recorded off-site and is therefore out of the scope of this narrative.

   c. There are four primary steps involved in the HFE portion of the aeromedical investigation. These are:

      (1) Preparation: Have the necessities on-hand and ready before you must head out to the mishap site.

      (2) Mishap Site Overview: Provides a general overview of the entire mishap site, including the location, orientation and condition of the aircraft and remains.

      (3) Cockpit/Cabin Inspection: The condition of the cockpit and/or cabin will help you to identify possible human engineering factors that may have contributed to the mishap.

      (4) Flight Gear Inspection: An examination of flight suits and ancillary gear can provide important clues to what the aircrew was doing at the time of the mishap. This is especially critical when the design of the flight gear may have contributed to the mishap.

2. Preparation.

   As a member of the mishap investigation team, you will already have prepared an aeromedical investigation kit prior to heading out to the mishap site. There are some items that should be included in the kit that can facilitate your human engineering survey of the crash site, aircraft and survivors/remains. Some of these are as follows:

   a. An audio recording device for notes. This precludes having to do much writing and allows for more spontaneous reflection on the situation at hand.

b. Human Factors. Engineering Investigation Checklist. Have this HFE investigation checklist available at the mishap site either electronically or in print. To prevent damage to these documents if printed, make certain to seal all checklist plates in a clear plastic, waterproof 'envelope.' Having this reference on-hand will preclude your having to remember the many steps in what can become an extensive process.

c. Terrain Map. Bring copies of applicable terrain charts/road maps/regional approach plates to the mishap site and indicate the location on your map. If possible, mark the flightpath of the aircraft from the point of entry into the area covered by your map to the point of impact. Having this diagram and easily retrievable information may prove critical when implicating terrain or man-made obstacles in the mishap.

3. Overview of Crash Site.

a. One of the most critical parts of the human engineering investigation is to assess the general layout of the mishap scene. This should be done as soon as possible; even from the earliest moments of a mishap, there is the problem of disturbed and missing items that may affect subsequent accuracy of the investigation. Take notes, either written or by hand-held audio recorder and, if possible, ensure that the official photographer takes both color photographs and videos of HFE-related subjects.

b. Walk throughout the entire site, making certain not to touch or otherwise disturb any evidence. Look at the position of the aircraft from many different angles, noting the extent of the damage and the scatter pattern of its components. Try to establish how the aircraft impacted the terrain, noting the situation of the terrain itself, especially height cues (open field, rolling hill, mountainous, forest, water, etc.). It is during this process that you should make an approximation of angle of attack and speed of impact, noting damage to any structure that the aircraft may have impacted during its descent (i.e. houses, towers, trees, etc.). Note whether the final resting position of the aircraft is inverted, on its side, or right-side up.

4. Cockpit Inspection: Next, an inspection of specific cockpit components (i.e., instruments, lighting, fuselage/canopy braces, etc.) will provide an idea as to whether these may have contributed to the mishap. Before you start the inspection, ensure that you are doing so will not disturb the overall position and stability of the cockpit.

In the case of an aircraft having canopy-based ingress/egress, DO NOT ENTER THE COCKPIT UNDER ANY CIRCUMSTANCES! For aircraft without canopies (those where entry/egress is normally through doors or hatches) enter the aircraft flight deck only when your safety and mishap state of the cockpit can be ensured. If this is not possible, make as much of your inspection as possible from outside the fuselage.

a. Cockpit Overview: Before commencing a detailed inspection of the cockpit, note its general condition; specifically, it's position (i.e., inverted, nose-down, on its side, upright, etc.), the extent of the damage (in the range from completely intact to destroyed) and the nature of that damage, especially any impact-related deformations of the braces, bulkheads and components. Next, begin your inspection of specific cockpit components as outlined in the following paragraphs.

It is important here to remember that during your inspection, DO NOT ATTEMPT TO DISMANTLE OR RECONSTRUCT ANY COCKPIT COMPONENTS FOR ANY REASON. If you cannot obtain a certain piece of critical information without tampering with the component, then make a note of that fact for investigators who will later perform a detailed inspection during the off-site engineering investigation.

b. Design/Location of Instruments and Controls Faulty and inadequate designs of cockpit displays and controls have often been cited as factors contributing to a mishap, especially those associated with stressful situations and high workload operations. Use the set of cockpit schematic diagrams as an aid in your examination of the instrument panels and components, especially when describing the extent and locations of damage. If possible, note the locations of those controls and avionics components which may have become detached from their original positions.

(1) Displays/instruments: Mishap narratives have suggested that instrument design deficiencies or improper placement of displays in a cockpit can result in problems associated with the 'performance triad'; that is, the perception of displayed information, the interpretation / understanding (cognition) of that information and the response to that information. This has further led to the subsequent improper use of cockpit instruments and displays.

- On occasion, certain aircrew will find specific instruments annoying, distracting, or unreadable in certain lighting conditions. In other cases, these instruments fail to provide certain types of critical information ("gouge") that pilots require. One method of getting around these problems has been the use of `homemade fixes'. Typically, these fixes include covering an instrument either in part or entirely. For 'gouge' information, pilots will occasionally adhere tape onto the faces of analog instruments to indicate upper and lower condition limits. Still others will `post' various types of information on or near various instruments and controls. Such `homemade fixes' have in the past been shown to have led to certain mishaps. Be sure, therefore, to note any unauthorized alterations, modifications, or `fixes' made to any instruments, i.e., shades over or blocking instruments, disabled switch guards, etc.
- When examining instruments and displays with limited damage, you should note some of the readings on the primary instruments (i.e., ADI position, altitude, airspeed, vertical velocity, fuel state, etc.). Although these may have been altered by the force of impact, such information can aid in later understanding of aircraft state shortly prior to and at the moment of impact. Also indicate whether any caution/warning flags were displayed and if power is still available; note whether any caution/warning lamps were illuminated.

(2) Controls: Poor design and placement of controls may preclude their operation under certain circumstances. Yoke or hand gripped stick controllers may prove confusing, anthropometrically inadequate, or too complex to be used in emergency situations.

- Cockpit panel controls may be of poor design, i.e., similar shape, proximity, color, etc., to hinder a crewman's ability to locate and operate that control. Mishap narratives have shown that such problems have resulted in the inadvertent or delayed operation of various critical switches and controls, whether as a deliberate act by the crewman or accidentally as a function of body movement or a control being `snagged' by a piece of flight gear.
- At the mishap site, you should examine hand and panel controls for state (i.e., location of throttles, positions of switches and switch guards) and damage. In the latter, note the condition of the control yoke/stick and rudder pedals/brakes, as position and damage to these are both indicators of whether control inputs were being made at impact. These indicators can later be compared with flight gear damage (i.e., tears to gloves, shoe/boot indentations, shattered helmet eye shields, etc.) and evidence of physical injury to the feet, legs, arms, hands and skull to help make the assessment. Further, if the remains are still seated in the cockpit, note whether their hands are on controls or their feet on rudder/brake pedals.

- To determine whether or not there may have been inadvertent control activation, note the presence and location of ancillary flight gear (i.e., checklists, kneeboards and survival vest contents), especially if they are physically in contact with a control.

c. Lighting: The HFE investigation must also include knowledge of lighting conditions at the time of the mishap. Primarily, the investigator wants to determine what effects if any ambient and direct lighting may have had on the ability of the aircrew to (1) continuously visually monitor cockpit data, (2) perceive/interpret instrument and caution/warning indicator information which may have suggested a problem and (3) observe anomalies physically on or in the aircraft.

(1) Using time-of-day and meteorological data, the investigator should be able to determine whether ambient lighting (i.e., sunlight, glare, or reflections, etc.) may have impeded the pilot's ability to read certain displays. Another way to determine this is by the presence of improvised "anti-glare shields" fastened above or to the side of certain displays or instruments. Usually, the use of this type of homemade fix reflects the existence of a contrast problem whereby the instrument face (in the case of older analog instruments) or the liquid crystal/light emitting diode display is washed out by direct sunlight (solar washout), even when display brightness is set at maximum. Further, although solar washout may be transient, some pilots may forget about the shade or will choose not to remove it when the problem no longer exists. Although the shade provides temporary relief from solar washout, it may prevent the pilot from reading parts of the same instrument or display as well as information from other displays.

