

Accidents college



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Aircraft Investigation

Each mishap has their own characteristics and there is no substitute for good old-fashioned common sense and initiative. Each wrecked aircraft has its own story to tell if properly investigated. However Air Force guidelines are quick to point out that investigators in their eagerness seek out the causes, often ignore safe investigation practices and common safety precautions. Air Force Investigators are maybe in even more difficult position due to the hazards that are unique to the military war fighting machines, Ill discuss a few of these hazards briefly before I get into the steps of Air Force accident investigations.

Munitions

Extreme care must be given to the munitions that may have been on board the aircraft. Just because the ammunition appears to be damaged beyond being dangerous the slightest amount of static electricity from clothing may detonate munitions. Before starting an investigation of any kind, obtain the list of munitions aboard and have the explosive ordinance disposal (EOD) team remove or inert them. Again eagerness must be controlled and situational awareness must be exercised to be on the lookout for those munitions that may not have been recovered. Also, though tedious, the locations of all munitions need to be noted, as they will hold clues as well. The ejection seats can also present extreme dangers to untrained and careless investigator.

Toxins

Hydrazine. Its a word that strikes fear in all that are familiar with it. New generation aircraft such as the F-16 use hydrazine for emergency power supplies. It looks like a clear oily substance that smells like ammonia. Some of the effects hydrazine can have on the human body include: liver damage, blindness, skin burns, and prolong exposure may be fatal. Only base bioenvironmental engineers are qualified enough to properly handle it.

Materials

Also somewhat unique but is gradually finding its way into the commercial side of aviation is the use of high composite materials along with exotic metals used in the effort to not only strengthen, but to lighten the overall weight of the airframe.

The composites used with most frequency today are boron, graphite and Kevlar. Each of these materials has their own characteristics and must be handled with care. While in its finished form Kevlar is very stable, boron and graphite must be handled with extreme care to avoid breathing in dust created when the structures become damaged. Boron fibers can pierce through skin and stay imbedded indefinitely and cannot be removed easily causing severe infections.

Funding Issues

The host base funds all in-house support (except billeting) even if the host base is not assigned to the convening authority's MAJCOM. In-house support includes administrative support and equipment, work areas, reproduction, and graphics. The MAJCOM or ANG command that possesses the mishap

aircraft is responsible for all costs associated with the crash site clean up and restoration. (USAF, 1998)

Steps

The following are a condensed version of the steps given to the accident board president to help guide them through the process of getting organized and to better use some the broad assets available to the military accident board president, the steps comprise parts of both AFI 51-503 and AFP 127-1.

1. Get organized before running to the smoking hole.

a. Find out what was done at the crash site.

b. Determine the support needed from the base that owns the aircraft. They will

be best informed of the nature of the airframe.

2. Get to know your board members so youll have an idea of their capabilities and how you can best use them.

a. If you know a sharp officer or NCO that you would like on the board, ask for

them.

b. Secure any voice recordings, videotapes and films pertinent to the mishap and be prepared to send copies when requested.

3. Working with the interim board members:

- a. Secure evidence they captured. They might lose it when they go back to their jobs.
- b. Have them provide a list of interim board members with their work/home phone numbers.
- c. Request they discuss with their safety office any glitches they discovered in the unit mishap response plan.
- d. Ensure a face-to-face hand-off takes place for a positive exchange of information and investigative authority.
- e. Assess exactly what was accomplished, and what the interim board feels is the next step.

4. Technical assistance/airlift support:

- a. Request it only if you need it.
- b. All requests should be made through the Air Force Safety Center (AFSC) mishap board member.

Explain your immediate needs to the AFSC mishap board member; they will coordinate all technical assistance with AFSC. Let AFSC decide who?

However, if you specifically need contractor support, you must specify this in your request for technical support. Remember, if you think you are going to need contractor support, request it early. They are much more helpful in the early stages of an investigation than in the latter stages. (USAF 1987)

5. Underwater Salvage Support. ACC/SEF will assist in this effort. They will contact US Navy Supervisor of Salvage. If necessary, they may direct contact with the Navy Command Ops. Center. Be patient during this process—moving ships on site and locating the wreckage will take days. While this is happening, keep the investigation on track with witness statements, profile reconstruction, etc.

