

ACCIDENT INVESTIGATORs HANDBOOK

November 2007

This Accident Investigation Manual was updated February 2007, and supersedes the Accident Investigator Handbook dated 1 February 1999.

This manual is used in conjunction with AR 385-10 Chapter 3 DA PAM 385-40 for Army accident investigations. It may be used as a guide for units in the field. This manual is not all encompassing nor does it supersede any regulations, official pamphlets, or local Standing Operating Procedures (SOP). Use of trademark names does not constitute endorsement by the U.S. Army. Comparable items are acceptable.

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INTRODUCTION

PURPOSE: To provide a concise, standardized set of instructions and procedures to assist U.S. Army Accident Investigation (CAI/IAI) Boards. It is designed to be taken to the investigation site and used as a guide and data recording tool.

APPLICABILITY: The manual is intended for use by accident investigation boards and as a guide for field accident investigators who are appointed by their local command.

Contents of this guide are intended for both aviation and non-aviation (ground) accidents. Unless otherwise stated, information pertains to either type accident. Where necessary, differences have been delineated. Additionally, this guide does not cover all circumstances. Contact the Operations Officer, USACRC, DSN 558-3410/2660, commercial (334) 255-3410/2660 for special instructions concerning situations and circumstances not covered in this handbook. In particular, for accidents involving fratricide or negligent discharge (see Appendix A for the definition of fratricide and negligent discharge), contact Operations Office, USACRC. Unless this publication states otherwise, masculine nouns and pronouns are not gender specific.

Point of contact for accident investigation and this guide is U.S. Army Combat Readiness Center, Director, Operations Directorate, DSN 558-2461, commercial (334) 255-2461.

CHAPTER 1 - ARMY ACCIDENT INVESTIGATIONS

1-1. OVERVIEW.

a. The mission of the Army Combat Readiness Center is to enhance combat readiness through proactive composite risk management to prevent accidents. The accident prevention process is fed, in part, by the accident investigation process, which identifies Army-level system inadequacies and required corrective actions across Doctrine, Organizations, Training, Materiel, Leadership and Education, Personnel, and Facilities (DOTMLPF). DOTMLPF is the framework used in the Army's strategic planning process. An investigation based on DOTMLPF will not only provide information that the Director of Army Safety can use to immediately effect changes at Department of Army (DA) level, but will also provide information necessary to identify Army-wide hazards and controls.

b. Concept. The on-site investigation and finalization of the "red book" is the first phase of the accident prevention process and provides valuable data for Phases II and III, Army-wide Systems Analysis of Hazards and Controls. The procedure used during on-site accident investigations is the '3W' approach (see Figure 1).

Figure 1. 3W Approach to Accident Investigation and Analysis

<table>
<tr><td>What Happenned?</td><td colspan="2">Why did it happen?</td><td colspan="2">What to do about it?</td></tr>
<tr><td>CAUSE FACTORS</td><td colspan="2">SYSTEM INADEQUACIES/ ROOT CAUSES</td><td colspan="2">CORRECTIVE ACTIONS (Recommendations)</td></tr>
<tr><td>Human Error (Man)</td><td>Unit-Level (company through MACOM)</td><td>Unit-Level (MACOM w/Army-level proponency,DA) {if applicable}</td><td>Unit-Level (company through MACOM)</td><td>Army-Level (DOTMLPF)</td></tr>
<tr><td>Material Failure (Machine)

Environment</td><td>Support
Standards
Training
Leader
Individual</td><td>Doctrine
Organizations
Training
Material
Leadership & Education
Personnel
Facilities</td><td>Most appropriate actions for that level of command</td><td>Doctrine
Organizations
Training
Material
Leadership & Education
Personnel
Facilities</td></tr>
</table>

* Army-level decisions/actions that influenced the accident unit and may have contributed to the accident/incident.

Accidents are unplanned events, which result in personal injury, illness, and/or property damage.

DOTMLPF is an Army acronym that lists all major force modernization areas required for warfighting integration: doctrine, organizations, training, materiel, leadership and education, personnel, and facilities.

The ‘3W’ approach reveals adverse interactions of man, machine and environment, which caused or contributed to the accident.

(1) What happened (mistake/error, materiel failure, and/or environmental factor). Identify key factors (human, materiel, environmental), which caused or contributed to the accident. In the case of injuries, explain how they happened.

(2) Why it happened (root cause(s)/system inadequacy(ies)). Identify the system inadequacy(ies) that permitted the mistake/error to occur, the materiel to fail/malfunction or the environment to become a factor in the accident. The reason a system inadequacy existed at unit level may be due to a deficiency in one or more of the DOTMLPF. After determining the root causes/system inadequacies, look at each and determine if the source is in the DOTMLPF (i.e., Was the unit set up for failure by decisions made at the Army-level?). If so, this will point you to Army-level recommendations targeting that DOTMLPF domain. For example, a training failure is identified at the unit-level. The source of that training deficiency may be at the Army level, e.g., the unit’s back-to-back deployments didn’t allow sufficient time for training. Identifying and resolving root causes/system inadequacies are the keys to preventing future accidents.

(3) What to do about it (recommendations). Identify the recommended actions and identify the proponent activity or lowest level of command that is most responsible for taking action targeted at eliminating/correcting the system inadequacies/root causes (both at the unit and, if applicable, Army-levels). It is important to provide the local commander with recommendations to address his local situation, but it is equally important to provide the Chief of Staff Army with recommendations to address Army-wide hazards.

c. Once this has been accomplished, the appropriate activity responsible for correcting each identified system inadequacy can be notified. This procedure is called the “3W” approach to accident investigation.

1-2. RESPONSIBILITIES (Ref CHAPTER 3 AR 385-10, paragraph 1-4). Director of Army Safety (DASAF) will--

a. Establish procedures for accident reporting and recording Army-wide.

b. Determine which accidents will be investigated by the U.S. Army Combat Readiness Center under the Centralized Accident Investigation (CAI) concept.

1-3. SAFEGUARDING ACCIDENT INFORMATION. All accident data/information will be safeguarded in accordance with (IAW) paragraphs 1-10 and 1-11, CHAPTER 3 AR 385-10. Pictures, notes, diskettes, drawings, and any other materials collected or generated by the board must be handled and stored to prevent unauthorized access. Access to the board’s work area must be controlled or materials secured to prevent unauthorized access. In general, information related to accident investigations is released only for accident prevention purposes. Board members do not communicate with media, next-of-kin of personnel involved in the accident, other Federal agencies, contractors, or other Army boards or investigations except IAW precise guidelines and controls.

1-4. THE ACCIDENT INVESTIGATION BOARD. (Shall be formed IAW Chapter 3 385-10 & DA PAM 385-40)

CHAPTER 2 - ARRIVAL AND ORGANIZATION

2-1. ARRIVAL.

a. Get to the accident site as quickly as possible. There are two important reasons. First, the board must gain control of the accident site and record any evidence that may be perishable. Trained safety personnel will usually attempt to preserve the site to the degree possible, however, well-intentioned, but uninformed senior officers and other interested personnel often feel the need to inspect the scene personally and may inadvertently destroy evidence in the process. Impending inclement weather is an obvious scenario where the board may find it necessary to view the site even during periods of darkness. Second, the board will want to display a sense of professional urgency in beginning the investigation.

b. One of the team's first challenges is to assemble the board. In most cases, the board will not arrive simultaneously. Board members may be provided by the host installation or may be required to travel from other locations. Selection, notification and travel of other board members may require days instead of hours. Whatever the circumstance, the board president and recorder must develop a plan to gain control of other board members and advisors immediately upon arrival.

c. It is also important to establish the board's working area as quickly as possible. In cases of remote accident sites, this may not always be possible. If the accident site is near the installation or designated work area, the board president may elect to establish the work area after ensuring that the preliminary accident site investigation is ongoing.

2-2. COMMAND IN-BRIEF. The board president should inbrief the appointing authority as soon as possible. The appointing authority in-brief is informal and does not require media support or a briefing room. Often, it is done in the appointing authority's (or designated representative's) office. The purpose is to inform the appointing authority regarding the board's mission, composition and requirements (see Appendix E). On occasion, the appointing authority may provide additional guidance regarding areas that he feels need particular emphasis.

2-3. INVESTIGATION PLAN.

a. Concept and plan. It is important to ensure that all board members understand the investigation concept and plan (see Appendix F). The investigation plan is a systematic process that will ensure continuity of effort from the preliminary examination of the accident site to the sub mission of the final report. The plan is divided into four phases--

(1) Organization and preliminary examination
(2) Data collection
(3) Data analysis
(4) Completing the technical report

b. Phase 1 - Organization and preliminary examination. This phase provides the opportunity for the board president to organize the board for the investigation. This should be accomplished in a board meeting

before departing for the accident scene. This meeting should ensure that every board member understands the areas of the investigation for which they are responsible, the initial tasks to be accomplished (see paragraphs below) and the data elements to be collected to complete the report. The board should also be briefed by the unit/installation safety director/ officer on the status of preliminary actions. Once the board arrives at the accident site, members of the board should make a controlled access (ensuring the site, to include ground scar/mark, is not disturbed) to get a "mental picture" of the physical layout as an early step in their individual tasks. This orientation will usually require less than 30 minutes. If the board cannot arrive at the scene with adequate daylight remaining, the preliminary examination may be delayed until the following morning.

c. Phase 2 - Data collection. Human, environmental and materiel factors are interrelated as each influence the performance of man and machine. Divide data collection into the following areas:
   (1) Environmental factors. Collection of environmental evidence is simultaneous and inclusive with the human and materiel factors evidence collection.
   (2) Materiel factors (see Appendix G). Materiel factors concerns gathering data necessary to evaluate the performance or design of the vehicle, aircraft, buildings, ground support equipment or other material involved.
   (3) Human factors (see Appendix G). Human factors are primarily concerned with gathering data necessary to evaluate the job performance of all personnel who influenced the operation that resulted in the accident. This should include the chain-of-command at least two levels above the accident unit. Your data collection must enable you to examine the influence of command activity, or lack thereof, in the context of its role in the accident or in the prevention of accidents.

d. Phase 3 - Data analysis. The analysis function is an ongoing process throughout the data collection phase. Conclusions derived from the analysis will be the basis for developing findings and recommendations. The analysis should be thorough and should focus on determining why the accident occurred. This should drive the analytical effort throughout the investigation, so that findings and recommendations can be developed that have the best potential for preventing similar accidents. (See chapter 5 for a detailed discussion of data analysis).

e. Phase 4 - Completing the technical report. In this phase, the board must ensure that all relevant evidence gathered is carefully recorded (Chapter 8 provides detailed instructions on completing the report). It is not unusual for some of the evidence to be contradictory. Contradictory evidence will be discussed and resolved to the extent possible in the analysis.

2-4. HOST INSTALLATION RESPONSIBILITIES.

a. The appointing authority will(Chapter 3, AR 385-10):

(1) Appoint the president and other members of the board from units or organizations other than the accountable organization.

(2) Request support from higher headquarters when investigation requirements are beyond the unit's capability.

(3) Give priority to accident investigation and reporting duties to ensure prompt completion of accident reports.

(4) Ensure that no member of the board has a personal interest in the outcome of the accident investigation.

(5) Provide a safety trained representative to support the board for the duration of the investigation. The duties and responsibilities of the safety representative are as follows:

(a) Provide initial classification for the accident, (i.e., Class A, B, etc.)

(b) Implement accident site security measures immediately upon completion of necessary emergency response actions.

(c) Immediately begin securing data IAW the POC checklist (see Appendix C).

(d) Meet the board upon arrival and assist the board president in coordinating actions upon arrival.

(e) Assist the president of the board in obtaining administrative and logistic support throughout the investigation.

(f) Coordinate witness interviews as directed by the board president.

(g) Assist the board in obtaining other technical assistance as required.

(h) Provide necessary interpretation of local regulations and directives.

b. Additionally, the appointing authority will ensure that the following assistance is provided to the investigation board, if needed (ref AR 385-10, para 4-4; and DA Pam 385-40, para 2-1c):

(1) Engineer. Surveying and mapping the debris pattern, preparation of required sketches, etc.

(2) Local Training Support Center (TSC). Photographic, audio, video, and graphic art assistance.

(3) Public Affairs Officer (PAO). Handling press representatives and public information releases.

(4) Hospital commander. Treatment and examination of personnel, identification of fatalities, facilities and support for conducting autopsies, lab support, and other medical support as necessary, (e.g., the preparation and shipment of body fluid samples and specimens to the Armed Forces Institute of Pathology (AFIP) for analysis).

(5) Provost Marshal. Providing guards, traffic control and site security.

(6) Weather officer. Obtaining complete weather information, to include graphic snapshots, if available, for the time and location of the accident.

(7) Maintenance support facility commander. Recovery of wreckage, disassembly, and removal of components, and preparation for shipment of items selected for teardown analysis. Also, preparation of estimated cost of damage (ECOD) to assist in classifying the accident (see Appendix U).

(8) Transportation officer. Assistance in transportation to and from the accident site and expeditious shipment of components selected for teardown analysis.

2-5. BOARD MEMBER QUALIFICATIONS. As soon as practicable upon arrival, either the board president or recorder will verify the qualifications of assigned board members. Do not assume their qualifications have already been established. Board members gain invaluable insight into the accident during the initial stages of the investigation and every effort must be made to prevent changes once the investigation begins.

* a. Instructor Pilot (IP). Qualified, current and serving as an instructor pilot or a standardization instructor pilot. If the accident occurred during instrument meteorologist conditions (IMC) or inadvertent IMC flight, the IP should also be a qualified and current instrument flight examiner (IFE).

b. Equipment/Task Subject Matter Expert (SME). An officer or senior NCO who is currently serving in a capacity that requires the conduct (or oversight thereof) of the mission or task that was being per formed when the accident occurred.

* c. Maintenance Test Pilot (MTP). A qualified and current maintenance test pilot, or maintenance flight examiner (MFE) in the type of air craft involved in the accident.

d. Vehicle/Equipment Maintenance Personnel. An officer, warrant officer, senior NCO, or a Department of Defense (DoD) civilian, who is currently serving in a capacity that requires performance (or oversight thereof) of the maintenance of the type vehicle/equipment involved in the accident.

e. Technical Inspector (TI). A warrant officer, NCO or DoD civilian who is serving in a TI position with direct oversight of maintenance of the type of aircraft involved in the accident.

f. Medical Officer. A doctor, or physician assistant who is currently serving in that capacity. In aviation accidents, a flight surgeon (if a flight surgeon is not available, an Army medical officer may be appointed) when an aviation accident involves personal injuries or problems associated with personal protective equipment, egress from the aircraft, MEDEVAC, rescue or survival.

g. Other. The board president will verify the qualifications of other board members as required such as master gunner, MP, or other advisors.

*Aviation accident only.

2-6. BOARD MEMBER DUTIES (ref Appendix G).

a. Board President. The duties and responsibilities of the president of an accident investigation board include, but are not limited to the following:

(1) Manage the investigation IAW AR 385 10.

(2) Convene the board at the earliest possible time after notification that an accident is to be investigated.

(3) Organize the board and assign areas of investigative responsibility to each member.

(4) Take control of the accident site after the area is declared safe for entry by rescue, explosive ordnance disposal (EOD), chemical, and firefighting personnel.

(5) Verify that adequate guards are on site to ensure the preservation and protection of evidence, to include site, equipment, separated parts, impact scars, etc., resulting from the accident.

(6) Coordinate for all required investigating equipment necessary to conduct the investigation.

(7) Dispatch members of the board to perform their duties and responsibilities.

(8) Evaluate the need for and request additional technical assistance as required.

(9) Ensure all available pertinent data is gathered before closing the field portion of the investigation.

(10) After coordination with the collateral board, authorize recovery of the wreckage from the accident site when the field examination is complete. Release wreckage/equipment for disposition to the owning organization when the investigation is completed.

(11) Conduct frequent meetings of the board to ascertain progress, exchange information, and adjust assignments as necessary.

(12) Ensure accident information is released only to appropriate authorities (i.e., appropriate command, staff, safety and investigation personnel).

(13) Advise appropriate safety officer/public affairs officer to contact local legal advisors in cases involving potential claims against the U.S. Government for personal injury or property damage.

(14) Ensure data is correctly analyzed and conclusions are supported by evidence.

(15) Ensure suitable recommendations are made and that a thorough and accurate report is completed and submitted IAW CHAPTER 3 AR 385-10 and this publication.

(16) If applicable, coordinate with the local Criminal Investigation Division (CID) handling the case.

(17) Write the history of flight/event, analysis, findings and recommen dations for the technical report.

b. Recorder. USACRC-trained recorders are mandatory for all CAI inves tigations. The responsibilities and duties of the recorder are as follows:

(1) Receive and administratively process information gathered by the members of the board (record the board member information on the sheet in Appendix H).
(2) Monitor report processing requirements and stages of completion.
(3) Assign tasks and monitor work of supporting clerical personnel.
(4) Ensure all necessary substantiating data are collected and posted to the technical report.
(5) Assemble the final technical report.
(6) Ensure the human, materiel, and/or environmental narrative of the technical report is complete.
(7) Perform other duties as assigned by the board president.
(8) Review unit safety program and ALSE program.

c. Maintenance Officer. When possible, a maintenance specialist should be assigned to the board. The responsibilities and duties of the maintenance member(s) are as follows:
(1) Evaluate all maintenance forms/records to determine the pre accident status of the equipment.
(2) Determine if equipment failed and could have contributed to or caused the accident.
(3) Research equipment records for adequacy of inspections and correction of discrepancies. Determine if discrepancies existed that may have caused or contributed to the accident.
(4) Supervise preparation and shipment of items selected for teardown/ analysis (see Appendix I).
(5) Monitor equipment recovery if accomplished before completion of the investigation.
(6) Review unit's maintenance procedures and record discrepancies.
(7) Ensure all maintenance/materiel factor requirements for the technical report are complete.
(8) Assist with the preparation of accident scene diagram(s).
(9) Write the materiel factors narrative for the technical report.
(10) Perform other duties as assigned by the board president.

d. Medical Officer. The responsibilities and duties of the medical officer board member are as follows:
(1) Lead the medical, physiological, and psychological analysis of the human factors investigation. AR 40 21 (Medical Aspects of Army Aircraft Accident Investigation), AR 40 2, (Army Medical Treatment Facilities General Administration) and appropriate chapters of this handbook govern the investigation and reporting of these factors.
(2) Evaluate accident survival, emergency egress, and rescue portions of the human factors investigations.
(3) Ensure the board is advised of medical/human factors related to the cause(s) of the accident, the reason therefore, and recommendations for corrective action.

(4) In case of off post accidents or where local coroners/ medical examiners are involved, promptly recover the remains for autopsy (if applicable), specimen collection, records, etc. (see Appendix J).

(5) Investigate and report data concerning personnel injuries this includes collecting all medical and treatment records and procedure reports.

(6) Collect and evaluate life support equipment (LSE), and personal protective clothing and equipment (PCE).

(7) Ensure the human factors narrative for the technical report is complete.

(8) Determine the medical qualification/status of the personnel involved and rescue personnel.

(9) Perform other duties as assigned by the board president.

e. Other board members. They should consist of individuals who have considerable knowledge and expertise in the required fields (instructor pilot, master/senior/equipment operator, etc.) The duties of other board members are as assigned by the board president. Other duties are, but not limited to the following:

(1) Examine and record all factors involving operations of the equip ment, to include assignment of personnel, mission planning, and the history of events from mission assignment to the time the accident occurred.

(2) Investigate and record the status of personnel/ individual training, experience, operating regulation, instructions, and unit directives. Recommend and prepare changes to ARs and TMs, if required.

(3) Investigate the activities of all personnel who were victims, had an influence on the mission, or played a role in the accident.

(4) Prepare a sketch of the accident site (see Appendix K).

(5) Conduct and summarize witness interviews as necessary for inclusion in the technical accident report.

(6) Assist with the writing of the technical report as required.

2-7. ADVISORS TO THE BOARD.

a. Advisors are not voting members of the board. The board president must exercise discretion with reference to the type of information shared with advisors. As a general rule, advisors are not allowed to participate in witness interviews. Remember that a manufacturer's representative is not bound by Army Regulations regarding promises of confidentiality. Therefore, manufacturer's representatives, and anyone else not bound by Army Regulations regarding promises of confidentiality, are not permitted in interviews where promises of confidentiality are granted. If the advisor has specific questions for the crew or operator that is deemed necessary to determine equipment functionality, then a board member may ask that question for him during the interview.

b. Any outside technical assistance requests must be routed through the USACRC operations.

2-8. CRIMINAL INVESTIGATION DIVISION (CID).

a. Contact with the local CID office should be made as soon as practical. Determine if the CID has assumed criminal investigative authority over the accident scene, initiated an investigation, removed any evidence, or completed/terminated its investigation of the accident site. The CID should determine as quickly as possible if a crime has been committed. If evidence indicates that the event was the result of criminal intent (other than negligence, dereliction of duty, or disobedience of an order), the criminal investigation takes priority over all other investigations, and the safety investigation will be discontinued.

b. When criminal activity is determined by the CID not to be a factor, the CID will release control of the investigation to the accident investigation board. In the interim, both investigations may proceed and the CID and the accident investigation board will cooperate with one another in order to ensure that each is able to effectively perform its mission. Information gained in the CID investigation can be released to, and used by, the accident investigation board. CID will, for example, provide the accident investigation board with copies of their report, to include witness statements, photographs, etc. However, the accident investigation board may release only those factual, non privileged portions of its report to CID.

2-9. THE MEDIA. The level of media interest will vary depending on the severity of the accident. It may range from no interest at all to concentrated national attention. The appropriate course of action is to allow the installation or the nearest local public affairs officer to address media requests. If a PAO is not immediately available, the board president may be required to interface with the press at the accident scene. The following guidelines will govern the president's handling of the media:

a. The board president will be the sole interface with the media. Board members will refer any requests for information to the board president.
b. Cooperate with the media to the extent possible.
c. Do not speculate as to the cause of the accident. The following statement is all that should be provided:
"An investigation of this accident is now ongoing; please refer all of your requests for information to the local installation, U.S. Army Combat Readiness/Safety Center, or Department of the Army Public Affairs Office."

NOTE: Give name and number of local PAO; if not known, be courteous and get the name and number for the reporter. This will show good faith and an attempt to be as helpful as allowed within the scope of the mission and regulations. If you can't get access to local PAO information, give the name and number of the U.S. Army Combat Readiness Center or Department of the Army Public Affairs Office to the reporter (U.S. Army Combat Readiness Center: Public Affairs Office, 334-255-3770; Department of the Army Public Affairs Office: Media Relations Division, 703-697-7550).

d. In most cases, news reporters will understand that it is too early in the investigation to determine what happened and that you will not in any form speculate about the cause of the accident. Without giving the appearance of trying to conceal anything or pass questions off lightly, the board president should advise reporters that the post or local PAO is the point-of-contact for responding to all of their future questions.

e. Accident investigation boards are not authorized to provide periodic updates in the form of news releases or press conferences to either media representatives or local PAOs. Board presidents should ask PAOs to seek information from other sources to use in responding to media requests for updates. Board presidents should steer PAOs in the direction of obtaining information to be released to the media from the collateral board, as one of the primary intents of a collateral investigation is to provide a means of answering the public's concerns regarding the accident.

f. No attempt should be made to tell reporters what should be written in their stories or to restrict them from interviewing civilian witnesses. You should, however, advise military personnel against making statements, expressing opinions, or giving out information concerning the accident.

g. In many instances, the news reporters are able to provide a great deal more information than they receive. Sometimes reporters are among the first persons to arrive at the accident site, and they may have talked to several witnesses before the rescue party arrives. This fact may not be apparent from their conversations, which probably will consist primarily of questions. Rather than strain relations at an accident scene by quoting regulations as the reason why you cannot provide reporters with accident details, attempt to be cordial and helpful, yet firmly refer reporters to a public affairs officer. Remember you may find it necessary later to interview the reporter as well.

h. In most cases, the reporters will be happy to pass their information along to the individual in charge of the accident scene and give the investigation team further assistance as needed if they understand the value of their efforts to the safety program. If the news agency is asked to provide photos or film clips, be advised that a fee will usually be involved, so arrangements for financing should be made before making this kind of request for assistance. The same caution applies to other nonmilitary agencies (police, fire departments, etc.).

i. When an accident occurs on nonmilitary property, media personnel should be allowed complete freedom in taking photographs from outside the secured area. If classified material is involved, the photographer should be advised of such. If necessary, the photographer may further be advised that the photographing of classified material may constitute a violation of Federal law (18 U.S. Code, Section 797). Any such classified material should be either covered or removed before

photographs are taken. Although no restriction is placed on the photographer, a tactful request will usually prevent use of photos that would violate propriety. Media personnel should also be advised that the notification of next-of-kin may not have been accomplished.

2-10. COLLATERAL/AR 15-6 BOARD.

a. It is to everyone's benefit that you cooperate with the collateral board to the maximum extent possible. Just like you, they have an important mission to accomplish and they require timely access to all appropriate information. Safety investigators must ensure that all appropriate data is shared with the collateral board in an expeditious manner (see Appendix L for specific instruction on what information is releasable and a memorandum {pg L-3} that can be given to the collateral board explaining the Department of the Army (DA) position on this matter). The collateral board, likewise, is obligated to share any information (which includes any pertinent analysis) with the safety board.

b. Collateral investigations are used to make a record of the facts for use in litigation, claims, and other administrative and disciplinary actions, whereas the safety investigation (hereafter referred to as the accident investigation) is conducted solely for accident prevention purposes. Collateral investigations are conducted independently and apart from the accident investigation. They are appointed and conducted by local commands as required by Department of Defense Instruction (DODI) 6055.7 and AR 385 10, and use procedures in AR 15 6 and AR 27 20. Safety personnel do not conduct, review, or store collateral investigations.

c. Accident and criminal investigations take priority over collateral investigations for purposes of access to evidence, witnesses, and the accident scene; however, a spirit of cooperation is also required to ensure that the collateral board will have equal access to the evidence.

d. The accident investigation board may only provide the collateral investigator with copies of common source, factual information (technical data, maintenance records, photographs, maps, diagrams, lists of witness names, etc.). The content of witness statements may not be provided; nor may the accident board provide its findings, analysis and recommendations or other privileged information to the collateral investigator. The accident board will also allow the collateral board a reasonable amount of time to perform an accident scene investigation before disturbing the evidence (by movement, disassembly, etc.). If this cannot be accomplished due to the urgency of the situation, then the accident board must ensure that the scene is documented with photographs and a wreckage distribution (accident site) diagram (Appendix N), which will be made available to the collateral board. If the accident board removes components for analysis, the collateral board should be so advised.

(Command/Office Symbol) (385-40)

MEMORANDUM FOR (Commander, Your Command)

SUBJECT: Accident Investigation Board (Safety) Appointment Orders

1. Under the Provisions of AR 385-40, Accident Reporting and Records, 1 Nov 94, the following individuals are appointed as the accident investigation board members for the class (A or B), (type of equipment or injury) accident that occurred on (date), at (location):

BOARD PRESIDENT: (full name, rank, ssn) (voting vs. non-voting), Name & mailing address of the assigned unit:

BOARD RECORDER: same as above

BOARD MEMBER: (SME, TI, MEDICAL DR. ETC, any individual whose role is necessary to the technical base of the board.)

BOARD ADVISOR: same as above (but indicate as non-voting)

2. The purpose of the board is to gather and evaluate evidence, determine causal and/or contributing factors, and prepare findings and recommendations to prevent future accidents. Individuals will be released from all other duties for full-time participation in the subject investigation.
3. These appointment orders are subject to subsequent amendment/ augmentation to include additional subject matter experts.
4. In accordance with the Health Insurance Portability and Accountability Act (HIPAA) (Public Law 104-191 enacted by Congress on August 21, 1996), I delegate my authority as a military commander to members of the board to access protected health information about individuals who are Armed Forces personnel when it is deemed necessary by the board president to assure the proper investigation of this accident.
5. The POC for this action is (name, rank, and DSN/COMM of Unit Safety POC).

SIGNATURE BLOCK OF SIGNATORY
AUTHORITY (usually the C/S)

DEPARTMENT OF THE ARMY
UNITED STATES ARMY COMBAT READINESS CENTER
FORT RUCKER ALABAMA 36362-5363

REPLY TO
ATTENTION OF

CSSC-OA
XX June XXXX

MEMORANDUM FOR Commander, Military Police/CID, Ft. Carson, CO.

SUBJECT: Release of Investigation Information Regarding Class A Ground Accident, M998 HUMMWV Rollover, X June XXXX

1. IAW Department of the Army Pamphlet 385–40, Safety, Army Accident Investigation and Reporting, "The CID should determine as quickly as possible if a crime has been committed." "Once criminal activity is determined not to be a factor, the CID will release control of the investigation to the accident investigation board."

2. IAW AR 385-40, Safety, Accident Reporting and Records, paragraph 4–7, Access to information from other investigations, "The accident investigation board will have access to all evidence, photographs, and witness statements collected by MP/CID investigators.

3. Request release of all information in terms of photographs, witness statements, or other material to the Centralized Accident Investigation Board (CAI) IAW the aforementioned regulations.

Investigator Bob
MSG, USA
CAI Board
Recorder

CHAPTER 3 - DATA COLLECTION

3-1. GENERAL.

a. Crucial to any investigation is the gathering of data and physical evidence. METT-T analysis will determine the level of detail collected in a combat zone. The data/evidence collected during an accident investigation becomes the very basis of the accident investigation board's analyses and conclusions. Therefore, a thorough effort to collect all relevant data and evidence must be made. The intent of this chapter is to assist investigators in accomplishing this effort.

b. Data and evidence collected during an investigation should include--

(1) Physical evidence - Matter related to the accident such as equipment, parts, debris, hardware, voice recorders and other physical items.

(2) Verbal evidence - Witness statements and observations.

(3) Documentary evidence - Paper and electronic information, such as records, reports, policies and procedures, photos, videos, accident site graphs, duty logs, board proceedings and notes, board member notes, etc.

c. The collection of evidence and data comes from six major areas--

(1) The Accident Scene

(2) Witness Interviews

(3) Command Data

(4) Environmental Data

(5) Materiel Data

(6) Personnel Data

d. Usually, the accident unit's parent organization designated safety representative initiates the gathering and preservation of data and evidence. To ensure the appropriate measures are taken, the board president (or safety investigation rep) should request the on-site safety representative to initiate the gathering of data and evidence as outlined in Appendix C, POC Checklist. A copy of the checklist can be faxed to the designated safety representative.

e. Once the board assembles at the accident location, the on-site safety representative should brief the board on actions taken prior to the boards arrival. At that time, all evidence and data collected by the on-site safety representative should be turned over to the board recorder with the appropriate documentation. The board recorder is responsible for the disposition of all data and evidence acquired during the investigation (see Appendix M for Handling and Disposition guidelines).

f. Although the initial gathering of evidence begins with the on-site safety representative, the majority of the evidence and data will be collected by the board once they assemble. Generally, the gathering of data and evidence is a simultaneous effort by various work groups and is an on-going process. Board member actions are listed in Appendix G. Preliminary evaluation of data and evidence by the board will lead to subsequent data collection.

3-2. ACCIDENT SCENE. Evidence may be inadvertently moved, removed or destroyed, especially if the situation does not permit preservation of the accident scene. Therefore, the on-site safety representative, after recording initial witness information and statements, should develop a diagram of the accident site/wreckage distribution (provided necessary precautions have been taken for composite/hazardous materials, see Appendix P). The site diagram should capture positions of debris, equipment, tools, body parts and injured persons (see Appendix N for an example). If fire caused the accident or resulted from the accident, see Appendix O.

a. It is imperative that all members of the board view the accident site as soon as possible after being briefed in order to have a general mental picture of what occurred. Consider the following issues before visiting the site:
   (1) If there is daylight left every effort should be made to visit the site.
   (2) Consider whether or not the accident involved composite or other hazardous materials and ensure the appropriate precautions are taken prior to and while visiting the site (See Appendix P, Composites and Bloodborne Pathogen Safety).
   (3) Also, check with the host organization's designated representative to see if any photos, diagrams, videos or other pictorial representations of the scene have been collected and are available for viewing.
   (4) When feasible, visit the accident site at the time of day commensurate with the accident time and under the same conditions. Doing so will give the investigators a more accurate picture of the existing environmental conditions at the time of the accident (glare, traffic, road conditions, etc.).
   (5) In the event of an accident on a public roadway and the scene has been cleared away, investigators should maximize local resources such as state, local, or military police reports and site diagrams.

b. Photographing the scene. The board recorder has the responsibility for ensuring that all necessary photographs are taken. Print or digital format is preferred. If an installation photographer is provided, the board member in charge of photography should supervise him. Remember: It is always better to have too many photos than not enough.
   (1) A recommended photographic checklist is shown below:

Aerial view from four directions (N, S, E, W)
Ground view from four directions (N, S, E, W)
General overview of wreckage beginning at the nose and circling site every 45º
Photos of any ground scars
Photos of major components/controls/parts
Instrument panel and consoles
Cockpit/cabin/cab areas (include seats and restraining systems)
Canopy
Detailed photos of suspected failed parts
Disassembly of parts/equipment (if done)
Other photos deemed necessary

(2) As photos are taken, a log should be completed noting the scene/subject, date, time, direction, and orientation of photos (see Appendix Q), as well as the photographer's name.

c. Inspecting physical evidence at the scene. After diagramming and photographic recording, a systematic inspection of physical evidence can begin. The inspection involves--
   (1) Survey the involved equipment, vehicles, structures, etc., to ascertain whether there is any indication that component parts were missing or out of place before the accident.
   (2) Note the absence of any parts of guards, controls, or operating indicators (instruments, position indicators, etc.) among the damaged or remaining parts at the scene.
   (3) Identify as soon as possible any equipment or parts that must be cleaned prior to examination or testing and transfer them to a laboratory or to the care of an expert experienced in appropriate testing methodologies.
   (4) Note the routing or movements of records that can later be traced to find missing components.

d. These observations should be recorded in notes, diagrams, and photographs so that investigators avoid relying on their memories. Some investigators find a small cassette tape recorder useful in recording general descriptions of appearance and damage; however, the potential failure of a recorder, inadvertent tape erasure, and limitations of verbal description suggest that verbal recorded descriptions should be used in conjunction with notes, diagrams, and photographs.

e. Before inspecting or removing physical evidence, follow these guidelines:
   (1) Obtain concurrence among board members before any wreckage or equipment is moved or removed to ensure observations are complete. However, final approval lies with the board president.
   (2) Complete site documentation prior to removing or moving any wreckage or equipment (measurements for maps, photographs and videotape made).
   (3) Be aware that the accident site may be unsafe due to hazardous materials or weakened structures.
   (4) Do not start recovery/removal until witnesses have been inter viewed, since visual reference to the accident site can stimulate one's memory.
   (5) Mark locations of removed wreckage or equipment with spray paint or wire-staffed marking flags. Annotate the marking flags to identify wreckage or equipment that was removed and to allow later measurement.
   (6) Use care during recovery/removal and preliminary examination to avoid defacing or distorting impact marks and fracture surfaces.

f. Following inspection of the scene, investigators may need to remove items of physical evidence. To ensure the integrity of evidence for later examination, the extraction of parts must be controlled and methodical. Before evidence is removed from the accident scene, it must be carefully packaged and clearly identified.

(1) Equipment, parts or subassemblies thought to be defective, damaged, or improperly assembled should be removed from the accident scene for technical examination. Document the removal using position maps/diagrams and photos to display the part in its final, post-accident position and condition. If improper assembly is suspected, investigators should direct that the part or equipment be photographed and otherwise documented as each subassembly is removed.

(2) Those items suspected of failure or malfunction must be wrapped or boxed to prevent loss or further damage. Suspected metal failure surfaces should be washed with 90% isopropyl (rubbing) alcohol, which can be purchased at any drug store. Pour the rubbing alcohol over the fracture surface to remove any dirt or mineral salts, do not rub the surface, and then blow dry. After washing, apply water resistant uncontaminated grease to the surface. If there is any question about the grease, use Vaseline. Carefully tag and mark (place, date, and serial number of the equipment) all parts so they are easily identified with the accident and their location at the accident scene. The tag should contain a brief statement regarding the suspected relationship of the parts to the cause of the accident. Both the part and the outside of the package should be labeled. Examples of parts that may be preserved for a more detailed examination are—

(a) Parts suspected of failure.

(b) Parts that appear to be improperly designed or contain faulty workmanship.

(c) Lines, fittings, wiring, or controls not properly supported and subjected to excessive strain or vibration.

(d) Ruptured plumbing or fittings.

(e) Faulty wiring, electrical or radio equipment.

(f) Defective engines, drive shafts, transmission and accessories, such as carburetors, fuel controls, governors, and generators.

(g) Defective hydraulic system components.

NOTE: Do not attempt to mate separated items. This will destroy evidence.

(3) Extreme discretion must be used in disassembling parts or components in the field. If it is known that parts and components will be submitted for teardown and analysis, disassembly should be avoided, as it tends to compromise the analysis by destroying or obliterating bits and shreds of evidence, the value of which may be known only to the analyst. However, when detailed disassembles

are made, all parts must be tagged with complete information to include nomenclature, part number, locations, and any other significant information. Document all disassembly with photographs. Assistance in disassembly and inspection of components, parts, fuel, and oil may be obtained from the next higher echelon of maintenance, U.S. Army depots or other experts identified by the safety investigation board.

g. In addition, a product quality deficiency report (PQDR) must be completed for items suspected of causing or contributing to the accident and submitted to the proponent agency.

h. Be sure to check with the on-site safety representative for a copy of the police report.

i. Reassembly of wreckage. It may be necessary to reassemble wreckage to determine the accident causes or to support a theory in an accident that is difficult to evaluate. When the entire system has been reconstructed, it may afford positive proof of the accident causes. Wreckage layout should resemble the original equipment as closely as possible. This gives the investigator a better overview of separations, fire damage, and control system. A detailed and documented inspection of the wreckage layout will often lead the investigator to the areas or system that played a role in the accident. The layout also assists the investigator in developing the sequence of events that occurred in the accident.

3-3. VERBAL EVIDENCE (WITNESS INTERVIEWS).

a. One of the greatest tools the investigator has in determining the sequence of events and accident causal factors is interviewing witnesses. There are three categories of witnesses--

(1) Participants - Individual(s) personally involved in the accident.

(2) Background witnesses – personnel whose information can aid the investigation. They include manufacturers, air traffic control (ATC) personnel, crash rescue personnel, friends and peers, supervisors, weather briefers, mechanics, etc.

(3) Eyewitnesses - persons who directly observed the accident or conditions preceding or following the accident as well as persons who heard or saw anything relevant to the subject matter of the investigation.

b. Locating witnesses. Although witness interviews provide insightful information, witness recollection rapidly deteriorates and can be inadvertently tainted through media exposure and from comparing stories with other witnesses. Statements taken from witnesses located immediately after the accident are more reliable. To ensure witness statements are accurate, detailed and as authentic as possible, witness interviews should be given a high priority.

(1) On-site designated representative and emergency response personnel (to include MP/CID, local and state police, firefighters, and paramedics, if applicable) can name the person who provided

notification of the incident and those present on their arrival, as well as provide the most complete list available of witnesses and all involved parties. Witness statements from police should be obtained for review.

(2) Individuals involved in the accident and eyewitnesses may be able to help develop a list of others directly or indirectly involved in the accident.

(3) First-line supervisors can provide information about individuals involved and provide insight into the planning and preparation phases of the mission prior to the accident.

(4) Staff in nearby facilities may have assisted or responded to the accident scene.