(2) Other indices of instrument/display illumination-related problems are associated with direct lighting: the illumination of instruments by internal lamps. Brightness levels can be adjusted by the pilot to meet ambient lighting requirements. For example, as mentioned above, when there is a problem with solar washout, brightness is usually adjusted to maximum. In aircraft cleared for missions requiring night vision device (NVD) use by aircrew, direct lighting is usually made compatible with NVD sensitivity limits. However, mishap narratives have revealed that pilots flying in such aircraft can still experience problems with lighting.

d. Cockpit/Cabin: Egress and Ejection. There are a number of human engineering factors associated with the ability of aircrews and passengers to egress from an aircraft safely and expeditiously. If egress from the mishap aircraft was attempted while still in flight, the HFE investigator must assess whether or not aircrew or passengers had attempted to get to exits or hatches, noting any physical obstacles they may have faced in doing so.

In aircraft equipped with ejection seats, the investigator must note whether or not canopy/hatch jettison may have impeded escape or caused injury. Finally, personal survival equipment (if available) should be inspected for use and operational effectiveness. What follows is a more detailed discussion of some of these factors.

(1) Physical Restrictions: If the cockpit and/or cabin are intact, the investigator may find that there were certain elements of fuselage design, which may have interfered with an individual egressing the aircraft without injury. Examples of such fuselage design elements include the blockage of cabin aisles by removed emergency hatches, the presence of "step over" bulkheads (requiring an individual to literally step over a doorway or sill to enter or leave the cockpit), warped bulkheads which may have blocked egress, large electronic interface access panels, support gear (i.e., galleys and their contents, stowage bins and lockers, etc.) or `fold away' seats which, upon impact, may have become dislodged from fuselage restraints and blocked the egress path.

(2) Hatches/Canopies: Check to see whether aircrew or passengers had made any attempts to remove fuselage hatches, doors, or the cockpit canopy. Note the positions of all door/hatch operation mechanisms or manual canopy eject handles. Note whether deformation of the fuselage may have prevented successful removal of the doors or hatches. Also note whether the canopy is in place and, if opened, the extent to which it remained open after the mishap.

(3) Seat Condition: The post-mishap condition of seats and restraints are often good indicators of whether their design helped prevent or contribute to injury. Further, mishap narratives have shown that under certain conditions, design elements of specific seats and restraints can inadvertently snag and operate cockpit controls.

During your inspection of the cockpit and/or cabin, note whether each seat remained intact or was in some way deformed. If the latter, note the nature and extent of deformation. It is also critical to report whether the seat had collapsed or had torn loose from its moorings to the fuselage.

- If the mishap involved a helicopter, make sure to note whether or not the seat had stroked; in particular, describe the extent of the stroke. Stroking is a mechanism by which vertical seat movement helps to partially absorb certain impact forces. A fully stroked seat (together with the Aeromedical Analysis) will help to determine the impact forces on the individual occupying the seat. If the seat is partially stroked (that is, did not travel the entire length of the mechanism), note the extent of the stroke and whether or not any cockpit equipment (i.e., electronics boxes, survival gear, ancillary equipment, etc.) may have impeded movement of the seat.
- In certain helicopter cabins, passenger seats are mounted to aircraft bulkheads and floors by metal arms and wires attached by spring-loaded clips to fuselage frames. Check these seats to see if they had lost integrity and had detached from any of their mooring points. Note the extent of damage to the seat material and the metal support frame.
- In aircraft where ejection seats are located in the cockpit, first ensure that the seats have been "safed;" that is, where authorized personnel have taken measures to preclude the activation of all ejection systems, i.e., seat charges, spring-loaded rails, etc. DO NOT ATTEMPT TO GO NEAR THE COCKPIT UNTIL THE EJECTION SEAT HAS BEEN SAFED! Even when “safed,” do not sit in the seat or in any way attempt to activate a control on or near the seat. As with other aircraft systems, the on-site inspection of ejection seats should
  be visual only!
- Check the seat for deformation, tears to the seat pillow/headrest fabric, damage to the metal seat pan and support frame, the condition of the ejection handles (or similar devices which initiate the ejection), seat-restraint separation rings and all other controls that change seat position. In particular, the investigator wants to note whether there were
  any pieces of cockpit gear that may have snagged any of these actuators.
- Restraints: Restraint systems provide the only means of retaining occupants in their seats, a function most critical during turbulent or uncontrolled flight as well as in survivable mishaps. Further, when used correctly, such restraints help to minimize injuries during ejection. If the restraints were improperly fastened or not used at all, this finding may be substantiated by off-site medical examination. In some cases, despite proper use, material failure can result in the restraint coming apart during impact at the

fastener connection points (i.e., single-point buckles, 4-point metal `hook and eye' latches, 5-point twist connectors, etc.), at bulkhead/seat mooring points, or in the case of degraded fabric,
at any point on the belts themselves.

- The HFE inspector should therefore examine all seat restraints (both in the cockpit and cabin) for their integrity and whether or not they successfully served their purpose. If the occupant is still in their seat at the time of your inspection (whether in the aircraft or restrained to a fixed cockpit, cabin, or expended ejection seat), note whether or not there might have been any attempt to activate the restraint operating mechanisms: the seat-mounted handles which release or lock restraint movement and the fastener connection release handles/dials. It is possible that malfunctions in either mechanism may have prevented occupant-seat separation. Note any fractures or breaks in connector mechanisms, any tears, or separations in the belt fabric and whether or not the belts remained moored to the fuselage or seat.

(4) Helmets: In military aircraft where helmets must be worn, note whether there is any damage to the helmet shell and visor (making sure to note whether or not the visor was in the down protective position). If an oxygen mask is required, note whether or not it is fastened in place on each crewmember.

These procedures are critical as severe damage to specific areas of the face and skull may indicate that upper torso restraints failed thereby allowing the pilot/co-pilot to rotate forward and strike the control yoke or stick.

- If the crash forces were minimal and the restraints failed (or were in the unlocked position, thus allowing freedom of movement), then the helmet, visor and oxygen mask should have provided some protection against stick or yoke impact and produced slight if any injury.
- If crash forces were high and the upper restraints failed, one should be able to observe greater damage both to the protective gear and crewman directly attributable to high G impacts with controls or the instrument panel.

1. When an active-duty member dies outside the boundaries of a military installation or if that military installation is not exclusive federal jurisdiction, the remains cannot be recovered or transferred from the place of death to some other location by military personnel without the expressed permission of local civil authorities.

   So that full accord exists regarding the control of active-duty deaths (disaster and non-disaster) on or off the installation, the AMO should work with the local Military Treatment Facility Mortuary Affairs Officer to ensure that a current effective MOU is established between the military installation and the medical examiners or county coroners and local law enforcement authorities as deemed appropriate. Remember that some regular use ranges cover more than one county so several MOUs may be needed to support one base. The MOUs' provisions are negotiated in the best interest of the military to the extent possible.

   a. The MOU includes, but is not limited to, the following items:

      - Search and recovery of remains
      - Identification and pathological examinations
      - Custody of the remains
      - Personal property
      - Transfer of the remains from the scene or place of death
      - Expenditures for professional services for the medical examiner or coroner; do not obligate any funds without proper authority, e.g., from the Senior Member of the Mishap Board.
      - Signing of death certificate(s)
      - Issuance of burial and transit permits
      - Some states retain concurrent jurisdiction with the United States. In these situations, it is necessary to accomplish the MOU with officials at state level rather than with local officials.

2. When an MOU is inappropriate or not possible to accomplish, a memorandum for the record is prepared. The document relates the situation, circumstances and unsuccessful efforts expended. Such official memorandums for the record will suffice in the absence of an MOU.

DO NOT ATTACH THIS FORM TO A JAG INVESTIGATION.