6. Classified Information. Witnesses, advisors, and reporters or stenographers must be properly

cleared before they are given access to classified information. (USAF 1998)

7. If prior to questioning you suspect a military witness of a criminal offense, then a rights advisement must proceed any questioning. If, at any time during an interview, you come to suspect a military witness of a criminal offense, then a rights advisement must precede any further questioning.

Once you have a reasonable idea what made it crash, or why the crew ejected, go for the basics. Start with the STP approach: check Supervision, Training and Procedures. Understandably you are under pressure to complete your report; but when it gets down to brainstorming your findings, causes, and recommendations, take a break even if for half a day. You will be so close to this problem for the next 20-30 days that sometimes it may be difficult to maintain objectivity.

Accident Investigation Board Report

Remove For Official Use Only markings from all documents that are included in the AIB Report. Before removing the markings, ensure the document is

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publicly releasable. The SIB president can authorize removal of such markings. Prior to public release of the AIB Report, brief the results of the investigation to the NOK of deceased persons and to seriously injured personnel. Usually the AIB president serves as a NOK briefing officer. If multiple briefings are required, then the convening authority selects additional briefing officers to ensure the NOK are simultaneously briefed. Following the NOK briefings, but before public release, provide a copy of the Report and a briefing to congressional members, if requested. (USAF, 1998)

Accident Investigation Boards and Safety Investigation Boards

Due to the complexity and immense chaos that follows aircraft accidents and mishaps,

the United States Air Force has developed a system to help and guide those who respond to the

scene of an accident. In today's Air Force, immediately after an accident two different boards

are convened in order to address the cause of the accident and the legal matters that follow an

accident. These two boards are an Accident Investigation Board (AIB) and a Safety

Investigation Board (SIB). The purpose and function of these two boards is very different from

one another but each board's mission is equally important.

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The purpose of an AIB is to provide a publicly releasable report of the facts and circumstances that surround an accident and it should also include a statement of opinion on the cause of the accident. The AIB is in charge of gathering and preserving evidence for claims, litigation, disciplinary, and adverse administrative actions as well as for all other purposes. When reports are made by an AIB they are used to:

1. Brief next of kin of crewmembers, military personnel and civilians killed in the accident or seriously injured.
2. Inform the public and media
3. Inform Congress upon request.
4. Inform other interested government agencies
5. Provide the Air Force with adjudication of wrongful death, personal injury, and property damage claims resulting from the accident.
6. Help the Air Force determine if any punitive or administrative action should be taken against those whose negligence or misconduct contributed to the accident.

As we can see AIB deals mostly with the legal matters on hand after an accident and its

investigation is aim to achieve that goal. On the other hand Safety Investigation Boards

purpose is totally different. The purpose of a SIB is not to blame or punish individuals but

instead it is to prevent mishaps. Safety investigations are performed to determine the causes

of accidents and to prevent future ones. Since SIB main focus is on prevention, time

requirements for conclusions are not as important. Also a big difference between an AIB and

a SIB is that confidentiality may be given to witnesses and this information then becomes

privileged and it is not to leave the safety channels nor be used in disciplinary actions,

liabilities, evaluations or anything else along those lines. (AFI 51-503, 1998)

The SIB is required to produce a two-part report. Part one should contain non-privileged information. Part two should contain confidential witness and contractor statements as well as the SIB findings, deliberations, and recommendations. Again part two is privileged information and only to be used for prevention and safety purposes. (AFI 51-503, 1998)

Now that I have explained the two types of boards that are convened for aircraft accidents and mishaps and showed the main differences between the two, let's proceed to talk in depth about AIBS and how they conduct investigations.

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Once an accident has occurred the AIB president should contact the host base liaison officer to request work areas, equipment and administrative support. It is important that the area assigned is convenient and comfortable for both the AIB and the witnesses. Once settled the AIB president should contact the SIB president and

1. Determine the status of search and rescue, recovery of remains, and salvage operations.
2. Coordinate a trip to the accident or mishap location before the wreckage is removed.
3. Assess the status of the safety investigation and decide how to proceed with the AIB.
4. Acquire Part I of the safety report and evaluate whether additional test should be done in things like metallurgy, forensics, etc.
5. Obtain all other non-privileged materials gathered by the SIB.
6. Obtain a list of the SIB witnesses.