(5) News media may have access to witness information and photographs or videos of the post accident scene. Obtain copies of local newspapers, especially if the team gets there a day after. Local media may have already interviewed eyewitnesses and this gives the board an initial list of witnesses and a summary of what they saw. Also, check with the media for video coverage of the wreckage or accident scene. Most media sources will provide a copy of the video coverage if they know it will help the investigation.
Use caution when using cell phones around the media. Many of them have scanners that can pick up cell phone conversations and intentions of the board can be compromised.

c. Interview preparation. Much of the investigation's fact-finding occurs in interviews. Therefore, to elicit the most useful information possible from witnesses, interviewers must be well prepared and have clear objectives for each interview. Interviews should be conducted after the board has established the topical areas to be covered and after the board president has reviewed with the board the objectives of the interviews, and strategies for obtaining useful information.

(1) Identify all witnesses. Initial contact information should be provided to the board president from the on-site designated repre sentatives. The board recorder must complete the "Summary of Witness Interview" form (Appendix U).

(2) Select a location. The location should present a comfortable atmosphere, free of distraction and environmental noise when possible.

(3) Schedule an interview with each witness.

(4) Select and prepare the interviewer. The number of board members present during the interview is at the discretion of the board president. However, more than two or three investigators could intimidate some witnesses. One investigator should conduct the interview and maintain eye contact with the witness while another monitors the tape recorder and takes notes.

(5) Determine whether or not Promise of Confidentiality is warranted- (IAW AR 385-10 Chapter 3)

(a) Promises of Confidentiality—Limited Use Reports. Witnesses in a Limited Use investigation may be given a promise of confidentiality per AR 385–40, paragraph 1–7 a. This promises that their statement will not be released outside the Department of Defense, either to members of the public, the press, state or local governments, or other Federal agencies. Such confidential witness statements are also protected from public release under the Freedom of Information Act (FOIA). In addition, the U.S. Army promises to oppose in court any attempt to get a legal order to release their statement, and to use the Army's best efforts to appeal any court order to release their statement. In addition to flight accidents and fratricide/friendly fire accidents, Limited Use Safety Accident Investigation Reports may be used for accidents involving other complex weapon systems, equipment, or military-unique items (such as ships and shipboard systems, guided missiles, laser devices, or armored vehicles), and military unique equipment/operations/exercises when the determination of causal factors is vital to the national defense. The selection of system categories to be included in this application of Limited Use Safety Accident Investigation Reports is delegated to the Commander, USACRC. Promise of Confidentiality may be offered for any type of limited use accident if the board president believes the witness can provide essential accident-related information and the witness is unwilling to make a complete statement without such a promise.

(b) If an individual witness is offered a promise of confidentiality, their summary will be captured on a separate witness summary form and be documented appropriately.

(c) A blanket promise of confidentiality for any specific type of accident or any specific category or group of individuals will not be given.

(d) A promise of confidentially will be given for witnesses placed under hypnosis or enhanced recall.

(e) Regardless of whether or not Promise of Confidentiality is warranted and offered, the appropriate witness interview summary form(DA FORM 285-W-R, for Ground and DA Form 2397-4-R, for Aviation) should be present during the interview to brief the witness and obtain or verify header information.

(6) Develop a standardized list of points or objectives that should be addressed in the interview. Ensure all board members understand the objectives and strategies and use consistent interviewing methods. Read written witness statements taken by police, CID, or the unit safety officer prior to the interview. Use the statements to formulate questions to clarify points or verify witness credi¬bility. Don't limit the focus of the interview to the accident itself. Use interviews to capture information pertaining to unit and personnel practices,

planing, training, etc. Ask several witnesses the same questions to corroborate facts.

(7) Develop sketches and diagrams for use during the interview to pinpoint locations of witnesses, equipment, etc.

(8) Test audio equipment before the interview. Use of a tape recorder is the preferred method of recording witness interviews and should be used unless the interviewee objects. Using a tape recorder allows the interviewer and interviewee to focus on the content of the interview. The individual conducting the interview should be familiar with the operation of the recorder.

d. Conducting the interview. It is important to create a comfortable atmo sphere in which witnesses are not rushed to recall their observations. Witnesses should be told that they are a part of the investigation effort and that their input will be used to prevent future accidents and not to assign blame. Before and after questioning, witnesses should be notified that follow-up interviews are a normal part of the investigation process and that further interviews do not mean that their initial statements are suspect. Also, they should be encouraged to contact the board whenever they can provide additional information or have any concerns.

(1) Create a relaxed atmosphere--

(a) Conduct the interview in a neutral location that was not associated with the accident.

(b) Introduce yourself and shake hands.

(c) Be polite, patient, and friendly.

(d) Treat witnesses with respect.

(e) Determine whether the witness has any issues that might interfere with conducting an effective interview (language, vision, hearing, seating, need for frequent breaks, etc.).

(2) Prepare the witness--

(a) Describe the investigation's purpose: to prevent accidents, not to assign blame, and the Promise of Confidentiality, if appropriate.

(b) Stress how important the facts given during interviews are to the overall investigative process.

(c) Explain that witnesses may be interviewed more than once.

(d) Let the witness know the interview session will be recorded unless they object.

(e) Using the witness interview summary form, brief the witness using the appropriate statement from block 15. If offered a Promise of Confidentiality, have the witness initial the appropriate statement in block 16 of the form.

(3) Things to avoid during the interview--

(a) DO NOT rush the witness while he/she is describing the accident or answering questions.

(b) DO NOT judge, display anger, refute, threaten, intimidate, or blame the witness.

(c) DO NOT suggest answers.
(d) DO NOT make promises that cannot be kept (for example, unrestricted confidentiality).
(e) DO NOT use inflammatory words (violate, kill, lie, stupid, etc.).
(f) DO NOT omit questions during the interview because you think you already know the answer.
(g) DO NOT ask questions that suggest an answer, such as "Was the odor like rotten eggs?"
(h) DO NOT embarrass a witness by reacting to obvious errors.
(i) DO NOT interrupt the witness.

(4) Begin the interview--

(a) Start the recorder and begin the interview by obtaining the "header" information. Ensure the information is stated out loud (in case more than one interview will be recorded on the same tape).
(b) Note crucial information immediately in order to ask meaningful follow-up questions.
(c) Ask the witness to describe the accident in full before asking a structured set of questions.
(d) Let witnesses tell things in their own way; start the interview with a statement such as "Would you please tell me about…?"
(e) Ask several witnesses similar questions to corroborate facts.
(f) Aid the witness with reference points; e.g., "How did the lighting compare to the lighting in this room?"
(g) Keep an open mind; ask questions that explore what others have already stated in addition to probing for missing information.
(h) Use visual aids, such as photos, drawings, maps, and graphs to assist witnesses.
(i) Be an active listener and give the witness feedback; restate and rephrase key points.
(j) Ask open-ended questions that generally require more than a "yes" or "no" answer.
(k) Observe and note how replies are conveyed (voice inflections, gestures, expressions, etc.).
(l) Determine if the witness has any physical restrictions such as hearing, eyesight, or colorblindness that impact on the credibility or quality of the testimony.

(5) Close the interview--

(a) Before closing the interview, check with board members to see if they have any additional questions.
(b) End on a positive note; thank the witness for his/her time and effort.
(c) Encourage the witness to contact the board with additional information or concerns.

(d) Remind the witness that a follow-up interview may be conducted.

(e) The board must be careful not to believe a witness based solely on his/her interview. Substantiate or refute his/her informa¬tion with other sources.

(f) Documenting witness interviews for the accident report—

(1) Summary of Witness Interview, DA Form 2397 4 R for Aviation and DA Form 285-W-R for Ground, will be used by the accident investigation board to summarize necessary witness statements to substantiate the accident report.

(2) Procedural guidelines for completion of the witness interview forms are delineated in DA PAM 385-40 as follows:

(a) DA Form 2397 4 R: paragraph 3-7 (page 18) with a sample at Figure 3-5, page 36.

(b) DA Form 285-W-R: paragraph 4-5 (page 80) with a sample at Figure 4-2, page 95.

3-4. COMMAND DATA. Command factors at all levels must be evaluated to determine if command influence or lack thereof, contributed to the cause of the accident or could play a role in preventing future accidents. Composite risk management must be assessed with respect to the accident under investigation. Determine what decisions were made which may have "set up" the accident and the authority level of the person making that decision, starting from the accident itself back (to include DA level decisions if appropriate). Collection sources include, but are not limited to:

a. Command Climate Assessments
b. Interviews and observations
c. Records of past unit assessments and inspections
d. Unit status reports (USR)
e. Quarterly training briefs (QTB)
f. Unit policies and procedures for-
   (1) Composite Risk Management (risk approval levels)
   (2) Pre-mission planning and briefings
   (3) Training
   (4) Utilization of personnel including crew rest/sleep plans and operator/crew selection and training
   (5) Equipment/vehicle/aircraft suitability and utilization
   (6) Predeployment or RIP/TOA training documentation
   (7) Mobilization/de-mobilization training
   (8) Suitability and availability of life support equipment (LSE) and protective equipment
   (9) Maintenance and dispatch procedures
   (10) Information flow
   (11) Pre-accident plan/emergency action plan
   (12) Copies of the actual mission briefing and risk assessment worksheets
g. Collecting both documentary and verbal evidence will help investigators determine whether personnel in the organization had knowledge of the policies and procedures as well as the organization's enforcement of

policies and procedures. Additional sources and tools for evaluating command factors are located at Appendix S.

h. ARAP Data

3-5. ENVIRONMENTAL DATA. Data pertaining to environmental conditions (at the time of the accident) must be collected for evaluation of its impact or influence on the performance of the individuals and/or equipment involved. Environmental conditions include terrain, noise, electromagnetic effects (E3) lighting, glare, space, quality of air, lunar illumination (moonrise/moonset) for night or NVC missions, AT for FLIR aircraft and weather/meteorological (humidity, pressure, temperature, wind and illumination) conditions. Sources include--

a. Observations from personnel in the vicinity.

b. Weather/meteorological and moon illumination reports from local forecasters .

c. Radar plot location and altitude data from Air Traffic Control (ATC) facilities.

d. Maps (topographical and other). Photos – if needed, satellite and aerial photos are often available from the installation in both digital and paper forms.

e. FMs, TMs, and unit policies and procedures.

f. Subject matter experts (SMEs) for evaluation of specific environmental concerns (Occupational Health/Industrial Hygiene Specialist for analysis of workspace and quality of air).

3-6. MATERIEL DATA (see Appendix G). Collect data necessary to evaluate the performance and survivability of the vehicle, equipment (including LSE and protective equipment), buildings, and or other support materiel. Some sources of information include—

a. Equipment records.

(1) As a minimum, collect data from the historical records for the past six-months such as work orders, modification work orders, services and periodic inspection records, as well as other relevant records. Include information pertaining to—

(a) Component times, replacement schedules and compliance with modification work order(s) (MWO).

(b) Safety-of-use messages, safety advisory messages, safety-of-flight messages, ground precautionary messages, maintenance advisory messages and technical bulletins.

(c) Current and delayed discrepancies records. Gather all deficiencies and discrepancies noted for correlation against other materiel/ maintenance factors uncovered during the investigation.

(2) Dispatch/logbook records and the daily inspection

b. Technical reports relevant to the equipment.

c. ECODs (see Appendix U).

d. Lab analysis reports from equipment/component teardown, fluids, digital source collectors or other like equipment.

e. Technical manuals and technical bulletins related to operation and maintenance of the equipment involved.
f. Commercial service bulletins, equipment manufacturers, contractors, and other DoD service components with like equipment.

3-7. PERSONNEL DATA. Gather data that will provide insight into the performance, health, qualification and training of the individuals involved in the accident (see Appendix V for aviation accidents). Individuals involved include those directly involved, those who influenced the operation, and those suspected to have a role in the accident. Sources of information include, but are not limited to--

a. Verbal evidence from supervisors, peers, and operations, training, and maintenance personnel.
b. Individual records.
   (1) Training and qualification records. National Guard and Reserve Soldiers' records are often not brought to theater and must be requested early in the investigation to allow for transmittal time. Records include ORB, and all NG records maintained by hand at home station.
   (2) Equipment/vehicle operator training record (DA 348/unit level logistics system (ULLS) equivalent and license optional form (OF 46) for specific equipment or vehicle involved. **Note: DA 348 defines vehicles individually and not by "family of vehicle" such as M998 FOV. DA 348 should read M998, M1114, M1A2 SEP, etc.
   (3) Performance counseling.
   (4) Personnel (ORB/ERB) records.
   (5) Medical records (include any hospital reports related to the injuries)
   (6) Blood and urine results (as required).
   (7) Previous accident history.
c. Evaluating injuries is part of the investigation and therefore autopsy information is very important.

CHAPTER 4 - DATA ANALYSIS

4-1. GENERAL.

a. The board must conduct a systematic analysis of data collected during the investigation to determine causes and develop findings and recommendations. Findings and recommendations are derived from the board's analysis and deliberations. With few exceptions (for example, insufficient data to make conclusive findings), findings and recommendations must be directly supported by the analysis of data. First, it is acknowledged that informal analysis occurs throughout the data collection phase as investigators pursue information. However, formal analysis begins when the board president determines that sufficient data has been collected for the board to arrive at findings and recommendations.

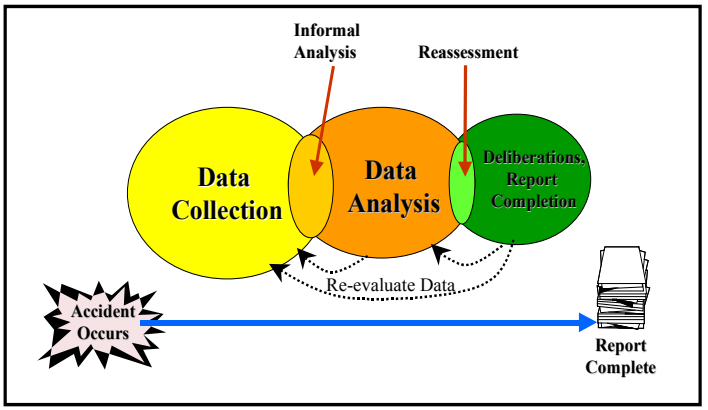


Figure 5-1
On-Site Accident Investigation Phases

b. The "what happened" (mistake/error, environmental factor, materiel failure) is often clear. The "why it happened" (system inadequacy/root cause) is usually more complex and difficult to determine. The reasons people make errors, materiel fails, environmental factors contribute, or injuries occur in an accident are the keys to accident prevention. It is also likely that a combination of active and latent failures contributed (see Appendix A for definitions). Identification of latent failures can be particularly challenging. A structured and meticulous analysis of the data provides the best opportunity for the board to reach accurate conclusions.

4-2. METHODOLOGY OF ANALYSIS AND DELIBERATIONS.

a. Establish a chronology.
b. Examine environmental conditions, materiel failure, and human factors that caused or contributed to the accident.
c. List all anomalies in each of these areas.
d. Evaluate anomalies as to their relationship to the accident to determine mistakes, materiel failures and environmental influences.
e. Identify system inadequacies/root causes for the mistake (the Human Factors Analysis and Classification System (HFACS) will help identify these (see para 5-9), materiel failure and/or environmental influences (Chapter 6).
f. Develop findings and recommendations (Chapter 7).

4-3. PREPARATION FOR ANALYSIS.

a. The facility used to conduct the analysis and deliberations should be secure, free from distractions, and allow for complete privacy. The board president and recorder are the key personnel to facilitate and record the analysis and deliberations. It is important that all board members review witness statements, unit and Army-level documents pertinent to the operation, as well as equipment, training and medical records and note any anomalies. Board members should review their notes as well as paragraph 2-8 of DA Pam 385-40 prior to the analysis and deliberation session.
b. The board president will chair the meetings and guide the proceedings. Charts will be prepared for the timeline, human factors, environmental factors, and materiel factors (see Appendix Z for a recommended methodology). The board president will brief the board members prior to beginning the analysis to facilitate more efficient proceedings. All appointed board members must attend the analysis and deliberations.

NOTE: Advisors are not considered voting board members.
If approved by the board president, other individuals, such as the installation/unit safety POC or technical advisors may attend the proceedings. The board president is responsible for the supervision of deliberations and should address the following areas prior to initiating the deliberation process:

(1) Categories of findings (present and contributing, present but not contributing, etc.).
(2) System inadequacies/root causes
(3) Minority reports
(4) Preparation of the report
(5) Disposition of the completed report

4-4. ACCIDENT CHRONOLOGY. During data collection, the board recorder should begin to develop timelines of the accident. Timelines are invaluable tools during analysis as the board attempts to determine cause and effects. They

graphically portray the sequence of events leading up to the accident and assist the board in establishing links between factors that may otherwise appear unrelated. A minimum of two timelines will be developed:

a. Macro Timeline. Macro timelines (Figure 4-2) are measured in terms of years, months and weeks (where latent failures are most often found). Based on the nature of the accident, this timeline will depict either the major events of the unit or individuals involved in the accident, or a combination of both. The macro timeline is developed to show the possible link between events that may have occurred months (or years) prior to the accident. An individual's assignment history may be a factor in the accident. For example, a UH-60 pilot whose experience has been solely in MEDEVAC units has an accident while performing sling-load operations after recently being assigned to an air assault unit. Another example may be a unit that has recently returned from extended peace keeping duties and has an accident while transitioning back to Mission Essential Task List (METL)-related training. Macro timelines will generally end at the point where the mission has been assigned.
b. Micro Timeline. Micro timelines (Figure 4-2) usually begin upon receipt of the mission and will continue through post-accident actions. Micro timelines are measured in terms of days, hours, minutes and seconds (where the active failures are most often found). It may be helpful to identify several individuals in a column under the timeline to track their respective actions. Use of crash kinematics found in Appendix AA may be required to document a valid and reliable timeline.

Figure 4-2. Macro and Micro-Timelines

ACCIDENT SEQUENCE MACRO-TIMELINE											
Sep-97	**Apr-Sep 99**	**Mar-00**	**May-00**	**Sep-00**	**6-22 Oct 00**	**Oct-Nov 00**	**Nov-00**	**Nov-00**	**1-15 Dec 01**	**Dec-Jan 01**	**8-12 Jan 01**
Last Sqdn Coll Tng (NTC		Deploy to Bosnia		Redeploy from Bosnia		Receive/Ferry Acft from port		Sqdn resumes normal operations		Block leave	Accident occurs during Platoon STX
	OH-58D(R) Fielding		Sqdn Change of Command		Block Leave		All acft back to home station		Sqdn-level aerial gunnery		

ACCIDENT SEQUENCE MICRO-TIMELINE										
	3-Aug	**4-Aug**	**5-Aug**							
	1030	**1530**	**530**	**700**	**830**	**845**	**937**	**942**	**944**	**954**
CPT X	Approves Msn	Signs Msn Brf								
Flight of Three							Flt Departs	Flt sees unit vehicles		
CW4 Z		Assigned as AMC	Wake up	PT	Arrive Flt Line	Briefs Flt PCs		Unaware acft departs Flt		
CW2 A		Assigned as PC	Wake up	PT	Arrive Flt Line	Flt Brf, Get Wx		Looking for vehicles		
CW2 B		Assigned as PI	Wake up	PT	Arrive Flt Line	Pre-Flt	On Flt Controls	Departs Flt to wave at vehicles	CRASH	
SPC C					Completes PMD	Added to Chalk 3	Films Flight			
Ground Vehicles						Returning from field site		See acft	Observe crash	Assist crew & call ops

4-5. IDENTIFY ANOMALIES.

a. The next step is to compile a list of all anomalies that were identified during the course of the investigation. Simply stated, anomalies are deviations from the norm. Anomalies can be positive events as well as negative events. The remainder of this chapter provides a template (a tool) to assist investigators in reviewing each area to identify where the anomalies exist. The goal is to list all of the anomalies uncovered during the data collection phase, regardless of perceived individual importance. The board recorder will prepare the necessary charts to record the anomalies discovered. The method is for the board to conduct a thorough review of the three major categories (environment, materiel and human) and their respective sub-categories. As the board president manages the discussion, the recorder will capture the information on butcher paper for easy reference during deliberations.

b. The recorder captures the list of anomalies from Environmental, Materiel, and Human Factors. The board recorder prepares the outlines of the anomalies prior to the board arriving for analysis. It is important that the president review with the board what constitutes environmental, materiel and human factors. As each new level of human factors is discussed, the definitions are reviewed to aid in the systematic analysis and organization of anomalies. This will aid in asking the question of "why" and trace the accident trajectory backward through the local chain-of-command into the Army operating systems and processes (see Figure 4-3 below for a list of the DOTMLPF and Appendix A for definitions).

DOTMLPF is used to determine Army requirements or assess an organization (e.g., functional area assessment).

Doctrine: Expressed in field manuals, texts and other publications, doctrine is used to guide how the Army fights.

Organizations: Organizations are designed to maximize the net effect of improved materiel, soldiers, training, leader capabilities and doctrine.

Training: Encompasses products, events and simulations to train soldiers.

Materiel: Equipment that is developed and fielded.

Leadership and Education: The sum of the schools, courses, training, and personal professional development required for leaders to properly leverage doctrine with their soldiers, organizations and equipment.

Personnel: Includes individual training, recruitment and retention of soldiers.

Facilities: Infrastructure that fully enables all DOTMLP functions above.

Figure 4-3
DOTMLPF

4-6. ENVIRONMENTAL FACTORS.

a. Meteorological. Weather conditions (clouds, precipitation, temperature, humidity, pressure, wind, and lightning) having an adverse affect on the performance of the individual or equipment so that an accident results or could result. Environmental factors can be divided into those which could not have been avoided, in which case environment is the causal factor, and those for which precautions could have been implemented to reduce or eliminate its adverse effects on personnel and/ or equipment. In the latter case, environment is considered to be contributory but not causal.

b. Other factors. Include noise, illumination and space in the operating environment. Investigators must also examine the cockpit, cab, turret, etc., to determine if the design of the equipment may have contributed to the accident. For example, sunlight may wash out video displays or excessive cockpit noise may prevent a crewmember from hearing a critical radio call. Areas to examine include--

(1) Illumination
(2) Noise
(3) Vibration and motion
(4) Terrain and vegetation (condition of surface)
(5) Obstructions (wires, towers)
(6) Thermal conditions (excessive heat/cold)
(7) Altitude or depth
(8) Contaminants (dust, smoke, snow, smog)
(9) Foreign objects
(10) Chemicals or radiation
(11) Animals or fowl

4-7. MATERIEL FACTORS.

a. Performance. Determine if the equipment functioned as designed. Materiel factors analysis is primarily concerned with evaluating the performance of the aircraft, vehicle, facility, ground support equipment, land/or other support materiel. Data concerning how environmental conditions have affected vehicle/ system/equipment performance must also be collected.

b. Appropriate use of equipment. Analysis of materiel factors should also lead investigators to examine if the required equipment was available, if it was used, and if it was used correctly. For example, was the AH-64 pilot using the Heads Up Display (HUD) or did he have it stowed? Was the driver wearing his night vision goggles (NVGs)/night vision devices (NVDs) (see Appendix Y). Were passenger safety belts used or were they taped to keep them out of the way?

c. Adequacy of Life Support Equipment (LSE) and Protective Clothing and Equipment (PCE). Examine the applicable LSE/PCE to determine if the equipment performed in the manner that was expected or if it contributed or caused injury. Identify shortfalls in LSE/PCE that should be addressed.

4-8. HUMAN FACTORS.

a. Support. Examine all areas of resource management in order to determine if adequate support was available to accomplish the mission or task to standard. The higher headquarters provides the support; resource management (personel, money, and equipment/facilities), organizational climate (structure, policies, and culture), and the operational process (operations, procedures, and oversight) that ultimately set subordinate commands (and their soldiers) up for success or failure. Areas to examine include--

(1) Personnel
(2) Equipment
(3) Money
(4) Services
(5) Supplies
(6) Facilities

b. Standards. Determine if adequate written procedures or guidance exist to support the mission or task. While the analysis will usually focus at the immediate task-condition-standard level, the board should conduct a review of all applicable publications--

(1) Field manuals
(2) Army regulations
(3) MACOM and Installation regulations
(4) Technical manuals
(5) Training circulars
(6) Graphic training aids
(7) Division/brigade/battalion/company standing operating procedures (SOPs)

c. Training. Determine if the training was correct, complete, and sufficient to enable the individual to perform to established standards. All applicable individual and collective training should be examined. This may include analysis of training received in Basic training, Military Occupational Specialty (MOS)-producing schools, officer basic courses, flight school, etc. Areas to examine include--

(1) Individual training
(2) Crew training
(3) Crew coordination training (see Appendix AC)
(4) Residual training (negative habit transfer)
(5) Weapons training (individual, crew, collective)
(6) Drivers training (see Appendix AD)
(7) Readiness level progression
(8) Pilot-in-command selection and training
(9) Unit collective training
(10) TRADOC (schoolhouse) training
(11) Composite risk management training
(12) Maintenance training
(13) Planning for training
(14) Resourcing training
(15) Unit Specific Required Training (mobilization/demob)

c. Leader/Command

(1) Examine the leadership's role in the accident to determine if the accident-causing mistake can be attributed to a leader's failure to enforce standards. Determine if composite risk management was conducted properly. Areas that should be addressed include (see HFACS {para 5-9} for further explanation):

(a) Unrecognized hazards or hazardous operation
(b) Inadequate documentation/procedures
(c) Inadequate supervision
(d) Crew endurance policy
(e) Personnel utilization
(f) Planned inappropriate operation
(g) Failure to correct known problem
(h) Supervisory violations

(2) Assess the influence of command activity, or lack thereof, in relation to the accident. Apply the composite risk management 5-step process. Look at each decision point in the accident sequence of events (from pre-mission planning to the actions immediately following the accident) and the authority level of the person making that decision. What decisions were make along the way that set up the accident? You will not always be able to determine the cause of an accident, but you can determine what allowed it to happen. This will provide the accident unit command solid information, which can be used to implement corrective action and prevent future accidents. This may also help to identify DA-level decisions (OPTEMPO, PERSTEMPO, etc.) that set that unit up for failure. The ultimate goal is to determine if informed decisions were made at the appropriate level of authority. As a minimum, investigators should analyze the following:

(a) Overall organizational climate (positive, negative, or indifferent)
(b) Command priorities (training, maintenance, other)
(c) Outside influences on the organization
(d) Application of Composite risk Management procedures (see AppendixV)
(e) Organizational process (policies, procedures, controls)
(f) Communications (one-way only, open, etc.)
(g) Character of the organization (professional, excessive centralized control, excessive decentralized control, etc.)
(h) Formal versus informal leadership
(i) Appropriate authority delegated with assigned responsibility
(j) Adherence to established policies
(k) Mentoring/counseling programs
(l) Command inspection programs

e. Individual. If it is determined that adequate standards existed and were known to the individual, that the individual was trained to standard (i.e., training was adequate), and that support was adequate to perform the task to standard, the source of the error is probably the individual himself/herself. Individuals fail to follow standards for a variety of reasons (lack of professional/self-discipline, complacency, haste, loss of composure, fatigue, etc.).

CHAPTER 5 - DELIBERATIONS

5-1. GENERAL.

a. Deliberations are the final stage of analysis and result in the development of findings and recommendations. Findings and recommendations are derived from the board's analytical results. Deliberations are conducted to:

(1) Identify mistakes/errors, materiel failures, environmental factors (What happenned).

(2) Identify root causes (why it happened).

(3) Develop recommendations (what to do about it).

b. NOTE: Every investigation must thoroughly examine environmental factors and materiel performance as potential causes of the accident. However, the focus of this chapter is on determining human error, both at the command and individual levels. There are several reasons for this focus. First, historically, human error causes approximately 80% of all accidents. Second, identifying human error is the least objective of all the causal factors. Third, human error is often present in accidents caused by environmental factors and materiel failures. Finally, the complex nature of human behavior and organizational culture mandates a systematic approach to investigations to ensure that all areas are thoroughly addressed.

5-2. PREPARATION FOR DELIBERATIONS. Deliberations should be conducted in the same manner as during the previous steps of analysis. The president will continue to chair the meetings and guide the proceedings. The recorder will ensure the products (timelines, anomalies) are posted in such a manner that all board members can see them. All relevant information will remain readily accessible. The recorder will also prepare butcher charts prior to beginning deliberations to capture the findings and recommendations as the board reaches their conclusions.

5-3. CONDUCT OF DELIBERATIONS (Deliberations example Worksheet is at Appendix AB).

a. Review anomalies to determine if they were present in the accident timeline trajectory. Active failures are readily apparent, but latent failures require more analysis. As the factors that were present in the accident timeline trajectory are isolated, place them into the written timeline to develop an event chart. Then analyze them to determine if they--

(1) Contributed to the accident (Present and Contributing).

(2) Suspected to have contributed to the accident (Suspected Present and Contributing).

(3) Did not contribute to the accident, but contributed to the severity of injuries or extent of property damage (Present and Contributing to the Severity of the Injuries/Extent of Property Damage).

(4) Did not contribute to the accident, but could adversely affect the safety of future operations (Present but not Contributing {PBNC}).

(5) In no way contributed to the accident, but identify local conditions or practices that should be corrected (Special Observation).

[NOTE: If a potential safety issue has Army-wide implications, making the finding

a PBNC rather than a Special Observation will ensure the problem has visibility above the accident unit level].

b. Mistake/error identification (refer to chapter 6 for detailed explanation and examples). Select the most descriptive mistake/error that caused or contributed to the accident from the list in DA PAM 385-40 Appendix B (Table B-1 for aviation or Table B-2 for ground). The more specific the error, the easier it is to determine the system inadequacies or root causes of that error and the corrective actions required. Also, specific mistakes/errors help USACRC accurately identify accident trends. Regardless of the task involved (for example, inadequate planning, installing a tail rotor, changing brake pads/shoes, and so forth), the explanation of how it was improperly performed should identify the directive, standard, and the performance deviated from or not complied with. The fact that an error occurred in itself has little meaning until its consequences and relevance to the accident are also explained. This is a key concept to understand during the actual writing of the findings and recommendations. Therefore, the defining and explanation process for human errors is not complete until--

(1) It is determined when and where the mistake/error occurred.

(2) The equipment and individual (by duty position) involved is identified.

(3) The mistake(s) is identified in relation to the deviation from a performance standard and the proper procedure for performing the task is identified.

(4) The directive or common practice governing the performance of the task is identified.

(5) Consequences of the mistake (the effect) is explained.

c. The five elements in paragraph 6-3b make up part 1 of the finding - the mistake/error. There is only one mistake/error per finding, but there can be multiple system inadequacies setting the stage for that one mistake/error.

NOTE: In the event of a materiel failure, cite the part number. The standard is the "mil spec" requirements concerning the manufacture and utilization of the component. Materiel failures often have human system inadequacies (support failures with respect to improper maintenance, improper installation, improper utilization).

d. The next step is to determine the root causes or system inadequacies that set the stage for the mistake/error and place them into the timeline. Again these could be latent failures that occurred hours, days, or months prior to the accident that set the condition for failure. The best way to identify system inadequacies is to work backwards from a mistake/error by asking questions aimed at "illuminating" the error. Remember that the system inadequacy may have occurred minutes, hours, days, weeks, or even m months before the mistake/error.

(1) The most direct source of information is the individual who made the error or the supervisor(s) of the individual. The interview transcripts may need to be reviewed and the tapes listened to again. These individuals may need to be re-interviewed for specificity of detail. Records and orders may need to be re-examined. The human factors

investigator will also have information from other sources. These include individual records, unit records, and other people who may have knowledge about the individual or the accident. A post-accident medical examination may identify physiological factors (acute fatigue, alcohol, carbon monoxide, drugs, impaired vision, etc.). The analysis should include a review of the previous command inspections, FORSCOM Aviation Resource Management Surveys (ARMS), previous accidents, safety council minutes, Quality Deficiency Reports (QDRs), etc. for any trends of known deficiencies and the corrective actions taken by the command.

(2) Select the most descriptive system inadequacy code that set the stage for the mistake/error or materiel failure from the list in DA PAM 385-40, Appendix B (Table B-5).

(3) The explanation of how the system inadequacy caused or contributed to the mistake/materiel failure becomes part two of the finding. Ensure this is added to the timeline/event chart.

e. Develop recommendations that will correct the system inadequacies, not the mistake/errors. These recommendations are developed for the appropriate level-of-command to take action to correct identified hazards.

(1) When the board has reached a consensus on each significant factor involved in the accident, develop corrective actions having the best potential for remedying each system inadequacy. The goal is to get accurate information and timely recommendations to the appropriate command level for an informed decision. When you reach a board consensus concerning corrective actions, the commands or activities having proponency for correcting the system inadequacies will be identified. When this is accomplished, the corrective actions proposed in the technical report can then be directed to the activities and levels of command best capable of accomplishing them. To achieve the goal of accident prevention, recommendations should not focus on specific punitive or administrative actions that might deal with the shortcomings of a particular individual in a specific case. Rather, the recommendations should address the issue on a broader level.

(2) Each recommendation will identify the actions to be taken at the appropriate level-of-command, such as unit-level actions, higher-level actions, DA-level action, or the agency/activity most appropriate to fix the system inadequacies. Recommendations up to Division and Corps level are often focused on the METL and Battlefield Operating Systems (BOS) that can rapidly respond to a division commander's immediate corrective guidance. Army-level recommendations are focused on the DOTMLPF (Figure 4-3) and often take months or years to respond to corrective input.

(3) The recommendations will be written in conjunction with the findings and will be included in the technical report of the accident. It is important to provide the local commander with recommendations to

address his local situation, but it is equally important to provide the Chief of Staff, Army (CSA) with recommendations to address the Army-wide hazards or systemic deficiencies.

(4) Recommendations/Remedial Measures/Countermeasures Code Identification. Select the most descriptive recommendation code from the list in DA PAM 385-40, Appendix B (Table B-6) that has the best potential for correcting the system inadequacies.

(5) The board president should not allow unresolved issues to be debated indefinitely during deliberations. If a board consensus on an issue cannot be reached within a reasonable amount of time, the board president will decide the issue and continue with the proceedings. There are provisions for submitting a minority report (para 2-1h, DA Pam 385-40).

NOTE: This can be a lengthy process. Analysis can take a day in itself, as can deliberations. While it is important to not become bogged down, the board president must ensure the board does not rush to conclusions or fail to find significant mistakes/errors and systemic deficiencies.

(6) It may become apparent during the deliberations that evidence is conflicting. In such cases, the board usually has two choices:

(a) They may further question personnel involved or other witnesses. If this approach is used, it is probably best to come directly to the point, such as, inform the personnel being questioned of the conflict and ask for an explanation.

(b) If the first approach does not resolve the conflict, it may be possible to rationalize why the conflict exists and then develop a hypothetical explanation. In any case, the board is responsible for resolving conflicts and must carefully weigh the evidence and decide what is most credible.

(7) Once all anomalies are reviewed and findings and recommendations drafted, the board president and recorder, in consonance with the board members, work to complete the written history, narrative, analysis, findings and recommendations IAW paragraph 1-7 of DA PAM 385-40. The board reviews the completed work for technical accuracy and consistency. Any discrepancies are corrected.

CHAPTER 6 - PRELIMINARY REPORT

6-1. PRELIMINARY HISTORY AND ANALYSIS The narrative of the investigation consists of four sections: History of Events/Flight, Human Factors, Materiel Factors, and the Analysis (see Chapter 8). Two of these sections are required in the preliminary report: History of Events/Flight and Analysis. Outlines for these sections are presented in Figures 6-1 (aviation) and 6-2 (ground). The History contains factual data only while the Analysis is reserved for the board's documentation of its conclusions, suspicions and opinions concerning the accident cause relationships.

History of Flight

- a. Preflight Phase
- b. Flight Phase
- c. Post Flight Phase

Analysis

- a. Accident sequence
- b. Environmental factors
  - (1) Weather conditions
  - (2) Other than weather
- c. Materiel factors
  - (1) Major components
  - (2) Major systems
- d. Human factors
  - (1) Support
  - (2) Standards
  - (3) Training
  - (4) Leader/Command
  - (5) Individual
- e. Other (observations)

Figure 6-1. Aviation Accident History & Analysis Outline

History of Events

- a. Pre-accident phase (
- b. Accident phase
- c. Post-accident phase Analysis
- a. Accident sequence
- b. Environmental factors
  - (1) Weather conditions
  - (2) Other than weather
- c. Materiel factors
  - (1) Major components
  - (2) Major systems
- d. Human factors
  - (1) Support
  - (2) Standards
  - (3) Training
  - (4) Leader/Command
  - (5) Individual
- e. Other (observations)

Figure 6-2. Ground Accident History & Analysis Outline

a. The 'History of Events/Flight' presents a sequential snapshot of the activities and events of the mission leading up to the accident, the accident, and the immediate actions following the accident. The timeline established during the investigation will assist in writing this paragraph. It should include enough detail to give the reader an accurate description of events. Detailed instructions for this paragraph start on page 32 of DA PAM 385-40 for aircraft accidents and page 78 for ground accidents. Typical errors in this section include not clearly identifying the units involved, not detailing the planning in preparation for the mission, including analytical statements, and including findings. Writers of this paragraph, normally the board president, should include only statements of fact. * Note names of the individuals may be used in the History, however names will not be used in the analysis.

b. The Analysis is normally written by the board president. Instructions for writing the analysis are located in DA PAM 385-40, paragraph 2-8 on page 13, with specific instructions for aviation and ground accidents at pages 34 and 79 respectively. The board president may modify the order of the environmental, materiel, and human factors sections but must make entries for each.

(1) The analysis paragraph summarizes the narrative and discusses the opinions, suspicions, and conclusions of the board. The analysis is essentially the documentation of board deliberations. It should clearly show the cause and effect relationship of the evidence gathered during the accident investigation. Not only must the analysis show the clear cause and effect of accident causes, but should also eliminate plausible accident causes the board determined did not cause or contribute to the accident. In comparison to the findings, the analysis presents all relevant data as the basis of the finding and recommendation. In other words, because this action did or not not occur, then this result happened. If the analysis shows that something did not take place, then the wording must explain why. For example, "because ballistics tests demonstrated that the US Soldiers' weapons did not fire the rounds, then the fratricide was caused by another coalition force."

(2) The following are required paragraphs for the analysis. The board must make an entry for each, regardless whether causal or contributory. In each paragraph, develop an analytical statement or statements and then articulate statements of fact that support the analysis. Include sufficient information to substantiate those areas deemed not causal/contributory.

(a) Begin the paragraph by specifying the scope and conclusions of the investigation. In all cases, begin the paragraph by the words: After analyzing the human, materiel, and environmental data collected during the investigation, the board concluded the accident was caused by …." Complete the sentence specifying the factors (human, materiel, environmental) that caused the accident.

(b) Accident sequence. Include a description of the accident that includes the board's estimate of how the accident occurred. This paragraph should create a picture in the reader's mind of how the aircraft crashed or how the vehicle rolled over, etc. It should not be a repeat of the history, but should include details of the accident dynamics. Include the board's analysis of how and why the accident happened as it did.

(c) Environmental Factors. This paragraph includes meteorological and non-meteorological factors. Use the key words under Table B-4, page 115 of DA PAM 385-40, describing the environmental phenomena present during the accident when applicable, along with the results. Environmental factors can be present at the time of the accident but not be causal. There can be no present and contributing finding against environmental factors if the board concludes they are not causal.

(d) Materiel Factors. This paragraph includes all materiel factors. Use the key words under Table B-3, page 114 of DA PAM 385-40 to describe what happened to a particular part, piece of equipment, system, or component. Refer to reports written by advisors to the board like manufacturer representatives. Develop a separate paragraph for each major component or system. Each statement of materiel failure must be followed by the cause of the failure. Also describe the consequences of the failure. For example, "when the bolts failed, the droop stop was thrown aft of the aircraft, allowing the red rotor blade to make contact with the fuselage." Be sure to identify the part number or the NSN of the part that failed. The board should explain why they ruled out a part, system, or component that could have caused the mishap. Design or maintenance issues that originated or occurred at the manufacturer are considered materiel issues.