Aeromedical Analysis Sample – June 2024

The structure and content of the Aeromedical Analysis (AA) is presented below as an example for how a thorough AA should be written. For those Aeromedical Officers that are unfamiliar with or need review of the Human Factors Analysis and Classification system (HFACS), an introduction can be found in the Naval Safety Command pocket flipbook or on the Aeromedical Division CAC-enabled website. Finally, the Naval Safety Command cannot stress enough the importance of uploading all necessary enclosures and relevant supporting documents with the AA into RMI. Please see the ASO RMI Operating Guide on the Naval Safety Command CAC-enabled Aviation Safety Officer website for additional details. Additional aeromedical mishap support resources are contained on the Naval Safety Command CAC-enabled Aeromedical Division website and on the Naval Safety Command App (Available on the App Store or Google Play). Information in the AA and supporting documents is utilized to draw important conclusions and inform recommendations which may save lives and aircraft. Aeromedical Officers are encouraged to elicit the help of AMSO's, PR's, NATOPS personnel, engineering/NAVAIR Fleet Support Teams, squadron safety personnel, and the Naval Safety Command, so that the AA and supporting documents may be finished in a timely and complete manner.

NOTE: The **AA contains privileged information** which must be handled and submitted accordingly. This document, as well as any others containing privileged information, will be uploaded to the Medical Analysis section under the Exhibits tab of RMI. Any documents, including the AA and enclosures, uploaded into RMI containing Controlled Unclassified Information (CUI) must be appropriately marked.

SAMPLE AEROMEDICAL ANALYSIS

FLT SRGN: William Smith **Rank/Grade:** LT, MC, USN (FS)
Mailing Address: UNIT 009, BOX 636, FPO AE 12345-6789
Phone Numbers: DSN 999-1234, Commercial (123) 321-1234
FLT SRGN Email: wsmith.mil@us.navy.mil
Date AA submitted: 3/25/22
Hours spent in investigation: 90
AMSO or others who assisted: LCDR Fred Jones, MSC, USN
AMSO Email: fjones.mil@us.navy.mil

ENCLOSURES TO AEROMEDICAL ANALYSIS
01 72-Hour Histories for Mishap Aircrew
02 AFMES Reports
03 Post Mishap Physical Examinations and pertinent medical record extracts
04 Copies of past two Physical Examinations with waivers for all personnel

Reporting Custodian:	**HELSQUAD009**	Mishap Severity:	**A**
Date of Mishap:	**01 Oct 22**	Mishap Category:	**FM**
Aircraft Model:	**SH-60B**	BUNO:	**645123**

05 Sensitive reports and pertinent photographs
06 SAFTE-FAST Analysis and 14-Day History for MHAC

ABBREVIATIONS USED

AA = Aeromedical Analysis
AC = Aircraft
AFMES = Armed Forces Medical Examiner System
AMB = Aviation Mishap Board
ASO = Aviation Safety Officer
CDI = Collateral Duty Inspector
CO = Commanding Officer
CTW = Commander Training Wing
DDG = Guided Missile Destroyer
FNAEB = Field Naval Aviator Evaluation Board
FRS = Fleet Replacement Squadron
FS = Flight Surgeon
H2P = Helicopter Second Pilot
HAC = Helicopter Aircraft Commander
HCO = Helicopter Control Officer
HOSS = Helicopter Onboard Surveillance System
HT = Helicopter Training
IFF = Interrogate Friend or Foe
LPU = Life Preserver Unit
LSO = Landing Signal Officer
MA = Mishap Aircraft
MAC = Mishap Aircrewman
MC = Mishap Crew
MH2P = Mishap Helicopter Second Pilot
MHAC = Mishap Helicopter Aircraft Commander
MPAX = Mishap Passenger
NATOPS = Naval Aviation Training and Operating Procedures Standardization
OIC = Officer in Command
PAC = Pilot at Controls
PAX = Passenger
PCL = Pitch Change Link
RHIB = Rigid Hull Inflatable Boat
SA = Situational Awareness
SEA = Survival Egress Air
SENSO = Sensor Operator
SOP = Standard Operating Procedures
SPDB = Student Progress Disposition Board
VFR = Visual Flight Rules
VT = Fixed Wing Training
WNL = Within Normal Limits

XO = Executive Officer

1. REVIEW OF EVENTS

a. Mishap Overview

Approximately five weeks prior to the mishap flight, the MH2P was the PAC during a night visual identification of a merchant vessel. The AC during this mission was the same AC as the MA. When decelerating and descending downwind to obtain a better visual identification of a merchant ship, the AC experienced an unintentional right yaw. The AC rotated through the wind line and completed 180 degrees of rotation before the MH2P regained control. After review of the incident with the HAC of that flight (not the MHAC) it was felt that the MH2P had become focused on the ship's lights and lost SA. This incident was not brought to the attention of the detachment OIC (the MHAC) until after the mishap.

Three weeks prior to the mishap flight, the MH2P was the PAC during a day VFR launch from a DDG. The AC during this mission was the same AC as the MA. Following an abrupt pull on the collective during takeoff, the AC completed 290 degrees of unintentional right yaw before the turn was arrested and the AC departed the DDG. The seriousness of the event generated personal message traffic between the incident ship's CO and the detachment ship's CO. After review of the incident by the HAC of that mission (same HAC as in the first incident described above) with the MH2P, it was felt that the AC had most likely a little right pedal remaining in following the prior landing. This slight right pedal input combined with an abrupt pull on the collective and some confusion on the wind direction resulted in the rightward yaw upon takeoff. Before the effects of appropriate left pedal input took over, the AC tail swung through the windline (15 degrees to port) adding additional force to the rightward turn. Regardless of wind direction, rightward or leftward yaw or pedal turns are never tolerated on takeoff, especially from a ship at sea. The typical brief is that when the nose breaks on takeoff put the AC down if at all possible. The incident was not brought to the attention of the detachment OIC until after the personal message traffic between the two ship COs. The MH2P was later informally counseled by the OIC but the incident was not brought to the attention of the squadron CO. Moreover, the OIC was not aware of the first incident at the time of this counseling.

In addition to these two incidents, the MH2P had the controls taken from him on two other occasions during this detachment. The first was when he drifted over the LSO control station during takeoff and did not respond to verbal direction from the HAC. The second was when he again drifted right and the HAC lost sight of the flight deck environment. The MC had been on detachment for approximately two and a half months prior to the mishap.

Except for the above-mentioned incidents, the detachment had been uneventful.

The MC had flown an uneventful mission the night prior to the mishap. All three were in bed by 0100 on the day of the mishap. The MC had received adequate rest prior to the mishap. The mission was to be a routine patrol. The XO of the ship was to accompany them as a PAX on a familiarization flight. The briefs and man up were uneventful. The MPAX sat in the SENSO seat and the MAC sat in the rescue seat in the far aft of the MA. Flight quarters were called and the rotors engaged. The MC then spent approximately 30 minutes trouble shooting an IFF problem. Once the IFF problem was fixed, the MHAC decided the crew would perform a cross-cockpit takeoff with the PAC (MH2P) in the right seat and the MHAC in the left seat with the MA in the starboard trap. The decision to perform the cross-cockpit takeoff was not made until the takeoff checklist had been completed. There was no formal brief but the MH2P stated that he was comfortable performing a cross-cockpit takeoff. Chocks and chains were removed and a "Green Deck" was called.

With the MH2P at the controls, the MA lifted off and immediately began a rightward turn. It was noted the AC did not reach standard hover altitude of 5 feet. The MHAC remembers that the MH2P pulled collective quite slowly and was not abrupt on the controls. He also remembers looking at the pedals as soon as he noted the rightward yaw and did not see any right pedal deflection. Shortly after the onset of the turn, the MH2P uttered an expletive and attempted to “hold it steady.” Between 60 and 90 degrees of turn, the MHAC had come on the controls and began to input left pedal, increasing deflection until he had applied full left pedal. The MHAC called set it down, but the MH2P did not respond. The MHAC then lowered the collective at approximately 160 to 180 degrees of yaw. The MA lost altitude, continued its rightward yaw, skipped across the flight deck and landed in the starboard safety nets, facing forward and teetering at nose high attitude of approximately 45 degrees. While the MA was in the nets, the MAC noted loose gear falling aft and lodging near the main cabin door, his primary egress route. He unfastened his harness and kicked the loose gear out the main cabin door. At this point the MH2P remembers fully lowering the collective. The MHAC then pulled the PCLs aft taking momentum off the rotor head. The MA increased its pitch to close to 90 degrees before rolling right, impacting the water tail low and completely inverted. The MAC was able to get two good handholds before the MA hit the water, but these were jarred loose upon impact. All members of the MC felt that they were instantly submerged and had no opportunity for “one last breath.”