Once all the data and evidence has been collected the advisors are brought in to review all the information and make judgments and evaluations, not to mention aid in the writing of the report.

A maintenance advisor reviews maintenance records, documentation, personnel and supervision. A Medical advisor should review:

1. Medical qualifications

2. Postmortem and toxicology reports. Which by the way are obtained from the SIB flight surgeon.

3. Post-accident medical examination records of survivors.

4. And last but not least autopsy protocols and medical records.

Also an aerodynamics advisor should review and examine the evidence on the airframe and analyze the flight parameters. A life support advisor should examine the egress system and personal and survival gear. And a pilot advisor should be brought in to shed some light on what a pilots action may or should have been. Once all the data and evidence has been evaluated and examined the AIB report can be written. The AIB report should contain factual information, including documentary and testimonial evidence as well as photographs. This report should not include recommendations. (AFI 51-503)

Now that we have briefly discussed the way AIB conducts an accident investigation lets see how the SIB conduct their investigations.

Once a SIB president has been appointed and a membership assigned. The board members can then move into the scene and begin to search for clues and evidence. Once in the scene investigators can start by searching any electronically stored data such as flight data recorders (FDR), cockpit voice recorders (CVR), nonvolatile memory chips on circuit cards from engine controls, programmable navigation equipment, and other avionics equipment. Once found they should be sent to the Mishap Analysis and Animation Facility or MAAF at AFSC. MAAF is the central Air Force activity for

recovery, transcriptions, and analysis of FDR data in support of Air Force safety investigations. Any data processed based upon privileged safety information or involving board deliberation renders the processed data non-releasable.

Next key evidence that should be collected is witness accounts. Usually physical and documented evidence is considered more credible. However, witness accounts are often time excellent leads. A witness can be anyone involved in the mishap, anyone who saw the accident and those who possess the training and qualifications that make them experts in the subject. A witness can make privileged or non-privileged statements; it is up to the investigator or SIB president to determine if and when to extend a promise of confidentiality. A promise of confidentiality is based upon the category of the mishap and the need for protection of the witness statement.

Human factors evidence is also important to a safety investigation. This type of evidence includes evidence of mental and physical capability and medical opinion about the capability of individuals to return to their duties.

When searching for human factors evidence as well as wreckage evidence it is important to document everything properly and accurate. Photographs and video can be extremely handy because they can preserve otherwise perishable evidence. As an investigator you should photograph liberally, but should also be selective and cautious when including photographs in the report. (AFI 91-204, 1999)

The way in which both boards conduct and carry out their investigations is very similar. The only thing that differs between the two is the way in which

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the information gathered from the scene gets used. AIBS goals are to settle the legal side of an accident while a SIB goal is to ensure that the accident does not go in vain and that we can learn from the accident in order to prevent future mishaps and make aviation a bit safer.

Missile Mishap Reporting/Investigation

Naturally with any aviation accident the investigation to find out what had happened will be similar in methods and even the regulations that were established to

conduct those investigations. The primary subject that separates the military from the

other investigative branches that handle mishap/accident reporting is the involvement of

ordnance, mainly missiles. The following section will address the issue of missile

mishap reporting/investigation.

Definitions:

Missile: Systems that are propelled through the air that are unmanned, guided by

internal or external systems, self-propelled, and designed to deliver ordnance to a target

or act as a target. This definition includes training missiles and sub-scale remotely piloted

vehicles (RPVs). (AFI 91-204, 1999)

Mishap: An unplanned or unsought event, or series of events, resulting in death,

injury, occupational illness or damage to, or loss of, equipment or property.

(AFI 91-204, 1999)

Missile Mishap: which involve missiles that occur:

During ground operations (use, maintenance, handling, transportation,

and storage). (AFI 91-204, 1999)

Categorizing The Mishap

The most important step in the process is to determine whether or not the mishap is in

fact a missile related mishap. You must ask the initial questions that will either lead you

to a defined missile mishap or another type of mishap. Missile mishaps must involve a

missile(s) and must occur during ground operations, use, handling, transportation, or

storage.