(e) Human Factors. This paragraph includes all human factors. Use the key words on pages 115 and 116 of DA PAM 385-40 to describe issues associated with each of the human factors system inadequacies/ root causes. Develop a separate paragraph for each of the basic root causes/system inadequacies and discuss the result of the deficiency. Again, in each case, develop analytical statements and then support with statements of fact--

1 Support. Describe issues relating to resourcing, facilities, services, equipment (design-induced error, etc.), numbers of personnel, and other support type factors.

2 Standards. Describe the adequacy of written guidance for a particular task. All findings refer to a standard of some type. Be sure to explain any standards shortcomings and the consequences of those shortcomings. If the board concluded all documents were ad equate, explain it that way. The presence of a standard in an FM or

ATP suffices as a standard if not included in the unit SOP. The lack of a repeated standard in the unit SOP should not be identified as a shortcoming.

3 Training. Describe the training an individual may have received either in an MOS-producing school, unit, or other. A soldier without adequate experience or with some sort of negative habit transfer is considered to have a training deficit. For other than active duty Army Soliders, ie. National Guard or other service soldiers, discuss mobilization or familiarization training.

4 Leader/Command.

- Leader Factors. Describe what an individual did in his or her capacity as a leader. Table B-5, DA PAM 385-40 \ discusses leader failure as a lack of supervision, but also consider it a leader issue when a leader chose not to enforce a standard, did not make an informed decision, or was not where he or she should have been.
- Command Factors. This paragraph should discuss things like composite risk management, command climate, unit morale, deployment information, unit training status, OPTEMPO, command priorities, formal versus informal leadership, general equipment status, communication up and down the chain-of-command, and other issues relevant to the accident. Comments like "Commander lacks factual and timely information for managing high-risk behavior," or "Commander or unit lacks experience, wisdom, or seasoned leadership to manage the composite risks associated with that unit" are comments the board could make here. For more examples, refer to paragraph 5-8 of this handbook.

5 Individual. Discuss the board's conclusions relative to an individual soldier in terms of the error or the indiscipline that caused the accident or permitted the soldier to make the error, along with the results of the soldier's actions. Include the injuries to the soldier in the results portion of the discussion. Although each injury does not need its own paragraph, injuries which are the result of an anomaly should be described.

(f) Other. In this paragraph include special observations (i.e., factors that in no way contributed to the accident but identify local conditions or practices that should be corrected).

[NOTE: If a potential safety issue has Army-wide implications, making the finding a PBNC rather than a Special Observation will ensure the problem has visibility above the accident unit level].

6-2.1 PRESENT AND CONTRIBUTING FINDINGS

a. Aviation Accidents. Each present and contributing finding reported in Block 1 of DA Form 2397-2R should be consistent with the coded summary of accident cause factors in Block 2. In addition, each finding (to include present but not contributing findings) must be fully substantiated in paragraph 4, Analysis, of DA Form 2397-3R. An example of the required elements in an aviation finding is presented in Table 6-1, immediately followed by the written example.

b. Ground Accidents. Present and contributing findings reported in Tab C for the report should be consistent with the information in Block 46 of DA Form 285. In addition, each finding (to include present but not contributing findings) must be fully substantiated by the Analysis portion of the report. An example of the elements in a ground accident finding is presented in Table 6-2, immediately followed by the narrative example.

c. Writing Findings. Instructions for writing each type of finding (human error, materiel failure and environment) follow.

(1) Human Error Findings. Each present and contributing finding is reported in narrative format. Detailed instructions are in DA PAM 385-40:

- Aviation Accidents - page 28
- Ground Accidents- page 77, para 4-3; page 88, Figure 4-1.

Remember, there is only one mistake/error per finding, but there can be multiple system inadequacies/root causes setting the stage for that one mistake. As a minimum, the following seven elements of information will be reported for each human error finding in the order stated in the table below.

Table 6-1. Human Cause Factor – Aviation Example

FINDING 1 (Present and Contributing: Human Error - Support and Standards failure) Required Information Example

1. Explanation of when and where the mistake/error occurred in context of the accident sequence of events. While conducting target identification at a stationary 20 ft AGL hover during a CALFEX, using ANVIS, aircraft night systems and information from available systems, … First Paragraph

2. Aircraft and individual involved by duty position. The OH-58D pilot-in-command (PC)… First Paragraph

3. Identification of mistake made (ref aviation-specific mistakes/errors in DA PAM 385-40, Table B-1) and an explanation of how task/activity was performed improperly. flying the aircraft, failed to maintain situational awareness. That is, he did not maintain the desired stationary hover position …First Paragraph

4. Directive (ATM, SOP, FM, TM, etc.) or common practice governing performance of task/activity. in contravention of TC 1-209, Task 1119. First Paragraph

5. Consequences of mistake/error. As a result, the aircraft drifted, undetected to the left rear approximately 65 ft, contacted a tree with the main rotor blades at about 20 ft AGL and crashed. The aircraft was extensively damaged and the two crewmembers sustained minor injuries. First Paragraph

6. Reason(s) {root cause(s)/system inadequacy(s)} for the mistake/error {ref System

Inadequacies in Table B-5 of DA PAM 385-40}. The PC's actions were a result of equipment design and inadequate written procedures. Second paragraph
7. Brief explanation of how each reason (root cause/system inadequacy) contributed to the mistake/error. That is, the OH-58D aircraft are not provided automatic hover stabilization systems (hover hold). Also, the hover bob-up symbology in the LCD unit, normally used for hover assistance, is not available when weapons data is displayed in the LCD unit. The data from the ODA could not be used to assist due to a software limitation as indicated in the Airworthiness Release (AWR) for fielding the OH-58D helicopters in the digital configuration. Also, the ODA intensity could not be adjusted to a usable level in the low ambient light conditions. Several tasks in TC 1-209, (Tasks 1067, 1114,…) require the PC and PI to direct their attention to specific cockpit functions simultaneously which, without the aid of an automatic hover system, leads to undetected hover drifts. Second paragraph

Narrative Example for Table 6-1
FINDING 1 (Present and Contributing: Human Error - Support, Standards)

While conducting target identification at a stationary 20 ft AGL hover during a CALFEX, using ANVIS, aircraft night systems and information from available systems, the OH-58D pilot-in-command (PC) flying the aircraft, failed to maintain situational awareness. That is, he did not maintain the desired stationary hover position in contravention of TC 1-209, Task 1119. As a result, the aircraft drifted, undetected to the left rear approximately 65 ft, contacted a tree with the main rotor blades at about 20 ft AGL and crashed. The aircraft was extensively damaged and the two crewmembers sustained minor injuries.

The PC's actions were a result of equipment design and inadequate written procedures. That is, the OH-58D aircraft are not provided automatic hover stabilization systems (hover hold). Also, the hover bob-up symbology in the liquid crystal display (LCD) unit, normally used for hover assistance, is not available when weapons data is displayed in the LCD unit. The data from the ODA could not be used to assist due to a software limitation as indicated in the Airworthiness Release (AWR) for fielding the OH-58D helicopters in the digital configuration. Also, the optical display assembly (ODA) intensity could not be adjusted to a usable level in the low ambient light conditions. Several tasks in TC 1-209, (Tasks 1067, 1114,…) require the PC and PI to direct their attention to specific cockpit functions simultaneously which, without the aid of an automatic hover system, leads to undetected hover drifts.

Table 6-2. Human Cause Factor - Ground Example
FINDING 1 (Present and Contributing: Human Error - Training and Leader Failure)
Required Information Example
2. Identification of individual involved by duty position and equipment involved (if applicable). the student driver of an M1117 Armored Security Vehicle (ASV)....First Paragraph
3. Identification of mistake/error made (ref ground-specific mistakes/errors in DA PAM 385-40, Table B-2) and an explanation of how task/activity was performed improperly. over-steered the vehicle. That is, while descending a hill on a dirt/gravel road, he made abrupt and excessive steering inputs causing the vehicle to swerve uncontrollably from one side of the road to the other …First Paragraph
4. Directive (SOP, FM, TM, etc.) or common practice governing performance of task/activity or function. in contravention of AR 385-55, AR 600-55 and TC 21-305. First Paragraph
5. Consequences of mistake/error. Consequently, the vehicle departed the roadway, slid into a ditch, pivoted and rolled four times, coming to rest in an upright position. The vehicle sustained substantial damage. The gunner and passenger were critically injured when they

were ejected from the vehicle during the rollover sequence. The driver and senior occupant received minor injuries. First Paragraph
6. Reason(s) {root cause(s)/ system inadequacy(s)} for the mistake/error {ref System Inadequacies in Table B-5 of DA PAM 385-40} The student driver's actions were the result of inadequate unit training and inexperience. Second paragraph
7. Brief explanation of how each reason (root cause/system inadequacy) contributed to the error. The unit failed to ensure the student driver received the required prerequisite training, testing and a learner's permit for the ASV before allowing him to attend NET and operate the vehicle on an unimproved road. Due to the student driver's lack of experience, he was unfamiliar with the handling characteristics of the ASV and over-steered the vehicle causing loss of control. * Second paragraph

* NOTE: When 'Leader' is identified as a system inadequacy/root cause, this will probably lead to a second finding, in which case a mistake/error will be assigned to the leader/command and the root cause(s)/system inadequacy(s) for that mistake will be identified. When a finding is written on a leader/command, it is important to determine why that mistake/error was made so that, if necessary, the problem can be brought to the attention of senior Army leadership. For example, if inadequate composite risk management is identified, was it due to a support problem (lack of sufficient resources), a standards problem, etc.

Narrative Example for Table 6-2
FINDING 1 (Present and Contributing: Human Error - Training and Leader Failure)
While receiving driver's training on an unimproved road during New Equipment Training (NET) at the Yankee Training Center, the student driver of an M1117 Armored Security Vehicle (ASV) over-steered the vehicle. That is, while descending a hill on a dirt/gravel road, he made abrupt and excessive steering inputs causing the vehicle to swerve uncontrollably from one side of the road to the other in contravention of AR 385-55, AR 600-55 and TC 21-305. Consequently, the vehicle departed the roadway, slid into a ditch, pivoted and rolled four times, coming to rest in an upright position. The vehicle sustained substantial damage. The gunner and passenger were critically injured when they were ejected from the vehicle during the rollover sequence. The driver and senior occupant received minor injuries.

The student driver's actions were the result of inadequate unit training and inexperience. The unit leaders failed to ensure the student driver received the required prerequisite training, testing and a learner's permit for the ASV before allowing him to attend the NET and operate the vehicle on an unimproved road. Due to inadequate supervision by unit leadership and the driver's lack of experience, he was unfamiliar with the handling characteristics of the ASV and over-steered the vehicle causing loss of control.

(2) Materiel Failure/Malfunction Findings. Each present and contributing finding is reported in narrative format. Detailed Instructions are in DA PAM 385-40:

- Aviation accidents - page 27
- Ground accidents - para 4-3 on page 77; Figure 4-1 on page 88.

As a minimum, the following six elements of information will be reported for each materiel finding in the order stated in Tables 6-3 (aviation) and 6-4 (ground) below:

Table 6-3. Materiel Cause Factor - Aviation Example
FINDING 1 (Present and Contributing: Materiel Failure)

Required Information Example
1. Explanation of when and where the materiel failure/malfunction occurred in the context of the accident sequence of events. During engine run-up of the CH-47D with rotor blades turning, …
2. Name and part number (PN) or national stock number (NSN) of the part, component or system that failed. the retention bolts (P/N NAS624H-5) securing the fixed droop stop to the aft rotor system red blade pitch shaft ...
3. Mode of failure (corroded, burst, twisted, decayed, etc.)(see DA PAM 385-40, Appendix B for definitions and examples) exceeded their design tolerance and allowed the engaged threads to strip from the nuts.
4. Consequences of materiel failure
This failure allowed the fixed droop stop and bolts to separate from the aircraft. As a result, during shutdown, with both engine condition levers at stop and the main rotor blades coasting slowly, the aircraft red main rotor blade contacted the fuselage, resulting in significant fuselage and main rotor blade damage.
5. Identification of reasons (root causes/system inadequacies) materiel failure/malfunction caused or contributed to accident. The droop stops failed due to improper installation by the manufacturer during aircraft overhaul.
6. Brief explanation of how each reason (root cause/system inadequacy) contributed to materiel failure/ malfunction. That is, the bolts (P/N NAS624H-5) installed in the separated fixed droop stop, though nearly identical in appearance, were 1/8-inch shorter than the bolts (P/N NAS624H-7) required by TM 55-1520-240-23P1.

Narrative Example for Table 6-3

FINDING 1 (Present and Contributing: Materiel Failure)

During engine run-up of the CH-47D with rotor blades turning, the retention bolts (P/N NAS624H-5) securing the fixed droop stop to the aft rotor system red blade pitch shaft failed and allowed the engaged threads to strip from the nuts. This failure allowed the fixed droop stop and bolts to separate from the aircraft. As a result, during shutdown, with both engine condition levers at stop and the main rotor blades coasting slowly, the aircraft red main rotor blade contacted the fuselage, resulting in significant fuselage and main rotor blade damage.

The droop stops failed due to improper installation by the manufacturer during aircraft overhaul. That is, the bolts (P/N NAS624H-5) installed in the separated fixed droop stop, though nearly identical in appearance, were 1/8-inch shorter than the bolts (P/N NAS624H-7) required by TM 55-1520-240-23P1.

Table 6-4. Materiel Cause Factor - Ground Example

FINDING 1 (Present and Contributing: Materiel Failure)
Required Information Example
1. Explanation of when and where the materiel failure/malfunction occurred in context of the accident sequence of events. While traveling on an interstate highway at approximately 55 mph, …
2. Name and part number (PN) or national stock number (NSN) of the part, component or system that failed. the left front tire (NSN 2610-01-214-1344) of a M925A2…
3. Mode of failure (see DA PAM 385-40, Appendix B for definitions and examples) failed (burst).
4. Consequences of materiel failure. As a result, the vehicle veered sharply to the left, striking a guardrail. The impact caused the driver to strike his head on the steering wheel and he received minor injuries. The left front and side of the vehicle received substantial

damage.
5. Identification of reasons (root causes/system inadequacies) materiel failure/malfunction caused or contributed to accident. The cause of the tire failure was inadequate quality control by the manufacturer. That is, a defect (weak spot) in the tire wall was not detected during the manufacturer's inspection process.
6. Brief explanation of how each reason (root cause/system inadequacy) contributed to the materiel failure/ malfunction. The inadequate quality control allowed a defective tire to be distributed and placed in service. During normal operation the tire failed causing personal injuries and equipment damage.

Narrative Example for Table 6-4
FINDING 1 (Present and Contributing: Materiel Failure - Support)
While traveling on an interstate highway at approximately 55 mph, the left front tire (NSN 2610-01-214-1344) of a M925A2 failed (burst). As a result, the vehicle veered sharply to the left, striking a guardrail. The impact caused the driver to strike his head on the steering wheel and he received minor injuries. The left front and side of the vehicle received substantial damage.

The cause of the tire failure was inadequate quality control by the manufacturer. That is, a defect (weak spot) in the tire wall was not detected during the manufacturer's inspection process. The inadequate quality control allowed a defective tire to be distributed and placed in service. During normal operation the tire failed causing personal injuries and equipment damage.

(3) Environmental Findings *. Each present and contributing finding is reported in narrative format (see DA PAM 385-40, page 28, for de tailed instructions). Refer to Table B-4, Appendix B, Page 115, DA Pam 385-40 for a list of environmental conditions.

* An environmental finding is written only in those cases where the environmental factor could not have been avoided.

Table 6-5. Environnemental Cause Factor – Aviation Example
FINDING 1 (Present and Contributing: Environment)
Required Information Example
1. Explanation of when and where the environmental factor occurred in context of accident sequence of events. While ground-taxiing to the parking ramp,…
2. Identification of individual involved by duty position and/or equipment involved. the AH-64A
3. Description of environmental factor. encountered an unforecast sudden microburst with winds exceeding 80 knots.
4. Consequences of environmental effect. As a result, the aircraft became airborne in an extremely nose-low condition and subsequently entered a rapid right spin from which the crew was unable to recover. The aircraft struck the ground causing major aircraft damage and fatally injuring one crewmember.
5. Explanation of reason(s) environmental conditions caused the accident. Microbursts are environmental events that cannot be seen or forecasted with present meteorological measuring equipment nor are they visible to aircraft crewmembers. They are normally a phenomenon associated with thunderstorms; however, there were no thunderstorms reported or visible in the vicinity.
Narrative Example for Table 6-5
FINDING 1 (Present and Contributing: Environment)

While ground-taxiing to the parking ramp, the AH-64A encountered an unforecast sudden microburst with winds exceeding 80 knots. As a result, the aircraft became airborne in an extremely nose-low condition and subsequently entered a rapid right spin from which the crew was unable to recover. The aircraft struck the ground causing major aircraft damage and fatally injuring one crewmember.

Microbursts are environmental events that cannot be seen or forecasted with present meteorological measuring equipment nor are they visible to aircraft crewmembers. They are normally a phenomenon associated with thunderstorms; however, there were no thunderstorms reported or visible in the vicinity.

Table 6-6. Environmental Cause Factor – Ground Example

FINDING 1 (Present and Contributing: Environment)	
Required Information	Example
1. Explanation of when and where the environmental factor occurred in context of accident sequence of events.	At approximately 1915 hours, a severe thunderstorm passed through ...
2. Identification of individual involved by duty position and/or equipment involved.	the heliport in Camp Doha, Kuwait, …
3. Description of environmental factor.	with estimated sustained winds of 40 mph and gusts to 60 mph.
4. Consequences of environmental effect.	As a result, two temporary sunscreen shelters were destroyed and four helicopters that were secured on the ramp were damaged. One UH-60A was damaged as the temporary shelter under which it was parked was destroyed. One destroyed shelter was blown into and damaged another UH-60A secured on the ramp. The high winds also overcame the main rotor blade tie downs for two AH-64 aircraft, causing extensive damage due to excessive blade flapping.
5. Explanation of reason(s) environmental conditions caused the accident.	The property damage was caused by an abrupt, rapidly developing thunderstorm that was neither forecasted nor expected. The exposed aircraft were secured on the ramp in accordance with established policy.

Narrative Example for Table 6-6

FINDING 1 (Present and Contributing: Environment)

At approximately 1915 hours, a severe thunderstorm passed through the heliport in Camp Doha, Kuwait, with estimated sustained winds of 40 mph and gusts to 60 mph. As a result, two temporary sunscreen shelters were destroyed and four helicopters that were secured on the ramp were damaged. One UH-60A was damaged as the temporary shelter under which it was parked was destroyed. One destroyed shelter was blown into and damaged another UH-60A secured on the ramp. The high winds also overcame the main rotor blade tie downs for two AH-64 aircraft, causing extensive damage due to excessive blade flapping.

The property damage was caused by an abrupt, rapidly developing thunderstorm that was neither forecasted nor expected. The exposed aircraft were secured on the ramp in accordance with established policy.

6-2.2 PRESENT AND CONTRIBUTING TO THE SEVERITY OF INJURY/ EXTENT OF PROPERTY DAMAGE.

This type of finding covers factors that did not contribute to the accident, but contributed to the severity of the injuries or extent of damage. Personnel injuries attributable to defects in life support equipment, personal protective clothing/equipment, or aircraft/vehicle crashworthiness design should also be summarized as findings in this category. See Table 6-7 for an example.

Table 6-7. Example of 'Present & Contributing to Severity of Injury'
THE FINDING LISTED BELOW DID NOT DIRECTLY CONTRIBUTE TO THE CAUSAL FACTORS INVOLVED IN THIS ACCIDENT; HOWEVER, IT DID CONTRIBUTE TO THE SEVERITY OF INJURIES AND DAMAGE.

While flying as the lead OH-58D(R) in a Scout Weapons Team (SWT), in free cruise formation, enroute to conduct a night veision goggle convoy security mission, approxiamatrly 325 feet above ground level (AGL) and 98 knots indicated airspeed (KIAS), the Board determined the PC, who was the pilot on the controls, improperly diagnosed/responded to the emergency (P07). That is, the PC failed to adjust the flight controls as necessary to establish an autorotation descent and landing as required by "Engine Failure-Low Altitude/Low Airspeed During Takeoff or Cruise", Chapter 9, TM 1-1520-248-10 and the Aircrew Training Manual (ATM) OH-58D Kiowa Warrior, TC 1-248. The PC, was slow in his reaction by not reducing the collective immediately to regain and sustain rotor RPM (NR) and then adjust as necessary to maintain rotor RPM. The PC failed to adjust the cyclic at 100 feet AGL to decelerate the aircraft's rate of decent, increase inertia to the rotor system, reduce forward airspeed. The PC failed to apply sufficient collective pitch to further decrease the rate of decent at approximately 15-25 feet to cushion the landing. As a result, the aircraft struck the ground hard and was destroyed. Two crewmembers received serious injuries.

The Board concluded the PC's actions were the result of his fear/excitement (15) and the unit's insufficient training (06) of the emergency procedure. The unit is conducting the training however, there is no tracking device to document when the last two semi-annual iterations of this task were performed or completed. Due to the PC's lack of proficiency in this training, he didn't properly perform the underlined (immediate action) steps in emergency procedure listed in paragraph 9-11 resulting in excessive decay of rotor RPM available to arrest his rate of descent.

6-2.3 PRESENT BUT NOT CONTRIBUTING (PBNC).

Factors that did not contribute to the accident, but could cause injuries or adversely affect the safety of continued operations if left uncorrected are PBNCs. Although PBNCs do not contribute to the accident being investigated, they are invaluable for two reasons: 1) Reporting these deficiencies will ensure they receive command attention throughout the chain-of-command to include Department of the Army-level action, and 2) This will enable later identification of Army-wide hazards and controls during the second and third phases of the accident prevention process (Hazards and Controls Systems Analysis)(see paragraph 10-8). See Table 6-8 for an example of a PBNC finding.

Table 6-8. Example of 'Present But Not Contributing' Finding
THE FINDINGS LISTED BELOW DID NOT CONTRIBUTE TO THIS ACCIDENT; HOWEVER, IF LEFT UNCORRECTED, THEY COULD HAVE AN ADVERSE EFFECT ON THE SAFETY OF FUTURE AVIATION OPERATIONS.

The guidance contained in FM 3-04.140(FM 1-140) does not adequately describe the standards needed during a pilot IHADSS rocket diving fire engagement less than 1500M. The lack of standards for airspeed and altitude for starting this engagement has caused Master Gunners to use the airspeed and altitude for task 1415, in the TC 1-251 perform diving flight. The aircrew workload during a pilot IHADSS rocket diving fire engagement is significantly greater than during diving flight. The airspeed and altitude used to initiate the engagement does not reflect practical tactical considerations for ground fire, aircrew workload, or recovery in a high temperature or density altitude environment. There is an unnecessary risk accepted using these parameters in peacetime or combat and the possibility exists of negative habit transfer endangering aircrews when they deploy to combat.

6-2.4 RECOMMENDATIONS

a. Immediately following the finding, the recommendations are written. The recommendations answer the question, "What to do about it?" Refer to Table B-6, Appendix B, Page 116, DA Pam 385-40, for completion of the recommendations. The recommendations must target the root causes/ system inadequacies.

b. Addressing the DOTMLPF.

(1) The ultimate goal of accident investigation is to provide information that will allow informed composite risk decisions at the approprate level-of-command, to include senior Army leadership (e.g., Chief of Staff, Army (CSA)). It is at these higher command levels that changes can be affected throughout the Army's Doctrine, Organizations, Train ing, Materiel, Leadership and Education, Personnel, and Facilities (DOTMLPF). Although DOTMLPF only applies to higher and Army-level actions (see Table 6-10 below for DOTMLPF proponents), using DOTMLPF as a framework will help you comprehensively identify recommendations (i.e., controls) and target decision makers at all levels of the Army (from the accident unit up). A common perception is that it is not realistic in this era of budget constraints, to recommend expensive materiel fixes or resource-intensive funding issues. How ever, the accident board's responsibility is to recommend corrective actions that will prevent or mitigate the occurrence of future accidents, regardless of cost. It is the job of higher headquarters to make those resource decisions. Even if the decision is made to reject the board's recommendation and accept the composite risk, documenting the prob lem and its potential solution each time it occurs may justify the ex penditure in the future due to the cumulative accident cost.

(2) The recommendations are addressed at three levels: unit (company, troop, battalion), higher (brigade, division, corps, MACOM) and Army (to include MACOMs with Army-level proponency). Include all three, even if 'none' is entered. Recommendations propose that the "Com mander, _____," take or initiate some action that will result in the desired change(s).

(3) Continuing with the examples of findings in paragraphs 6-2.1 6-2.2

and 6-2.3: Figures 6-3 through 6-10 illustrate the format for the cor responding recommendations.

NOTE: The DOTMLPF domain is inserted where appropriate for instructional purposes only.

Table 6-9. Proponents for DOTMLPF

- Doctrine:
  - ODCSOPS
  - TRADOC: Joint/Army Doctrine Directorate (ATDO-A), DCSDOC
- Organizations:
  - HQDA (DCSOPS)
  - TRADOC: Force Design Directorate (FDD), DCSCD, HQ, TRADOC(ATCD-F), Fort Leavenworth, KS
  - FORSCOM
- Training:
  - ODCSOPS,
  - TRADOC: Training Operations Mgmt Activity (TOMA), DCST, ATOM-FA)
  - FORSCOM
- Materiel:
  - ODCSLOG
  - AMC
  - ATEC
- Leadership and Education:
  - TRADOC: CG CACDCG-CA
  - ARSTAF: DA DCSPER
- Personnel:
  - HQDA (DCSPER)
  - TRADOC: Leader Development Division, Individual Training Directorate, DCST, HQ TRADOC (ATTG-IL)
- Facilities:
  - TBD

Figure 6-3. Human error aviation example where the system inadequacies were identified as support & standards:

RECOMMENDATION (1, 2, 3, etc.):

a. Unit-Level Action: Commander, _____ (unit): Brief all unit personnel on the facts and circumstances surrounding this accident. Emphasis should be placed on how human limitations combined with less than optimum systems and high task loading allow situations that contribute to undetected hover drifts.

b. Higher-Level Action: None.

c. Army-Level Action:

(1) Commander, U.S. Army Training and Doctrine Command:

(a) Validate requirements for automatic hover stabilization systems for

all aircraft to assist in reducing task saturation. {Materiel}

(b) Validate OH-58D crew coordination requirements, especially in Tasks 1067, 1114, 1140, 1147, and 1148 in TC 1-209, for both crew members to simultaneously direct their attention inside the aircraft, especially in aircraft without automatic hover stabilization systems. {Doctrine}

(c) Validate requirements for night vision systems with greater fields-of-view and resolution. {Materiel}

(d) Increase, within the flight-training program, emphasis on situational awareness and spatial disorientation. {Training}

(2) Program Executive Officer, Aviation, field upgrades to OH-58D aircraft which allow the use of the hover bob-up mode symbology in the LCD unit, even with weapons displayed in the LCD unit, and allow for adjusting the ODA intensity during low light ambient conditions. {Materiel}

(3) Commander, U.S. Army Combat Readiness Center, disseminate/ publish the facts and circumstances surrounding this accident as appropriate.

Figure 6-4. Human error ground example where the root causes/ system inadequacies were identified as training and leader:
RECOMMENDATION (1, 2, 3, etc.):

a. Unit-Level Action: Commander, ABC Company, 123 Battalion, X Bri gade:

(1) Inform all unit personnel of the facts and circumstances surrounding this accident, with emphasis on how lack of adequate driver training can lead to accidents and injuries.

(2) Enforce the requirements of AR 385-55 and AR 600-55 for driver training and all aspects of motor vehicle operations. Incorporate a system to ensure adequate driver training for specific types of vehicles, with emphasis on technical knowledge, experience, and competence on specific vehicles prior to operation under abnormal conditions.

b. Higher-Level Action:

(1) Commander, X Brigade:

(a) Inform all subordinate units of the facts and circumstances sur rounding this accident.

(b) Integrate all aspects of safe motor vehicle operation throughout the command.

(c) Ensure compliance with AR 385-55, AR 600-55, TC 21-305, and applicable installation regulations for the safe operation of motor vehicles. Incorporate a system to ensure adequate driver training for specific types of vehicles, with emphasis on technical knowledge, experience and competence on specific vehicles prior to operation under abnormal conditions.

(2) Commander, X Division:
(a) Inform all subordinate units of the facts and circumstances surrounding this accident.
(b) Integrate all aspects of safe motor vehicle operation throughout the command.
(c) Ensure all subordinate units comply with AR 385-55, AR 600-55 and applicable installation regulations for the safe operation of motor vehicles.
(3) Commander, Fort Yankee, inform all subordinate units of the facts and circumstances surrounding this accident.

c. Army-Level Action: Commander, U. S. Army Combat Readiness Center, publish the facts and circumstances surrounding this accident in KNOWLEDGE.

Figure 6-5. Materiel failure aviation example where the root cause/system inadequacy was identified as support:

RECOMMENDATION (1, 2, 3, etc.):

a. Unit Level Action: Commander, Company Z, 999th Aviation Regiment, 99th Infantry Division, inform all assigned aviation personnel of the facts and circumstances surrounding this accident and lessons learned.
b. Higher Level Action: None
c. Army Level Action:
(1) Program Executive Officer, Aviation:
(a) Direct a revision of all the tasks associated with the fixed droop stops in TM 55-1520-240-23-1 to add a warning advising of the potential for failure associated with installing the wrong bolts IAW the submitted DA Form 2028. {Doctrine}
(b) Conduct a review of the maintenance practices at the manufacturer to determine how improper droop stops retention bolts could be installed. {Materiel}
(2) Commander, U.S. Army Combat Readiness Center, publish the facts and circumstances surrounding this accident in FLIGHTFAX.

Figure 6-6. Materiel failure ground example where the root cause/system inadequacy was identified as support:

RECOMMENDATION (1, 2, 3, etc.):

a. Unit Level Action: None.
b. Higher Level Action: None
c. Army Level Action: Commander, U.S. Army Materiel Command:
(1) Review historical information to determine if this failure was an anomaly or indicates a trend of failure for this tire.
(2) Coordinate with the manufacturer to evaluate the adequacy of the qual ity-control procedures used to detect tire defects. {Materiel}

Figure 6-7. Environnemental cause factor example (aviation):
RECOMMENDATION (1, 2, 3, etc.):

a. Unit-Level Action: None
b. Higher-Level Action:
   (1) Commander, Aviation Brigade, brief all unit personnel on the facts and circumstances surrounding this accident.
   (2) Commander, U.S. Army Aviation Center and Fort Rucker:
      (a) Coordinate, through the Commander, U.S. Air Force, 1st Weather Group, Fort McPherson, Georgia, to establish a proactive interface with several groups sponsoring research into the area of wind shear. These groups include the National Aeronautics and Space Administration (NASA), the National Technical Information Service (NTIS), the Federal Aviation Administration (FAA), the American Meteorological Society, the Langley Research Center, and the National Center for Atmospheric Research.
      (b) Inform all aviation personnel assigned to Fort Rucker, Alabama that severe weather in the form of micro-bursts can occur near isolated thunderstorms or rain showers clouds.
c. Army-Level Action: Commander, U.S. Army Combat Readiness Center, disseminate/publish the facts and circumstances surrounding this accident as appropriate.

Figure 6-8. Environnemental cause factor example (ground):
RECOMMENDATION (1, 2, 3, etc.):

a. Unit-Level Action: None.
b. Higher-Level Action: None.
c. Army-Level Action: Commander, Forces Command, in consonance with the Commander, U.S. Air Force Weather Agency, direct an assessment of the weather reporting and forecasting facilities and capabilities supporting the operations at Camp Doha, Kuwait, and upgrade as appropriate.

Figure 6-9. Example of Present & Contributing to the Severity of Injury:
RECOMMENDATION (1, 2, 3, etc.):

a. Unit-Level Action:
   (1) Commander, 99th Battalion, 99th Infantry, 1st Brigade, 99th Army Division, enforce the Fort Army PAM 600-5 requirement for soldiers to wear Kevlar helmets in training areas.
   (2) Commander, 999th Main Support Battalion, Division Support Com mand, 99th Army Division, enforce the Fort Army PAM 600-5 require ment for soldiers to wear Kevlar helmets in training areas.
b. Higher-Level Action: Commander, 99th Army Division, take command ac tion to enforce the requirement to wear Kevlar helmets while in training areas.
c. Army-Level Action: None.

Figure 6-10. Example of Present But Not Contributing (PBNC):
RECOMMENDATION (1, 2, 3, etc.):

a. Unit-Level Action: Commander, 999th Air Ambulance Company, 9th Medical Evacuation Battalion, 99th Corps Support Command, ensure compliance with the unit and airfield pre-accident plans and ensure all personnel involved are trained in their duties.

b. Higher-Level Action

(1) Commander, 99th Corps Support Command, ensure all subordinate units actively participate in planning and practice of pre-accident plans with supported installations.

(2) Commander, II Corps and Fort Army, ensure all subordinate aviation units participate in all aspects of the installation pre-accident plan.

c. Army-Level Action: Commander, U.S. Army Medical Command, ensure MEDEVAC units comply with the requirements of the MEDEVAC and military assistant to safety and traffic (MAST) programs.

6-3. INTERNAL BOARD STAFFING.

a. Internal board staffing is an essential element in producing a quality prod uct. While establishing the timeline for USACRC staffing, the board president will allow sufficient time for the board to conduct an internal review of the product.

b. When the board president completes the initial draft, he will designate a time for the board to carefully read the draft history, analysis, and find ings and recommendations. The suggested technique is to make separate copies for all board members and allow them enough time to thoroughly read the written product. Instructions should be given that the primary intent is to review for clarity and accuracy of content. An additional ben- efit is that the review will also identify major grammatical and spelling errors.

c. Once all members have completed reading, the board president will lead the board in a paragraph-by-paragraph discussion. Board members should feel free to point out errors and disagree with what is written. The board president will assess comments and make changes as required.

d. IAI Board Presidents may contact the USACRC G-3 operations to have investigators assist the Board with review of their products and provide advise on the presentation of their investigation material.

CHAPTER 7 - PREPARING THE OUT-BRIEF

7-1. GENERAL. At the conclusion of the investigation, the board president will prepare and present an out-brief to inform the appointing authority of the board's findings and recommendations.

Remember that it may be 60 days or longer before the final report is submitted for distribution through command channels. In most cases, the out-brief will be an execution document for the appointing authority to implement corrective actions. Therefore, the out-brief must be as thorough and clear as possible. That said, you must make it clear that the out-brief is a field briefing based on information currently available to the board. Based on the circumstances of the accident, you must ensure that the appointing authority understands that the report may change if new information is made available (e.g., teardown analysis reveals unsuspected materiel failure).

7-2. ATTENDANCE.

The appointing authority is the primary target of the out-brief. With the exception of the board, all other attendees will be at the direction of the appointing authority. In many cases, the installation or unit POC will ask the board president for advice on who else should attend. As a general rule, the chain-of- command down to battalion-level should be present. In aviation accidents, brigade or battalion-level ASOs, SPs and/or MEs are normally appropriate. In ground accidents, command sergeants major or other senior NCOs (e.g., master gunner) may be appropriate.

This brief is not for the general public or other personnel not in the chain-of-command or in the safety business.

NOTE: Pre-briefing the chain-of-command is not a requirement. Based on the circumstances, the board president will decide if it is appropriate to pre-brief the brigade and battalion commanders. This should be accomplished if specific command-related or controversial findings are to be presented. However, a pre-brief will not be conducted if the brigade or battalion commanders are subject to be called as witnesses for the collateral board or have any other interest in the accident except for accident prevention. The board president should NOT leave a copy of the briefing after the pre-brief.

All board members should attend the out-brief. The board president will ensure they are prepared to field questions in their areas of expertise. Advise board members that they represent the convening authority, not their respective units.

7-3. PREPARING THE OUT-BRIEF.

The board president should not wait until the end of analysis before preparing the out-brief. You can, and should, begin preparing the briefing early in the investigation. Many of the slides can be developed before analysis begins. Examples include the board members, pre and post-accident timelines, photo slides and diagrams, drawings or other pictures that you may expect to use to discuss analysis. The more you have done before deliberations, the more time you will

have to develop a polished product. Inquire early in the investigation as to who might attend the out-brief, where the out-brief will take place, and what audio-visual equipment is available. Finalize the briefing after the board deliberations are completed. This avoids making the slides and writing the script or briefing note cards the night before when you should be rehearsing the briefing or relaxing. Personally conduct a recon of the briefing site a few days prior to eliminate as many unknowns as possible. Normally, the briefing is given to the command group on the installation.

After the board president has prepared and rehearsed the briefing, he should present it to the board members. This serves two purposes: first, it serves as a quality review to resolve any problems, solicit comments for improvement, and ensure all information is presented accurately; second, it provides the board president an opportunity to prepare the board members for possible questions that may arise during the actual briefing. All board members should be present to provide technical support to the board president.

7-4. RECOMMENDED STRUCTURE OF THE OUT-BRIEF.

The board president may utilize the following format for the command out-brief (see Appendix AC for example). Slides are listed in standard order of presentation:

7-5. PRESENTATION.

The board recorder should document the names and duty positions of personnel briefed at each briefing conducted, as well as any questions and comments, to include respective board responses.

Due to the sensitive nature of the information presented and expected changes to the final report, only one copy of the out-brief is normally left with the command. At the request of the General Court Martial Convening Authority (GCMCA), a copy may be left with the installation safety director and should be labeled "For Accident Prevention Purposes Only. This briefing is not for distribution." Upon completion of the presentation, the recorder and Board president will document the outbrief through a written AAR memorandum for record.

7-6. TIPS FOR EFFECTIVE PRESENTATION.

To assist the board president in presenting the most professional briefing possible, the following recommendations are made:

The board president should write a script for the briefing. Using the notes pages allows the board president to maintain continuity during the briefing and assists him in finding his place in the event of a question or untimely interruption. If you decide to brief from note cards, make sure you know the briefing thoroughly. Briefing using note cards can lead to "shooting from the hip." It is possible to say things you didn't want to say and dig yourself into a hole that's hard to get out of.

When constructing the briefing slides, use text that is large enough for the audience to read. Use a dark colored background with light colored text or a

light colored background with dark colored text. Slides are very difficult to read when using dark colored text on a dark colored background or using light colored text on a light colored background. Choice of slide colors is the board president's prerogative. Remember also, if you have to construct a slide that is not listed in Appendix AC, keep it simple. "Busy" slides make it difficult for the audience to discern the point you are trying to make.

The board president should conduct a practice briefing in front of the board members. This allows the board members to "sharp shoot" the briefing to ensure all possible questions are answered in the briefing. Additionally, minor errors, such as spelling, incorrect times, or sequence of events, can be corrected. Remember "Practice, Practice, Practice."

The following tips are listed to assist the board president in his presentation:

- Recon the briefing room.
- Know your audience. Remember, they may have just lost a soldier.
- Rehearse, rehearse, rehearse.
- Be yourself, be natural, be flexible, and be mature.
- Listen. If a question or comment is raised, ensure you have addressed it before you continue your briefing.
- Be professional. No profanity or off-color jokes. Use proper grammar, pronunciation, and enunciation.
- Speak loudly, vary the rate of delivery and avoid monotone.
- Do not be condescending or argumentative. Do not come across as a "know-it-all." Discussions with strap hangers should be held until after the briefing.
- Avoid turning your back to the audience and speaking to the screen.
- Maintain eye contact, scan the audience, and look at everyone.
- Do not walk or lean in front of overhead projector.
- Do not pace. Stand behind a podium and use an assistant to change slides (PPT or VGT).