The MAC was the first to surface, less than ten seconds after the MA hit the water. The shaded visor had fallen down in front of his eyes during water impact, so he removed his helmet prior to egress. He did not feel a need to use his SEA device. On the surface, he did not inflate his LPU. He began counting heads and noted only two others beside himself. He then climbed onto the now sinking MA, removed his LPU, and dove back into the

water alongside the cockpit. He was able to feel around inside the cockpit but did not find the missing crewman. He surfaced and noted the previously missing crewman (the MH2P) floating next to him. He then inflated the MH2P's LPU.

The MPAX was the second to surface just after the MAC. The MPAX had difficulty finding the cabin window emergency release handle and opted to egress through the main cabin door. His LPU caught briefly in the doorway, but he was able to free it without difficulty. He was uninjured and inflated his LPU on the surface.

The MHAC was the third to surface. Review of the HOSS tape revealed that it took 19 seconds for the MHAC to surface. During the interview, he stated that he had swallowed a lot of water and was afraid to use his SEA device for fear of aspiration. He admitted that he had initially given up and was thinking of how lonely it felt to drown. He began to think of his family and when he thought of his kids, he "suddenly came to." He found the cockpit window emergency release handle, pushed it forward, released his harness, and pulled himself free. Once on the surface, he inflated his LPU.

The MH2P was the last to surface. Review of the HOSS tape revealed that it took 56 seconds for him to surface. During the interview, he stated that he had difficulty finding the cockpit window emergency release handle and opted to use his SEA device. He too felt that he had swallowed a lot of water. He found his SEA device but failed to purge it prior to taking his first breath and aspirated a small amount of water. He then abandoned the SEA device. At this point, he admitted to feeling a little panicked. He removed his helmet and released his harness without holding onto a reference point. He moved towards what he thought was the aft portion of the helo looking for the main cabin door. When he encountered rotor pedals, he returned to his original position and found the cockpit window emergency release handle. He pushed it forward and egressed without difficulty. On the surface, other crewmembers noted that he was confused. He did not inflate his LPU until assisted by the MAC.

The HOSS tape begins with the MA sitting in the starboard safety nets, nose high, with main rotor blades intact and still turning. The tail rotor cannot be seen even with frame-by-frame analysis. As the MA's pitch increases, the main rotor blades impact the water and can be seen disintegrating. The SENSO seat did not stroke properly. The rescue seat in the SH-60B is not a stroking seat. The rescue seat had a broken support wire not noted on preflight. It was not a cause of additional injury to the MAC. Examination of all passenger compartments did not reveal any structural failure or additional damage caused by impact with their respective occupants. The MAC's helmet was lost at sea and therefore, unavailable for examination of defects related to the visors.

A complete review of aircrew and witness statements, damage to the ships flight deck, damage to the MA (salvaged two days after the mishap), and

review of the HOSS tape lead the AMB to believe that the MA completed 180 degrees of right turn before the tail wheel impacted the flight deck. This was followed by the stabilator impacting the LSO control station and then the main mounts impacting after 240 to 270 degrees of yaw. Since the collective was not fully lowered, the MA retained some of its rightward momentum and bounced across the flight deck before landing in the starboard safety nets. A thorough wreckage examination of all tail rotor drive components, tail pylon, yaw flight-control linkage, and servos as well as engineering investigation of key drive chain components revealed internal scuffing on the piston of the tail rotor servo. Review of maintenance records was unremarkable. The damage to the tail rotor and tail rotor drive components was consistent with a rotating tail rotor at the time of water impact. This led the AMB to conclude that the unintentional right yaw may have been due to a sticking in the tail rotor servomechanism. Other pilots on the DET did not notice sticking in the rudder pedals on prior flights in the MA.

Reconstruction of the mishap scenario was conducted in a simulator to look at yaw rates with minimal left-pedal input while simultaneously inducing a momentary sticking of the tail rotor servo piston. It was noted that "less than standard" input of left pedal at the time of collective pull produced rightward yaw rates approaching those observed by the MC and witnesses, especially as the AC rotates through the windline. The MH2P's minimal left-rudder input combined with the sticking servo allowed right turn yaw rates to develop that were not arrested. Therefore, the AMB concluded that a lack of left pedal input by the MH2P at the time the collective was pulled was causal to the mishap. Visual inspection of the SENSO seat revealed the retaining nut of the lower actuator rod was missing. This resulted in an asymmetrical downward motion of the SENSO seat at the time of the mishap. The seat was last installed during a phase inspection six weeks prior.

b. Aircrew Profile

(1) MHAC

The MHAC is a 34-year-old Caucasian male LCDR with 1,600 total flight hours, 1,400 of which are in the MA model. He has been at the squadron for ten months and this was his first detachment as OIC. He had previously served as an instructor pilot in the MA type. He is generally considered a mature, competent, and safe aviator who enjoys flying. There are no known interpersonal problems between him and his fellow officers or enlisted. He has been happily married for seven years and has two daughters aged two and five. During the detachment he has communicated with his family by e-mail at least weekly. He has never been involved in a mishap prior to this one. He denies any psychosocial or financial problems.

NATOPS review was remarkable for having received three downs in his

primary VT syllabus and one down in his advanced HT syllabus. He received two SPDBs during this time, both recommending retention. His overall HT grades were average. His FRS performance was noted to be outstanding. He had flown with the MH2P a total of three times in the past six months.

Medical record review revealed the MHAC to have a current flight physical on which he was found to be PQ/AA DIACA SGI with no waivers. No active or recent medical problems were noted.

Review of his 72-hour history was remarkable for an average of only 6.5 hours of sleep/24 hours. He had only six hours of uninterrupted sleep prior to the mishap. A 14-day history was also obtained. A subsequent SAFTE-FAST analysis which is included in the enclosures did not show a significant decrement in performance. His last alcoholic beverage was approximately 66 hours prior to the mishap. He was on no current medications.

Physiology training was up to date.

The MHAC sustained some superficial lacerations, abrasions, and musculoskeletal injuries during the mishap. He was released from ship's medical within an hour of presenting. AFMES toxicology results were all negative or WNL as were locally run labs and a complete spine radiograph series.

(2) MH2P

The MH2P is a 28-year-old Caucasian male LT with 600 total flight hours, 350 of which are in the MA model. He has been at the squadron for 10 months and this was his first detachment as an H2P. He is generally considered to be a relatively inexperienced, but competent, aviator and is liked by his colleagues. He is not known to have difficulty getting along with his superiors and peers. There are no known interpersonal problems between him and his fellow officers or enlisted. As stated previously, he has had two prior unintentional loss of tail rotor authority situations during this detachment while he was the PAC. He does admit to being the recipient of mild banter from his fellow pilots for being abrupt on the controls but does not feel that this has affected him in any way. He is single with no children. During the detachment he has communicated with his family and friends by e-mail at least weekly. He has also had some communications with a former girlfriend he had broken up with just prior to going on this detachment. He has never been involved in a mishap prior to this one. He denies any psychosocial or financial problems.

NATOPS review was remarkable for having received four downs during the VT syllabus of his primary flight training. He received three SPDBs during this time. The last SPDB recommended attrition with CO concurrence, but CTW recommended retention. He was seen by his FS at this time, diagnosed with performance anxiety, grounded, and referred for stress management training. Psychological screening exams were WNL and he successfully completed the

training. He was returned to flight status 14 days after being grounded. No major difficulties were noted in his intermediate or advanced training. His overall HT grades were average. His FRS time showed a range of performance with both "hot and cold" days. He was known as a "plodder," getting through the syllabus without any serious problems, yet "carrying a reputation as being a bit lazy." No specific problem areas or negative trends were noted.