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Post Launch and On/Off Range Due To Malfunction: Mishaps

If the event took place after launch, and the missile does not complete its intended

mission because of a missile system malfunction, the investigation will be considered a Aircraft Flight Mishap (missile involvement). However if the missile impacts on/off target in an unsuccessful attempt due to warhead (explosive) malfunction, this will be reported as an Explosive /Missile Mishap.

All other off range impacts is Aircraft Flight/Aircraft Flight Related (Explosives/Missile Involvement).

Ground Launched Missiles: Mishaps

Mishaps relating to ground launched missiles are also considered missile mishaps.

However, when investigating ground-launched missiles, you must report any accidents involving the missile support equipment as missile mishaps.

Pre-Launch/In-flight: Mishaps

Damage due to or caused by, live or captive missiles or explosives are reported

as Aircraft Flight (Explosives/Missile Involvement).

External Explosions: Mishaps

Mishaps, which involve missiles that are damaged by explosives external to the missiles are reported as explosives (missile involvement) mishaps.

(AFI 91-204, 1999)

Rocket Related: Mishaps

Unplanned events during aging and surveillance test firing of rocket motors are not considered mishaps, unless collateral damage occurs to items other than

the rocket motor. (AFI 91-204, 1999)

Mishap Classification

During a missile mishap report/investigation it is very important for the reporting that the

mishap is classified under a specified criterion of classification. This process involves first

accessing the cost and damage created by the mishap, and applying that information to

the established criteria in order to determine the class of the mishap (a-d).

The criteria

provided below is quoted from AFI 91-204:

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Estimating Cost of Mishap:

If the intended mission objectives are not met due to the failure of a non-recover-

able missile and damage results, report the acquisition cost of the launch vehicle

and the acquisition cost of the payload..

Missile Support Equipment: Calculate MSE damage at the full cost of repair or

replacement of the property, not counting normal launches residual damage.

Pre-launch Damage: Compute all ground-launch missile pre-launch damage occurring without the missile being launched, to include transportation and storage, at the full cost to replace or repair. These costs will include the direct

labor and materials for the repair.

Drop Criteria: For missiles or all-up-round components dropped a distance that

exceeds the drop criteria in the specific item technical order, estimate the mishap

cost at 15 percent of the item replacement cost in the current stock catalog.

After

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initial mishap class determination, upgrade or downgrade the mishap class only if

actual cost can be determined. Upgrade or downgrade can be accomplished after

completion of final evaluation.

Parachute-recovered Missiles: Include the repair costs or loss involved related

to abnormal events or clearly excessive damage. Abnormal events include torn

parachutes, late recovery initiation, failure of a parachute to blossom or release,

high winds, etc. Excessive damage includes buckling of the main fuselage, fire at

impact, destruction of the payload section, etc. Do not include the cost of

expected damage to parachute-recovered missiles resulting solely from

surface impact during an otherwise normal recovery sequence is an operational

expense and not reportable. Do not include cost of recovery since recovery is normally a mission objective for recoverable missiles.

Classification Criteria:

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

Reportable damage of \$1, 000, 000 or more.

A fatality or permanent total disability. (AFI 91-204, 1999)

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

Reportable damage of \$200, 000 or more but less than \$1, 000, 000.

A permanent partial disability.

Inpatient hospitalization of three or more personnel. (AFI 91-204, 1999)

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

Reportable damage between \$10, 000 and \$200, 000.

An injury resulting in a lost workday case involving 8 hours or more away

from work beyond the day or shift on which it occurred; or occupational

illness that causes loss of time from work at any time. For military personnel,

do not count the day of injury or the day returned to duty. Do not count days

when military personnel were not scheduled to work. (AFI 91-204, 1999)

Class D Mishaps: A mishap resulting in one or more of the following:

Applies to air-launched missiles only.

Total cost of \$2, 000 or more for property damage but less than \$10, 000.

Property damage includes all government equipment, vehicles, or munitions.

(AFI 91-204, 1999)

A nonfatal injury that does not meet the definition of a Class C and results in less than eight hours lost time (military lost work hour cases are not included). HAP Events. Significant aircraft, missile, space, explosives, miscellaneous air operations, or ground occurrences with a high potential for causing injury, occupational illness, or damage if they recur. These events do not have reportable mishap costs. If the event meets report-able mishap criteria do not designate it as HAP. Do not use the HAP designation in conjunction with classes of mishap.

Aviation Essays