Arrive at the briefing site early. Check all audiovisual equipment. Ensure spare bulbs are available and the seating arrangement is appropriate for the audience.

CHAPTER 8 - BOARD REVIEW OF FINAL REPORT

8-1. Reviewing THE NARRATIVE.

a. DA PAM 385-40 requires the investigation board to report, in narrative form, the facts, conditions, and circumstances, as established during the investigation. This portion of the report is the "Narrative of the Investiga tion" and must be completed for all on-duty Class A and B accident reports. The narrative will be prepared on letter size paper for ground accidents (paragraph 4-4, DA Pam 385-40) and on a DA Form 2397-3-R (paragraph 3-6, DA Pam 385-40) for aviation accidents.

b. The narrative of the investigation consists of four sections, the History of Events/Flight, Human Factors, Materiel Factors, and the Analysis. The first three sections of the report contain factual data only while the last section, the Analysis, is reserved for the board's documentation of its conclusions, suspicions, and opinions concerning the accident cause and effect relationships.

c. Each section has specific areas the board must consider. The board must comment on each of these specific areas, regardless whether causal/con tributory. In the History, Human Factors and Materiel subordinate paragraphs, the board may be brief and say something like the "board concluded not a factor" when this is the case. However, each subordinate paragraph in the Analysis section must include sufficient information to substantiate areas not identified as causal or contributory.

d. Outlines of aviation and ground accident narratives are presented below in Figures 8-1 and 8-2 respectively.

(1) Paragraph 1 (History of Events/Flight) presents a sequential snapshot of the activities and events of the mission leading up to the accident, the accident, and the immediate actions following the accident. The timeline established during the investigation will assist in writing this paragraph. It should include enough detail to give the reader an accurate description of events. Detailed instructions for this paragraph start on page 32 of DA PAM 385-40 for aircraft accidents and page 78 for ground accidents. Typical errors in this paragraph include not clearly identifying the units involved, not detailing the planning in preparation for the mission, including analytical statements, and including findings. Writers of this paragraph, normally the board president, should include only statements of fact.

1. History of Flight
   a. Preflight Phase
   b. Flight Phase
   c. Post Flight Phase
2. Human Factors Investigation
   a. Personnel background
   b. Personnel management information
   c. Aircraft suitability

d. Communications/air traffic control
e. Navigational aids
f. Meteorological information
g. Ground support services
h. Crash survival
i. Emergency egress, survival, and rescue
j. Special investigation
k. Witness investigation

3. Materiel Factors Investigation
a. Aircraft airworthiness
b. Digital Source Collection
c. Airframe
d. Systems
e. Power plant
f. Rotor system or propellers
g. Transmissions/gearboxes and drive train
h. Laboratory analysis
i. Crash site information
j. Fire

4. Analysis
a. Accident sequence
b. Environmental factors
(1) Weather conditions
(2) Other than weather
c. Materiel factors
(1) Major components
(2) Major systems
d. Human factors
(1) Support
(2) Standards
(3) Training
(4) Leader/Command
(5) Individual
e. Other (observations)

Figure 8-1. Ground Accident Narrative Outline

1. History of Events
a. Pre-accident phase
b. Accident phase
c. Post-accident phase

2. Human Factors Investigation
a. Personnel background & personnel management information
b. Vehicle/system/equipment suitability
c. Communications
d. Meteorological information

e. Support services
f. Accident survivability
g. Rescue operations
h. Special investigation
i. Witness investigation

3. Materiel Factors Investigation
   a. Vehicle/system/equipment worthiness
   b. Systems
   c. Engine
   d. Transmission
   e. Laboratory Analysis
   f. Accident site information
   g. Fire
4. Analysis
   a. Accident sequence
   b. Environmental factors
      (1) Weather conditions
      (2) Other than weather
   c. Materiel factors
      (1) Major components
      (2) Major systems
   d. Human factors
      (1) Support
      (2) Standards
      (3) Training
      (4) Leader/Command
      (5) Individual
   e. Other (observations)

Figure 8-2. Ground Accident Narrative Outline

(2) Paragraph 2 (Human Factors Investigation) is described on page 33 of DA Pam 385-40 for aviation accidents and on pages 78 and 79 for ground accidents. The Medical Officer and SME, with assistance from the board recorder, are responsible for writing this paragraph.

(a) The number one error in this paragraph is not including information for every principal person involved in the accident. A good rule of thumb, air or ground, is that if there is a finding concerning them, if they are injured, or if they are a crewmember on board an aircraft at the time of the accident, include them in this paragraph.

(b) The next most prevalent error is not including enough information on the individuals listed. Go into as much detail as possible in the paragraph discussing personnel background information and personnel management. For example, it is not enough to say that "the soldier was assigned to the unit on 1 December 2000" and noth ing more.

(c) In each of the remaining paragraphs, list the required information as listed in DA Pam 385-40.

(3) Paragraph 3 (Materiel Factors Investigation) is described on page 34 of DA Pam 385-40 for aviation accidents and on page 79 for ground accidents. The Maintenance Officer, with assistance from the board recorder, is responsible for writing this para graph. The principal objective of this paragraph is to establish the equipment's condition at the time of the accident.

(4) Paragraph 4 (Analysis) is normally written by the board president. In structions for writing the analysis are located in DA PAM 385-40, paragraph 2-8 on page 13, with specific instructions for aviation and ground accidents at pages 34 and 79 respectively. The board president may modify the order of the environmental, materiel, and human fac tors sections but must make entries for each.

(a) The analysis paragraph summarizes the narrative and discusses the opinions, suspicions, and conclusions of the board. The analysis is essentially the documentation of board deliberations. It should clearly show the cause and effect relationship of the evidence gathered during the accident investigation. Not only must the analysis show the clear cause and effect of accident causes, but should also eliminate plausible accident causes the board deter mined did not cause or contribute to the accident.

(b) The following are required paragraphs for the analysis. The board must make some entry for each. In each paragraph, develop an analytical statement or statements and then articulate state- ments of fact that support the analysis.

(1) Begin the paragraph by specifying the scope and conclusions of the investigation. In all cases, begin the paragraph by the words: After analyzing the human, materiel, and environmental data collected during the investigation, the board concluded the accident was caused by …." Complete the sentence specifying the factors (human, mate riel, environmental) that caused the accident.

(2) Accident sequence. Include a description of the accident that includes the board's estimate of how the accident occurred. This paragraph should create a picture in the reader's mind of how the aircraft crashed or how the vehicle rolled over, etc. It should not be a repeat of the his tory, but should include details of the accident dynamics. Include the board's analysis of how and why the accident happened as it did.

(3) Environmental Factors. This paragraph includes meteorological and non-meteorological factors. Use the key words under Table B-4, page 115 of DA PAM 385-40, describing the environmental phenomena present during the accident when applicable, along with the results. Environmental factors can be present at the time of the accident but not be causal. There can be no present and contributing finding against environmental factors if the board concludes they are not causal.

(4) Materiel Factors. This paragraph includes all materiel factors. Use the key words under Table B-3, page 114 of DA PAM 385-40 to describe what happened to a particular part, piece of equipment, system, or component. Refer to reports written by advisors to the board like man ufacturer representatives. Develop a separate paragraph for each major component or system. Each statement of materiel failure must be fol lowed by the cause of the failure. Also describe the consequences of the failure. For example, "when the bolts failed, the droop stop was thrown aft of the aircraft, allowing the red rotor blade to make contact with the fuselage." Be sure to identify the part number or the NSN of the part that failed. The board should explain why they ruled out a part, system, or component that could have caused the mishap. Design or maintenance issues that originated or occurred at the manufacturer are considered materiel issues.

(5) Human Factors. This paragraph includes all human factors. Use the key words on pages 115 and 116 of DA PAM 385-40 to describe issues associated with each of the human factors system inadequacies/root causes. Develop a separate paragraph for each of the basic root causes/ system inadequacies and discuss the result of the deficiency. Again, in each case, develop analytical statements and then support with state ments of fact--

1 Support. Describe issues relating to resourcing, facilities, services, equipment, numbers of personnel, and other support type factors.

2 Standards. Describe the adequacy of written guidance for a particular task. All findings refer to a standard of some type. Be sure to explain any standards shortcomings and the consequenc es of those shortcomings. If the board concluded all documents were adequate, explain it that way.

3 Training. Describe the training an individual may have received either in an MOS-producing school, unit, or other. A soldier with out adequate experience or with some sort of negative habit trans fer is considered to have a training deficit.

4 Leader/Command.

- Leader Factors. Describe what an individual did in his or her capacity as a leader. Table B-5, DA PAM 385-40 discusses leader failure as a lack of supervision, but also consider it a leader issue when a leader chose not to enforce a standard, did not make an informed decision, or was not where he or she should have been.
- Command Factors. This paragraph should discuss things like composite risk management, command climate, unit morale, deployment information, unit training status, OP TEMPO, command priorities, formal versus informal leader ship, general equipment status, communication up and down the chain-of-command, and other issues relevant to the accident. Com

ments like “Commander lacks factual and timely information forman aging high-risk behavior,” or “Commander or unit lacks experience, wisdom, or seasoned leadership to manage the composite risks as sociated the that unit” are comments the board could make here. For more examples, refer to paragraph 5-8 of this handbook.

5 Individual. Discuss the board’s conclusions relative to an individual soldier in terms of the error or the indiscipline that caused the ac cident or permitted the soldier to make the error, along with the results of the soldier’s actions. Include the injuries to the soldier in the results portion of the discussion.

(6) Other. In this paragraph include special observations (i.e., factors that in no way contributed to the accident but identify local conditions or practices that should be corrected). [NOTE: If a potential safety issue has Army-wide implications, making the finding a PBNC rather than a Special Observation will ensure the problem has visibility above the accident unit level].

8-2. FORMS.

a. AVIATION ACCIDENTS - 2397 SERIES FORMS.

(1) CLASS A OR B ACCIDENT REPORT (Right Side)

DA FORM	DESCRIPTION	TAB
2397-14-R	Index B	N/A
2397 R	Statement of Reviewing Officials	A
2397 1 R	Summary Mishap	B
2397 2 R	Findings/Recommendations	C
2397 3 R	Accident Narrative	D
2397 4 R	Summary of Witness Interviews	E
2397 5 R	Wreckage Distribution Data	F
2397 6 R	Impact/Crash Damage Data	G
2397 7 R	Maintenance/Materiel Data	H
2397 8 R	Personal Data	I
2397 9 R	Injury/Occupational Illness Data	J
2397 10 R	Escape/Survival/Rescue Data	K
2397 11 R	Weather Data	L
2397 12 R	Fire Data	M

(2) CLASS A OR B ACCIDENT REPORT (Left Side)

TITLE	TAB
Index A (DA FORM 2397-13-R)	N/A
Board Orders	1
Weather Reports	2
Certificate of Damage/ECOD	3
Photos, Maps, Diagrams	4
Copy of Deficiency Reports, EIR/QDR Information	5
Laboratory Analysis	6

Weight and Balance	7
Directives, Regulations, etc.	8
Autopsy Report (DD Form 1322)	9
Flight Planning Data	10
Aviators Flight Record (2408-12)	11
Equipment Inspection & Maintenance Record	12
Uncorrected Fault Record (DA Form 2408-14)	13
Equipment Modification Record	14
Additional Information	15
Additional Information	16

b. GROUND ACCIDENTS DA Form 285-R Series. Responsibility for obtaining information and completing the various forms of the series should be assigned commensurate with aviation accident investigations.

(1) CLASS A or B ON DUTY ACCIDENT REPORT (Right Side)

DA FORM	DESCRIPTION	TAB
285-B-R	Index B	N/A
285-O-R	Statement of Reviewing Officer	A
285	Accident Report	B
N/A	Findings and Recommendations	C
N/A	Narrative	D
285-W-R	Witness Interviews	E

(2) CLASS A or B ON DUTY ACCIDENT REPORT (Left Side)

DA FORM	DESCRIPTION	TAB
285-A-R	Index A	N/A
N/A	SIR/Casualty Report	1
N/A	Board Orders	2
N/A	Map	3
N/A	Diagram/Photos	4
N/A	ECOD	5
N/A	Deficiency Reports	6
N/A	Directives/Regulations	7
N/A	Technical and Laboratory Reports 8	
5987-E	Uncorrected Fault Record	9
2408-5	Modification Record	10
N/A	Weather Data	11
N/A	Medical Data	12
	Other	13
	Other	14

DA Forms 285-A-R and 285-B-R should be used to track form completion and as a log to ensure that all required data is captured prior to departure from the field site.

APPENDIX A
DEFINITION OF TERMS

(For a complete listing of terms see CHAPTER 3 AR 385-10 & DA Pam 385-40)

1. Aircraft Flight or Flight-Related Accident. An accident involving Army aircraft when intent to fly exists.
   a. Flight Accidents. Those accidents in which there is intent for flight and reportable damage is sustained by the aircraft. (NOTE: Explosives, chemical agents, or missile events that cause damage to a DoD aircraft with intent to fly are categorized as flight accidents to avoid dual reporting.)
   b. Flight-Related Accidents. Those accidents in which there is intent for flight and no reportable damage is sustained by the aircraft, but accident involves a fatality, injury to personnel, or other property damage. Included in this category are rappelling, fast roping, hoist, and helocast accidents.
2. Aircraft-Ground Accidents. Those accidents in which there is no intent for flight, but at least one engine is running and there is reportable dam age to the aircraft and/or reportable injury. This category includes hot refueling of aircraft on the ground.
3. Ground Accidents (Reported using DA Form 285 or AGAR). Those accidents occurring on the ground, such as Army motor vehicle accidents (training), range operations, ground training accidents, parachute (free fall and static line) operations, and maintenance/servicing of air craft with engines not in operation.
4. Circadian Dysrhythmia. The biological time clock that regulates the body's daily sleep-wake patterns is disrupted resulting in fatigue (e.g., "jet lag"). Reversing day/night work/rest schedules or flying to a place where night occurs during the body's day poses a problem for the cir-cadian clock. Symptoms include disturbed sleep, increased waking sleepiness, degraded performance (poor decisions, increased reaction time, reduced vigilance, poor communication, etc.), and gastrointestinal problems.
5. DOTMLPF. The order in which requirements determination occurs during the Army's force development process. Force development is the process of determining Army doctrinal, organizational, training, ma-teriel requirements, leader development, personnel development, and facilities and translating them into programs and structure, within al located resources, to accomplish Army mission and functions.
   a. Doctrine - body of thought composed of the fundamental principles by which military forces guide their actions in support of objectives It represents the consensus on how the Army conducts operations today. It ranges from tactics, techniques and procedures (TTP) to basic doctrine (such as FM 3-0).

b. Organizations - changes or additions to any of the Army's Table of Organization and Equipment (TOE). These range from modifying the numbers or types of equipment in a current organization to docu menting an entirely new organization through the force design process.

c. Training - the conception, development and execution of solutions to training requirements identified through the combat development process. The solutions may include new or revised training programs, material, methods, media, and system and non-system training devices.

d. Materiel - changes/additions to any of the Army's families of weapons systems; support systems; or training aids, devices, simula tors and simulations (TADSS). They range from modernizing exist ing materiel through parts replacement; major product improvements of existing materiel; one for one replacement of old materiel with new materiel designed to do the same job, to completely new families of materiel designed to do something that has not been done before.

e. Leadership and education - a continuous, progressive and sequen tial process through which leaders acquire the skills, knowledge, and behavior necessary to maintain a trained and ready Army in peace time to deter war.

f. Personnel - changes or additions to the Army's MOS structure. These range from changes in the numbers of soldiers needed in an MOS to the creation of an entirely new MOS and identifying the skills desired of these soldiers.

g. Facilities – multi-functional, state of the art infrastructure that fully enables all DOTLMP functions above (includes enhancing the qual ity of life for soldiers and their families.

6. Fratricide. A circumstance in which members of a US or friendly military force are mistakenly or accidentally killed or injured in action by US or friendly forces actively engaged with an enemy or who are directing fire at a hostile force or what is thought to be a hostile force.

7. Habit Interference. An error is made because task performance was interfered by:
   a. The way the person usually performs similar tasks
   b. The way the person performs the same task under different conditions or with different equipment (e.g., a particular control is operated in one direction for early models, but reversed in subsequent models)

8. Human Factors Analysis and Classification System (HFACS). A frame work for analyzing human factors issues in accidents that was developed for the US Navy by Shappell and Weigmann. It is based upon Reason's model of latent and active failures. The US Navy is among organiza- tions that has applied the technique and has documented their process in OPNAV 3750.6R.

9. Negative habit transfer. Negative transfer of training; i.e., it is more difficult to learn Task B as a result of having learned Task A.

10. Negligent Discharge- An accidental discharging of a firearm involving culpable carelessness.

APPENDIX B
LIST OF ACRONYMS

AAAR	Abbreviated Aviation Accident Report
AAR	After Action Review
ABSO	Aviation Branch Safety Office
AC	Active Component
ACH	Army Combat Helmet
ACU	Army Combat Uniform
ACOD	actual cost of damage
A&E	Ammunition and Explosives
AFIP	Armed Forces Institute of Pathology
AGAR	Abbreviated Ground Accident Report
AGL	above ground level
AH	attack helicopter
ALSE	Aviation Life Support Equipment
AMC	Army Materiel Command
AMCOM	Aviation and Missile Command
AMDF	Army Master Data File
ANVIS	aviator's night vision imaging system
AOC	Army Operations Center
APC	armored personnel carrier
AR	Army regulation
ARI	Army Research Institute

ARL	Army Research Laboratory
ARMS	Aviation Resource Management Survey
ARSTAF	Army Staff
ARTEP	Army Training and Evaluation Program
ASMIS	Army Safety Management Information System
ASO	Aviation Safety Officer
ASOC	Aviation Safety Officer Course
ATB	Aviation Training Brigade
ATC	air traffic control
ATEC	Army Test and Evaluation Command
ATM	aircrew training manual
AWR	Airworthiness Release
BBP	bloodborne pathogens
BCT	Brigade Combat Team (can also be HBCT, SBCT, IBCT)
BDU	battle dress uniform
BOS	Battlefield Operating System
CAI	Centralized Accident Investigation
CAIRA	Chemical Accident and Incident Response and Assistance
CALFEX	Combined Arms Live Fire Exercise
CAO	Casualty Assistance Officer
CCAD	Corpus Christi Army Depot
CENTCOM	Central Command
CFLCC	Coalition Forces Land Component Command

CG	Commanding General
CH	cargo helicopter
CITV	Commander's Independent Thermal Viewer
CID	Criminal Investigation Division
CMAOC	Casualty and Memorial Affairs Operations Center
CRM	Crew Resource Management
CSA	Chief of Staff, Army
CTA	Common Table of Allowances
CVR	cockpit voice recorder
CW or CWO	Chief Warrant Officer
DA	Department of the Army
DA PAM	Department of the Army Pamphlet
DAITM	Department of the Army Investigation Team for Malfunctions
DASAF	Director of Army Safety
DCD	Directorate of Combat Developments
DCSPER	Deputy Chief of Staff for Personnel
DDESB	Department of Defense Explosives Safety Board
DES	Directorate of Evaluation and Standardization
DMV	Department of Motor Vehicles
DoD	Department of Defense
DoDI	Department of Defense instruction
DOTDS	Directorate of Training, Doctrine, and Simulation
DSN	Defense Switch Network

DTG	date-time group
DTLOMS	doctrine, training, leader development, organization, materiel, and soldiers
DUI	driving under the influence
E3	Electromagnetic Environmental Effects
ECOD	estimated cost of damage
ECP	engineering change proposal
EIR	Equipment improvement report
EOD	explosive ordnance disposal
ERB	Enlisted Record Brief
ETT	Embedded Training Team
FAA	Federal Aviation Administration
FDR	flight data recorder
FM	field manual
FORSCOM	Forces Command
FUP	Full-up-pack (tank engine and transmission)
GCMCA	General Court-Martial Convening Authority
GO	general officer
GOMO	General Officer Management Office
GPM	Ground Precautionary Message
GPS	Global Positioning System
GS	general schedule
HEAT	HMMWV Egress Assistance Trainer

HFACS	Human Factors Analysis & Classification System
HIRTA	high intensity radio transmission area
HMMWV	high mobility multipurpose wheeled vehicle
HQDA	Headquarters, Department of the Army
HUD	heads-up display
IAI	installation-level accident investigation
IAW	in accordance with
IBA	Interceptor Body Armor
IBD	inhabited building distance
ICSE	International Center for Safety Education
IERW	Initial Entry Rotary Wing
IFE	instrument flight examiner
IG	Inspector General
IIMC	inadvertent instrument meteorological conditions
ILD	intraline distance
IMC	instrument meteorological conditions
IMD	intermagazine distance
IP	instructor pilot
IPR	in-process review
JAG	Judge Advocate General
JPG/JPEG	Joint Photographic Experts Group
LCMC	Lifecycle management commands
LCD	liquid crystal display

LEL	lower explosive limit
LPU	life preserver unit
LRAS3	Long Range Advanced Scout Surveillance System
LSE	life support equipment
LZ	landing zone
MACOM	changed to Army Combatant Commands, Army Service Com ponent Commands, Direct Reporting Units, Field Operating Agencies, and Staf Support Agencies
MAST	military assistance to safety and traffic
MEDEVAC	medical evacuation
METL	mission-essential task list
MILES	Multiple Integrated Laser Engagement System (aka SAWE)
MFE	maintenance flight examiner
MNC-A	Multi National Corp Afghanistan
MNC-I	Multi National Corp Iraq
MOLLE	Modular lightweight load carrying equipment
MOPP	Mission Oriented Protective Posture
MOS	military occupational specialty
MP	military police
MSG	message
MSL	mean sea level
MTDS	mission, type, design and series
MTF	military treatment facility
MTP	mission training plan or maintenance test pilot

MWO	modification work order
NCO	noncommissioned officer
NLT	not later than
NOK	next-of-kin
NSN	national stock number
NTAP	National Track Analysis Program
NTC	National Training Center
NTIS	National Technical Information Service
NTSB	National Transportation Safety Board
NVD	night vision device
NVG	night vision goggles
ODA	optical display assembly
ODCSLOG	Office of the Deputy Chief of Staff for Logistics
ODCSOPS	Office of the Deputy Chief of Staff for Operations and Plans
OH	observation helicopter
OHR	operational hazard report
OPNS	operations
OPTEMPO	operational tempo
ORB	Officer Review Board
ORSA	Operations Research Systems Analysis
OSHA	Occupational Safety and Health Administration/Act
PAO	public affairs officer
PASGT	Personnel Armor System for Ground Troops

PBNC	present but not contributing
PC/PIC	pilot-in-command
PCE	protective clothing and equipment
PCS	permanent change of station
PEO	Program Executive Officer
PERSTEMPO	personnel tempo
PI	pilot
PLF	Parachute Landing Fall
PMCS	preventative maintenance checks and services
PN or P/N	part number
POC	point-of-contact
POI	program of instruction
PPC	performance planning card
PPE	personal protective equipment
PPT	Power Point (Microsoft)
PQDR	Product Quality Deficiency Report
QASAS	Quality Assurance Specialist (Ammunition Surveillance)
QD	quantity distance
QDR	quality deficiency report
QTB	quarterly training brief
QTG	quarterly training
RC	reserve component
RTS	Recommendation Tracking System

SAMS	Standard Army Maintenance System
SAWE	Simulated Area Weapons Effects
SDNCO	staff duty noncommissioned officer
SDO	staff duty officer
SIR	serious incident report
SME	subject matter expert
SN	serial number
SOP	standing operating procedure
SOUM	Safety-of-Use Message
SP	standardization instructor pilot
SPORTS	Slap, Pull, Observe, Release, Tap, Squeeze
SSWG	System Safety Working Group
TACSOP	tactical standing operating procedure
TADSS	training aids devices simulators and simulations
TC	tank/track commander or training circular
TDY	temporary duty
TI	technical inspector
TM	technical manual
TOE	Table of Equipment
TOMA	Training Operations Management Activity
TP	What you probably forgot
TRADOC	Training and Doctrine Command
TSC	Training Support Center

TSG	The Surgeon General
TSI	Transportation Safety Institute
TTP	tactics, techniques, and procedures
UCMJ	Uniform Code of Military Justice
UEL	upper explosive limit
UH	utility helicopter
UIC	unit identification code
ULLS-G	unit level logistics system ground
ULLS-A	unit level logistics system air
USAARL	US Army Aeromedical Research Laboratory
USAAWC	US Army Aviation Warfighting Center
USACRC	US Army Combat Readiness Center
USATCES	US Army Technical Center for Explosives Safety
USR	Unit Status Report
UT	unit trainer
VFR	visual flight rules
VGT	view graph transparency
XO	executive officer
Y/N/U/NA	Yes/No/Unknown/Not Applicable

APPENDIX C
POC CHECKLIST

NOTE: The Accident Unit is requested to designate a permanent POC to assist the Investigation board.

POC is requested to keep all equipment used or involved in an accident undisturbed and secured at the accident site until the accident investigation board releases it for recovery. POC is requested to provide those records that pertain to the equipment which is used in or contributed to the accident.
Recommended

AVIATION POINT-OF-CONTACT CHECKLIST

___ 1. Orders appointing investigation board.
___ 2. Blood/urine samples from all personnel involved.
___ 3. Witness information: Name, rank, telephone number. (Keep personnel segregated until they can be interviewed).
___ 4. Secure work area with access to commercial/DSN telephone, and SIPR/NIPR for voice and data.
___ 5. CID/MP/Casualty Reports/SIRs.
___ 6. Collect individual flight records and ATM records for all personnel involved. Close out flight records.
___ 7. Individual medical records/autopsy results as applicable
___ 8. Individual personnel records for all involved in accident—
__ a. ORB or ERB.
__ b. Training folders (individual, unit).
__ c. Individual counseling records.
___ 9. ECOD initiated through support maintenance.
___10. Access to laser printer and color printer.
___11. Transportation to accident site by air (for overhead photos) and/or ground.
___12. Name and location of flight surgeon, bodies, injured.
___13. Weather statement (signed by forecaster).
___14. Unit and parent organization SOPs to include:
___ a. Training and Standardization.
___ b. Administrative.
___ c. Maintenance.
___ d. Shop standards.
___ e. Crew rest.
___ f. Safety.
___ g. Crew selection.
___ h. Composite risk Management worksheets and SOP.
___ i. USR (Unit Status Report).

___15. Directive/policy letters/supplements to regulations that pertain to—
___ a. That particular operation.
___ b. Assignment of tasks/missions.
___ c. Field manuals/training circulars.
___16. Safety meeting minutes/council meeting minutes/OHR file/last ARMS results, unit hazard log.
___17. 1:50,000 map which includes location of accident site.
___18. Survey of mishap site/wreckage (if requested by board).
___19. UICs/office symbols and chain-of-command addresses from unit through Army Command (MACOM).
___20. Name, grade, phone number of safety officer.
___21. Collateral officer's name, unit, and telephone number.
___22. Post organization chart and installation phone book.
___23. ATC tapes (from initial contact through -1 hours) and any avail able radar data.
___24. Unit and installation pre-accident plan and quarterly AARs of testing.
___25. Unit training schedule that covers the activity.
___26. Schedule 30 minutes with battalion and brigade commanders.
___27. Recovery team for aircraft (on-call).
___28. Inventory of aircraft (if destroyed).
___29. Photo lab support/printing.
___30. Copies of past 2 QTB briefings for unit and METL.
___31. Copies of past 2 QTG briefings from higher headquarters and long-range training calendar.
___32. MEDEVAC information (if utilized). Must include LOG, Tri age sheet, name all personnel involved.
___33. Duty logs from unit and higher, base operations logs, MEDE VAC log, fire station logs, range control, etc.
___34. Installation supplement to AR 95-1 (as required).
___35. Unit ARTEP manual/mission training plan (MTP).
___36. Access to interpreter (if required).

MAINTENANCE RECORDS

E-form equivalents may be used as forms and records are updated to ULLs, ELAS, etc., and E-Pubs may be used in lieu of hard copy manuals.

___ 1. Aircraft logbook.
___ a. DA Form 2408 5
___ b. DA Form 2408 12
___ c. DA Form 2408 13, 13-1, 13-2, 13-3
___ d. DA Form 2408 14
___ e. DA Form 2408-18
___ f. Weight and balance records.

___ 2. Historical records.
- ___ a. Six month file (DA Form 2408-13).
- ___ b. DA Forms 2408 15, 16, 17, and 18.
- ___ c. Oil analysis records.
- ___ d. DA Forms 2404 retained on file.
- ___ e. DA Forms 2407 Maintenance Work Orders.

___ 3. Equipment Improvement Report (EIR), Quality Deficiency Report (QDR) or Product Quality Deficiency Report if appropriate (SF 368).
- ___ a. Oil analysis records and samples sent.
- ___ b. Fuel analysis.
- ___ 4. -10 Operators Manual (with all current changes).
- ___ 5. Checklist.
- ___ 6. ATM and any unit supplemental tasks.
- ___ 7. -23 maintenance repair manual.
- ___ 8. –23P parts manuals.
- ___ 9. TM series 1-1500-204-23-1 thru 10.
- ___ 10. TM 1-1500-328-23.
- ___ 11. DA PAM 738-751.
- ___ 12. Units last flying hour report for that type aircraft.
- ___ 13. Operations Information.
- ___ a. PPC.
- ___ b. Briefing forms/composite risk assessment.
- ___ c. Flight plan.
- ___ d. Planning weather DD175.
- ___ e. Weight and Balance DD365-4.

___ 14. Aviation Life Support Equipment(ALSE) maintenance records, helmets, vests, radios, LPU, etc.

___ 15. NVG maintenance records and TMs.

___ 16. Copy of maintenance contract (if aircraft is under contract maintenance).

Recommended FACILITIES, SUPPLIES AND EQUIPMENT

Meeting room with sufficient tables and chairs, and lockable room with key.
Telephone lines (a minimum of 2), access to speaker phone and internet access if required.
Easels (2) with pads of paper.
White board markers and felt tip pens (assorted colors).
Binders, three-ring, one and three inch (3 ea.).
Document protectors (one box).
Manilla file folders (one box).
Blank CD's (preferably CD-RW) (5 ea.).
Notebook dividers (6 ea.).
Scissors.
Stapler (with staples).

Masking tape (one roll).
Scotch tape (one roll).
Assorted post-it pads.
Assorted post-it tape flags.
Note pads (one per board member).
Computer paper (two reams).
Boxes (three) to be used for temporary storage files.
Trash bags.
Hole punch (two and three hole punch).
Access to copier, shredder, FAX.

GROUND POINT-OF-CONTACT CHECKLIST

___ 1. Orders appointing investigation board.
___ 2. Blood/urine samples. (Ask that the command direct the testing of all personnel directly involved.)
___ 3. Witness information: name, rank, telephone number, summaries. Keep personnel segregated until they can be interviewed.
___ 4. Secure work area with access to commercial/DSN telephone. Table and seating capacity for 8 members.
___ 5. SIR, Casualty, MP, CID reports.
___ 6. Individual personnel records for all involved in accident.
__ a. ORB or ERB.
__ b. Training folders (individual, unit).
__ c. Individual counseling records.
___ 7. ECOD initiated as applicable.
___ 8. Individual(s) medical records and autopsy results, if applicable.
___ 9. Access to laser printer.
___10. Photo lab support (printing).
___11. Location and name of doctor conducting autopsy. (Request a doctor on the board be a part of the autopsy).
___12. Weather statement (signed by forecaster).
___13. Transportation to accident site by air (for overhead photos) and or ground.
___14. Unit and parent organization SOPs to include:
___ a. Training/Administrative.
___ b. Maintenance.
___ c. Shop Standards.
___ d. TACSOP.
___ e. Safety SOP.
___ f. Composite Risk Management Worksheets.
___ g. Unit Status Report (USR).
___15. Directives that pertain to that particular operation or assigned tasks to include Operation Order, METL or ARTEP task number, FMs, etc.

___16. OF 346 / 346-E Operator's Permit.
___17. DA Form 348-E/348 Operator's Qualification Record.
___18. 1:50,000 map which includes accident site.
___19. UICs/office symbols and chain-of-command to MACOM.
___20. Collateral officer: Name, address, phone number.
___21. Name, grade, title of safety manager, and address to send report.
___22. Chain-of-command organizational diagram.
___23. Installation Safety Office POC name and phone number.
___24. Unit POC name and phone number.
___25. MEDEVAC information (if utilized). Must include LOG, Triage sheet, name all personnel involved.
___26. Equipment Improvement Report, Quality Deficiency Report or Product Quality Deficiency Report if appropriate (SF 368).
___27. Range control LOG (if applicable), name and phone number for range POC.
___28. Safety meeting minutes/council meeting minutes.

NOTE: Ensure all equipment used in the operation is secure and available for the investigating board (i.e. ropes, field gear, parachute, etc.)

MAINTENANCE RECORDS (Vehicular/equipment accidents)

___ 1. DA Form 5988-E/2404, Daily Inspection Worksheet.
___ 2. DA Form 5988-E/2404 retained on file (Latest scheduled service).
___ 3. DA Form 5988-E/2408-14, Deferred Maintenance Worksheet.
___ 4. DA Form 2407/5504/5990-E, Maintenance Request Form (workorder).
___ 5. DA Form 5989-E Maintenance request register.
___ 6. DA Form 2408 20,5991-E Oil Analysis Record.
___ 7. DA Form 314, AWCMF-450 Preventive Maintenance Record.
___ 8. DA Form 2406, AWCMF-456 Materiel Condition Status Report.
___ 9. Calibration Records.
___10. DA Form 5987-E/1970 Motor Vehicle Dispatch.
___11. DA Form 2401/5982-E, Dispatch Log.
___12. Equipment Logbook.
___13. -10 Operator's Manual.
___14. -20 Organizational Maintenance Manual.
___15. "P" Parts Manual.
___16. DA 5992-E, 2408-9 Equipment Periodic usage.
___17. All associated equipment components for technical inspection.

Accident Unit Responsibilities

POC checklist for POV CAI
15 February 2007
(Date supersedes previous POC checklists)

Under the provisions of AR 385-40, the following list of information will be available and/or coordinated upon arrival of the investigation board:

It is the responsibility of the unit POC to perform these requirements and obtain the following items to facilitate the investigation.

** Denotes high priority. These items must be collected/completed prior to the board's arrival.*

- * ___ 1. Unit wiring/organizational diagram. (company, Bn, Bde)
- *___ 2. A copy of the unit Mission Statement.
- *___ 3. ORB or ERB of accident soldier(s).
- *___ 4. Work area with key:
  - Securable room (24 hour access), table and seating for 10
  - Phones (DSN & commercial), two internet access connections (preferably four), access to copier, shredder, fax & color printer
  - Telephone lines (2)
  - Easels (2) with pads of paper
  - White board markers and felt tip pens (assorted colors)
  - Document protectors (one box)
  - Manila file folders (one box)
  - Notebook dividers (6 ea)
  - Scissors
  - Stapler (with staples)
  - Masking tape (one roll, 2" wide)
  - Scotch tape (one roll)
  - Assorted post-it pads
  - Assorted post-it tape flags
  - Note pads (one per board member)
  - Computer paper (two reams)
  - Boxes (three) to be used for temporary storage files
  - Trash bags
  - Hole punch (two and three hole punch)
- *___5. Witness statements which include: name, rank and telephone number. Keep personnel segregated until interviewed.
- ___6. Identify list of personnel to be interviewed to include: name, rank, and phone number: Immediate supervisor, Section Sergeant, Platoon Sergeant, 1st Sergeant, Platoon Leader, and Company Commander.

- ___7. List of all members of his squad/section
- ___8. Soldier Member's name, phone number and address (if married) – Coordinate with BN chaplain for support.
- ___9. List of close friends in/outside of squad members.
- ___10. Vehicle Inspection Checklist(s) (If applicable)
- ___11. Counseling Statement(s)
- ___12. Safety Council Minutes
- ___13. Unit and parent organization SOPs, directives, policy letters, and supplements that pertain to:
  1. driver education and training
  2. unit safety
  3. pass and leave
  4. deployment and redeployments
  5. risk management.
- ___14. Copy of the unit training schedules for the last six months (QTBs).
- ___15. Risk assessments or documented risk management processes (TRiPS record) pertaining to the events leading up to or sur rounding the accident.
- ___16. Soldier's:
  1. personnel records: field 201 file, 2 and 2-1, etc…
  2. training records:
  3. counseling folder,
  4. driver's training records to include SF 346, DA Form 5984-E and/or DA Form 348.

Board Recorder Requirements
POC checklist for POV CAI
15 February 2007
(Date supersedes previous POC checklists

Under the provisions of AR 385-40, the following list of information will be available and/or coordinated upon arrival of the investigation board:

- ____1. Coordinate for the list of personnel to be interviewed to include: name, rank, and phone number: Immediate supervisor, Section Sergeant, Platoon Sergeant, 1st Sergeant, Platoon Leader, and Company Commander.
- ____2. Obtain a copy of the weather report at the time of the accident (Memo signed by forecaster that states weather conditions at the site, at the time of the accident).
- ____3. On-scene photos
- ____4. Collateral officer: Name, address, phone number.
- ____5. Obtain a map of the accident site. (1:50,000)
- ____6. Obtain copy of EMS & 911 run sheets and transcript of calls.

- ____7. Obtain copy of Medevac/Emergency response information (log, triage sheets, service provider data).
- ____8. Obtain list of name(s) and phone number(s) of the responding Police officer(s) who responded to the call.
- ____9. Obtain soldiers' medical records.
- ____10. Obtain name, grade, phone number, and title of the unit Safety manager.
- ____11. Obtain copy of SIR, CID, MP Blotter, Casualty report, and lo cal police report and press release (if the accident occurred off post).
- ____12. Determine location of vehicle involved in accident and coordi nate access to it.
- ____13. Location and name of doctor conducting autopsy. (Request a doctor on the board is a part of the autopsy).

Installation Director Requirements
POC checklist for POV CAI
15 February 2007
(Date supersedes previous POC checklists

Under the provisions of AR 385-40, the following list of information will be available and/or coordinated upon arrival of the investigation board:
It is very important to conduct the following tasks to facilitate the investigation.

- 1. Orders appointing the investigation board. (Ensure it has the HIPAA statement). Note Subject Matter Expert (SME) requirements below.
    a. Driving Accident Investigations SME Requirements
    1) Physician (may be a highly experienced PA).
    2) Police Officer – E-7 or above (a highly experienced E-6 is acceptable) or experienced DAC Police Officer; traffic ac cident reconstructionist preferred.
    3) Identify and notify the above individuals prior to arrival of the Accident Investigation Board from Fort Rucker. Subject Matter Experts will report to the USACRC Board members upon their arrival to the accident installation.
    4) Identified Subject Matter Experts are required to commit full time to the investigation Board, until released by the Board President. Investigations require at least 14 days to complete. The Board operates seven days per week.
    5) Subject Matter Experts need to read/review DA PAM 385-40, Chapter 1 and Chapter 2 through 2-6c, when identified as Board members. The Board Physician will focus on Human Factors of the accident and the Traffic Officer will focus on Materiel Factors.

- 2. The Soldiers' chain of command addresses (1st line leader thru MACOM level). Note: Chain of command address/ Letter of transmittal data are included in package
- 3. Assist in coordinating a secure board room for a two week period.
- 4. Obtain information on the following list of personnel for possible contact: (include name, position, and phone numbers for 24 hour access). This information is needed prior to the initial board in-briefing.
    - ___ Unit POC
    - ___ Installation Casualty Assistance Officer
    - ___ Installation JAG representative
    - ___ Installation Provost Marshall
    - ___ Installation Military Police liaison
    - ___ CID representative
    - ___ Installation Chaplain
    - ___ Installation traffic engineer representative.