Medical record review revealed the MH2P to have a current flight physical on which he was found to be PQ/AA DIACA SGI with no waivers. No active or recent medical problems were noted.

Review of his 72-hour history was unremarkable. His last flight was the night prior to the mishap with a land time of 0015 on the day of the mishap. He had 8.2 hours of uninterrupted sleep prior to the mishap. His last alcoholic beverage was approximately 64 hours prior to the mishap. He was on no current medications.

Physiology training was up to date.

The MH2P sustained some superficial lacerations, abrasions, and musculoskeletal injuries during the mishap. He also aspirated a small amount of seawater when he failed to purge his SEA device prior to inhaling. Initial room air pulse oximetry was 92%. He was placed on high flow oxygen and his lung fields cleared within 30 minutes. He was released from the ships medical department after six hours of observation. He was placed on prophylactic antibiotics due to the high prevalence of contaminated seawater. AFMES toxicology results were all negative or WNL as were locally run labs and a complete spine radiograph series.

(3) MAC

The MAC is a 33-year-old Caucasian male AWH1 with 3,200 total flight hours, 1,600 of which are in the MA model. He was the SENSO for this mission. He is well liked and generally considered a mature, competent, and safe Naval Aircrewman who enjoys flying. There are no known interpersonal problems between his shipmates and him. He had been married for three years, separated for four years, and just recently formally divorced. He describes a good relationship with his ex-wife and an amicable divorce. He has no children and has been dating another woman for the past four months. During the detachment he has communicated with his girlfriend and his family by e-mail at least three times each week. He has never been involved in a mishap prior to this one although he was involved in an incident in which a tail chain was not removed prior to takeoff. This incident did not result in a mishap. He denies any psychosocial or financial problems.

NATOPS review was unremarkable.

Medical record review revealed the MAC to have a current flight physical on which he was found to be PQ/AA DIF NAC - SAR/HELO with no waivers. No active or recent medical problems were noted.

Review of his 72-hour history was unremarkable. His last flight was the night prior to the mishap with a land time of 0015 on the day of the mishap. He had 10.5 hours of uninterrupted sleep prior to the mishap. His last alcoholic beverage was approximately six days prior to the mishap. He was on no current medications.

Physiology training is up to date.

The MAC sustained some superficial lacerations and musculoskeletal injuries during the mishap likely from impact with the MA cabin contents when the MA impacted the water (he had released his harness prior to impact). He was released from ships medical within an hour of presenting. AFMES toxicology results were all negative or WNL as were locally run labs and a complete spine radiograph series.

2. AEROMEDICAL DISCUSSION AND CONCLUSIONS

a. Aeromedical Conditions Causal to the Mishap

(1) Acts

(a) Violations (AV002 Commits Widespread/Routine Violation). MHAC failed to properly brief a cross-cockpit takeoff. Cross-cockpit takeoffs require a thorough briefing in order to ensure the aircrew has a common understanding of how the PAC's field of view will be affected. This briefing is particularly important for less experienced aircrew. Nevertheless, the MHAC decided to allow the MH2P to make a cross-cockpit takeoff after the takeoff checklist had been completed, without an appropriate brief.

(b) Performance-Based Errors (AE104 Overcontrolled/Undercontrolled Aircraft). The MH2P failed to apply sufficient left pedal during takeoff. The completion of flight control preflight checks normally results in a neutral pedal position. However, a neutral pedal position at takeoff, if not adjusted for increasing power when feet are resting on the pedals, will result in a right yaw of the aircraft.

(c) Performance-Based Errors (AE103 Procedure Not Followed Correctly). The MH2P failed to apply left pedal to arrest right yaw. Immediately following lift, the aircraft began a right yaw. The MH2P recognized that the yaw was unintentional and stated that he concentrated on holding the aircraft level. As the aircraft yawed through the relative wind (40 degrees to starboard), the MHAC also recognized that the yaw was unintentional and that the left pedal was slightly forward (approximately one-half inch) of the right pedal. The MHAC applied full left pedal in one to one- and one-half seconds and estimates that left pedal input began at

approximately 90 degrees of rotation and full left pedal was applied by approximately 135 degrees. The MHAC described the initial yaw rate as similar to a pedal turn, which accelerated as the rotation continued.

(d) Judgement and Decision-Making Errors (AE206 Wrong Choice of Action During an Operation). MH2P failed to lower the collective once the right yaw was recognized and when directed. In the NATOPS flight brief, the MHAC directed that in the event of uncommanded yaw over the flight deck the appropriate response was to "put the aircraft down." At the onset of right yaw, the MH2P stated that he concentrated on maintaining a level attitude and was "trying to hold it steady." The MHAC first made yaw control inputs, then verbally directed the MH2P to "put it down." The MH2P remembers hearing the MHAC say, "put it down" but he continued to attempt "to hold [the aircraft] steady." When the MH2P failed to respond to verbal commands the MHAC lowered the collective, without taking controls, and observed that the MH2P's left arm was straight.

(e) Performance-Based Errors (AE103 Procedure Not Followed Correctly). The MH2P failed to completely lower the collective while the MA was over the flight deck. The MHAC verbally directed the MH2P to lower the collective and then made a physical input to reduce power. After approximately 210-230 degrees of yaw, the MA impacted the flight deck, bounced alternately on the main mounts, skidded, and yawed before coming to rest on the starboard edge of the flight deck heading approximately 315 degrees relative. The MH2P recalls that as the aircraft teetered on the flight deck edge, that he lowered the collective fully down; too late to counter the rotational momentum and prevent the mishap.

(f) Performance-Based Errors (AE103 Procedure Not Followed Correctly). The MHAC failed to ensure that the collective was fully lowered. With full left-pedal input made, the MHAC gave a verbal command to the MH2P to put it down. The MHAC came on the collective and lowered it, observing that the MH2P's left arm was extended and straight. The MHAC's observation of the MH2P's arm led him to believe that the collective had been fully lowered. However, the MH2P did not completely lower the collective until the MA was on the flight deck edge. Fully lowering the collective would likely have resulted in the MA landing sooner, with a slower yaw rate, and permitted the MA weight to counter rotational momentum.

(2) Preconditions

(a) Mental Awareness (PC102 Fixation). The failure of the MH2P to make sufficient pedal input resulted from a fixation on avoiding abrupt collective movement. This was done in an attempt to compensate for

his tendency to be abrupt on the flight controls.

(b) State of Mind (PC209 Motivation. MH2P's fixation may have been compounded by peer pressure and preoccupation with performing his first cross-cockpit takeoff.

(c) Physical Problem (PC307 Fatigue). The fatigued state of the MHAC contributed to the poor communication and coordination during takeoff. The MHAC was mildly sleep deprived having received an average of 6.5 hours of sleep during the previous 72 hours.

(d) Teamwork (PP106 Critical Information Not Communicated). The MH2P failed to communicate with the MC. Communication is an integral part of aircrew coordination. The ability to verbalize a situation helps to focus efforts on appropriate actions. As the aircraft yawed right, the MH2P focused on holding the MA steady and did not communicate his lack of control or his intentions to the MC. Had the MH2P immediately communicated his perceptions of the situation, the MHAC may have been able to respond prior to build up of the yaw rate.

(e) Teamwork (PP106 Critical Information Not Communicated). The other detachment HAC (not MHAC) failed to provide the OIC with adequate information regarding the professional development of the MH2P. The MH2P was at the controls during two previous incidents of unintentional right yaw. In both cases, the maneuvers were induced by improper flight control inputs and involved right yaw of approximately 180 and 290 degrees respectively. The HAC (same in both incidents) failed to promptly inform the OIC of these incidents of unintentional right yaw and downplayed their seriousness when he did debrief the OIC. Uncontrolled aircraft motion in any environment is a serious safety of flight issue, even more so at night or over a single spot deck. The HAC's failure to quickly and accurately relay these incidents, and his willingness to downplay their serious nature inhibited the OIC's ability to recognize a skill deficiency pattern in the MH2P's flying abilities. Based on the above analysis the AMB concludes that the other detachment HAC failed to provide the OIC with adequate information regarding the professional development of the MH2P.