APPENDIX D
AMMUNITION AND EXPLOSIVES ACCIDENT INVESTIGATIONS

E-1. REFERENCES.

a. AR 75-1, Malfunctions Involving Ammunition and Explosives, 20 Aug 93.
b. AR 195-2, Criminal Investigations Activities, 30 Oct 85.
c. CHAPTER 3 AR 385-10,Accident Reporting and Records,1 Nov 94.
d. AR 385-64, U.S. Army Explosives Safety Program, 20 Nov 97.

E-2. GENERAL. Investigations of accidents, which involve ammunition or explosives (A&E), are essentially like all other Army accident investigations, except that they can involve an additional investigation team. (Explosives accidents are described in chapter 9 of CHAPTER 3 AR 385-10).

E-3. COMMAND AND CONTROL. As with any accident in which criminal activity is suspected, primary jurisdiction over the accident site rests with CID, IAW chapter 3 of AR 195-2. Following release by the CID, the CAI/IAI Board conducts the primary accident investigation for DA/MACOM. All other investigations assume a subordinate role. The CAI/IAI Board President controls the coordination and investigative actions of all technical teams supporting the board, access to the accident site, and is responsible for releasing the site after all legitimate investigative actions are complete.

a. The U.S. Army Technical Center for Explosives Safety (USATCES) provides technical assistance upon request (IAW AR 385-64) to CAI/IAI investigations if A&E are involved. When the assistance of USATCES is not requested, technical ammunition assistance may be requested locally from supporting Quality Assurance Specialist (Ammunition Surveillance) (QASAS) personnel.
b. The DA Investigation Team for Malfunctions (DAITM) is authorized to perform an on-site inspection to establish the probable cause of an ammunition malfunction IAW AR 75-1, Chapter 3 and will conduct its investigation as part of the CAI/IAI.
c. Common factual information may be shared between the CAI/IAI, CID and the DAITM. However the contents of interview statements will not be released between the teams or with any other investiga tive bodies, except when the DAITM is part of the CAI/IAI. Each legitimate investigative body may, however, conduct separate inter views with the witnesses.
d. The DoD Explosives Safety Board (DDESB) has a legitimate interest in Army accidents, which involve A&E. However, the DDESB has no authority at an Army accident site and it should not correspond directly with the CAI/IAI Board concerning specific accidents. AR 385-64 establishes USATCES as the intermediary between the Army and the DDESB on requests for information, reports and requests for assistance. The CAI/IAI Board should refer requests for information from the DDESB to USATCES.

E-4. The supplementary technical data indicated below (as applicable) will be included in the appropriate blocks of DA Form 285 or DA Form 285-AB-R, per the form's instructions. Required data that is not entered on the DA Form 285 or DA Form 285-AB-R will be included as attachments. If a malfunction investigation was conducted as part of the investigation, much of this information should be available in the ammunition malfunction reports, prepared by the DAITM or local QASAS. If an ammunition malfunction investigation was not conducted, questions and assistance concerning the collection of this data may be obtained from local QASAS personnel or by calling the USATCES Hotline, DSN 956-6140, or commercial (918) 420-6140. All data must be addressed; if not applicable, so state—

a. Type of operation or transportation mode engaged in at the time of the accident (include reference to applicable standing operating procedure (SOP) or regulatory document).
b. The following information, if not previously reported: quantity, type, lot number, configuration, and packaging of ammunition/explosives involved in the accident.
c. Type of reaction or reactions—
    (1) Single reaction such as detonation, deflagration, fire, release, or activation.
    (2) Multiple reaction such as detonation and fire.
    (3) Communications of reactions such as detonations caused by fire, fire caused by detonation, detonation propagates to detonation, detonation to deflagration, etc., and the time sequences between such events, if applicable.
d. Possible or known causes.
e. Aerial and ground photographs, color whenever possible, of the accident taken as soon as possible after the accident.
f. Maps, charts, and overlays of the accident area showing or listing the following data:
    (1) Location of personnel killed or injured with respect to the accident origin.
    (2) Area containing property with complete destruction (more than 75 percent).
    (3) Area containing property damage beyond economical repair (50 to 75 percent).
    (4) Area containing repairable property (1 to 49 percent).
    (5) Radii of uniform or irregular glass breakage. When possible, include type and dimensions of glass broken at the farthest point.
    (6) Locations and dimensions of craters.
    (7) Distances from the accident origin at which direct propagation occurred, and whether from blast, fragments, firebrands, or fire.
    (8) Approximate number, size, and location of hazardous fragments and debris.

g. Describe any influence of the following factors on the accident:
    (1) Environmental and meteorological, such as cloud cover, wind direction and velocity, temperatures, relative humidity, electromagnetic radiation (EMR), and electrostatic conditions.
    (2) Topographical features such as hills, forests, lakes.
    (3) Structural features at the accident origin such as exterior and interior walls, substantial dividing walls, bulkheads, roofs, and overheads, doors and windows, cells or magazines, earth cover, barricades.
    (4) Safety features other than structural at the accident origin such as remote controls, sprinkler systems, deluge systems, detectors, alarms, blast traps, suppressive shielding, protective clothing and equipment (PCE).
    (5) Position, orientation, and type of construction of all structures, damaged or not, located within the maximum radius of damage. When the applicable intermagazine distance (IMD), intraline distance (ILD); or inhabited building distances (IBD) are greater than the radius of actual damage, show the location, orientation, and type construction of all structures situated within quantity distance (QD) radii.
    (6) Vessels, vehicles, and mobile equipment locations within maximum radius of damage. If QD requirements are greater than the actual area of damage, indicate the actual distance and damage sustained to all equipment located within all the QD arcs.
    (7) Personnel locations within maximum radius of damage. If QD requirements are greater than the actual area of injury, indicate the actual distance to all personnel located within all the QD arcs and extent of injuries received.
    (8) Explosives, ammunition, and chemical agent location, type of configuration, amounts, and protection provided within maximum radius of damage, or if QD requirements are greater, the location within the applicable magazine and intraline arcs.
    (9) Identify buildings, exposures, and other locations that are under special consideration or waiver. The completed waiver package will be submitted as an appendix to the report. Describe interim safety measures that prevented injury or damage.
h. The report will include an analysis of the accident sequence, the conclusions reached from the investigation, and recommendations to prevent reoccurrence.

APPENDIX E
COMMAND IN-BRIEF

G-1. GENERAL. The board president should attempt to in-brief the local chain-of-command as soon as possible after arrival. The command in-brief is informal and does not require media support or a briefing room. Often, it is done in the appointing authority's (or designated representative's) office. The purpose is to inform the appointing authority of the board's mission, composition and requirements. On occasion, the appointing authority may provide additional guidance regarding areas that he feels need particular emphasis. If time is available, the board president may need to in-brief the chain-of-command down to the battalion level (may be conducted via telephone).

G-2. CONDUCT OF THE IN-BRIEF. In many cases, this will not be the first accident investigation for the appointing authority. The board president will adjust the in-brief as necessary to provide the appropriate amount of detail. At a minimum, ensure the following areas are addressed:

a. Introduce yourself (and recorder if available).
b. Identify other board members and advisors.
c. Briefly explain investigation process.
    (1) Investigation conducted IAW CHAPTER 3 AR 385-10.
    (2) "3W" approach.
    (3) For accident prevention purposes only.
    (4) Accident causes - environmental, materiel and human.
    (5) Expect investigation to take 2-3 weeks.
d. Explain any significant assistance the board may require.
e. Explain relationship with collateral board (you may want to mention that a collateral investigation is required for all Class A accidents IAW paragraph 1-8c, CHAPTER 3 AR 385-10).
f. Explain that routine updates will NOT be provided. However, you will notify the chain-of-command of any hazard that requires immediate attention.
g. NOTE: the appointing authority may issue you additional guidance to closely examine specific areas of interest. Be prepared to take notes.

APPENDIX F
INITIAL BOARD BRIEFING

H-1. Reference: Paragraph 2-1 b(1), DA Pam 385-40.

H-2. In most cases, this will be the first time any of the board members have performed an accident investigation. It is important that everyone understand the mission and end result of the accident investigation. The initial board briefing, conducted by the president, should include at least the following:

a. Introductions (office/phone #).
b. Ensure board is comprised of personnel qualified in the system under investigation; i.e., technical inspector (TI), maintenance officer, medical doctor (per CHAPTER 3 AR 385-10).
c. Explain (and ensure understanding) that they are to be dedicated to the investigation (reschedule calendars for 2 weeks).
d. Explain investigative mission:
    (1) For accident prevention purposes only. Investigative results CANNOT be used for personnel actions or in support of determining legal liabilities.
    (2) Human/materiel/environmental causes.
    (3) Approximate duration of investigation (2 weeks).
    (4) Recap date/time/summary of accident (you may ask the unit POC to give the summary if he has a better understanding than you do at this point).
    (5) Review DA Pam 385 40 as a guide for completing the forms (Chapter 3 for Aviation; Chapter 4 for Ground).
e. Explain investigation:
    (1) Data collection phase-Collection of factual information.
    (2) Analysis phase- Analysis of the factual information to determine its relevancy/correlation to the accident. Additional data collection may ensue pursuant to those issues raised during this phase.
    (3) Deliberations phase- The board's proceedings to collectively identify the cause of the accident, determine why it occurred, formulate the findings, and present recommendations to prevent recurrence.
f. Assign work groups/leaders:
    (1) Human factors (doctor, IP, training specialist).
    (2) Materiel factors (test pilot, TI, maintenance technician).
    (3) Environmental factors (as required).
g. Explain report preparation.
h. Assign responsibility for report sections:
    (1) History of flight/events (president)
    (2) Human Factors
    (3) Materiel Factors

(4) Analysis (president)
(5) Findings/recommendations (president)
(6) DA Form 2397/285 series (all groups)

i. Establish a daily meeting time to exchange information.
j. Allow work groups organization time.
k. Request for support personnel (i.e., CCAD, Natick Lab, AMCOM, etc.) will be coordinated through USACRC operations, DSN 558-2660/3410.
l. Discuss release of information outside board (only PAO and Board President).
m. Discuss work relationships with technical advisors (e.g., manufacturers).
n. Discuss work relationship with the collateral investigation board.
o. Collection of all notes, materials, etc. at completion.
p. Use of cell phones and potential release of information. Type of information appropriate for cell phone: facts only. Do not discuss findings, recommendations, analysis, opinions, etc.

APPENDIX G
MATERIAL AND HUMAN FACTORS TEAM ACTIONS
Aviation Materiel Factors Team
(Maintenance Officer and Technical Inspector)

Initial action at accident scene:

1. Remain outside the secured crash site area until the initial site photography is completed. The board president or recorder will notify you when to enter.
2. Do not move (or touch) any items (parts, pieces, controls, etc.) or disturb ground scars or marks until they are properly documented (measured and photographed).
3. Systematically record instrument readings, control positions, switch positions, and avionics equipment settings as soon as possible. Pre serve with photographs.
4. Assist the board recorder in the photography and data collection for the wreckage distribution diagram.
5. Account for all aircraft parts.
6. Check continuity of drive train and examine rotational damage.
7. Keep a notebook and record anomalies as you find them. Safeguard notes throughout investigation and provide them to the recorder upon completion of the investigation.
8. Keep an open mind, don't speculate or draw conclusions until all data is collected.
9. Do not discuss anything concerning the accident or the data collected with anyone outside the investigation board (especially the collateral officer).

Be aware of bloodborne pathogens and composite materials. Use appropriate personal protective equipment.

The responsibilities and duties of the maintenance member(s) are as follows:

1. Evaluate all maintenance forms/records to determine the pre accident status of the equipment.
2. Determine if equipment failed and could have contributed to or caused the accident.
3. Research equipment records for adequacy of inspections and correction of discrepancies.
4. Determine if discrepancies existed that may have caused or contributed to the accident.
5. Supervise preparation and shipment of items selected for teardown analysis.
6. Monitor equipment recovery if accomplished before completion of the investigation.
7. Review unit's maintenance procedures and record discrepancies.
8. Assist with the preparation of accident scene diagram(s).

9. Examine and record all factors involving operations of the equipment.
10. Ensure all data is collected concerning the following issues prior to deliberations:
    a. Materiel inspection (failures and design errors)
    b. Maintenance SOP review
    c. Weight and balance record review
    d. Maintenance record review (current and 6 month file)
    e. Historical records review
    f. POL analysis
11. Ensure all maintenance/materiel factor requirements for the technical report are collected. Write the materiel factors narrative for the technical report.
12. Gather data to support the following paragraphs in the report:
    a. Aircraft airworthiness
    b. Flight recorders
    c. Airframe
    d. Systems
    e. Power plant
    f. Rotor system or propellers
    g. Transmission/gear boxes and drive train
    h. Laboratory analysis
    i. Crash site information
    j. Fire
13. Collect required data and complete the DA Form 2397 series as directed by the board recorder.
14. Perform other duties as assigned by the board president.

Aviation Human Factors Team
(Flight Surgeon, Instructor Pilot, Instrument Flight Examiner, Maintenance Flight Examiner)

Initial action at accident scene:

1. Remain outside the secured crash site area until the initial site photography is completed. The board president or recorder will notify you when to enter.
2. Do not move (or touch) any items (parts, pieces, controls, etc.) or disturb ground scars or marks until they are properly documented (measured and photographed).
3. Systematically record possible injury mechanisms based on the seating positions of crewmembers. Preserve with photographs.
4. Investigate ALSE. Document location, use, operability, possible impact on preventing or causing injury, etc. Preserve with photographs.
5. Assist the board recorder in the photography. Point out anomalies that need to be recorded.

6. Account for all crewmembers personal gear. Check for over the counter medications.
7. Observe possible egress paths out of fuselage. Determine survivability based on crewmember locations (adequate space).
8. Keep a notebook and record anomalies as you find them. Safeguard notes throughout investigation and provide them to the recorder upon completion of the investigation.
9. Keep an open mind, don't speculate or draw conclusions until all data is collected.
10. Do not discuss anything concerning the accident or the data collected with anyone outside the investigation board (especially the collateral officer).

Be aware of bloodborne pathogens and composite materials. Use appropriate personal protective equipment

Aviation Human Factors Team
(Flight Surgeon, Instructor Pilot, Instrument Flight Examiner, Maintenance Flight Examiner)

The responsibilities and duties of the human factors board members are as follows:

1. Lead the medical, physiological, and psychological analysis of the human factors investigation. AR 40 21, AR 40 2, and appropriate chapters of this handbook govern the investigation and reporting of these factors.
2. Evaluate accident survival, emergency egress, and rescue portions of the human factors investigations.
3. Ensure the board is advised of medical/human factors related to the cause(s) of the accident, the reason therefore, and recommendations for corrective action.
4. In case of off post accidents or where local coroners/medical examiners are involved, promptly recover the remains for autopsy (if applicable), specimen collection, records, etc.
5. Investigate and report data concerning personnel injuries.
6. Collect and evaluate life support equipment (LSE), and personal protective clothing and equipment (PCE).
7. Determine the medical qualification/status of the personnel involved and rescue personnel.
8. Investigate and record the status of personnel/individual training, experience, operating regulations, instructions, and unit directives. Recommend and prepare changes to ARs and TMs, if required.
9. Investigate the activities of all personnel who were victims, had an influence on the mission, or played a role in the accident.
10. Complete a weight and balance form and PPC for the actual conditions at the time of the accident.

11. Ensure all human factors requirements for the technical report are collected. Write the human factors narrative for the technical report.
12. Gather data to support the following paragraphs in the report:
    a. Personnel background information
    b. Personnel management
    c. Aircraft suitability
    d. Communications/Air Traffic Control
    e. Navigational Aids
    f. Meteorological information
    g. Ground support services
    h. Crash survivability
    i. Emergency egress, survival, and rescue
    j. Special investigation
    k. Witness investigation
13. Collect required data and complete the DA Form 2397 series as directed by the board recorder.
14. Perform other duties as assigned by the board president.

Ground Materiel Factors Team
(Maintenance Officer and Technical Inspector)

Initial action at accident scene:

1. Remain outside the secured crash site area until the initial site photography is completed. The board president or recorder will notify you when to enter.
2. Do not move (or touch) any items (parts, pieces, controls, etc.) or disturb ground scars or marks until they are properly documented (measured and photographed).
3. Systematically record instrument readings, control positions, and switch positions, as soon as possible. Preserve with photographs.
4. Assist the board recorder in the photography and data collection for the accident site diagram.
5. Account for all vehicle/equipment parts.
6. Keep a notebook and record anomalies as you find them. Safeguard notes throughout investigation and provide them to the recorder upon completion of the investigation.
7. Keep an open mind, don't speculate or draw conclusions until all data is collected.
8. Do not discuss anything concerning the accident or the data collected with anyone outside the investigation board (especially the collateral officer).

Be aware of bloodborne pathogens and composite materials.
Use appropriate personal protective equipment.

Ground Materiel Factors Team

(Maintenance Officer and Technical Inspector)

The responsibilities and duties of the maintenance member(s) are as follows:

1. Evaluate all maintenance forms/records to determine the pre accident status of the equipment.
2. Determine if equipment failed and could have contributed to or caused the accident.
3. Research equipment records for adequacy of inspections and correction of discrepancies.
4. Determine if discrepancies existed that may have caused or contributed to the accident.
5. Supervise preparation and shipment of items selected for teardown analysis.
6. Monitor equipment recovery if accomplished before completion of the investigation.
7. Review unit's maintenance procedures and record discrepancies.
8. Assist with the preparation of accident scene diagram(s).
9. Examine and record all factors involving operations of the equipment.
10. Ensure all data is collected concerning the following issues prior to deliberations:
    a. Materiel inspection (failures and design errors)
    b. Maintenance SOP review
    c. Maintenance record review (current and past)
    d. Historical records review
    e. POL analysis
11. Ensure all maintenance/materiel factor requirements for the technical report are collected. Write the materiel factors narrative for the technical report.
12. Gather data to support the following paragraphs in the report:
    a. Vehicle/system/equipment worthiness
    b. Systems
    c. Engine
    d. Transmission
    e. Laboratory analysis
    f. Accident site information
    g. Fire
13. Collect required data and complete the ground accident report forms (DA Form 285 series) as directed by the board recorder.
14. Perform other duties as assigned by the board president.

Ground Human Factors Team

(Medical Officer, Master Gunner/Driver, Jumpmaster, etc.)

Initial action at accident scene:

1. Remain outside the secured accident site area until the initial site photography is completed. The board president or recorder will notify you when to enter.

2. Do not move (or touch) any items (parts, pieces, controls, etc.) or disturb ground scars or marks until they are properly documented (measured and photographed).
3. Systematically record possible injury mechanisms based on the seating positions of crewmembers. Preserve with photographs.
4. Assist the board recorder in the photography. Point out anomalies that need to be recorded.
5. Account for all crewmembers personal gear. Check for over-the-counter medications.
6. Observe possible egress paths out of fuselage. Determine survivability based on personnel locations in vehicles (adequate space).
7. Keep a notebook and record anomalies as you find them. Safeguard notes throughout investigation and provide them to the recorder upon completion of the investigation.
8. Keep an open mind, don't speculate or draw conclusions until all data is collected.
9. Do not discuss anything concerning the accident or the data collected with anyone outside the investigation board (especially the collateral officer).

Be aware of bloodborne pathogens and composite materials. Use appropriate personal protective equipment.

Ground Human Factors Team
(Medical Officer, Master Gunner/Driver, Jumpmaster, etc.)

The responsibilities and duties of the human factors board members are as follows:

1. Lead the medical, physiological, and psychological analysis of the human factors investigation. AR 40 21, AR 40 2, and appropriate chapters of this handbook govern the investigation and reporting of these factors.
2. Evaluate accident survival, emergency egress, and rescue portions of the human factors investigations.
3. Ensure the board is advised of medical/human factors related to the cause(s) of the accident, the reason therefore, and recommendations for corrective action.
4. In case of off post accidents or where local coroners/medical examiners are involved, promptly recover the remains for autopsy (if applicable), specimen collection, records, etc.
5. Investigate and report data concerning personnel injuries.
6. Collect and evaluate personal protective clothing and equipment (PCE).
7. Determine the medical qualification/status of the personnel involved and rescue personnel.
8. Investigate and record the status of personnel/individual training, experience, operating regulations, instructions, and unit directives. Recommend and prepare changes to ARs and TMs, if required.

9. Investigate the activities of all personnel who were victims, had an influence on the mission, or played a role in the accident.
10. Ensure all human factors requirements for the technical report are collected. Write the human factors narrative for the technical report.
11. Gather data to support the following paragraphs in the report:
    a. Personnel background information
    b. Personnel management
    c. Vehicle/system/equipment suitability
    d. Communications
    e. Meteorological information
    f. Support services
    g. Accident survivability
    h. Rescue operations
    i. Special investigation
    j. Witness investigation
12. Collect required data and complete the ground accident report forms (DA Form 285 series) as directed by the board recorder.
13. Perform other duties as assigned by the board president.

Appendix H. Board Member Information

Investigation	C	(YYMMDD)	Time

Board	Name	Rank	S	B	Av

Unit / Company	Home	Tempora
Phone	Phone	Phone
E	E	

Board	Name	Rank	S	B	Av

Unit / Company	Home	Tempora
Phone	Phone	Phone
E	E	

Board	Name	Rank	S	B	Av

Unit / Company	Home	Tempora
Phone	Phone	Phone
E	E	

Board	Name	Rank	S	B	Av

Unit / Company	Home	Tempora
Phone	Phone	Phone
E	E	

Board	Name	Rank	S	B	Av

Unit / Company	Home	Tempora
Phone	Phone	Phone
E	E	

Appendix I
Request for Teardown Analysis

USASC Request For Teardown Analysis		
Requested by:		Date:
Address:		Ph: DSN
		Com
Comp	Comp	Comp
SN	SN	SN
NSN	NSN	NSN
P/N	P/N	P/N
TSN	TSN	TSN
TSO	TSO	TSO
Prior Overhaul	Prior Overhaul	Prior Overhaul
Activity / Date	Activity / Date	Activity / Date
QDR No.	QDR No.	QDR No.
Mishap date & time:	Aircraft SN:	Aircraft MTDS:
Mishap class:	Request approved by:	
Org performing analysis:	Date report received:	
Date CCAD notified:	USASC Control #:	
Reason for analysis:		

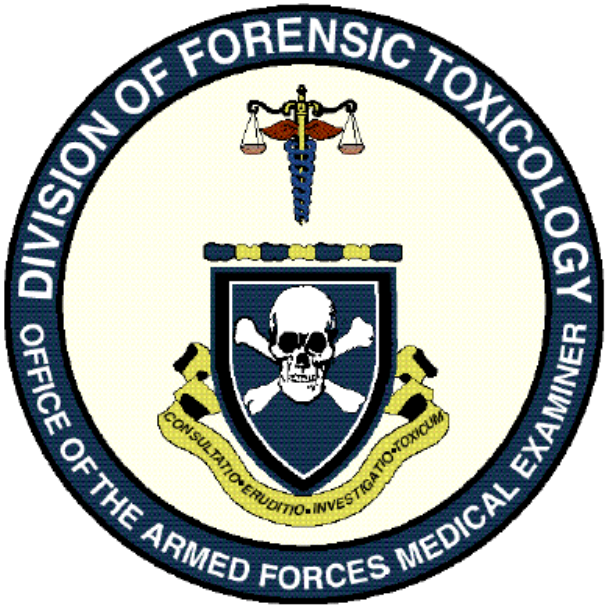
USASC Form 500

USASC Request For Teardown Analysis		
Requested by:		Date:
Address:		Ph: DSN
		Com
Comp	Comp	Comp
SN	SN	SN
NSN	NSN	NSN
P/N	P/N	P/N
TSN	TSN	TSN
TSO	TSO	TSO
Prior Overhaul	Prior Overhaul	Prior Overhaul
Activity / Date	Activity / Date	Activity / Date
QDR No.	QDR No.	QDR No.
Mishap date & time:	Aircraft SN:	Aircraft MTDS:
Mishap class:	Request approved by:	
Org performing analysis:	Date report received:	
Date CCAD notified:	USASC Control #:	
Reason for analysis:		

USASC Form 500

DIVISION OF FORENSIC TOXICOLOGY
OFFICE OF THE ARMED FORCES
MEDICAL EXAMINER

ARMED FORCES INSTITUTE OF PATHOLOGY



GUIDELINES FOR THE COLLECTION AND SHIPMENT OF SPECIMENS FOR TOXICOLOGICAL ANALYSIS

MICHAEL L. SMITH, Ph.D., D.A.B.F.T.
COL, MS, USA

Chief Deputy Medical Examiner
Forensic Toxicology

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World Wide Web*: http://www.afip.org/oafme/tox/tox.html
*reflects change

March 1, 1999

TABLE OF CONTENTS

I. *MISSION*

The Division of Forensic Toxicology (DFT), Office of the Armed Forces Medical Examiner (OAFME), Armed Forces Institute of Pathology (AFIP), located at the AFIP Annex, Rockville, MD, remains the DoD's centralized laboratory which performs routine toxicological examinations on Class A, B, and C military aircraft, ground, and ship (sea) mishaps in which *no* fatalities occur (hereinafter referred to as incidents); OAFME cases to include all military aircraft, ground, and ship (sea) accidents involving fatalities; selected military autopsies; biological specimens from AFOSI, CID, and NCIS criminal investigations; blood for legal alcohol and drug tests in DUI and DWI medicolegal determinations; blood and urine in fitness-for-duty interrogations; and, selected forensic cases of national interest.

II. *NON-FATALITY CASES (Aircraft ,Ground, & Ship Incidents):*

A. COLLECTION:

The following specimens should be collected and submitted:

BLOOD:	7 - 14 mL (NaF; [*gray* top] tubes)
	7 - 14 mL (EDTA; [*purple* top] tubes)
	5 - 10 mL (Clot; [*red top*]* spun or unspun tubes)
URINE:	50 - 70 mL (no preservative)

***DO NOT use SST / CORVAC/ Tiger Top tubes** for blood collection; the serum- separating gel has been shown to absorb certain classes of drugs. Hand-mix the blood tubes after collection and forward all specimens to our laboratory after properly labeling each tube or container with the name and SSAN of the individual. You are not required to retain any samples at your facility unless your protocol requires it. Send all urine collected; do not delay the entire shipment if the urine container(s) and/ or blood tube(s) are less than the optimal amounts.

B. PACKAGING & SHIPMENT:

Each specimen should be individually wrapped in an absorbent packing material and then placed in a heat-sealed or zip-lock plastic bag; blood and urine should be packaged separately. Next, place all specimens and paperwork (paperwork should also be sealed in a separate plastic bag) from a single individual in another heat sealed or zip-lock plastic bag; do not package different types of specimens together nor package more than one set of patient specimens in each bag. The blood and/or urine should be packed, ***unfrozen***, in a shipping container of sturdy cardboard, plastic or metal construction, sealed, and then sent by the fastest means possible to the AFIP, such as FedEx®, U.S. Priority Mail, or U.S. Second-Day Mail. ***DO NOT*** send package(s) by Registered, Certified, Air Freight, or "Return Receipt Requested" as this will cause significant delays in the delivery of the specimens. Each individual's set of specimens submitted **must** have an accompanying AFIP Form 1323 (see *Attachment 1*) and any other documentation pertinent to the case (paperwork should be sealed in a plastic bag). Note that failure to submit a properly completed AFIP Form 1323 will delay processing, may result in an incomplete analysis of the submitted specimens, and may cause test results to be returned to the wrong address.

III. *FATALITY CASES (Aircraft, Ground, Ship, & Routine Autopsies):*

A. COLLECTION:

In order for the Division to furnish accurate and meaningful toxicological analyses, it is strongly recommended that the following fluid and tissue samples be submitted for testing:

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

1) For victims who survive and later expire during a hospital stay, it can be extremely beneficial if the contributor can furnish any antemortem samples (often stored in a clinical laboratory's refrigerator) along with the postmortem samples. Clearly label the source of all samples (e.g., heart blood or peripheral blood) and clearly differentiate antemortem from postmortem specimens. In addition, list the date and time when the specimens were collected.

2) Prompt collection of specimens is essential so they may be protected from contamination and degradation. The remains should be refrigerated as soon as possible. ***NO ONE***, under any circumstances, should attempt collection of blood, urine, or bile by needle puncture if an autopsy is to be performed. Such attempts may result in unsuitable toxicology specimens and cause contamination of crucial evidence such as body wounds, markings, and other prominent features.

3) Excellent specimens can easily be obtained at autopsy. The pathologist should select the toxicology samples during examination of the remains and have his or her assistant(s) prepare containers or tubes beforehand. For accidents involving fragmentation of two or more bodies, the flight surgeon and/or pathologist must ensure that the fragments are properly identified before being submitted as specific individuals. If this cannot be guaranteed, specimens must be labeled as commingled remains.

4) If no fluids or organs can be recovered, 100 grams of muscle (psoas, perispinal, or deep thigh preferred), and/or fat and red bone marrow can be submitted. In severe crush injuries, the gallbladder will often remain intact, permitting bile collection. Remember that even in the most severely burned or fragmented cases, valuable information can often be obtained from only a few grams of dried blood or tissue (esp. spleen). If in doubt, submit as much tissue as is practical; ***do not submit formalin-fixed tissue for toxicological analysis***. All specimens must be labeled with the sample type, decedent's name, and SSAN (if known). A properly completed AFIP Form 1323 (see *Attachment 1*) **must** be submitted with each fatality or OAFME case (including any other documentation pertinent to the case).

B. PACKAGING & PRESERVATION:

Each specimen must be individually packaged and (preferably) heat sealed in a sturdy polyethylene bag (see *Table 1* for NSN supplies). ***Plastic containers and cellophane-laminated plastic bags must not be used*** for frozen specimens, as they will become brittle, crack, and break when frozen on dry ice.

Fluids should be placed in tightly closed, screw-cap, polyethylene containers and must be labeled with the contents, decedent's name, and SSAN. Indelible felt tipped pens are very useful for this purpose. Care must be taken to avoid contamination of the specimens with solvents that may be found in some inks, formalin-fixed tissue, alcohol, disinfectants, or deodorants. Make sure each tissue is individually packaged, since drug distribution studies of different organs often provide critical information concerning drug use and potential toxicity. Chemical fixatives, such as formalin, embalming fluids, etc., cause interference with toxicological analyses; ***do not submit formalin-fixed tissue for toxicological analysis***.

FREEZING with dry ice is the method of choice for preserving tissue. Note that ***glass tubes will often shatter upon thawing when frozen on dry ice*** and paper and tape labels will not stick under the same conditions; it is imperative that each specimen and its accompanying paperwork are all *individually* packaged to prevent contamination upon thawing.

C. SHIPMENT:

All specimen containers should be wrapped with sufficient absorbent material to contain any leakage and then placed in another polyethylene plastic bag and again heat sealed. The AFIP Form 1323 and any other pertinent paperwork should be placed in a separate, sealed plastic bag and placed inside the box (along with the samples) and not included with other shipping documents that may be affixed to the outside of the mailing box. A third, large polyethylene bag should be used to keep all specimens and forms from one individual together.

The frozen tissue(s) and body fluid(s) must then 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, do not use containers in which CO_2 gas is not permitted to escape; gas pressure within a sealed container presents a hazard and could cause the container to burst! ***Dry ice must not be placed in a thermos bottle***. Do not use glass containers for packaging or allow fluid containers to come in direct contact with the dry ice, as they will crack. Rather, place tissue containers closest to the dry ice and isolate glass tubes (if used) by encasing them in a separate plastic container *away* from the dry ice.

The shipment MUST be sent via an express mail service. Although Saturday and Sunday delivery is acceptable, it is preferred that packages *arrive* Monday through Friday. This is the only rapid means available to ensure that frozen specimens arrive at the AFIP as quickly as is necessary to prevent decomposition.

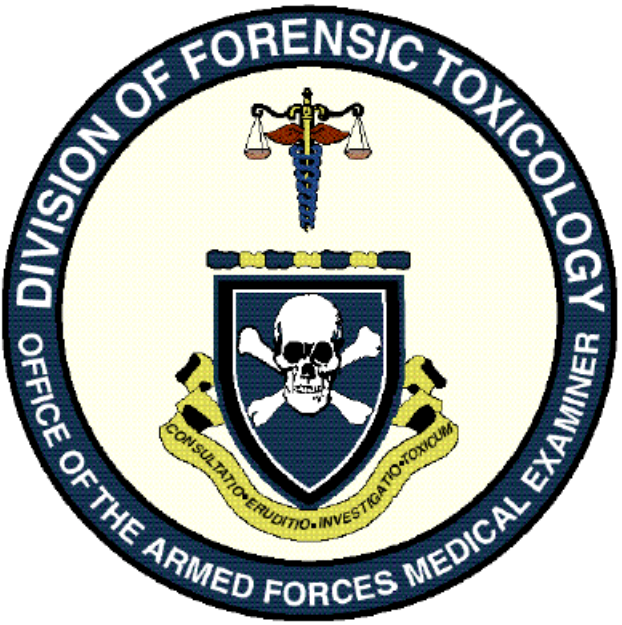
*********DO NOT MAIL ANY PARCELS TO OUR ROCKVILLE, MD ADDRESS*********

A courier service has been implemented to transport your packages from the AFIP main building (Washington, DC) to our location in Rockville, MD.

We cannot overemphasize the need to pack the specimens with the utmost of care in sturdy containers that are properly labeled and with the correct paperwork. Doing so will protect the integrity of the samples and safeguard all individuals who deliver, open, and process your mail.

DIVISION OF FORENSIC TOXICOLOGY
OFFICE OF THE ARMED FORCES
MEDICAL EXAMINER

ARMED FORCES INSTITUTE OF PATHOLOGY



GUIDELINES FOR THE COLLECTION AND SHIPMENT OF SPECIMENS FOR TOXICOLOGICAL ANALYSIS

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World Wide Web*: http://www.afip.org/oafme/tox/tox.html
***reflects change**

March 1, 1999

V. *MAILING ADDRESS:*

Though our laboratory has moved, ***please continue to use the following address*** for all submissions. ***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."* It is also important that the word "Biohazard" ***DOES NOT*** appear anywhere on the outside wrapping of the package. Refer to the ***Domestic Mail Manual Sections CO23.8.4 through CO23.8.10 for complete instructions.***

Armed Forces Institute of Pathology
Attn: Division of Forensic Toxicology
Building 54
6825 16th Street, NW
Washington, DC 20306-6000

VI. *COMMUNICATION:*

Division of Forensic Toxicology (AFIP-Annex, Rockville, MD) Voice and VoiceMail:
Forensic Toxicology (Comm & DSN).....(301) 319-0100 or 285-0100 (DSN)
Forensic Toxicology (Toll-Free).....(800) 944-7912, Option # 4

AFIP Main Building (Washington, DC) Voice:
AFIP Information (24 hrs.).....(202) 782-2100 or 662-2100 (DSN)
AFIP Case Search (Center for Adv Path).....(800) 774-8427
AFIP Receiving & Accessions (RRR).....(202) 782-1630 or 662-1630 (DSN)

Facsimile (FAX):
Forensic Toxicology.....(301) 319-0628 or 285-0628 (DSN)

E-Mail: FORTOX@AFIP.OSD.MIL

World Wide Web (WWW) address* to view and print electronic version of this SOP, or obtain fillable Adobe Acrobat or Delrina Formflow versions of AFIP FORM 1323: (*changed)
http://www.afip.org/oafme/tox/tox.html

VII. *PAPERWORK:*

NEW AND IMPROVED! A single-sided AFIP Form 1323, rev. FEB 99, *AFIP/ Division of Forensic Toxicology - Toxicological Request* Form has been developed to replace the outdated version created in 1960. Significant improvements including larger demographic boxes, clearer subject areas, and an updated chain-of-custody section should make completing one easier than ever. The form is also downloadable from the Web in both printable and fillable formats. ***Submitting triple copies of the AFIP Form 1323 is no longer required***; complete and submit one form for each person (see ***Attachment 2 sample),*** including any other applicable forms relative to the case. The paperwork should be placed and sealed in a separate polyethylene bag. All available information [a brief history of the events surrounding the incident, crash, death, etc.; pertinent drug history; scene description; condition of the body(ies) when recovered; and/ or autopsy report] should also be submitted with the specimens. These historical data and array of applicable facts can assist the toxicologist in selecting special procedures to supplement routine analysis. Paperwork should be carefully printed or typed. Again, we cannot overemphasize the importance of establishing chain-of-custody documentation with a properly completed AFIP Form 1323 form. Correctly completed paperwork must be submitted with each case or significant delays will occur.

Appendix K. Crash Site Worksheet

Debris/component location as measured from:

Component/Debris	Ph	Dist	Azim	Component/Debris	Ph	Dist	Azim
1.				13.			
2.				14.			
3.				15.			
4.				16.			
5.				17.			
6.				18.			
7.				19.			
8.				20.			
9.				21.			
10.				22.			
11.				23.			
12.				24.			

Ground scars/ strike marks / gouges as measured from:

Scar/mark (Description)	Ph	Measurements	Dist	Azim
1.		L x W x D (∠ °) Orientation		
2.		L x W x D (∠ °) Orientation		
3.		L x W x D (∠ °) Orientation		
4.		L x W x D (∠ °) Orientation		
5.		L x W x D (∠ °) Orientation		
6.		L x W x D (∠ °) Orientation		
7.		L x W x D (∠ °) Orientation		
8.		L x W x D (∠ °) Orientation		
9.		L x W x D (∠ °) Orientation		
10.		L x W x D (∠ °) Orientation		
11.		L x W x D (∠ °) Orientation		

Crash Site Data

Location: MGRS: _____ Lat/Long: _____

Source of grid: ☐ GPS ☐ Map ☐ Data: ☐ WGS84 ☐ Earlier

Slopes: In direction of travel: ____ ° Perpendicular to direction of travel: ____ °	**Aircraft Attitude @ Impact**
Terrain type: ☐ Mountain ☐ Desert ☐ Rolling ☐ Flat ☐ Water	Pitch ____ °
Obstacles: ☐ Stumps ☐ Trees ☐ Bldg ☐ Wires ☐ Rocks/Boulders ☐ Other _____	Roll ____ °
Surface: ☐ Prepared ☐ Ice ☐ Sod ☐ Snow ☐ Soggy ☐ Water	Yaw ____ °

Crash Dynamics Data

Damage to landing gear: _____

Landing gear that struck the ground prior to fuselage: ☐ Both ☐ One ☐ None

APPENDIX L
AUTHORIZED COLLATERAL BOARD INFORMATION

O-1. References: CHAPTER 3 AR 385-10, para 1-8; DA Pam 385-40, para 2-1f.

O-2. GENERAL. IAW CHAPTER 3 AR 385-10, the accident investigation board has priority over the collateral investigation. Collateral board members will not interfere with the accident investigation at any time. For cases of fratricide, Operations Office, USACRC, will provide special instructions.

O-3. Witnesses may not appear before a Collateral Board until the Accident Investigation Board has released them. The accident board will provide a list of witnesses to the collateral officer.

O-4. The memorandum written for the Collateral Board explains the mandates regarding CAI release of information. The following information may be provided to the Collateral Inves¬tigation Board:

a. Photographs (dependant upon captions on the photos)
b. Teardown and analysis
c. Fuel and oil analysis
d. ECOD
e. Maintenance records
f. Flight planning materials
g. Medical, Flight, and Training records
h. Preliminary Accident reports
i. Autopsy reports
j. Weather reports
k. Cockpit voice transcripts

O-5. Information that will not be given the Collateral board includes--

a. Witness statements taken in the safety investigation effort (285W and 2397-4).
b. The Board's Findings, analysis, and recommendations.
c. Any other analysis or assumptions derived at by the Accident Investigation Board.

NOTE: The board president should consult the USACRC legal officer concerning the release of gun camera videos, and information obtained from flight data recorders and other electronic information recording devices installed on Army vehicles and aircraft.