(3) Supervision

(a) Inadequate Supervision (SI001 Supervisory/Command Oversight Inadequate). The OIC (MHAC) failed to provide adequate professional guidance. As the ship's aviation safety officer, the detachment OIC is responsible for establishing and supervising the safe conduct of embarked flight operations. This responsibility includes oversight of

aircrew proficiency and professional development. Given that the mishap was the third incident of unintentional right yaw for the MH2P while on this detachment it stands to reason that the OIC (MHAC) would have taken measures to prevent its occurrence in the future. Although the detachment HACs periodically met to discuss the professional development of the H2Ps, the importance of reviewing operations in light of safety requirements was not sufficiently ingrained to properly highlight a hazardous pattern with the MH2P. Thus, detachment flight safety awareness was insufficient to recognize a significant flight hazard and this inability resulted from supervisory failure to establish and maintain strong safety communication links.

b. Maintenance Conditions Causal to the Mishap

(1) Acts

(a) Violations (AV003 Extreme Violation - Lack of Discipline). Examination of the tail rotor servo revealed internal scuffing on the piston. An EI stated that the scuffing occurred over a period of time, prior to the mishap. The tail rotor servo was changed during a phase inspection six weeks prior to the mishap. The mechanic who replaced the servo stated that he did not refer to the maintenance publication during the process, as required by the directive. The mechanic felt he knew by memory the proper steps for removing and replacing the servo.

(b) Performance Based Errors (AE103 Procedure Not Followed Correctly). The mechanic failed to properly align the piston during tail rotor servo installation IAW the maintenance publication. The mechanic stated that he thought there was only one correct way to install the servo. A review of his process indicated that he failed to properly align the servo rod to its connector. Misalignment of the servo piston could result in internal chaffing of the piston with its outer casing. The mechanic misjudged the importance of proper servo alignment.

(2) Preconditions

(a) State of Mind (PC 208 Complacency). Removing and replacing a tail rotor servo requires the completed installation be inspected by a CDI. The CDI observed the completed work. However, due to his trust in the mechanic's previous workmanship, the CDI did not closely inspect the completed action. Inadequate supervision of the mechanic's work by the CDI resulted in the CDI missing the incorrect servo rod installation.

c. Aeromedical Conditions Causal of Additional Damage or Injury

(1) Acts

(a) Judgement and Decision-Making Errors (AE206 Wrong Choice of Action During an Operation). The MAC received first aid injuries after releasing his harness prior to impact. When the MA settled onto the flight deck edge, numerous equipment bags in the tunnel fell aft onto the MAC. He released his harness and proceeded to throw the bags out the cabin door. When the MA pitched and rolled over the edge, the MAC seized some handholds but was thrown forward when the MA hit the water. Relatively low impact forces kept the MAC from sustaining serious injury as he was thrown about the cabin.

(2) Preconditions

(a) Mental Awareness (PC104 Confusion). The MH2P stated that after water impact he was a little confused and swallowed a lot of water. This likely contributed to his failure to initially use, and subsequently purge, his SEA device leading to the aspiration.

(3) Organizational Influences

(a) Policy and Process Issues (OP007 Purchasing or Providing Poorly Designed or Unsuitable Equipment). The design of the SEA device made it likely that aspiration of water will occur if not purged properly during egress. Given that water mishaps are often met with subsequent states of panic when submerged, several aircrew have either aspirated water while using the SEA device improperly or have elected not to use the SEA device for fear of aspirating water. Had the SEA device been designed with a dual regulator, the need to purge the device prior to use would be alleviated.

d. Aeromedical Conditions Present but Not Causal to Either the Mishap or of Additional Damage or Injury

(1) Acts

(a) Judgement and Decision-Making Errors (AE206 Wrong Choice of Action During an Operation). MH2P removed his helmet prior to egress. This action, although improper, did not result in additional injury. It does, however, offer insight into the mental state of the MH2P while he was submerged.

(b) Judgement and Decision-Making Errors (AE206 Wrong Choice of Action During an Operation). MAC removed his helmet prior to

egress. The shaded visor of the helmet came loose impeding his vision. He removed his helmet to see better. This action, although improper, did not result in additional injury. A HAZREP regarding potential problems with helmet visors was submitted.

(c) Judgement and Decision-Making Errors (AE206 Wrong Choice of Action During an Operation). MAC re-entered the sinking MA. Contrary to the Naval Aviation Water Survival Training Program teaching, the MAC re-entered the sinking MA (with only his upper torso) in search of a missing crewman. This action placed the MAC at a significantly increased risk of further injury or death. It did not, however, result in additional injury.

(d) Performance Based Errors (AE103 Procedure Not Followed Correctly Error). The MH2P failed to properly use his SEA device resulting in the aspiration of seawater. Initially hesitant to use his SEA device, he attempted to locate the emergency window release handle to egress. However, he was unable to locate the handle. Feeling the need for air, he then attempted to use the SEA device but forgot to purge the bottle completely prior to his first breath resulting in the aspiration of water. He successfully egressed after approximately 1 minute underwater.

(2) Preconditions

(a) Mental Awareness (PC104 Confusion). The MH2P stated that after water impact he was a little confused and swallowed a lot of water. This likely contributed to his failure to initially use, and subsequently purge, his SEA device.

MISHAP SEQUENCE OF EVENTS

	Causal Factor	HFACS Category
1.	MHAC failed to properly brief a cross-cockpit takeoff.	Violations AV002
2.	The MH2P failed to apply sufficient left pedal during takeoff.	Performance-Based Errors AE104
3.	The MH2P failed to apply left pedal to arrest right yaw.	Performance-Based Errors AE103
4.	MH2P continued to hold the AC steady and failed to lower the collective once the right yaw was recognized, and when directed.	Judgement and Decision-Making Errors AE206
5.	The MH2P failed to completely lower the collective while the MA was over the flight deck	Performance-based Errors AE103

Reporting Custodian:	**HELSQUAD009**	Mishap Severity:	**A**
Date of Mishap:	**01 Oct 22**	Mishap Category:	**FM**
Aircraft Model:	**SH-60B**	BUNO:	**645123**

DO NOT ATTACH THIS FORM TO A JAG INVESTIGATION.

6.	The MHAC failed to ensure that the collective was fully lowered.	Performance-Based Errors AE103
7.	The failure of the MH2P to make sufficient pedal input resulted from a fixation on avoiding abrupt collective movement.	Mental Awareness PC102
8.	MH2P's fixation may have been compounded by peer pressure and preoccupation with performing his first cross-cockpit takeoff.	State of Mind PC209
9.	The fatigued state of the MHAC contributed to the poor communication and coordination during takeoff.	Physical Problem PC307
10.	The MH2P failed to communicate with the MC.	Teamwork PP106
11.	The Detachment HAC (not MHAC) failed to provide the OIC with adequate information regarding the professional development of the MH2P.	Inadequate Supervision SI007
12.	The Detachment OIC (not MHAC) failed to provide adequate professional guidance.	Inadequate Supervision SI001
13.	Maintainer failed to use proper maintenance publication	Violations AV003
14.	Maintainer failed to properly align tail rotor servo piston	Performance-Based Errors AE103

3. AEROMEDICAL RECOMMENDATIONS

a. For HSL 99: Conduct pilot training on the hazards associated with the pilot not at the controls making single axis control inputs and the increased communications required to safely cross control an aircraft.

b. For HSL 99: Recommend aircrew training that reviews the importance of conducting thorough pre- and post-flight briefs.

c. For HSL 99: Recommend training for all aircrew to include comprehensive review of aircrew coordination and human factors processes. Training should include review of operational risk management principles and individual obligations to identify and report hazards.

d. For HSL 99: Recommend aircraft commander training on the importance of documenting and reporting the professional development of junior pilots.

e. For HSL 99: Recommend review of current NATOPS procedures covering loss of tail rotor drive to determine if a submission of NATOPS change for loss of tail rotor drive below the recommended cutgun height of 30 feet is appropriate.

f. For COMHSLWINGX: Recommend review of the current OIC course curriculum to determine if the current training adequately addresses the unique safety and human factors requirements associated with deployed-detachment operations.

g. For COMNAVAIRSYSCOM: Develop a lightweight, flexible and easy-to-use cargo net system for use in the SH-60B tunnel.

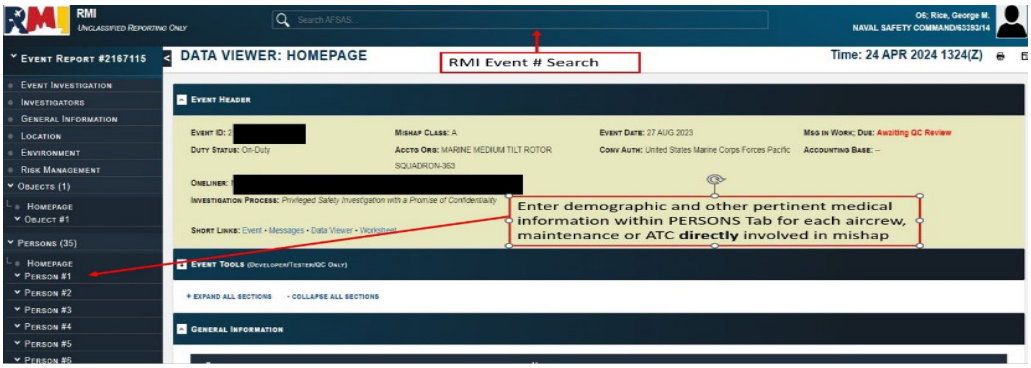
APPENDIX V: RMI MISHAP UPLOAD GUIDE – MAY 2024

RMI Mishap Requirements and Guidance for Flight Surgeons

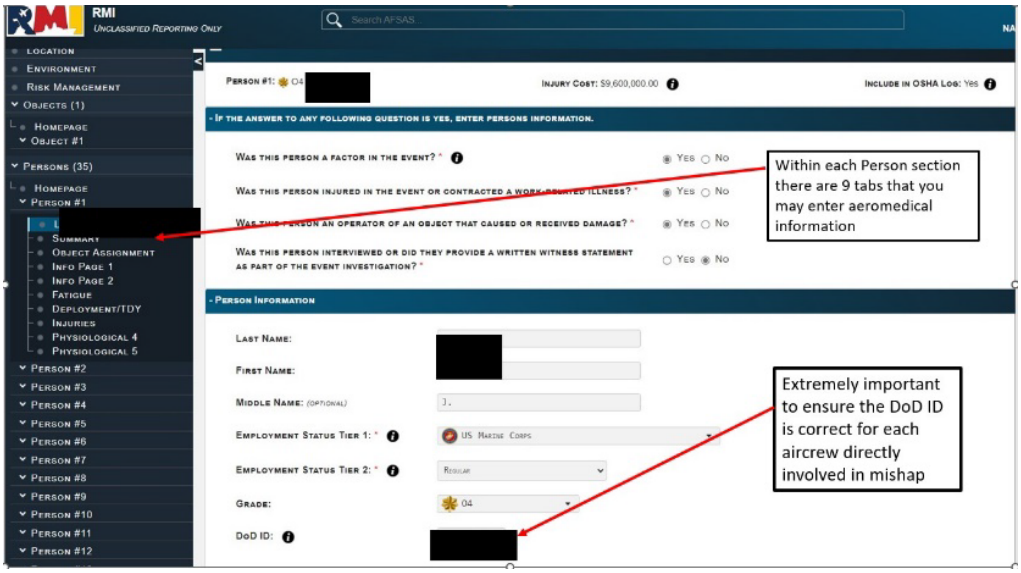
Upload to Exhibit Sections – Medical Information (MI) or Medical Analysis (MA)

General Guidance: For all AMB investigated mishaps:

1. Ensure you have an active RMI account through your individual command.
2. Log on to the RMI webpage. Homepage (af.mil)
3. Enter the RMI event number in the Search field at the top of the screen.
4. For each aircrew involved in the mishap, general demographic information shall be entered to include accurate DoD ID within the PERSONS tab. Work with your ASO for assistance with RMI functionality and to coordinate demographic data entry. See screen shot below.

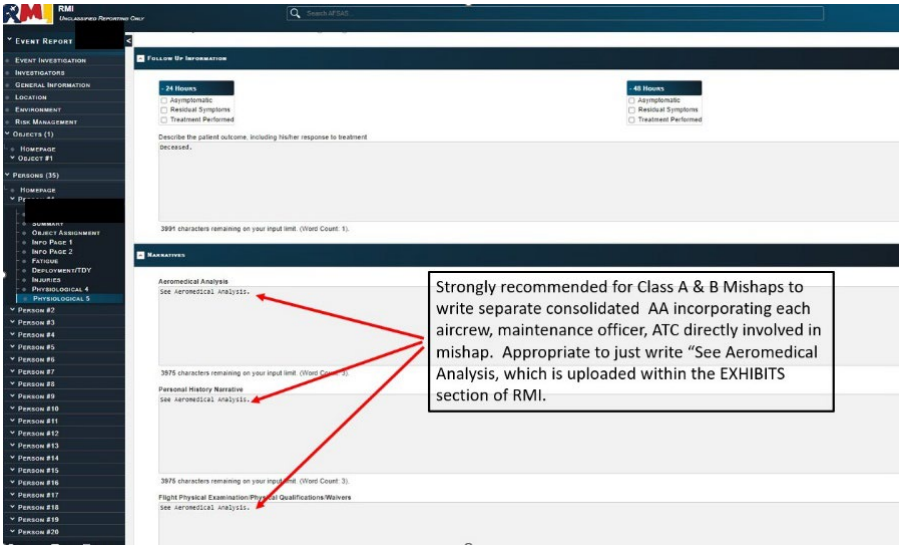


5. Within the Person section, there are nine separate tabs in which important medical mishap data may be entered. See screen shot below of person #1.



6. Specifically, within the PERSON section, Physiological 4, enter sleep/fatigue data and within Physiological 5 enter physical exam, pertinent laboratory values and the Aeromedical Analysis (AA) for that person.

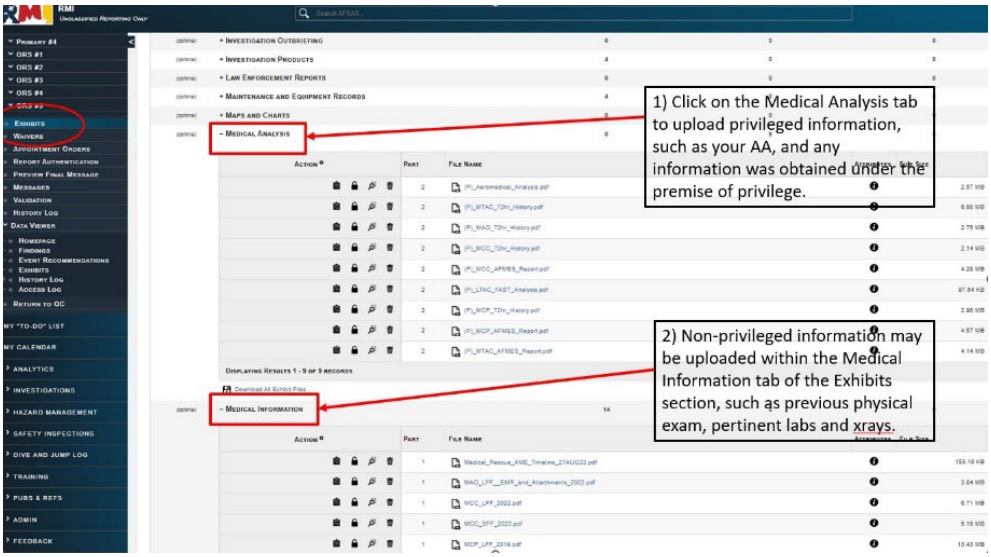
NOTE: It is strongly recommended for Class A and B mishaps that you do NOT write AAs for each individual within the RMI narrative fields but rather that you write a separate AA utilizing the format in the referenced sample below which gets uploaded as an Exhibit. It is completely appropriate to write "see Aeromedical Analysis" within the RMI PERSON sections where you address information to refer the reader to the AA that you have uploaded in the Exhibits section. (see Screen shot below of Physiological 5 tab, with Person #1 section)



7. As mentioned previously, a separately written AA is strongly recommended and may be uploaded into the Exhibits Section, under the Medical Analysis section of RMI. A template for the AA may be found on the Naval Safety Command Aeromedical website or within Appendix U of the latest version of the AMO Mishap guide which is also on the Naval Safety Command CAC-enabled website at: Naval Safety Command Home (intelink.gov).