APPENDIX M

HANDLING AND DISPOSITION OF PHYSICAL EVIDENCE

P-1. PURPOSE. To establish written guidance for the disposition of evidence gathered by the accident investiga¬tion board. Evidence includes witness inter-view audio tapes, written transcripts, laboratory reports, field technical reports, photos, slides, videotapes, negatives, hand written notes, copies of personnel and medical records, draft forms and records, etc. The board recorder will be responsible for the disposi¬tion of all evidence acquired during the course of the investigation.

P-2. RESPONSIBILITIES.

a. The board is responsible for handling and disposition of evidence and materials. This includes destruction of all verbal and documentary evidence and materials that are not part of the final report. Procedures are found in paragraph P-3 below.

b. If the recorder departs the Combat Readiness Center, the appropriate division chief, or someone designated by him, is responsible for handling and disposition of evidence and materials.

c. Board members are responsible for assuring that all evidence and materials are provided to the board recorder.

P-3. PROCEDURES.

a. Audiotapes and written transcripts of witness interviews: Summarize audiotapes and/or transcripts as soon after the inter¬view as practical. Destroy tapes or transcripts when no longer needed or when the formal report has been approved for staffing, whichever comes first. If a criminal investigation is ongoing, consult the USACRC Command Judge Advocate prior to destruction.

b. Technical reports, personnel and medical records, field notes, etc., will be turned over to the board recorder/ president. All notes and documents that are not included in the final report will be safeguard-ed by the board recorder until the report is reviewed and approved by the board appointing authority. At this point, all materials that are not part of the final report will be destroyed/shredded.

c. Multimedia products.

(1) Retain control of all pictures, slides, videotapes, and other multimedia products until the final report is completed.

(2) Normal photographing procedures/techniques remain in effect.

(3) If possible, make a videotape of the accident site.

(4) Collect originals/copies of all photographic and audio sources. This includes any injury or body part photographs provided to the surgeon.

(5) For digital photos taken with the digital cameras, refer to the settings described in paragraph P-4 below.

(6) For videotapes, refer to the techniques established below.

(7) Upon completion download all photos to the appropriate accident folder as noted in paragraph P-5. This location will ensure limited access to the material and will serve as the storage area for accident photos.

d. The board recorder will maintain control of all Audio Visual material until the final report is returned. Chain of Command will provide final disposition instructions for the material.

P-4. DIGITAL PHOTOS.

a. Set quality of digital image for capture Kodak DC290 Best/Ultra setting
b. Upon completion immediately library the photos.
c. Download camera. Place all images from all sources into subdirectory.
d. Add any photos supplied from other sources. Rename to accident name - 01, 02, 03, etc.

P-5. Instructions for filing products from CAI investigations. Photos and other media products will be stored in the following manner:

a. Aviation. Common\Accidents\Aviation\A-Accident case number (ex: A-000815-0946-7015473)\A000815-0946-7015473-01 (01 is the photo number)
b. Ground. Common\ Accidents\ Ground\ Accident case number (G-20010101)\ G20010101-01 G20010101-02 (01 and 02 are the photo numbers)
c. Select photos for accident report (Check with M&M for decisions on best photo quality). Maintain a copy of the final PPT out-brief in this subdirectory. Give all photos with body parts to USACRC Flight Surgeon, but assure those not used in the final report are destroyed.

P-6. REDUCING KODAK ORIGINAL PHOTO FILES TO PPT-SIZE FILES. First, it is essential that the board recorder maintain original photo files at the large size for future use. Due to their size, do not attempt to insert in PPT. Instead, make a smaller version for use in PPT presentations and for email. A procedure for reducing digital photos to manageable size follows:

a. In order to reduce the disk space and transmission time required for PowerPoint presentations, follow the procedure below. This procedure is relatively simple and does not require manipulation of individual photographs--
    (1) Set up your PowerPoint presentation exactly as you want it to appear when you transmit it to the Center. Save as a ppt file.
    (2) Go to the drop down menu under 'File' and click on 'Save As.' When the 'Save As' box opens:
    (3) Go to the drop down menu labeled 'Save as type' (bottom of box).
    (4) Scroll down to 'JPEG File Interchange Format' and click.
    (5) Click on the 'Save' button to the right. This will save your file with a .jpg extention.
    (6) A box will appear that asks if you want to export every slide in the presentation. Answer yes. PowerPoint will

then create a folder of JPEG images, one for each slide in the presentation.

b. Next open a blank file in PowerPoint, then--
   (1) Go to the drop down menu under 'Insert' and click on 'Picture'.
   (2) Click on 'From File.'. Go to the folder created for the .jpg pictures (i.e., step 2 above).
   (3) Insert one picture per slide in your new file.
   (4) Size and position each picture as desired and then save the file as a PowerPoint file in the conventional way with a different name than your original.

c. You will end up with three files: the original ppt (step 1), the jpg folder (step 2), and the reduced ppt for transmission (step 3). The new PowerPoint presentation will be reduced by as much as 90% from the original and can be much more easily sent via email.

APPENDIX N
WRECKAGE DISTRIBUTION DIAGRAM
(Ref: DA Pam 385-40, paragraph 3-8)

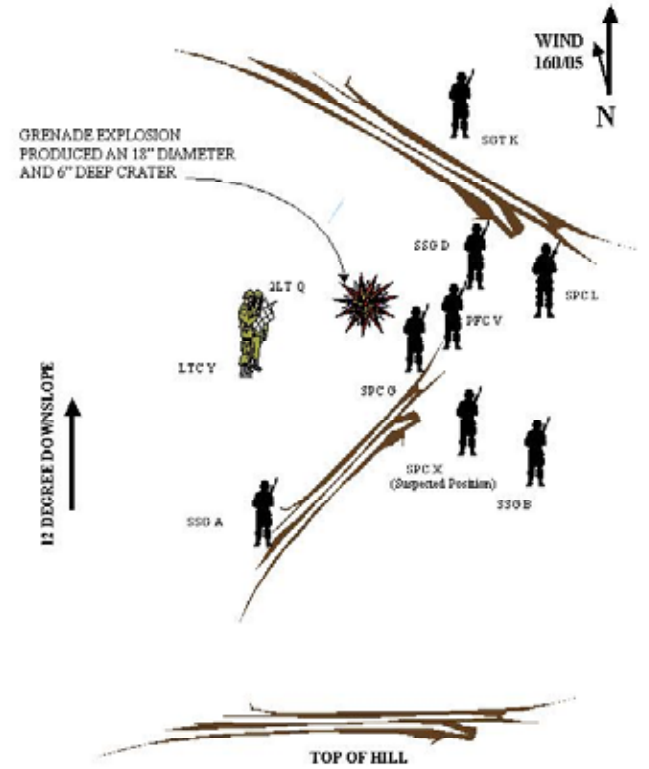
Q-1. The Wreckage Distribution Diagram depicts the location of all components in their post-crash/accident positions. Diagramming of the accident site should begin as soon as possible after arrival at the accident site. No one should be allowed into the secured area until the locations of all components are accounted for and marked. Make sure that all parts or pieces are accounted for and diagrammed. The board should consider using post or local engineer survey assets, when available, to conduct a to-scale site survey. The Board should build a sector sketch that will represent a clear view of the accident scene.

Q-2. The following is a sample checklist to follow for the Wreckage Distribution Diagram.

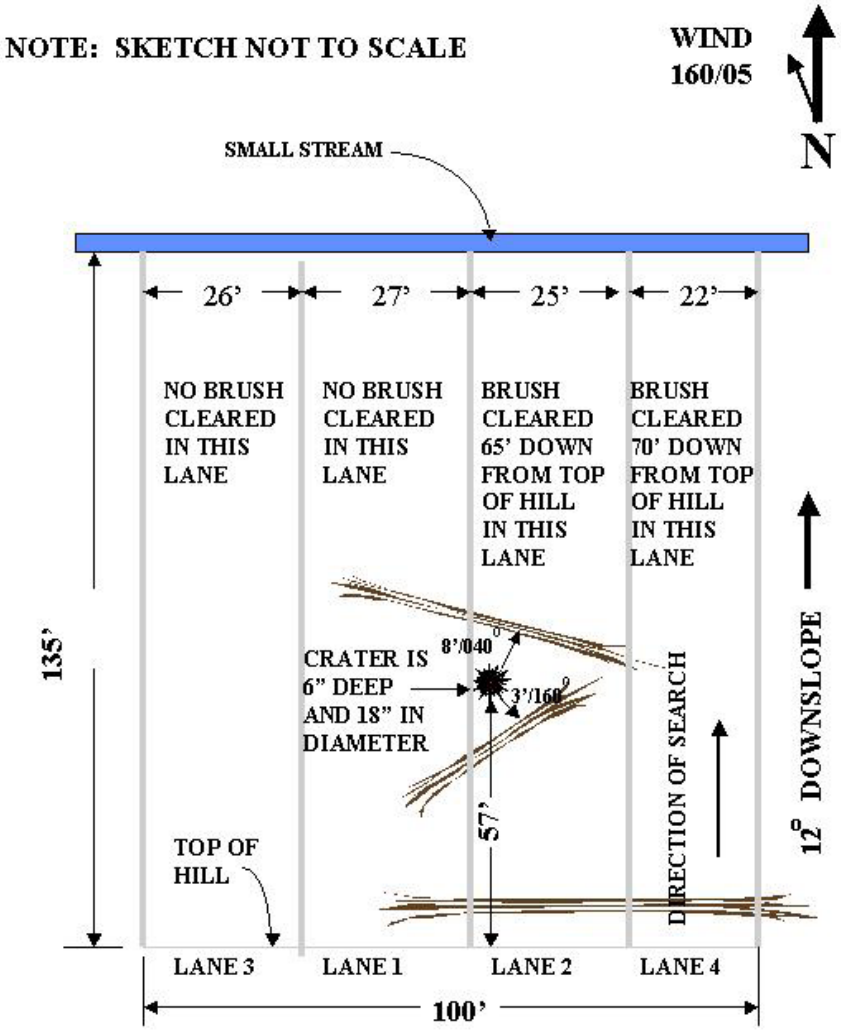
___ a. Has arrangement been made for facility engineers to plot wreckage?
___ b. Has the wreckage distribution plot been initiated?
___ c. Does the wreckage distribution plot show location of all aircraft/vehicle components in their post-crash/accident position relative to the flight path of aircraft just prior to impact?
___ d. Does the wreckage distribution plot show a plane and profile view?
___ e. Does the wreckage distribution plot show all terrain marks made by aircraft/vehicle/equipment in the crash sequence (earth gouge depth, length and width, snow or earth pushed in front of the aircraft/vehicle, etc.)?
___ f. Have all components, terrain marks, obstacles, witnesses, terrain features been surveyed to give distance and azimuth from the main wreckage?
___ g. Does the wreckage distribution plot show the major impact of the aircraft/vehicle or equipment?
___ h. Does the wreckage distribution plot show the secondary impact(s) of the aircraft/vehicle?
___ i. Does the wreckage distribution plot show the location of eyewitnesses?
___ j. Is the wreckage distribution plot complete and accurate?
___ k. Have the locations of all occupants been determined?
___ l. Has flight controls and settings been determined and noted (controls, radios, autopilot, flaps, etc)?
___ m. Has the flight path or direction of travel been determined?
___ n. Has flight altitude prior to accident descent been determined?
___ o. Has flight attitude prior to accident descent been determined?
___ p. Have the lateral and longitudinal attitudes at ground impact been determined?
___ q. Has the speed at impact been determined? G-forces?

___ r. Has the angle of impact been determined?
___ s. Has the angle from obstacle to initial ground impact been determined?
___ t. Has the distance of travel and of structural displacement from initial impact been accurately measured?
___ u. Has the manner of flight (straight, cart-wheeling, etc.) after impact been determined?
___ v. Have the personal effects been plotted/accounted for?

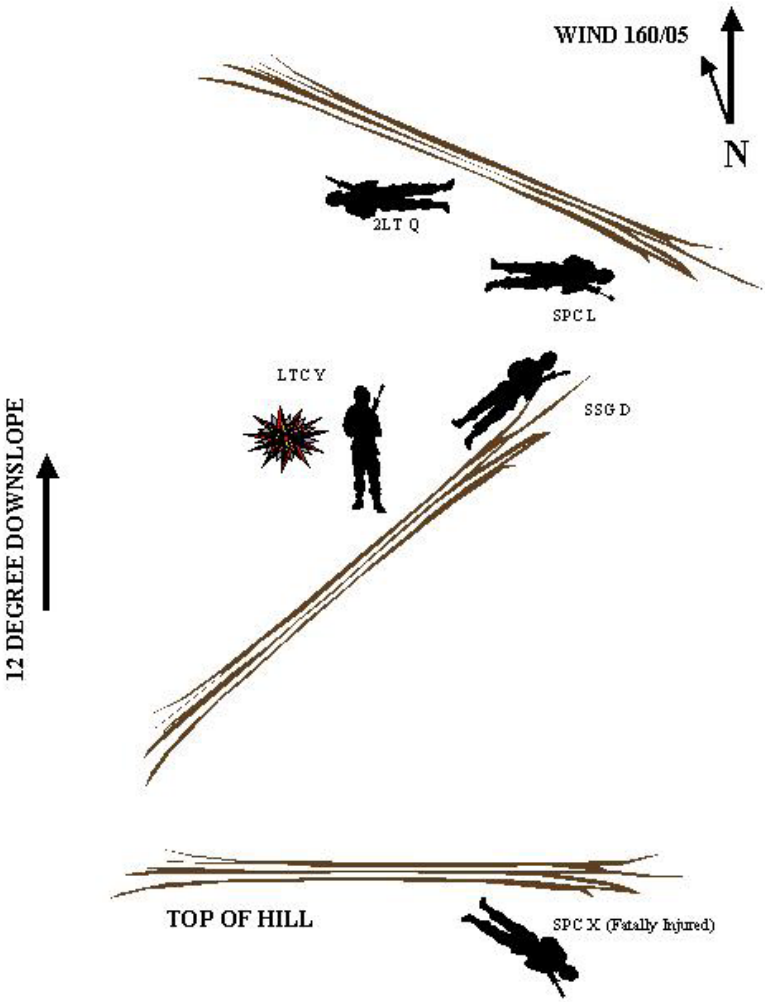
Q-3. Examples of site/wreckage distribution diagrams (Ground Investigations).



ACCIDENT SCENE SKETCH SHOWING APPROXIMATE POSITION OF SOLDIERS JUST PRIOR TO THE GRENADE EXPLODING. LOCATIONS ARE BASED ON WITNESS INTERVIEWS.
SKETCH IS NOT TO SCALE.

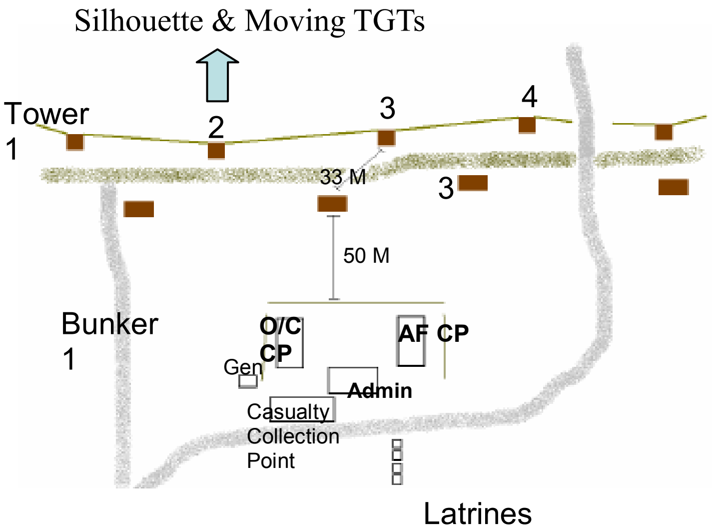


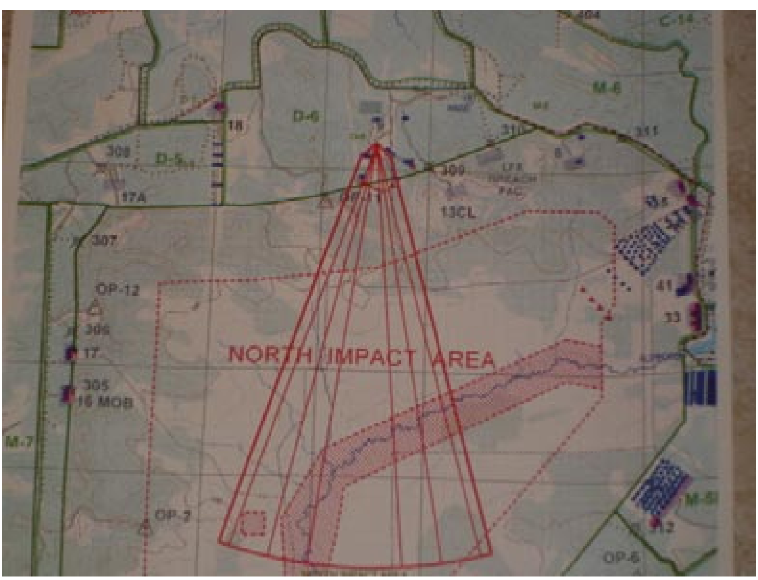
ACCIDENT SCENE SKETCH DEPICTING HOW AREA WAS CORDONED OFF INTO LANES AND THEN SYSTEMATICALLY SEARCHED FOR THE GRENADE.



ACCIDENT SCENE SKETCH SHOWING APPROXIMATE POSITION OF SOLDIERS WHO WERE CRITICALLY AND FATALLY INJURED WHEN GRENADE EXPLODED. LOCATIONS ARE BASED ON INTERVIEWS WITH MEDICS FIRST ON THE SCENE.

SKETCH IS NOT TO SCALE.


Silhouette & Moving TGTs
Tower 1
2
3
4
33 M
3
50 M
Bunker 1
O/C CP
AF CP
Gen
Admin
Casualty Collection Point
Latrines


NORTH IMPACT AREA
D-6
D-5
308
17A
307
OP-12
306
17
305
16 MOB
M-7
OP-7
309
13CL
310
311
M-6
41
33
M-5
312
OP-6
18

APPENDIX O
FIRE INVESTIGATION

I. INTRODUCTION.

Fire frequently destroys or consumes clues that could readily disclose the accident cause; for example ruptured or chafed-through fuel lines may be the origin of the fire and the cause of the accident and then subsequently be consumed by the fire. Fire that is a result, rather than a cause, of an accident also hampers the investigator by destruction or damage of evidence. With a thorough knowledge of fire science, fire behavior, and the vehicle and aircraft systems, the investigator will be able to determine the origin of the fire, its ignition source, the reason for the fire, and the category of fire.

Remember, a fire investigation is a systematic search of the accident scene for information about a fire. Its primary purpose is to reconstruct the events that led to the fire – to seek out the cause of the fire.

II. DEFINITIONS.

a. Auto-ignition temperature – the temperature at which a material will ignite on its own without any outside source of ignition.
b. Combustibles (Ordinary) – sources of fuel for a fire that include flammable materials such as wood, paper, cloth, metal, rubber, plastic, and glass.
c. Combustible liquid – liquid having a flash point at or above 100º F.
d. Deflagration – subsonic gaseous combustion resulting in intense heat and light and possibly a low level shock wave. Deflagration is a very rapid burning that produces intense heat. It can occur when a combustible gas (such as propane from a barbecue grill) becomes mixed with air in particular proportions and is then ignited. The type of explosion gives an indication of the amount of gases involved or the explosive limit of the gases. For example, a large volume of gases creates longer burning fire with a small explosion and a characteristic whoosh sound. In addition to sound, where the explosion takes place can be significant. Some gases are lighter than air, hence an explosion that occurs in the bottom half of a structure might eliminate certain ignition sources.
e. Detonation – a supersonic combustion process occurring in a confined or open space characterized by a shock wave preceding the flame front.
f. Diffusion flame or open flame – rapid oxidation reaction with production of heat and light. A gas flame or candle flame is termed an open flame, as is the initial fireball during an aircraft impact.
g. Eutectic Melting – the lowest temperature at which aluminum alloy will melt. At this temperature, a phenomenon called “broom straw effect ”occurs if the aluminum is highly stressed.

h. Explosion – detonation within a confined space resulting in a rapid buildup of pressure and rupture of the confining vessel.
i. Fire – rapid oxidation or other fuel reaction producing heat and light.
j. Fire Resistant – the ability of a material or structure to withstand the effects of fire over time.
k. Flame Resistant – material is considered flame resistant when it does not continue to burn when the ignition source is removed.
l. Flammable liquid – liquid that has a flash point below 100º F and a vapor pressure not exceeding 40 pounds per square inch absolute (psia) at 100º F. Fuel (JP-4, -5, -8, MOGAS), hydraulic fluid, engine oil, and skydrol are examples of flammable liquids.
m. Flammability limits – generally expressed as the upper explosive limit (UEL) and lower explosive limit (LEL). These describe the highest and lowest concentrations of a fuel in air by volume in percent, which will sustain combustion. A fuel-air mixture below the LEL is too lean to burn and a mixture above the UEL is too rich too burn. These limits do not play a role in a post crash fire but are significant in in-flight fire. For there to be an in-flight fire, the aircraft must be in a temperature/altitude condition where the fuel-air mixture can exist. Normally, this is between altitudes of 13,000 and 20,000 feet MSL. Below 13,000 feet MSL, there is too much oxygen and too little vapors for an in-flight fire and above 20,000 feet MSL, there are too many vapors and not enough oxygen for an in-flight fire.
n. Flashover – the situation where an area or its contents are heated to above its auto-ignition temperature, but does not ignite due a lack of oxygen. When oxygen is added, the area and its contents ignite simultaneously, sometimes with explosive force.
o. Flash point – the lowest temperature at which a material will produce a flammable vapor. It is a measure of the volatility of the material.
p. Ground fire – fire which spreads over a wide area (or several separate areas) and normally exists as puddles of burning, uncontained fuels spilled from fuel tanks and lines damaged in the crash. Also known as post-crash fire.
q. Impact fire – fires whose explosion-like fireball is a direct result of high energy (steep and fast i.e., stall/spin) crashes that atomize fuel into a fine, fast, hot-burning mist.
r. In-flight fire – fire that existed before the aircraft impacted the ground.
s. Post-crash fire – same as ground fire.
t. Production of explosive gases – explosive gases are produced during the second stage of a fire. That is, as the temperature of the fire rises toward 800° to 1000° F and the available supply of oxygen is lowered, incomplete burning produces smoke and gases. The hazard

here is that these gases are not vented and they become heated above their ignition temperature. These gases are capable of igniting with explosive force when a new air supply is suddenly introduced. This sudden ignition of hot, unburned gases is termed backdraft.

u. Stoichiometric - Every chemical reaction has its characteristic proportions. Stoichiometry is the branch of chemistry and chemical engineering that deals with the quantities of substances that enter into, and are produced by, chemical reactions.

v. Volatility - is the evaporation capability of a given substance. The greater the tendency of substance to vaporize, the more volatile it is.

III. FIRE SCIENCE AND FIRE BEHAVIOR.

Fire investigation requires both knowledge of fire science and fire behavior. To have a fire there must be fuel, oxygen, and heat (See Figure R-1 below - The Fire Triangle).

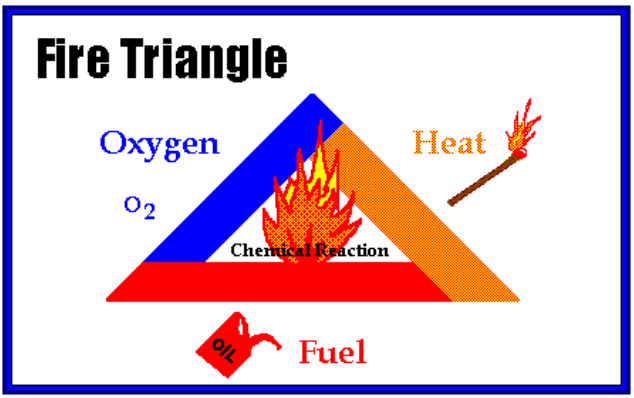


FIGURE R-1. The Fire Triangle.

The heat must be of sufficient intensity to cause the fuel (liquid, or solid) to vaporize and then ignite the vapors. The three elements of the fire triangle may be independently varied with ignition occurring under certain conditions. A change in one element may affect the other two elements. A stronger ignition source (heat) may lower the amount of oxygen required (lower oxygen concentration) and/or reduce the amount of fuel vapors necessary at ignition. Increasing the amount of oxygen available may lower the energy necessary for ignition (heat) and/or decrease the amount of fuel vapors needed. For sustained burning, the fire itself must produce enough heat to vaporize more fuel, creating a chain reaction. Additionally, the more oxygen added to the fire, the faster and hotter it burns. An external aircraft in-flight fire will burn at temperatures greater than 3000º F due to the slipstream of air. A post-crash fire will normally burn at 2000º F in still air.

a. By-products of Combustion.

(1) Flame – burning fuel vapor along with hot fuel particles.

(2) Gases – invisible products of complete or incomplete burning. These include acrolein, ammonia, carbon monoxide, hydrogen bromide, hydrogen cyanide, hydrogen chloride, hydrogen sulfide, sulfur dioxide, and nitrogen dioxide.

(3) Smoke – smoke is a combination of gases, air, and suspended particles that are the products of incomplete combustion.

(4) Heat – generated by the chemical reaction called burning. Heat always flows from a higher temperature to a lower temperature, never from a lower temperature to a higher temperature without an outside force being applied. Fires generate heat, which is necessary to sustain fire. Excess heat is then transferred to surrounding objects, which may ignite, explode, or decompose. Heat transfer is accomplished by three methods – conduction, convection, and radiation.

b. Methods of Heat Transfer – An understanding of how heat travels, allows the investigator to start the investigation with where the fire was extinguished and backtrack along avenues of heat travel to the origin of the fire.

(1) Convection – heat transfer through the movement of gases. The gases may be the direct product of fires, the results of chemical reaction, or additional gases brought to the fire by the movement of air and heated at the fire surfaces by conduction. Convection determines the general direction of the spread of the fire. Convection causes fires to rise as heat rises and to move in the direction of the prevailing air currents.

(2) Conduction – the transfer of heat through direct contact of two materials. Heat a metal pipe and touch a second pipe, the second pipe will also get hot. This often accounts for a fire spreading from one area to another, even when a wall separates each area.

(3) Radiation – radiation is defined as the electromagnetic wave transfer of heat to a solid. Waves travel in all directions from the fire and may be reflected off a surface, as well as be absorbed by it. Absorbed heat may raise the temperature beyond the material's combustion point, and then a fire erupts. Heat may also be conducted through a vessel to its contents, which will then expand and may explode.

c. Heat Intensity. Heat intensity is another possible means by which the investigator can determine the crash/fire sequence. The flame temperature of a post-crash fire, in which combustibles like gasoline,

JP-4, lubricating oils, and hydraulic fluids are being consumed, are normally in the range of 1600º to 2000º F. The flame temperatures of an in-flight fire may be in excess of 3000º F due to the forced draft of the slipstream. The effect of the forced draft causes the fuel/air ratio to be a nearly stoichiometric mixture. Therefore, when parts having a melting point in excess of 2000ºF, like stainless steel and titanium, show evidence of melting, it is a strong indication the fire occurred in flight. The indication of an in-flight fire is even stronger if the part is found in an area in which it appears that the ground fire was not intense. But remember, it is possible for ground fires to exceed 2000ºF. Strong ground winds may provide a forced draft, or peculiar piling of the wreckage may produce a "chimney effect" and the fire will make its own draft. Also, materials like magnesium may be present which burn with an intense flame. Usually, the areas in which a flame temperature is hot enough to melt stainless steel and titanium are very small and are the result of some localized jet effect, similar to that made by a welding torch.

d. Soot Patterns. A soot pattern is formed as a result of the soot drifting with the air stream. Soot can attach itself to an object by means of the unburned oils it contains and by electrostatic attraction. Remember that soot will not attach itself to surfaces that are over approximately 700º F. Any object that tends to shroud or block off another part will affect the shape of the pattern. The blocked part will show the general outline of the object that provides the blocking effect. If a part is found with such an outline, but the part that did the blocking is not there, the pattern must have occurred before impact. However, if both the outlined and blocking part are to be related but the blocking part is not normally in this position in the aircraft, the pattern was formed after impact; for example, the finding of a clean surface when unfolding a sooted piece of metal.

e. Heat Patterns and Ignition Characteristics of Flammable Materials and Liquids. A heat pattern consists of the deterioration and discoloration of the objects in the affected area. In order to detect the pattern, an investigator must know the effects of heat on various materials. The degree of these effects is a function of time at temperature. The time of exposure must be considered in cases of a sustained fire. Usually, a knowledge of the effects of heat on materials will enable the investigator to determine the relative deterioration and from this, the heat pattern. Listed below are heat and ignition characteristics on some flammable materials and liquids.

    (1) Magnesium – Magnesium chips and thin sections burn more readily than thick sections and require an intense fire to ignite. It turns molten at 1050° F to 1200° F and may ignite. It burns with an intense white flame, is a good source of re-ignition for other flammable materials and

liquids, and typically cannot be extinguished with the usual aircraft fire-extinguishing agents. Magnesium fires are self-sustaining and the oxide deposits vary between white and black. Magnesium is used in bearing supports and frames, and housings and other engine and landing gear components.

(2) Pure Aluminum – Aluminum fires are not self-sustaining and pure aluminum melts at 1175° F.

(3) Aluminum Alloys – Aluminum alloys melt at 1200° F and ignite at 1250° F. They are used in compressor casings, seals, fittings, aircraft skin, and honeycomb construction.

(4) Titanium – Titanium chips and thin sections burn more readily than thick sections. It melts at 3100° F, ignites at 2500° F and high speed rubbing between titanium parts may cause ignition. It burns smoothly with little sparking and requires a high concentration of oxygen to continue burning. It discolors from tan to light blue to dark blue to gray with increasing temperature. Titanium has a high affinity for gases when heated and a scale will begin to form at 1100° F. This scale (crust or flaking) increases in thickness with time at temperature. Titanium is used in compressor blades, cases, supports, and other engine and landing gear parts.

(5) Steel – Steel melts at 2700° F and ignites at 2750° F. It begins to discolor at 800° F to 900° F and turns tan to light blue to dark blue to black. Low and medium carbon steels are used in compressor rotor discs and turbine casings. Stainless steel is used in inlet guide vanes, cases, supports, and other engine and landing gear parts.

(6) Zinc Chromate – turns tan at 450° F, brown at 500° F, dark brown at 600° F, and blackens at 700° F.

(7) Copper – melts at 2000° F. Copper is used in bearing cages and wiring.

(8) Brass – melts at 1600° F to 2000° F. Brass is used in bearings and bushings.

(9) Lead – melts at 625° F.

(10) Rubber – Neoprene rubber blisters at 500° F and silicone rubber blisters at 700° F. Rubber is used in seals, clamp liners, gaskets, and fuel hoses.

(11) Petroleum Products (Flammable Liquids) – Generally require temperatures over 800° F for ignition. High airflow (slipstream) reduces likelihood of ignition but produces more damage when fire does occur. Skydrol will sustain a fire at temperatures of 425° F or greater.

Flame temperatures of post-crash fires in which fuel is being burned in still air are generally in the range of 1600°-2000°F. Listed below are the flammability characteristics of some aircraft fuels and oils:

(a) JP-4 – has a flashpoint of 0º F and an ignition temperature of 470º-480º F.

(b) JP-5 (Kerosene or Jet-A) – has a flashpoint of 105º-150º F and an ignition temperature of 440º-475º F.

(c) JP-8 – has a flashpoint of 115º F and an ignition temperature of 435º F.

(d) Jet A/A-1 – has a flashpoint of 105º - 140º F and an ignition temperature of 435º - 484º F.

(e) MIL-H-5606 – has a flashpoint of 220º F and an ignition temperature of 400º F.

(f) MIL-H-83282 – has a flashpoint of 425º F, an ignition temperature of 680º F, and is fire resistant.

(g) Skydrol – has a flashpoint of 360º F, an ignition temperature of 925º F, and is fire resistant.

(h) Hydraulic Fluid (Petroleum Based) – has a flashpoint of 195º F and an ignition temperature of 437º F.

(i) Hydraulic Fluid (Synthetic) – has a flashpoint of 320º F and an ignition temperature of 945º F.

(j) Engine Oil – has a flashpoint of 437º F and an ignition temperature of 440º - 480º F.

(k) Kerosene – has a flashpoint of 95º - 145º F and an ignition temperature of 440º - 480º F.

(l2) Composites. In today's aircraft and vehicles, carbon fiber and fiberglass are the principal composites. Fiberglass will melt at 1200º F, but the reaction of a carbon fiber composite is dependent upon the resin that is used in the construction of the material. The carbon will decompose no farther with exposure to fire but the resin will melt, destroying the integrity of the structure. The melting temperature of the resin varies with the each resin, but they will normally burn out at 1100º F or below.

NOTE 1: Parts with large mass may retain sufficient heat to discolor the edges of the fracture surfaces.

NOTE 2: Additional heat affects (discoloration) of metals are listed in Figure R-2.

NOTE 3: Additional temperature ranges and melting points of different metals are listed in Figure R-3.

f. Smoke Stain Analysis. Smoke travels in a consistent pattern that is based on what the structure allows it to do. Smoke will travel upwards and at a slight slant (depending on air currents) away from the fire source. It will therefore stain ceilings (inside of the aircraft and vehicle) unless those ceilings are involved with direct flame contact. The smoke, once its vertical travel is halted, will move horizontally seeking to continue upward. If the horizontal and vertical movements are stopped, the smoke begins to "pile up" in one corner; when this happens the smoke is forced downward in an identifiable pattern known as mushrooming. Mushrooming looks like fingers on a hand splayed in a downward direction.

g. Smoke Color Analysis. The color of smoke is of help in determining what is burning. The earlier the smoke color is observed, the more meaning it has. Smoke colors and their meanings are at paragraph f above.

h. Burn Pattern Analysis. Each object involved in a fire is affected in a more or less unique way by heat and flames. The type of damage done and the rate and intensity of burning depends on such factors as the material, shape, surface area, and exterior finish of the object. These factors, and the fire itself, determine the patterns of damage that remain on the object after the fire is extinguished.

(1) Characteristic Burn Patterns--

(a) Ordinary Combustibles. When these products burn they leave a V shaped pattern on walls and floors. The width of the V shape is dependent on the speed of burning of the combustible.

(b) Flammable Liquids. These liquids form pools and hence their burn pattern is oval and irregular in shape.

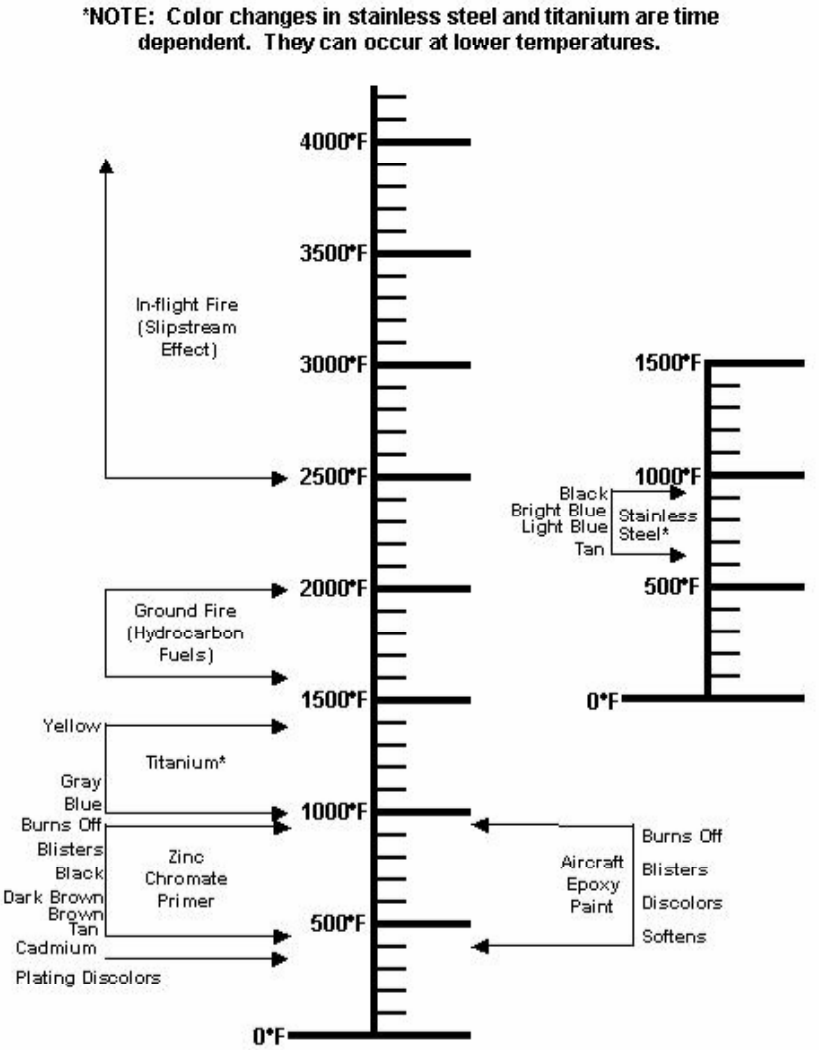


Figure R-2. Useful

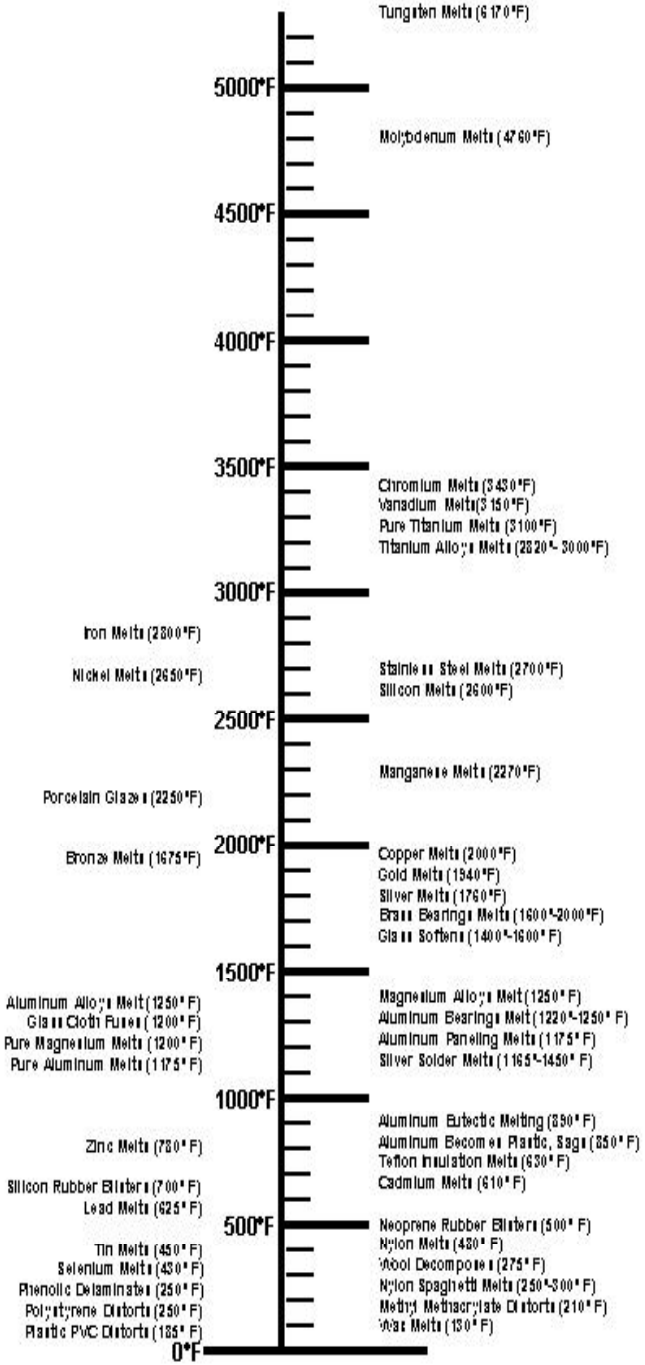


Figure R-3. Melting Points of Aircraft Materials

IV. THE FIRE INVESTIGATION.

The four primary objectives in a fire investigation are:

a. Determining the Point of Origin: This is the exact location where the fire started. This may be a specific point or it may be an area as is the case with flammable liquid spills. This is important in determining how the fire started.

b. Determining the Heat Source (Source of Ignition): The heat source is the source of heat energy that started the fire. Typical heat sources are--

(1) Engine hot section parts. This is a source of ignition on all aircraft, ground vehicles, and other pieces of equipment equipped with a gas or diesel powered engine.