If a separately written AA is not produced and uploaded into RMI, all the same information must be incorporated into the appropriate aeromedical data and narrative text fields within the Physiological Information sections under the Person tab as described above.

NOTE: All Privileged information should be uploaded within the Medical Analysis tab of the Exhibits section. There are over 30 tabs within Exhibits section of RMI, so you will need to scroll down to upload your parts to the Medical Analysis and Medical Information tabs. (Below is a screenshot of the Exhibits section with Medical Analysis tabs and Medical Information tabs highlighted).



8. Below is a summary of guidance for placement of various aeromedical information within the Medical Analysis (MA) and Medical Information (MI) tabs of the Exhibits section:

   a. Post-Mishap Physical Exam: (MI) or (MA) if containing privileged information.

   b. 72-hour history: (MI) or (MA) if containing privileged information or comments/additions made by the AMB

   c. Current aeromedical waiver letters: (MI)

   d. Last 2 prior physical exams: (MI)

   e. Relevant ER/hospital reports for significant injuries (contact NAVSAFECOM for further consultation if any questions): (MI)

   f. Toxicology reports: (MI) if only the standard post-mishap panel. (MA) if any supplemental toxicological evaluation is requested based on privileged information or AMB analysis.

   g. If any privileged information was obtained over the course of the AMB investigation or while collecting aeromedical content, ensure the signed Privileged Advice to Witness Form is uploaded appropriately into RMI as an exhibit for each person. Legally, privilege will not be provided unless the form is completed and uploaded appropriately.

9. For all bailouts, ejections and crashes with or without suspected spinal injuries, full spinal X-rays are required. Separate X-rays do not need to be obtained for spinal segments if higher level imaging (CT or MRI) of that segment has already been performed.

   a. Must upload spine imaging reports if there are ANY abnormalities: (MI)

b. If NO abnormalities at all, the specific imaging studies obtained must be individually listed in RMI or the AA and annotated as normal.

10. For all fatalities:

    a. Autopsy report: (MI)

    b. Any autopsy or aeromedical related photos referencing specific injuries or factors discussed in the AA. (MA) Any photos that have depictions, references to the report, comments, arrows or other annotations are all considered privileged and must be in the MA section.

11. For any class of mishap in which fatigue is suspected/reasonably considered OR whenever RMI indicates fatigue should be considered as a factor, unless specifically exempted by the NAVSAFECOM Aeromedical Division, Code 14:

    a. 14-day history (should be obtained if possible): (MI) or (MA) if containing privileged information or comments/additions made by the AMB

    b. Fatigue-modeling software (SAFTE-FAST) analysis (shall be performed): (MA)

Summary

1. It is the expectation of the Naval Safety Command (NAVSAFECOM) that the aeromedical officer serving on the AMB is directly involved with the HFACS analysis and crafting recommendations for all mishaps. If all AA information is populated into RMI fields and no separate AA report is provided to the AMB, the aeromedical officer is still required to provide an independent, stand-alone HFACS analysis and pertinent aeromedical related recommendations to the AMB. The aeromedical findings, HFACS analysis and recommendations may differ from that of the final SIR due to their potentially subjective nature, especially opinions within a psychosocial profile and psychological aspects of someone's personality, mood, affect, etc. Mental health questions can be posed to NAMI in these cases as needed since they are the subject matter experts.

2. Any standard toxicology results having abnormalities for any mishap class must be reported appropriately in RMI and uploaded into the medical information (MI) section. If supplemental toxicological assessment is requested beyond the standard post-mishap labs based on additional information available to the AMB, these toxicology results should be uploaded into the medical analysis (MA) section and considered privileged.

3. An AA is to be completed for all mishaps with an AMB (Class A/B and major class C mishaps as well as any others where an AMB is directed by the convening authority) unless there is direct communication from NAVSAFECOM stating that one is not required, which is in line with the OPNAVINST 3750.6 series. For E, D and minor Class C mishaps, the Commanding Officer may request labs and physical exams for those involved although the scope of the investigation may be limited per Section 208 of OPNAVINST 3750.6 series. In these limited investigations, the aeromedical officer is still expected to provide HFACS analysis support; however, additional reporting in RMI may be significantly abbreviated and tailored to the specific details of the mishap as indicated.

4. Any privileged information, sensitive aeromedical items (autopsy reports, psychological/psychiatric evaluations), or products containing content indicating AMB deliberations or analysis (such as the AA) shall be uploaded to the Medical Analysis (MA) section of RMI. Additionally, any documents listed above for upload to the Medical Information (MI) section that contain comments, additions, or markings added by the AMB become privileged and should be uploaded to the Medical Analysis (MA) section.

5. Upload into the appropriate RMI exhibit section any other significant items supporting the AA, conclusions, or recommendations of the AMB that are important to understanding the mishap or that could be relevant to future mishap prevention efforts and analysis. Documents that may be perishable due to Non-DoD Electronic Health Records or other sources can be uploaded in RMI as an exhibit to preserve information. The caveat is to only upload information that is salient to the case. For example, spinal x-ray reports with abnormal findings should be included since they provide relevant details, but not all 100 autopsy photos need to be uploaded when the only pertinent information is in 10 of them where sustained injuries are depicted.
6. All privileged uploads to the Medical Analysis section must have a "(P)" before the file name.

APPENDIX W: MISHAP INVESTIGATION RESOURCES

OPNAVINST 3750.6 series Naval Aviation Safety Programs:
https://navalsafetycommand.navy.mil/Resources/Instructions-Policy-Guidance/

OPNAVINST 5102.1 series Navy Safety Investigation and Reporting Program:
https://navalsafetycommand.navy.mil/Resources/Instructions-Policy-Guidance/

Air Force Manual 91-223 - Aviation Safety Investigation and Reports:
https://static.e-publishing.af.mil/production/1/amc/publication/afman91-223_amcsup/afman91-223_amcsup.pdf

Air Force Instruction 91-204 - Safety Investigation and Reports:
https://static.e-publishing.af.mil/production/1/af_se/publication/dafi91-204/dafi91-204.pdf

Federal Aviation Administration Order 8020.11D - Aircraft Accident and Incident Notification, Investigation and Reporting:
https://www.faa.gov/documentLibrary/media/Order/8020.11D_w_CHG_1.pdf

U.S. Army Accident Investigation Guide:
https://safety.army.mil/REPORTINGINVESTIGATION/RegulationsandGuidance.aspx

DODIST #6055.7 - Mishap Notification, Investigation, Reporting and Record Keeping:
https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodi/605507p.pdf

NTSB Major Investigations Manual:
https://www.ntsb.gov/about/Documents/MajorInvestigationsManualApp.pdf

OPNAVIST 3750.16C - Participation in a Military or Civil Aircraft Accident Safety Investigation:
https://www.secnav.navy.mil/doni/Directives/03000%20Naval%20Operations%20and%20Readiness/03-700%20Flight%20and%20Air%20Space%20Support%20Services/3750.16C.pdf

Naval Safety Command ASO RMI Operating Guide:
https://intelshare.intelink.gov/sites/nsc/Pages/ASO.aspx