(2) Hot engine exhausts. This is a source of ignition on all aircraft, ground vehicles, and other pieces of equipment equipped with a gas or diesel powered engine.

(3) Electrical arcing. This is extremely possible in military intelligence gathering aircraft such as the RC-12 series and the RC-7B. The RC-7B has 1000 pounds of wiring to operate the on-board systems. Be sure to check if Kapton wiring is used on the aircraft.

(4) Overheated equipment. This is extremely possible in military intelligence gathering aircraft such as the RC-12 series and the RC-7B. Both types of aircraft have systems on-board requiring large quantities of electricity to operate and a separate cooling system. If the cooling system be comes inoperable during flight, overheating of the equipment may occur.

(5) Bleed air systems. Heat ducts on the aircraft may become extremely hot and become a source of ignition.

(6) Static discharge. Static electricity is generated by the contact and then separation of dissimilar materials. As the aircraft flies, it generates static electricity. If the electrical potential difference is great enough, a static discharge may occur in the form of electrical arcing. If the energy level of the arcing is great enough and occurs in the vicinity of flammable vapors, such as fuel vapors, a fire may be the result.

(7) Lightning. Lightning will normally strike an external element of the aircraft, such as a prop or the wingtip. It travels through the aircraft and exits through the tail or some other aft external part. If the aircraft is properly bonded and the bond is maintained, nothing usually happens. If the bond is not maintained and the electrical charge passes in the vicinity of flammable vapors such as fuel vapors, a fire may occur.

(8) Hot brakes or wheels. Hot brakes or wheels can generate enough heat to ignite a high velocity spray of hydraulic fluid.

(9) Heaters.

(10) Auxiliary power units.
(11) In-flight galleys/ovens.
(12) Open flames.
(13) Smoking materials.
(14) Friction sparks. Friction sparking occurs when a metal is rubbed against another material. The spark is dependent upon the metal involved. Sparking from steel, magnesium, and titanium will ignite fuel vapors.
(15) Hazardous cargo. Determine what type, if any, hazardous cargo was aboard the vehicle or aircraft. These include flammable liquids and solids, oxidizers, spontaneously combustible materials, and materials that are dangerous when wet.

NOTE: There must be a heat source at the point of origin; if there is not, something is definitely wrong and further investigation is required.

c. Determining the Reason for Fire: The circumstance or set of circumstances by which the heat source and the combustible fuel came together at the point of origin.
d. Determining the Category of Fire:
(1) Natural – Takes place without human action or intervention.
(2) Accidental – One that results from either an unsafe act or unsafe condition.
(3) Arson – A fire that is started deliberately and maliciously, with the intent to cause damage to property.

NOTE: The fire investigation should be conducted to determine the objectives in the order they are listed.

e. Aircraft Fire Investigation.
(1) Examine the ground around the aircraft. A fire resulting from impact with the ground will often leave imprints of twigs, grasses, or leaves in the soot pattern on the burned wreckage. Also, look for the burn pattern around the main wreckage. A large oval or irregular shaped pattern indicates a flammable liquid (normally fuel) fire.
(2) Examine the wreckage. A ground fire will have smoke, heat and soot patterns that will normally go upwards but may vary slightly due to surface winds. Look for pieces of folded metals and unfold sooty looking or clean surfaces indicating in-flight or ground fires (see Figure R-4).

Locate all aircraft parts, those that separated in-flight and after impact. If these parts show evidence of fire burn, soot, and heat patterns, the fire more than likely occurred in-flight. Additionally, locate any buried parts. Buried parts normally will not be exposed to the post crash fire, but if it shows evidence of burning, then the air craft was on fire prior to impact.

a) Examine the exterior of the aircraft. In many post-crash and in-flight fires, the engine exhaust is a prime ignition

source. Examine the area around the engine exhaust and inside the cowlings for evidence of burning. The inside of the cowlings are normally discolored due to the heat of the engine. Look for molten pieces of metal and the orientation of the heat, soot, and burn patterns. Examine rivet holes. Most metal failures occur along lines of rivets. If the rivets were exposed to fire prior to impact, the rivet holes should be clean. Look for shadowing. Sometimes one part will protect another from the post crash fire. If the protected part shows evidence of burning, this is an indication of an in-flight fire.

(b) Examine the interior of the aircraft. When examining the interior of the aircraft, look for mushrooming along the walls and ceiling indicating there was a fire in the cabin or cockpit. Examine the windows, if anything remains. A cabin or cockpit fire would be indicated by soot, smoke, or burning on the inside of the window. Additionally, if the remains of the glass or plastic show no evidence of being exposed to the slipstream airflow in flight, then the glass or plastic melted and/or burned as a result of the post-crash fire.

(3) In-flight fire versus post-crash fire. In-flight fires, other than electrical, are usually the result of some failure or condition that releases combustible fluids or vapors. The fluid or vapor may drift or flow a considerable distance and be widespread before reaching an ignition source. Once ignited, it will flashback to the source of the combustible and produce a reasonably concentrated fire similar to an electrical fire. The spread of flame, soot, heat, and consequently fire damage is greatly influenced by the airflow in the region of the fire. The usual influence of the airflow is to confine the fire to a shape of a cone with an apex of the cone at the combustible source and expanding in the direction of the airflow. Confining the effects of the fire results in outlines or patterns of soot and heat. The patterns formed in flight will not be the same as those formed on the ground. The direction of the soot and heat patterns is controlled by the direction of the airflow across the parts. In flight, this is usually from front to rear. When the aircraft is at rest, the direction of the airflow across the parts will be changed. The smoke and flame will rise vertically, or be blown in the direction of the surface wind. Additionally, the impact of the aircraft will cause the parts to be in random orientation. The impact or continued ground fire may open up fuel cells or other combustible material containers and provide a broader source of combustibles. A fire that has limits beyond the surfaces of the aircraft will produce a pattern that cannot be

detected. It may be necessary to reconstruct the aircraft from the remaining parts in order to detect a fire pattern. If, following the reconstruction of the aircraft, there is a detectable pattern in the direction of the in-flight airflow, an in-flight fire is indicated. Conversely, if there is no continuity of pattern across lines of failure, the patterns were formed after the impact. Listed below are some additional tips and hints to assist the investigator in determining if the fire occurred in-flight.

(a) In-flight fires leave less metal residue than ground fires because molten metal is deposited downstream of the fire.

(b) Look for in-flight fire evidence on parts not subjected to the ground fire.

(c) Burn and soot patterns uniformly across and into folds of crumpled metal indicates in-flight fire.

(d) Parts or molten metal droplets may be found along the flight path.

(4) Additional Aircraft Fire Investigation Tips.

(a) Some parts or components may have been moved prior to the arrival of the investigator.

(b) Secondary fires may obscure or mask other fire evidence.

(c) Water or dirt may protect parts from ground fire.

(d) Halon fire extinguishing agents may react with hot components.

(e) Soot and discoloration patterns may be from normal operations. JP-8 burns hotter and dirtier than JP-4 and it leaves a soot trail on top of the wings.

(f) Bright scratch marks, scuffs, and smears in the soot and heat pattern indicates damage occurred after the soot and discoloration.

(g) Soot in torn edges or fracture surfaces indicates that fire occurred after impact.

(h) Explosions can occur with little or no soot or thermal evidence.

(i) Rain, snow, and fire fighting operations may affect soot pattern evidence.

(j) Discoloration of torn edges and scratches may be due to residual heat in large mass parts.

(k) Molten metal will not deposit on objects with a greater melting temperature of the molten metal.

(l) Molten metal may be deposited by gravity, airflow, blast wave, or relative motion or a combination of these.

(m) Gas released from pressurized containers will give strange burn patterns. Nitrogen will tend to suppress the fire while high-pressure oxygen will increase the temperature and rate of burning.

(n) Rupture discs or thermal plugs on pressurized containers (landing gear tires) may give pressure and temperature information.

(o) Oxygen release may result in severe burning often resulting in a white ash deposit.

(p) Normal fire behavior results in upward extension more rapidly than lateral extension.

(q) Witnesses may give a different account of the same event. Do not presuppose until several eyewitnesses' statements support a conclusion. Making a witness statement matrix will assist the investigator in comparing witness information.

(r) A breaking spar can sound like an explosion.

(s) Fuel and hydraulic fluid spray/mist may look like smoke.

(t) Fire and smoke emissions, either internal or external to the aircraft are important in identifying location, color, intensity, and time of emissions.

(u) Determine if survivors and/or eyewitnesses had time to discuss the accident before they are interviewed. Be sure to qualify your witness, one man's pop maybe another man's crack. Have eyewitnesses retrace their actions and have them show their location in reference to the accident site and what they said they saw or heard.

(v) Impact or fire may loosen nuts. If more than ¼ turn is required to tighten a nut, then the fire did not cause the accident.

(w) Electrical arcing damage will be localized, have an eroded appearance, and possible metal splatter. Strands of copper wiring may fuse together and little beads may form on the end of the strands.

(x) Aluminum, near the molten state and shock loaded, will "broomstraw" or "feather," (eutectic melting). The end of the molten aluminum piece will look like a broken piece of wood. See figure R-5.

FIGURE R-5. Aluminum that is near the molten state and is shock-loaded will "Broomstraw."

(y) If the fire warning lights can be located and anything remains of the component, send it off for light bulb analysis to determine if a fire warning light illuminated in flight.

(z) If aircraft was equipped with cockpit voice recorder (CVR), determine if crew had discussed any type of fire. If not equipped with CVR, contact the air traffic control facility that last had contact with the aircraft to determine if the crew had declared an emergency, and the nature of that emergency.

Completion of DA Form 2397-12. Upon completion of a thorough and in-depth fire investigation, the investigator should be able to easily complete DA Form 2397-12. The form will indicate when the fire started, indications of the fire, origin of the fire, source of ignition, the combustible materials that were the principal fuel for the fire, if the fire suppression and detection systems operated as designed or were even activated, and the extent of fire damage to the aircraft. Additionally, the history of flight and analysis paragraphs on DA Form 2397-3 should also state this same information.

f. Ground Vehicle Fire Investigation.

(1) Examine the ground around the vehicle. Preservation of evidence such as tread marks, foot prints and containers in the area may be important if arson is discovered. If the ground has been involved, compare wind direction at the time of the fire with the burn pattern on the ground. Fire extending from a vehicle to the ground will fan out and leave a wide burn pattern on the grass. If the fire started accidentally in the grass, a heat source must be present.

(2) Examine the exterior of the vehicle.

(a) Upper half of the vehicle – Examine blistered and peeled paint. This may give evidence of a low burn point, even if the fire was confined to the interior of the vehicle. At the same time check all upper areas for sagging. The area with the most pronounced sagging would be located over the hottest part of the fire-usually the point of origin.

(b) Lower half of the vehicle – Examine the gas tank filler tube and cap. If the gas cap is found and it has distorted locking flanges and the filler tube has matching damage, then the gas tank probably exploded. An examination of vehicle appendages should be conducted to determine if the serviceability of tires, hubcaps, etc. is consistent with the age of the vehicle. If the fire start point is below the vehicle, the area beneath the vehicle should be sampled for flammable liquids.

(3) Examine the interior of the vehicle.

(a) Driver/Crew Compartment. Study all materials to include windows, seat springs and upholstery to determine where damage is most severe. It is important to correlate available data. This allows you to determine the area of heaviest burning. Checking seat springs for elasticity gives an indication of the proximity of the fire to the seat.

(b) Engine Compartment. If a disconnected line is suspected to be the culprit, then deposits of soot can be found around the connectors and inside the line. If distributor points are fused, the heat source may be electricity. If the battery is dead, a massive short may have occurred. No matter what the source, the engine compartment contains very little flammable material. For this reason, a fire in the engine compartment will usually burn itself out if the hood is closed. If the hood is open and the wind is blowing the fire against the windshield, then the windshield can break or melt.

(4) Completion of DA Form 285. There are no specific blocks to check for fire when completing DA Form 285. The history and analysis paragraphs are the only areas where fire is discussed. These paragraphs should be written so the reader knows that the investigator determined the origin of the fire, source of ignition, the reason for the fire and the type of fire. The investigator should also state if the fire was a cause of the mishap or a result of the mishap.

V. CONCLUSION

A fire investigation is not an easy task and often clues are deceptive. The investigator must correlate all significant data to determine the origin of the fire, the source of ignition, the reason for the fire, and the type of fire. Never base your conclusions on one piece of evidence. Most smoking holes contain false clues. Test your hypothesis and support your conclusions with all possible independent evidence sources. Remember, there is help available. Start with the local fire department and use all available professional fire assistance.

APPENDIX P
BIOLOGICAL< CHEMICAL AND PHYSICAL HAZARDS

INTRODUCTION.

Accident investigators are potentially exposed to many hazards during the process of an investigation and its associated travel. Although the probability of exposure to health hazards during an investigation is moderate to low in most cases, a risk assessment needs to be done to mitigate known hazards. Although there are hundreds of potential exposures of concern, some of the more common hazards are:

a. Chemicals and carbon and/or aramid fiber decomposition byproducts of Chemical Agent Resistant Coating (CARC AMV paint), aircraft paint(s), and composite materials which make up vehicle components
b. Synthetic and petroleum-based hydraulic fluids, fuels, oils and lubricants from engines, transmissions and differentials
c. Acids and heavy metals from batteries (lead, acid, NiCd)
d. Metals such as beryllium, hexavalent chromium, titanium (from airframes and electronics)
e. Physical eye, neck, back and leg stress/ strain from extended travel, awkward positions and lengthy computer monitor use
f. Unexploded ordinance and chemical residue from partially exploded ordinance
g. Bacteria, micro-organisms and viruses from scavenging mammals and birds and their associated insect parasites like fleas, ticks and mites
h. travel associated airborne bacteria, microorganisms, and viruses (i.e. SARS)

Note: References and website hyperlinks for these and other potential hazards are located at the end of this appendix.

S-1. GENERAL. Board presidents and recorders must assume they are the experts on composite materials and bloodborne pathogens safety at a minimum. As such, they must ensure that all board members are adequately protected and that all other personnel involved with the accident scene are advised appropriately.

S-2. PURPOSE. To ensure that exposure to airborne and contact health hazards such as composite materials and/or bloodborne pathogens does not result in physical harm or illness to investigators. This appendix explains the minimum precautions investigators will take to minimize the composite risk posed by composite materials and bloodborne pathogens. Some of the hazards listed in the introduction require additional controls and/or PPE.

S-3. COMPOSITE MATERIAL SAFETY.

a. THE THREAT. Accidents involving composite materials that frag-

ment and/or burn upon impact may pose a significant health threat to investigators. The primary threats are inhalation and dermal exposure to fragmented materials. The aircraft and vehicles that contain a potentially damaging quantity of composite materials include, but are not limited to:
UH-1, AH-1, AH-64, CH-47D, OH-58D, RAH-66, UH-60, V-22 HMMWV, M-1 ABRAMS, M-2/M-3 BRADLEY, M-9 ACE, M-109 HOWITZER, M-113 APC

WARNING: Unless confirmed otherwise, assume the equipment contains composite materials and proceed IAW this Appendix.

b. RESPONSIBILITIES.

(1) Unit Safety Personnel. Safety personnel must assume that they are the most qualified individuals to evaluate the potential for illness that could be caused by composite materials in all accidents (both air and ground).
They must ensure that composite materials will not result in illness to investi¬gators, guards or recovery personnel.
Additionally, safety personnel will ensure the following

(a) That a Composite Material Safety Kit is available to all members of an investigation team if protection from composite materials is required.

(b) That coordination is made with the activity incurring the accident so that on-site personnel can properly equip them¬selves to prevent injury. Guidelines for use of proper equipment are contained below.

(2) Board president. The accident investigation team board president has the overall responsibility to ensure personnel are properly attired and equipped for an investigation involving composite materials. Specifically, he will--

(a) Conduct a specific procedures briefing regarding composite materials. Remind personnel that a U.S. Army Chemical Protective Mask is not authorized PPE for composite material protection. The authorized respiratory protection is a full-face respirator with a dual high efficiency particulate air (HEPA) and organic vapor cartridge.

(b) Ensure only properly equipped board members enter the accident site area. See paragraph S-3c for proper equipment.

(c) Advise the unit regarding the hazards of composite materials to ensure that the recovery team is properly protected to prevent composite material injury or illness.

(3) Board members have the respon¬sibility to ensure they use the appropriate protective equipment when working near fragmented or burned composite materials. See paragraph S-3e to determine the proper equipment.

c. COMPOSITE MATERIAL SAFETY KIT. Upon the determination that a composite material hazard exists, a Composite Material Safety Kit will be issued. CAI personnel will maintain this equipment on hand to minimize time required for deployment. The minimum essential equipment includes the following:

(1) Two NIOSH approved respirators (full-face, dual filter cartridge) to be used when fire has consumed composite materials or fragmentation exists. The investigator must be fitted-tested for the respirator in accordance with AR 11-34, The Army Respiratory Protection Program, and 29 CFR 1910.134, Respiratory Protection. (As an interim measure safety goggles with side shields will be worn if the investigator was issued a half-face respirator.)

(2) Tyvek□ disposable coveralls with hood and booties (two sets for each inves¬tigator). These will be used when a fire has involved composite materials or fragmentation exists.

(3) Four sets of leather gloves to be used when¬ever fire has occurred or fragmentation exists.

(4) Four sets of nitrile gloves to be used as inserts to the leather gloves.

NOTE: With the exception of the respirators, all equipment must be properly discarded after use to prevent potential subsequent injury.

d. USE OF COMPOSITE MATERIAL SAFETY KIT.

(1) In evaluating an accident where composite material is involved, consider fire and fragmentation.

(2) If either fire or fragmentation has occurred on any airframe or vehicle known or suspected to contain composite materials, then a Composite Material Safety Kit must be issued.

e. EQUIPMENT USE. To ensure that all personnel are adequately protected, the following guidelines must be followed:

(1) Burning aircraft or ground vehicles/equipment. Only emergency rescue personnel or fire fighters should be in the immediate vicinity of the accident site during the burning and smoldering phases.

(2) Previously burned composite materials (fire extinguished (no smoldering) or fragmented composite materials). All protective equipment, to include respira¬tors, coveralls, and leather gloves with inserts, will be worn at the accident site.

f. ON-SITE PROCEDURES. These are procedures designed to minimize the dangers of composite material fragmentation to personnel in the vicinity of the accident site.

(1) Security. The accident site must be cordoned off with a single entry and exit point. All unauthorized personnel must be restricted from the accident site.

(2) Personnel should avoid downwind locations. Remain downwind

when approaching and, when possible, while working at the site.

(3) No eating, smoking or drinking at the site.

(4) Fixant. Once the fire has been extinguished, the wreckage cooled, and smoldering has stopped, the composite materials must be sprayed with a fixant. A fixant is similar to an acrylic floor wax, which can be locally purchased or commercially procured. Alternatively, polyacrylic acid (B. F. Goodrich XL-II) can be used. Either product is satisfactory and must be sprayed on the entire area consumed by fire. By doing this, the composite material fragments are held in place.

(5) Prior to shipping composite materials, ensure they are heavily wrapped in plastic.

(6) All personnel must shower in cool water as soon as possible after working with burned composite materials.

(7) All equipment (except the respirators) can be discarded as non-hazardous waste material after use (see installation industrial hygienist for correct method of destruction). Respirators will be serviced upon completion of the safety investigation.

S-4. BLOODBORNE PATHOGEN SAFETY.

a. PURPOSE. To provide guidance to personnel investigating accidents which involve the possible exposure to human blood or body fluids. Care must be taken to minimize exposure to bloodborne pathogens (BBP).

b. BACKGROUND. During an accident sequence, blood and body parts may contaminate the equipment and immediate area of the accident scene. Personnel who assist in the recov¬ery of parts or components may unknowingly come into contact with blood soaked items and become infected. Exposure of rescue and investigative personnel to bloodborne diseases have the potential to cause health problems.

c. PROCEDURES.

(1) Complete information regarding OSHA regulations regarding bloodborne pathogens are found in OSHA Standard 29 CFR 1910.1030.

(2) Immunizations: All military personnel regardless of MOS should have received Hepatitis A immunization. Any personnel not so immunized should be directed to a military treatment facility (MTF) to receive this immunization. All military personnel with a medical or law enforcement MOS (as well as those deployed to designated areas) should have received Hepatitis B vaccine. OSHA Standard 29 CFR 1910.1030 states that Hepatitis B vaccination will be made available to anyone who may be exposed to BBP; this includes all safety personnel.

(3) Every accident site should initially be treated as a contaminated

area. After the immediate stabilization and evacuation of survivors, no one should be allowed into the accident site until it has been cleared of contamination or until personnel are provided the appropriate protection. Removal of bodies or body parts should only be done by qualified and properly equipped medical personnel.

(4) If the accident scene is determined to be contaminated, biohazard signs and placards will be placed, and the area must be roped off with a single entry/exit point and secured to control and prevent unauthorized access. The extent of the contaminated area will be designated by the medical officer and safety officer.

(5) All personnel entering the contaminated area will wear appropriate personal protective equipment (PPE). The safety officer, in conjunction with the medical officer, will determine what PPE will be used. Examples of typical PPE are listed below. Ensure enough protective equipment is available for multiple entries into the area. Once the individual leaves the contaminated area, all equipment, except the respirator (if used) will be properly bagged and disposed of as biological hazard waste. The medical personnel will normally accomplish this; however, means of disposal of biohazard material should be specified in the pre-accident plan.

(6) Only designated personnel will enter the contaminated area, the board president or safety officer will determine who will enter. If manufacturer's representatives are needed, they must receive BBP composite risk briefings, and sign a statement acknowledg ing and accepting the composite risk.

(7) If ALSE clothing or equipment is to be shipped to a medical laboratory (U.S. Army Aeromedical Research Laboratory {USAARL}) for analysis, do not clean or alter it in any manner. Ensure the articles are properly wrapped in a biohazard bag. If biohazard bags are unavailable, plastic bags (multiple wrap) may be used and must be marked as a biological hazard.

(8) All of the victim's equipment and personal clothing, etc., which is contaminated must be identified and disposed of as a biological hazard waste. Do not dispose of clothing/ equipment until the board has had an opportunity to examine the materials. Personal belongings (rings, watches, etc.) can be returned to family members if and when they can be decontaminated. Military equipment (flight helmets, CTA 50 items) may be returned to the unit if they can be decontaminated. Military equipment will not be re¬leased to family members.

(9) Any contaminated wreckage or parts to be shipped for analysis must be decontaminated with a ten percent bleach solution, then wrapped and labeled specifying how decontamination was

accomplished. DO NOT use bleach on any parts suspected of having fatigue fractures. Theses parts will be bagged and labeled as biohazard.

(10) In the event someone believes contamination has occurred, the affected area should be washed for 20 minutes with running water and soap. The person must then report to a military treatment facility (MTF) or other facility for examination and required testing or treatment. In the case of reserve component (RC) units or personnel, arrangements should be made with supporting active Army (AC) medical facilities, RC medical units, or civilian hospitals, and the appropriate facility named in the pre-accident plan. If the person was cut, the item that caused the injury should be saved and tested for contamination.

d. BLOODBORNE PATHOGEN SAFETY KIT. The following is a guide to equipment that may be necessary for personnel potentially exposed to biological hazards. Once used, the equipment, except respirators, must be bagged and treated as biological waste hazards. The local MTF will handle the waste disposal. In the case of RC units, arrangements should be made with supporting AC medical facilities, RC medical units, or civilian hospitals, and the appropriate facility named in the pre-accident plan.

(1) NIOSH-approved respirators with biological filters. One respirator with several filters per individual.

(2) Surgical masks.

(3) Tyvek Disposable coveralls (at least two sets per individual in contaminated area).

(4) Rubber gloves (latex or . Recommend medical personnel have a box (100+) on hand at the site. Anyone handling parts, clothing, etc., must wear gloves if so directed.

(5) Leather gloves as appropriate for the recovery of metal or fragmented machine parts.

(6) Antiseptic Towelettes/alcohol pads.

(7) Goggles/face shields

(8) Boot covers

S-5. PPE REMOVAL CHECKLIST.

a. Establish a designated area for PPE exchange.

b. Disinfect & remove work gloves.

c. Remove Coveralls.

d. Disinfect latex gloves.

e. Remove & disinfect boot covers.

f. Re-glove.

g. Remove & disinfect goggles.

h. Remove mask.

i. Remove latex gloves.

j. Close & seal waste bag.

k. Clean hands & face with disinfectant wipes.
l. Exit via controlled entry point.
m. Wash with soap & water.

NOTE: Should the personal uniforms (especially boots) of the investigation team become contaminated by hazardous materials such as blood and/or fuels or POL's, provisions must be made to change into uncontaminated clothing as soon as possible. If there is skin contact, thorough washing with soap and water and appropriate follow-up action as in S-4,(10) above.

Links to Articles, Fact Sheets and Regulations

Army School of Aviation Medicine, Flight Surgeon Refresher, Aviation Toxicology, Section 3:
http://usasam.amedd.army.mil/FSRC/PDF/fsrc308.pdf (copy this link and paste into browser)

DODI 6055.1: DoD Occupational Safety and Health Program:
http://www.dtic.mil/whs/directives/corres/html/60551.htm

AR 385-10: The Army Safety Program: http://www.army.mil/usapa/epubs/pdf/r385_10.pdf

29 CFR 1910.134, Respiratory Protection: http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=12716&p_table=STANDARDS

AR 11-34: The Army Respiratory Protection Program: http://www.army.mil/usapa/epubs/pdf/r11_34.pdf

Advanced Composite Fiber (carbon, graphite, fiberglass, ceramic) Decomposition By-products:
MSDS's: http://www.bgf.com/MSDSWoven.asp
Other: http://www.tc.faa.gov/its/worldpac/techrpt/ar98-34.pdf

http://www.safetycenter.navy.mil/AVIATION/aeromedical/downloads/References/Composites/USAF%20COMPOSITES%20SEPT%2098.PDF

http://www.osha.gov/dts/osta/otm/otm_iii/otm_iii_1.html

Batteries:
http://ir.electroenergyinc.com/releasedetail.cfm?ReleaseID=195723

http://www.dlis.dla.mil/hmirs/ (registration required for MSDS)

http://www.saftbatteries.com/020-MS_Aviation/20-40-20_download.asp?content=3&sSegment=Aviation&sSegmentLien=10%2D10%2D10%5FAviation%2Easp&sSecteurLien=20%2D10%2D10%5Faircraft%2Easp&Secteur=Aircraft

Clearing Military vehicles for entry into U.S.: http://chppm-www.apgea.army.mil/documents/FACT/33-001-0605.pdf

Confined Spaces:
https://crc.army.mil/guidance/leaderguides/Confinedspace21sep04.doc

http://chppm-www.apgea.army.mil/documents/FACT/55-001.pdf

Cumulative Trauma Disorders:
http://chppm-www.apgea.army.mil/documents/FACT/88-003-0599.pdf

Beryllium:
http://chppm-www.apgea.army.mil/documents/FACT/64-003-0302.pdf

Bloodborne Pathogens, Viral, and Bacterial:
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10051

http://chppm-www.apgea.army.mil/documents/FACT/59-004-1001.pdf

http://chppm-www.apgea.army.mil/documents/FACT/59-010-1001.pdf

http://chppm-www.apgea.army.mil/hmwp/Factsheets/37-032-0905revision.pdf

http://chppm-www.apgea.army.mil/documents/FACT/36-001-1001.pdf

http://chppm-www.apgea.army.mil/documents/FACT/57-005.pdf

Chemical Agent Resistant Coating (CARC) Paint:
http://chppm-www.apgea.army.mil/hmwp/Factsheets/CARCPaint.pdf

Dust & Sand:
http://chppm-www.apgea.army.mil/documents/FACT/65-038-0503.pdf

Ergonomics: http://chppm-www.apgea.army.mil/ergopgm/ergopolicy.aspx

Fuel: http://chppm-www.apgea.army.mil/documents/FACT/65-027-0503.pdf

Latex Allergy:
http://chppm-www.apgea.army.mil/documents/FACT/65-010-0503.pdf

http://www.bestrubber.com/latex.htm

Metals:Depleted Uranium:
http://chppm-www.apgea.army.mil/documents/FACT/65-050-0503.pdf
Hexavalent Chromium:
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table =FEDERAL_REGISTER&p_id=18599
Titanium MSDS: http://www.sciencestuff.com/msds/C2876.html

Radio-frequency Radiation:
http://chppm-www.apgea.army.mil/documents/FACT/65-025-0503.pdf

Toxic Chemicals:
http://chppm-www.apgea.army.mil/documents/FACT/65-030-0503.pdf

Insect/ Pest Related: http://chppm-www.apgea.army.mil/ento/
Leishmaniasis: http://chppm-www.apgea.army.mil/ento/FACTS/Leishmaniasis.pdf
Mosquitoes: http://chppm-www.apgea.army.mil/mosquitoes/

Tick-borne Diseases: http://chppm-www.apgea.army.mil/news/ProtectYourselffromTick-BorneDiseases-JustthefactsNov2005(2).pdf

Scorpions/ Arachnids: http://chppm-www.apgea.army.mil/hio_public/IMAGES/AFGHANARACHNIDS02-19-04.PDF

http://chppm-www.apgea.army.mil/DEPLOYMENT/ARACHNIDSOFIRAQANDKUWAIT.PDF

Snakes: http://chppm-www.apgea.army.mil/hio_public/IMAGES/AFGHANSNAKEPOSTER.JPG

http://chppm-www.apgea.army.mil/HIO_PUBLIC/IMAGES/SWASIASNAKEPOSTER03-10-03.JPG

West Nile Virus: http://chppm-www.apgea.army.mil/documents/FACT/18-002-0506WNVandHorsesJustheFacts-May2006.pdf

SARS: http://www.osha.gov/dep/sars/index.html

Stress; Human Remains Recovery:
http://chppm-www.apgea.army.mil/documents/FACT/36-004-0202.pdf

Temperature and Altitude Extremes:
Heat Related Injury: http://chppm-www.apgea.army.mil/doem/pgm34/HIPP/HeatRiskManGuideMar04.pdf
Cold Related Injury: http://chppm-www.apgea.army.mil/coldinjury/CI_Files/Cold%20weather%20injuries%20book%20updateNov2004.pdf

CHPPM Cold Injury Page: http://chppm-www.apgea.army.mil/coldinjury/ColdWeather_TempHome_20061121.pdf

Army Cold Weather Policy: http://chppm-www.apgea.army.mil/Documents/ColdInjury/ColdWeatherRelatedInjuryPreventionProgram06-07-20061106.pdf

Hydraulic Oils: http://www.fammllc.com/famm/msds/gen07%20eng.doc

Appendix Q
Photo Log

Accident
Aircraft/Equipment:
Case: _____

YY/MM/DD *TIME* *ACFT SN (if aviation)*

Film roll #:

#	Digital Taken	Azimuth	Description (Aspect, component nomenclature, debris, etc.)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
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21			
22			
23			
24			

APPENDIX R
Witness List

1. Name (Last, First, MI)	2. Occupation Title	3. Grade	4. SSN	5. Age
6. Address (Include Zip Code) (If Military, Include Organization)		7. Telephone Number		
		8. Date of Interview		
		9. Interviewer		
10. Experience and Background	11. Location At Time Of Accident	Confidential Y ☐ N ☐		

1. Name (Last, First, MI)	2. Occupation Title	3. Grade	4. SSN	5. Age
6. Address (Include Zip Code) (If Military, Include Organization)		7. Telephone Number		
		8. Date of Interview		
		9. Interviewer		
10. Experience and Background	11. Location At Time Of Accident	Confidential Y ☐ N ☐		

1. Name (Last, First, MI)	2. Occupation Title	3. Grade	4. SSN	5. Age
6. Address (Include Zip Code) (If Military, Include Organization)		7. Telephone Number		
		8. Date of Interview		
		9. Interviewer		
10. Experience and Background	11. Location At Time Of Accident	Confidential Y ☐ N ☐		

1. Name (Last, First, MI)	2. Occupation Title	3. Grade	4. SSN	5. Age
6. Address (Include Zip Code) (If Military, Include Organization)		7. Telephone Number		
		8. Date of Interview		
		9. Interviewer		
10. Experience and Background	11. Location At Time Of Accident	Confidential Y ☐ N ☐		

APPENDIX S

Command Factors Assessment

PART I. Reviewing Application of Composite risk Management

(Ref: AR 385-10, FM 101-5 and FM 100-14)

V-1. General. As part of the analysis phase, investigators are required to examine and discuss the **influence of command activity, or lack thereof, relative to accident cause factors and accident prevention**. AR 385-10 requires decision makers at every level to use the composite risk management process in efforts to reduce overall mission composite risk and avoid unnecessary residual composite risk to the mission, personnel, equipment, and environment. Therefore, an assessment must be made to determine if and how the organization has integrated the composite risk management process into the planning, preparation and execution phases of operations. Apply the composite risk management five-step process to the accident. Look at each decision point in the accident sequence of events (from pre-mission planning to the actions immediately following the accident) and the authority level of the person making that decision. What decisions were made along the way that set up the accident? You will not always be able to determine the cause of an accident, but you can determine what allowed it to happen. This will provide the accident unit command solid information, which can be used to implement corrective action and prevent future accidents. This may also help to identify DA-level decisions (e.g., OPTEMPO, PERSTEMPO, etc.) that set the unit up for failure. The ultimate goal is to determine if informed decisions were made at the appropriate level of authority. Some basic questions to get you started follow.

a. What evidence exists that the organization routinely uses composite risk management during daily operations? Describe how and when.

b. What evidence exists that the organization routinely identifies obvious hazards related to missions, including personnel, equipment or environment? Describe.

(1) ***If not or insufficient***, explain, (e.g. lack of knowledge, policy, training, experience, supervision or policy enforcement.

(2) If yes, were adequate composite risk assessments performed? Were controls developed, then selected by the appropriate decision maker? Were controls applied?

(a) If yes, describe the hazards and controls and explain why the controls were ineffective.

(b) If not, explain why not? Describe any failure of the Composite risk Management process.

c. How were personnel involved in the mission made aware of hazards and the applied controls? Were they used to help identify hazards and develop controls?

d. Does the organization have standard methods and/or tools to assess composite risk levels for each hazard? If so, do the methods and/or tools prompt individuals to identify controls to reduce composite risks and to seek guidance from the appropriate approval authority?

e. What guidance is given to individuals to identify and determine the appropriate decision authority?

f. If/when conditions changed during the mission were hazards and associated composite risks properly identified, reassessed and additional controls considered and implemented?

V-2. In addition to determining if the organization properly assessed the mission composite risk, talk with junior leaders (LTs, SGTs, and SPCs). Do they understand the Composite risk Management concept and process? Do they understand their responsibility as supervisors for performing Composite risk Management on all tasks they perform or supervise?

V-3. In many cases, organizations have pre-printed assessments for particular operations or training events. These can be excellent sources of information. However, pre-printed assessments lose effectiveness when simply filed away, not using the lessons learned or when current METT-T conditions are not evaluated to identify existing hazards and appropriate controls.

PART II. Command Climate Checklist

AVIATION ACCIDENT

1. What is the PC, crew, flight lead selection process in the unit?
2. What is the UT selection process in the unit?
3. How are aviators distributed within a unit?
   -- Are senior aviators (CW3/4, CW5), IPs, ASOs and MTPs equally distributed throughout the organization to the extent possible?
4. Is the commander and/or platoon leader (or appropriate leader) current and proficient in the aircraft and equipment assigned to his unit, e.g., NVGs?
5. Does the unit perform its mission requirements without "surging" on a continuing basis?
   --- If not, why not? Is it because of:
   --- Management (operations, aviation maintenance, personnel)?
   --- Leadership?
   --- Mission requirements out of balance with resources?
   --- Everything #1 priority?
   --- Personnel assigned to special projects not related to unit mission??
6. Does the pace of the unit operations and mission requirements appear excessive or out of line with available resources?
   -- Crawl, walk, run concept appear sound?
7. From the flight surgeon's perspective, are unit personnel healthy (mentally and physically)?
   -- Are the same aviators in the unit incurring the accidents?
8. Are training programs in line with the unit mission (METL)?
   -- What is the unit's NVG training program?
9. What is the IP-to-pilot ratio in the unit?
10. Is the unit experiencing difficulties in meeting various currency requirements (i.e., NVG)?
11. Is RL progression within the unit enable them to meet mission requirements?
12. What has been the aviator turnover rate for the past year (PCS, TDY, retire, etc.)?
13. Does the unit have number of pilots by MTOE/TDA to crew their aircraft or are they forced to cross-level among units?
14. Does the unit have number of crew chiefs by MTOE/TDA to crew their aircraft or are they forced to cross-level among units?
15. What is the utilization rate for aircraft mechanics on a day-to-day basis?
16. What is the unit's "C" rating? Has it changed significantly in the past 24 months? If so, why?
17. Review the Unit Status Report (USR) and Quarterly Training Briefs (QTBs).
18. Review unit health indicators (substance abuse, UCMJ, congressional inquiries, IG complaints, etc.).

COMMAND CLIMATE CHECKLIST
GROUND ACCIDENT

1. What is the crew, TC, driver selection process in the unit?
2. How are NCOs (E5 through E9) distributed within a unit?
   -- Are senior NCOs equally distributed throughout the organization to the extent possible?
   -- What is the authorized versus on-hand strength?
3. Is the commander and/or platoon leader (or appropriate leader) current and proficient in the equipment assigned to his unit, e.g., NVGs?
4. Does the unit perform its mission requirements without "surging" on a continuing basis?
   --- If not, why not? Is it because of:
   --- Management (operations, maintenance, personnel)?
   --- Leadership?
   --- Mission requirements out of balance with resources?
   --- Everything is #1 priority?
5. Does the pace of the unit operations and mission requirements appear excessive or out of line with available resources?
   -- Crawl, walk, run concept appear sound?
6. From the medical doctor's perspective, are the soldiers healthy (mentally and physically)?
7. Are training programs in line with the unit mission?
   -- What is the unit's NVG training program?
8. Is the unit experiencing difficulties in meeting various currency requirements, i.e., NVG?
9. What has been the leadership turnover rate for the past year (PCS, TDY, retire, etc.)?
10. Does the unit have sufficient soldiers to man their equipment or are they forced to cross-level among units?
11. Are there sufficient mechanics in the unit?
12. What is the utilization rate for mechanics on a day-to-day basis?
13. What is the unit's "C" rating? Has it changed significantly in the past 24 months? If so, why?
14. Review the Unit Status Report (USR) and Quarterly Training Briefs (QTBs).
15. Review unit health indicators (substance abuse, UCMJ, congressional inquiries, IG complaints, etc.)

COMMAND CLIMATE CHECKLIST
DRIVING ACCIDENT

1. What is the driver training process in the unit (DDC, MSF, ADIP, etc.)?
2. How are NCOs (E5 through E9) distributed within a unit?
   --Are senior NCOs equally distributed throughout the organization to the extent possible?
   --What is the authorized versus on-hand strength?
3. Is the commander and/or platoon leader (or appropriate leader) knowledgeable about and using ASMIS-2 for TDY, leaves, passes and PCS IAW the Army Safety Campaign Plan guidance?
4. Do commanders complete the Commander's Safety Course prior to assuming command?
5. Do additional-duty/collateral safety officers and NCOs complete the Additional Duty Safety Course within 30 days after receipt of additional duty assignment orders?
6. Does the unit have a written safety program, which covers the required elements in AR 385-10, Chapter 2, and other elements when applicable to the unit's mission?
7. Does the unit perform its mission requirements without "surging" on a continuing basis?
   --- If not, why not? Is it because of:
   --- Management (operations, maintenance, personnel)?
   --- Leadership?
   --- Mission requirements out of balance with resources?
   --- Everything is #1 priority?
8. Does the pace of the unit operations and mission requirements appear excessive or out of line with available resources?
   -- Crawl, walk, run concept appear sound?
9. From the medical doctor's perspective, are the soldiers healthy (mentally and physically)?
10. Does the installation have a Motorcycle Mentorship Program?
    -- Do unit members participate?
    -- What ranks and skill levels?
11. Are the unit leaders knowledgeable about street racing?
    -- Are they aware of any unit members who own the types of automobiles used for street racing?
    -- Do they know of street racing locations in their area?
12. Are POV/POM inspection programs well documented and do the leaders physically look at the vehicles?
13. Do leaders conduct additional safety briefings for weekends, holidays, block leave, etc.?
    -- Are the briefings comprehensive and effective?
    -- How are the briefings received by unit personnel (believe them to be effective; same old information each time; don't listen to them; etc.)?

14. What has been the leadership turnover rate for the past year? (PCS, TDY, retire, etc.)
15. Does the unit have sufficient soldiers to man their equipment or are they forced to cross level among units?
16. What is the unit's "C" rating? Has it changed significantly in the past 24 months? If so, why?
17. Review the Unit Status Report (USR) and Quarterly Training Briefs (QTBs).
18. Review unit health indicators (substance abuse, UCMJ, Congressional inquiries,

APPENDIX T

ELECTROMAGNETIC ENVIRONMENTAL EFFECTS (E3) CHECKLIST

E3, formally known as electromagnetic interference (EMI), is a recognized potential cause factor and should be thoroughly evaluated during all accident investigations, to deter¬mine if E3 could or could not have influenced the operation of the equipment involved. If E3 could have been a factor, then it must be rigorously evaluated. E3 should be considered a potential cause factor for any air or ground system with electronic components, especially modern, complex systems.

The following E3 checklist is recommended for use whenever E3 is suspected as a cause factor. Use of a checklist will ensure a thorough evaluation of E3.

E^3 CHECKLIST

1. During the initial stages of the investigation, attempt to determine if there is any evidence of an external influence on the aircraft/vehicle/weapon system or its subsystems. Consider cock¬pit/instrument indications reported by surviving crewmembers, eyewitness reports, and other physical evidence. This is especially important where the physical evidence indicates that the aircraft/vehicle/weapon system was out of control prior to accident sequence termination.

2. If E3 can be ruled out as a causal factor during this stage, then document the actions taken to eliminate E3 (i.e., "E3 was considered but ruled out for the following reasons:...").
   -- Aviation accidents: Document this in paragraph 2j (Special Investigation) of the DA Form 2397-3 narrative.
   -- Ground accidents: Document this in the Narrative of DA Form 285, paragraph 2I, Special Investigation.

3. If E3 cannot be eliminated early on or there are positive indications of an external influence, advise USACRC Operations immediately at DSN 558-3410/2660, and request technical assistance. In addition, perform the following:
   a. Check for High Intensity Radio Transmission Areas (HIRTAs) in the area of the accident. Note VFR sectional or tactical map for large towers (transmitters) within 5 miles of the accident site.
   b. While taking aerial photographs of the accident site, recon the area surrounding the accident (5 miles) for large towers (transmitters) such as radio/television, telephone microwave, radar, etc.
      (1) All towers (transmitters) are considered a potential source and should be plotted on a diagram in relation to the accident site.
      (2) Contact owners of the towers (transmitters) to determine:

(a) Hours of operation.
(b) Nature of transmission (signal power level and frequency).
(c) Signal beam width.
(d) Azimuth(s) of transmitter signal(s).

c. For aviation accidents, gather any and all available ATC tapes, to include radar and voice, for later review.

d. If there are surviving crewmembers, record all cockpit/ instrument indications experienced during the accident (caution/warning/ advisory light illumination, audio warning tones, and degradation/ loss of flight controls, stiffness of pedals, etc.). Compare cockpit/ instrument indications against the database of known type aircraft responses to E3.

e. If there are no surviving crewmembers, analysis of the abov data plus any additional information gained from flight data recorders (if so equipped) will indicate possible contribution to E3.

f. Close coordination with USACRC Operations will be maintained throughout the E3 investigation. Aviation and/or Ground Systems and Accident Investigations will conduct detailed analysis of the above data at the USACRC.

g. E3 can be eliminated as a causal factor only if accident circumstances (physical evidence, aircraft/vehicle maintenance history, witness statements, etc.) indicate a failed part or human error was the primary cause.

APPENDIX U

DETERMINATION OF TOTAL ACCIDENT COSTS

1. Army accident costs consist of the cost of damage to Army property, damage to non-Army property as a result of Army operations, and the cost of injury or occupational illness to Army personnel.
2. Injury costs. The standardized cost data in Table U-1 will be used to compute the cost of injuries and occupational illnesses to Army personnel. These costs are used solely to provide total acci¬dent cost and are not used for determining accident classification.
3. Damage costs. Costs of damage to Army property and equipment will be computed using criteria in the Army Master Data file (AMDF), to include such things as actual cost of new or used parts or materials and labor cost at the standard rate of $41 per hour, unless the actual labor cost rate is available within the reporting time limits. When Army property, other than aircraft, is damaged to the extent it cannot be repaired, or the cost of repair exceeds the cost specified in FED LOG or the property book, the accident cost will be the property cost listed in FED LOG or the property book, plus any additional equipment not included in the original property cost. When damaged equipment or facilities will not be repaired or replaced, the cost reported will be the acquisition cost AMDF plus the esti¬mated cost to clean up the site. For destroyed equipment, the estimated scrap value or residual value of the parts may not be used to reduce the accident classification.
    a. Organizational or Support maintenance repair. The repair cost will be actual cost of repair. An estimated cost of repair may be used if the actual cost of repair is not available within the required reporting time frame.
    b. Depot Repair cost. Use actual cost to repair, rebuild, or inspect repairable aircraft, vehicle, or equipment components, as defined in the appropriate parts Technical Manual (TM), or the cost established by the repair facility for the components. If neither the depot actual or established cost can be determined within the reporting time frame, an estimated cost of repair may be used.
4. Costs peculiar to aircraft accidents.
    a. Destroyed, missing, or abandoned aircraft cost. The cost of destroyed, missing, or abandoned Army aircraft is to be computed per aircraft replacement cost figures, obtained from TB 43-0002-3, Tables 3-1 and 3-2.
    b. Army parts cost. The cost will include:
        (1) For destroyed parts or components, the cost of replacement per current AMDF, which can be found in technical supply or direct support units. Unit Turn-In Credits will not be used to reduce the accident classification.
        (2) The cost to repair damaged parts.
    c. Direct man-hour costs to repair damaged parts will include:

(1) The cumulative (estimated) man-hours required to remove, repair, and replace damaged aircraft assemblies, subassemblies, or components.

(2) Man-hours required to restore the aircraft to serviceable condition if economically repairable.

(3) Man-hours expended in removing and replacing undamaged aircraft components in order to remove, repair, or replace damaged components.

(4) Man-hours required to remove and replace a part that is not economically repairable.

(5) Man-hours expended to determine damage amount.

d. Man-hours not included in aircraft accident cost.

(1) Depot and contract overhaul man-hours.

(2) Time used in setting up equipment preparatory to actual repair of the aircraft.

(3) Man-hours used in removing, replacing, and inspecting undamaged parts and components solely to satisfy technical manual inspection requirements.

(4) Indirect man-hours such as investigating, travel, test flights, maintenance operational checks, etc.

(5) Maintenance facility overhead cost.

e. Replacement of damaged components. Removing a damaged component and replacing it with a new component to decrease the number of man-hours and costs for purposes of accident classification is prohibited. If another like compo¬nent is available, it may be installed so that the aircraft will be available for flight. However, the total best available estimated man-hour costs to re move, replace, and repair the damaged component will be included for accident classification.

f. Cost computation of aircraft engine. When an aircraft engine is damaged as a result of the accident sequence to the extent that it must be returned to a depot, the cost of such damage or inspection will be computed at 17% of the engine cost. Depreciation and/or turn-in credits will not be used when calculating damage costs to determine accident classification.

g. Cost computation of helicopter main rotor blades. Costs will be computed based on the following criteria:

(1) Destroyed blades are to be calculated at the full unit cost per the AMDF. Depreciation and/or turn-in credits will not be used when calculating damage costs to determine accident classification.

(2)Blades that are to be repaired locally will be the actual cost of damage (ACOD), if known or at the ECOD (ECOD if the ACOD is not known prior to the submission of the report). Early submission to reduce the blade cost is prohibited.

(3) Blades sent to Depot or Contract rebuild facilities for repair or rebuild will be the ACOD, repair facility established cost, or 44% of the AMDF cost of the blade with no depreciation allowed. For example, if a repairable blade is returned to depot for repair and the AMDF cost of the blade is $100,000; the cost of the blade for classification and reporting would be $44,000. Depreciation and/or turn-in credits will not be used when calculating damage costs to determine accident classification.

NOTE: 44% of AMDF cost does not apply when a tip cap is the only damage.

h. Aircraft Structural Damage - When available, the actual cost of aircraft structural damage should be cited. When actual cost cannot be determined and the structural damage is repairable, use the following calculations:

(1) For minor structural damage not requiring realignment (jigging), use 3% of the aircraft replacement cost in TB 43-0002-3.

(2) For major structural damage (i.e., extensive damage to fuselage or damage requiring structural realignment, use 6% of the aircraft replacement cost cited in TB 43-0002-3.

(3) For structural damage deemed un-repairable use the actual cost of the fuselage when available or 40% of the replacement cost for the aircraft, as cited in TB 43-0002-3, Table 3-1 or 3-2.

(4) Percentile calculations include man-hours, transportation, and inspection.

j. Cost computation of other aircraft components. When a major aircraft component (as defined in the appropriate maintenance technical manual (TM)) is damaged to the extent that it must be returned to depot for overhaul or inspection, the reported cost for repair will be computed at 15% of the unit cost. Depreciation and/or turn-in credits will not be used when calculating damage costs to determine accident classification. Examples of aircraft major components are as follows:

(1) Helicopter tail booms or empennages.

(2) Aircraft wings or fuselage.

(3) Helicopter main rotor heads.

(4) Main transmission or gearbox(es).

(5) Landing gear assemblies (exclusive of wheels, brakes, tires, outriggers, or protective gear, helicopter skids, cross tubes, and tail gear).

(6) Vertical stabilizer (exclusive of rudder), horizontal stabilizer (exclusive of elevator), and stabilators or similar devices.

NOTE: A major component is defined as a combination of subassemblies, assemblies, components, modules, and parts connected in such a manner as to be a self-contained unit which, although part of an end-item, is capable of operating independently of the end-item (e.g., engine T-53).

5. Damage not included in aircraft accident costs:

a. Fair wear and tear (FWT), unless the malfunction or failure results in damage to another component or part.
b. Equipment that is intentionally jettisoned or released in-flight buy an aircraft.
c. Damage to helicopters incurred solely from flying debris during operations in confined areas and unimproved landing sites is considered FWT.
d. Discovery of cracks, breaks, wrinkles, or ruptures during required periodic or scheduled inspections is considered FWT. They will be reported per DA Pam 738–751 and DA Pam 750-8.
e. Damage or injury to Army property or personnel as a direct result of action by an enemy force or terrorist group (considered "combat loss").
f. Planned destruction of Army experimental or prototype equipment during authorized testing or combat training.
g. Authorized intentional destruction of Army property or equipment.
h. Aircraft foreign object damage (FOD) (other than engine(s)) discovered during scheduled maintenance.

Table U-I. COST STANDARDS TABLE

	Fatality	Permanent Total Disability	Permanent Total Disability	Lost Time Case	Days Hospitalized	No Cost Time Case
Submarine or Flying Officer	$1,100,000	$1,300,000	$210,000	$425 day	$466 day	$120 day
Other Officers	$395,000	$845,000	$145,000	$425 day	$466 day	$120 day
Enlisted Personnel Cadets	$125,000 $270,000	$500,000	$115,000	$375 day	$466 day	$120 day
Civilian Employees	$460,000	$385,000	$250,000	$350 day	$466 day	$120 day

APPENDIX V

CREW INFORMATION SHEET

Name: _____

Grade: _____ SSN: _____

Local address:

_____

_____

Home phone: _____ Duty phone: _____

Height (inches) _____ Weight _____ DOB _____ Sex _____
Sec Clearance _____

Duty during accident _____

_____

Unit/Organization _____ Service _____

Date entered service: _____ Date assigned unit: _____

Date last leave ended: Year _____ Month _____ Day _____ Type _____
Days _____

Date of last crewmember duty prior to accident:
Year _____ Month _____ Day _____

Hours worked (From arrival at duty station until departure):
Past 24 hrs _____ Past 48 hrs _____ Past 72 hrs _____

Duty hours remaining this day had accident not occurred: _____

Hours slept: Past 24 hrs _____ Past 48 hrs _____ Past 72 hrs _____

Hours of last sleep period: _____ Hours continuously awake prior to accident: _____

Date of last physical exam: Year _____ Month _____ Day _____

Glasses: Regular / Clear / Tinted Required: _____ Worn: _____
Prescription / Clear / Tinted Required: _____Worn: _____

Smoke tobacco: Yes _____ No _____
If yes, # cigarettes per day: _____ Cigars per day: _____

Education: _____ Years

Number and date of previous accidents: _____
_____

Aviation–Specific

Date of most recent flight in this series (Prior to accident date): _____

Duration of most recent flight in this series (Prior to accident):
Hrs _____ Min _____

Date of last standardization flight in this aircraft series:
Year _____ Month _____ Day _____

Hours flown in past 24 hours (Include this accident): _____
_____

Hours flown in past 48 hours (Include this accident): _____
_____

Hours flown in past 72 hours (Include this accident): _____
_____

Recent flight time: This month Previous 30 days Previous 60 days
Previous 90 days

Total flying hours: _____ Combat flying hours: _____

Instrument qualification/date: RW _____ FW _____

Physiological/Alt/Surv Training: Type _____ Date _____

RW/FW Graduation Date: _____

Date graduated IERW: _____ Type of aircraft qualified: _____

MTDS current / qualified: _____ Date completed APART: _____

FAC Level: _____ Date completed: _____

Readiness level: _____ Date completed: _____

Date completed –10 exam: _____ Qualified IP, SIP, UT: _____

Date of NVG qualification: _____ Date of last NVG flight: _____

Waivers: _____
_____

A/C Qualification when assigned to unit: _____
_____

A/C Qualification since assignment to unit: _____
_____

Major duties while assigned to unit:_____

Major duties at time of accident and percent of time devoted to them:_____
_____

Type helmet: _____ Visor: _____ Clear / Tinted Up / Down

Clothing anomalies: Undergarments _____
Flight suit / jackets _____

Did shoulder harness inertia reel lock? Yes / No Manually / Automatically

Where crewmember was located in the aircraft: _____
_____

Order of exit from aircraft (First, Second, etc.) _____
_____

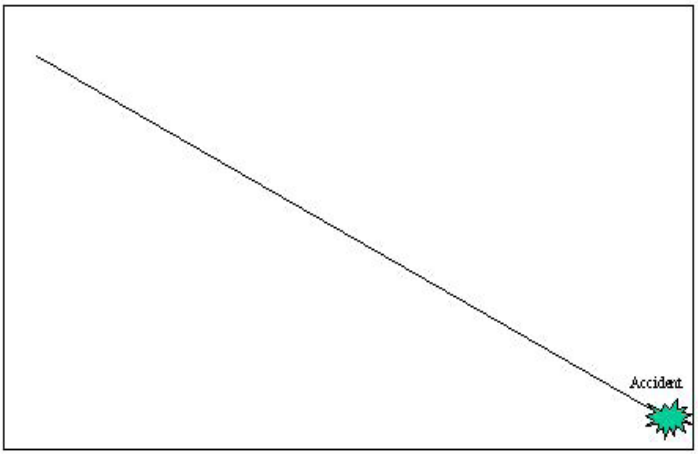
APPENDIX W

RECOMMENDED CHARTS FOR ANALYSIS AND DELIBERATIONS

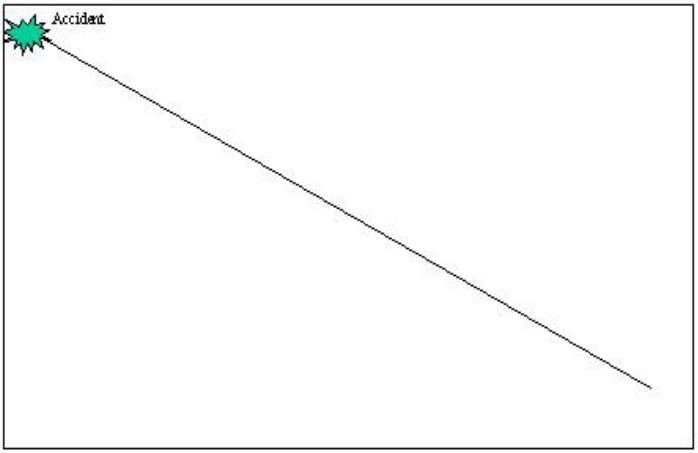
Investigators may use any method to collect data during analysis and deliberations. The following examples are provided to assist in the organization of the collection effort.

Environmental Factors Meteorological Non-meteorological	Material Factors Performance Appropriate use of equipment Adequacy of LSE/PCE
Human Factors Support Standards	Human Factors Training Leader/Command

Pre-Accident Timeline - Work backwards to event leading up to accident.



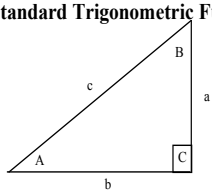
Post-Accident Timeline – Work forward to events after accident.



APPENDIX X

CRASH KINEMATICS

Standard Trigonometric Functions



For angle A:

sine A =	$\frac{\text{opposite}}{\text{hypotenuse}} = \frac{a}{c}$	a = c • Sin A	A= Sin^{-1} (a ÷ c)
cosine A =	$\frac{\text{adjacent}}{\text{hypotenuse}} = \frac{b}{c}$	b = c • Cos A	A= Cos^{-1} (b ÷ c)
tangent A =	$\frac{\text{opposite}}{\text{adjacent}} = \frac{a}{b}$	a = b • Tan A	A= Tan^{-1} (a ÷ b)

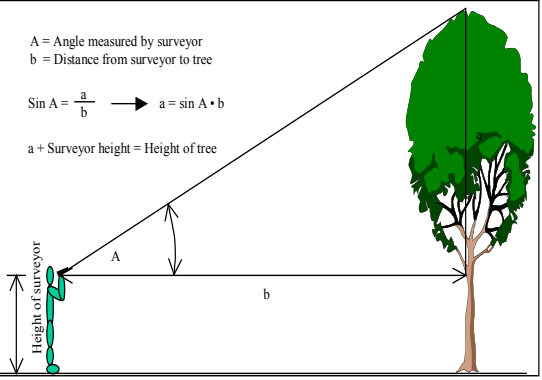
For angle B:

sine B =	$\frac{\text{opposite}}{\text{hypotenuse}} = \frac{b}{c}$	b = c • Sin B	B= Sin^{-1} (b ÷ c)
cosine B =	$\frac{\text{adjacent}}{\text{hypotenuse}} = \frac{a}{c}$	a = c • Cos B	B= Cos^{-1} (a ÷ c)
tangent B =	$\frac{\text{opposite}}{\text{adjacent}} = \frac{b}{a}$	b = a • Sin B	B= Tan^{-1} (b ÷ a)

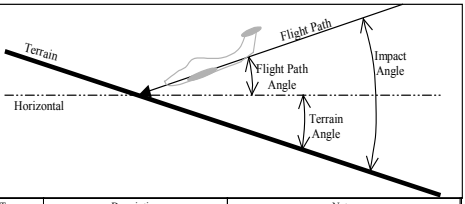
A = Angle measured by surveyor
b = Distance from surveyor to tree

Sin A = $\frac{a}{b}$ → a = sin A • b

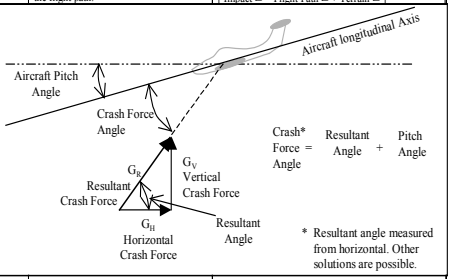
a + Surveyor height = Height of tree



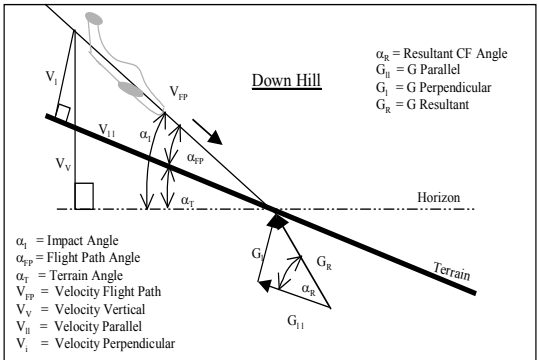
Crash Force Computation Terminology



Term	Description	Notes
Terrain Angle	The angle between the impact surface and the horizontal, measured in the vertical plane of the flight path.	The algebraic sign of the terrain angle is positive when the direction of flight is uphill & negative when the direction of the flight is downhill.
Flight Path Angle	The angle between the aircraft's flight path and the horizontal at the moment of impact.	The algebraic sign of the flight path angle is positive if the aircraft is moving downward immediately prior to impact. The sign is negative if impact occurs while the aircraft is moving upward.
Impact Angle	The angle between the flight path and the terrain, measured in the vertical plane of the flight path.	The impact angle is the algebraic sum of the flight path angle plus the terrain angle. [Impact ∠ = Flight Path ∠ + Terrain ∠]

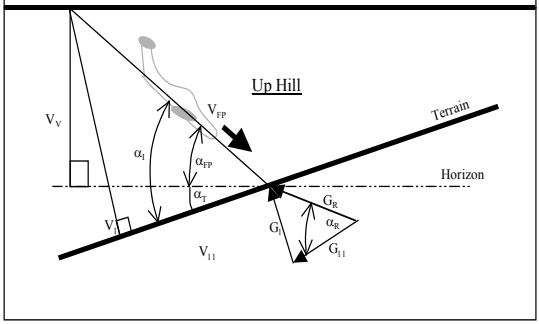


Term	Description	Notes
Crash Force Resultant	The geometric sum of the horizontal and vertical crash forces. Horizontal and vertical crash forces are determined on the basis of horizontal and vertical velocity components at impact and horizontal and vertical stopping distances.	The algebraic sign of the Crash Force Resultant angle is positive when the line of action of the resultant is above the horizontal and is negative if the line of action is below the horizontal.
Attitude at Impact	The aircraft attitude at moment of impact. Pitch – Nose above or below horizon Yaw – Nose right or left Roll – Right or left bank	The algebraic sign of the aircraft pitch angle is negative when the nose of the aircraft points below the horizon and positive when the nose points above the horizon.
Crash Force Angle	The angle between the resultant crash force and the longitudinal axis of the aircraft.	For impacts with little lateral component of force the crash force angle is the algebraic sum of the crash force resultant angle plus the aircraft pitch angle.



$V_{FP} = \frac{V_V}{\sin \alpha_I}$	$\text{Tan } \alpha_{FP} = \frac{V_I}{V_{II}}$	$G_R = \frac{G_I}{\sin \alpha_R}$	$\text{Tan } \alpha_R = \frac{G_I}{G_{II}}$
$V_I = \sin \alpha_I \bullet V_{FP}$	$V_{II} = \cos \alpha_I \bullet V_{FP}$	$G_I = \frac{V_I^2}{32.17 \bullet SD}$	$G_{II} = \frac{V_{II}^2}{32.17 \bullet SD}$
MPH • 1.467 = Ft/Sec	KTS • 1.69 = Ft/Sec		

V_V is measured perpendicular to the Horizon, not the Terrain.



Math Key

Solve for:

Ð A

Sine A = $\frac{\text{Opposite}}{\text{Hypotenuse}} = \frac{a}{c}$

Cosine A = $\frac{\text{Adjacent}}{\text{Hypotenuse}} = \frac{b}{c}$

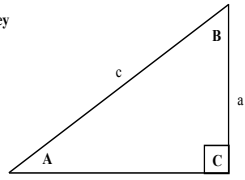
Tangent A = $\frac{\text{Opposite}}{\text{Adjacent}} = \frac{a}{b}$

Ð B

Sine B = $\frac{\text{Opposite}}{\text{Hypotenuse}} = \frac{b}{c}$

Cosine B = $\frac{\text{Adjacent}}{\text{Hypotenuse}} = \frac{a}{c}$

Tangent B = $\frac{\text{Opposite}}{\text{Adjacent}} = \frac{b}{a}$



$a^2 + b^2 = c^2$

Ð C = 90º

Example: Solve for length of sides a and b if angle A is 20º and side c is 10 feet long

Sine of ∠A = .3420 Length of side c is 10 ' Solve for length of side a.	Sine A = a ÷ c 0.3420 = a ÷10 a = (0.3420)(10) **a = 3.420 feet long**
Cosine of ∠A = .9397 Length of side c is 10 ' Solve for length of side b.	Cosine A = b ÷ c 0.9397 = b ÷10 b = (0.9397)(10) **b = 9.397 feet long**

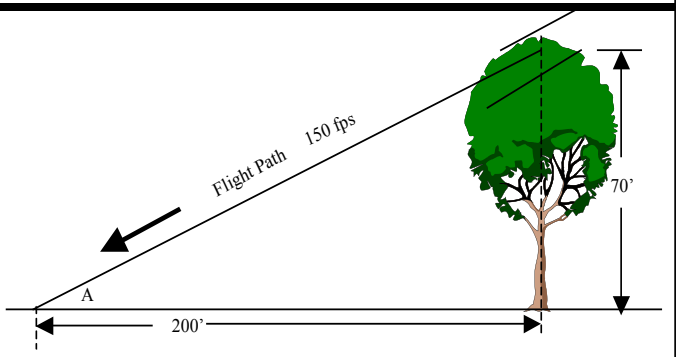
Check accuracy of computations:

$a^2 + b^2 = c^2$ $(3.420)^2 + (9.397)^2 = 10^2$ 11.6964 + 88.3036 = 99.6072 ≈ 100

V = Velocity in feet/second (f/s) V_V = Vertical Velocity V_H = Horizontal Velocity V_{FP} = Velocity of flight path V(MPH) • 1.467 = V f/s V(KTS) • 1.69 = V f/s	Gravity (g) = 32.17 G_V = G Load Vertical G_H = G Load Horizontal SD = Stopping Distance in feet SD_V = Stopping Distance V SD_H = Stopping Distance H	KE = Kenetic Energy in foot/pounds (ft/lbs) W = Weight of Object h = Height CF = Centrifugal Force in pounds Radius = 1/2 diameter
Solve for impact angle: Impact ∠ → Tan A = $\frac{\text{Opposite}}{\text{Adjacent}} = \frac{a}{b}$	Solve for vert impact "G" load: $G_V = \frac{(V_V)^2}{g \cdot SD_V}$	Solve for horizontal imbalance: $CF = \frac{W \cdot \text{Radius} \cdot (RPM)^2}{2937}$
Solve for vertical velocity, given flt path velocity (f/s): Sine A = $\frac{V_V}{V_{FP}}$	Solve for horizontal impact "G" load: $G_H = \frac{(V_V)^2}{g \times SD_H}$	Solve for kinetic energy: $KE = 1/2 \cdot \frac{W}{g} \cdot V^2$ (V in fps, answer in ft/lbs)
Solve for horizontal velocity given flt path velocity (f/s) Cosine A = $\frac{V_H}{V_{FP}}$	Solve for Velocity: $V = \sqrt{2gh}$ $V = 8\sqrt{h}$	Stopping Distance $SD = \frac{V2}{32.17 \cdot G's}$ (Ft needed to survive x amount of G's)
Solve for velocity: $V^2 = \frac{\text{K.E.}}{\frac{1}{2} \cdot \frac{\text{weight}}{32.17}}$	Solve for G's: $G's = \frac{V^2}{32.17 \cdot SD}$	MPH • 1.467 = Ft/Sec KTS • 1.69 = Ft/Sec

Problem #1
An airplane impacts on level ground after passing through the top branches of a tree. By measurement, you determine that the airplane struck the tree 70 feet above the ground at a point 200 feet horizontally from the point of impact.

Find:
1. The angle of impact.
2. The horizontal and vertical velocities at impact if the flight path velocity is 150 feet per second.

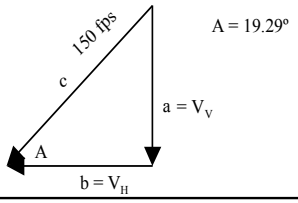


(1) **Find the angle of impact**

$\text{Tan A} = \frac{a}{b} \rightarrow A = \tan^{-1}(70 \div 200) = 19.29^{o}$

(2) **The horizontal and vertical velocities at impact if the flight path velocity is 150 ft/sec.**

a. Draw sketch of airplane impact angle



b. Find V_V and V_H using sine and cosine

$V_V = a, \quad V_H = b$

$V_V = (\sin A = a \div c) \rightarrow \sin A \bullet c = a \rightarrow \sin 19.29\,(150) = 49.55 \text{ fps}$

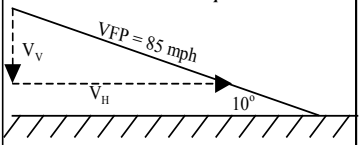
$V_H = (\cos A = b \div c) \rightarrow \cos A \bullet c = b \rightarrow \cos 19.29\,(150) = 141.58 \text{ fps}$

Problem #2
An aircraft crashes in a level open field. Flight path angle is 10 degrees and the true airspeed is 85 mph. Initial impact occurs with the fuselage level (zero pitch angle). The impact causes a 2-foot-deep gouge, and the aircraft comes to rest 25 feet from initial impact. The fuselage is crushed 12 inches vertically and 5 feet horizontally.

Find:
1. The aircraft ground speed (V_H) and vertical velocity (V_V) in feet per second.
2. The mean vertical and horizontal accelerations, in G's.
3. The magnitude and direction of the mean crash resultant.

(1) To find V_H and V_V

a. Sketch conditions at impact



b. Convert 85 mph to ft/sec

(85 mph)(1.467) = 124.69 ft/sec

Answer rounded to 124.7 ft/sec

c. Determine vertical and horizontal velocities (Round answers to nearest 10th for next step)

$\sin 10^o = V_V \div V_{FP} \rightarrow V_V = V_{FP} \bullet \sin 10^o \rightarrow V_V = (124.7)(0.174) = \underline{21.70 \text{ ft/sec}}$

$\cos 10^o = V_H \div V_{FP} \rightarrow V_H = V_{FP} \bullet \cos 10^o \rightarrow V_H = (124.7)(0.985) = \underline{122.83 \text{ ft/sec}}$

(2) To find G_V and G_H

a. Determine vertical and horizontal stopping distances

Vertical stopping distance $(S_V) = (2 \text{ ft})_{gouge} + (1 \text{ ft})_{structure} = 3 \text{ ft}$

Horizontal stopping distance $(S_H) = (25 \text{ ft})_{gouge} + (5 \text{ ft})_{structure} = 30 \text{ ft}$

b. Determine vertical and horizontal accelerations (G's)

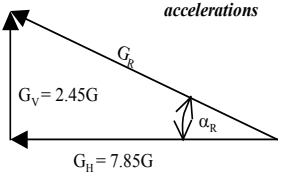
$$G = \frac{V^2}{64S}$$

$G_V = (21.7)^2 \div (64 \bullet 3) = \underline{2.45 \text{ G}}$

$G_H = (122.8)^2 \div (64 \bullet 30) = \underline{7.85 \text{ G}}$

(3) To find a_R and G_R

a. Sketch the vector diagram of the impact accelerations



b. Use tangent trig function to find direction of resultant acceleration

$\tan \alpha_R = \frac{G_V}{G_H} = \frac{2.45}{7.85} = 0.312$

$\alpha_R = \text{arc tan } 0.312 = \underline{17.3^o}$

c. Use the cosine function to find the magnitude of the resultant acceleration

$\cos 17.3^o = \frac{7.85}{G_R} \rightarrow G_R = \frac{7.85}{\cos 17.3^o} = 8.22 \text{ G}$

Problem #3

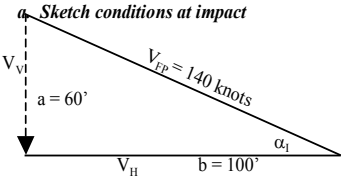
An aircraft crashes on level ground at an airspeed of 140 knots. Accident investigators discover that the airplane struck the top of a tree at a point 60 feet above the ground and crashed 100 feet from the base of the tree. The aircraft came to rest at the end of a gouge 32 feet long and 3 feet deep. Measurements show that the airplane was crushed 60 inches longitudinally and 12 inches vertically.

Find:

1. Horizontal and vertical velocities, in feet per second.
2. Mean vertical and horizontal accelerations, in G's.
3. Magnitude and direction of the crash force resultant.

(1) To find V_H and V_V

a. Sketch conditions at impact



b. Convert 140 knots to ft/sec

(140 kts)(1.69) = 236.6 ft/sec

c. Determine impact angle

$\tan \alpha_I = \frac{a}{b}$ $\quad \alpha_I = \tan^{-1}(\frac{60}{100}) = 30.96^o$

(Answer rounded to 31º for next computation)

d. Determine vertical and horizontal velocities (Round answers to nearest 10th)

$\sin 31^o = V_V \div V_{FP}$ $\quad V_V = (236.6)(\sin 31^o)$ $\quad Vv = (236.6)(0.515) =$ <u>121.849 ft/sec</u>

$\cos 31^o = V_H \div V_{FP}$ $\quad V_H = (236.6)(\cos 31^o)$ $\quad Vh = (236.6)(0.857) =$ <u>202.766 ft/sec</u>

(2) To find G_V and G_H

a. Determine vertical and horizontal stopping distances

Vertical stopping distance $\quad (S_V) = (3 \text{ ft})_{gouge} + (1 \text{ ft})_{structure} = 4 \text{ ft}$

Horizontal stopping distance $\quad (S_H) = (32 \text{ ft})_{gouge} + (5 \text{ ft})_{structure} = 37 \text{ ft}$

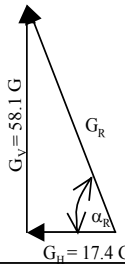
b. Determine vertical and horizontal accelerations (G's) (Round answers to nearest 10th)

$G = \frac{V^2}{64S}$ $\quad G_V = (121.8)^2 \div (64 \bullet 4) =$ <u>57.950 G</u>

$G_H = (202.8)^2 \div (64 \bullet 37) =$ <u>17.368 G</u>

(3) To find a_R and G_R

a. Sketch the vector diagram of the impact accelerations



b. Use tangent trig function to find direction of resultant acceleration

$\tan \alpha_R = \frac{G_V}{G_H} = \frac{58.0}{17.4} = 3.33$

$\alpha_R = \tan^{-1}(3.33) =$ <u>73.28º</u> (Round answer to nearest 10th)

c. Use the cosine function to find the magnitude of the resultant acceleration

$\sin 73.3^o = \frac{G_V}{G_R} = \frac{58.0}{G_R}$ $\quad G_R = \frac{58.0}{\sin 73.3^o} =$ <u>60.55 G</u>

Problem #4

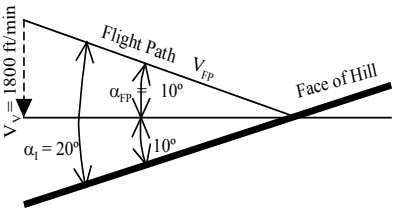
An aircraft crashes against a 10-degree uphill slope. The impact angle is 20 degrees. At the time of the impact, the aircraft vertical velocity was 1,800 feet per minute. The airplane came to rest after sliding 80 feet. Maximum depth of the gouge was 1 foot, and inspection revealed that the airplane structure was crushed 1 foot vertically. There was no horizontal crushing of the structure.

Find:

1. Flight path velocity.
2. Mean longitudinal and vertical acceleration, in G's, with respect to the face of the hill.
3. Mean crash force resultant magnitude and direction..

(1) To find flight path velocity

a. Sketch conditions at impact



b. Convert V_V to feet/sec

$$\frac{1{,}800 \text{ ft/min}}{60} = 30 \text{ ft/sec}$$

c. Determine flight path velocity

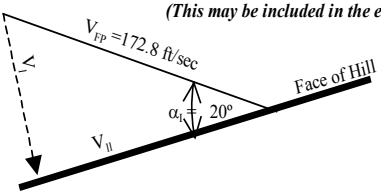
$$\sin \alpha_{FP} = \sin 10° = \frac{V_V}{V_{FP}} = \frac{30}{V_{FP}}$$

$$V_{FP} = \frac{30}{\sin 10°} = \underline{\underline{172.76 \text{ ft/sec}}}$$

(Round answer to nearest 10th)

(2) To find G_{II} and G_I

a. Sketch the known conditions, with respect to the face of the hill.
(This may be included in the earlier sketch).



b. Determine velocity parallel to face of hill and velocity perpendicular to face of hill.
(Round answers to nearest 10th)

(1) $\cos 20° = V_{II} \div V_{FP}$ $\quad V_{II} = (V_{FP})(\cos 20°) = (172.8)(\cos 20°) = \underline{\underline{162.378 \text{ ft/sec}}}$

(2) $\sin 20° = V_I \div V_{FP}$ $\quad V_I = (V_{FP})(\sin 20°) = (172.8)(\sin 20°) = \underline{\underline{59.101 \text{ ft/sec}}}$

c. Determine stopping distances parallel to the face of the hill and perpendicular to the face of the hill.

(1) S_{II} = 80 feet

(2) S_I = (1 foot) + (1 foot) = 2 feet

d. Determine accelerations parallel to the slope and perpendicular to the slope.

$$G = \frac{V^2}{64S}$$

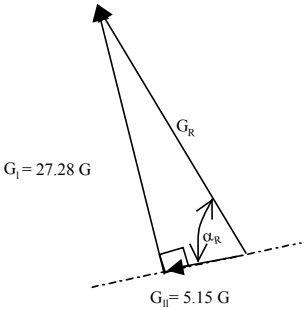
(1) $G_{II} = (162.4)^2 \div (64 \bullet 80) = \underline{\underline{5.15 \text{ G's}}}$

(2) $G_I = (59.1)^2 \div (64 \bullet 2) = \underline{\underline{27.28 \text{ G's}}}$

Problem #4 continued:

③ **To find a_R and G_R**

a. Sketch the vector diagram of the mean accelerations.



b. Determine α_R.

$\tan \alpha_R = \dfrac{G_I}{G_{II}} \qquad \dfrac{27.28}{5.15} = 5.29$

$\alpha_R = \tan^{-1}(5.29) = 79.29^\circ$

(Round answer to nearest 10th)

c. Determine magnitude of crash force resultant.

$\sin 79.3 = \dfrac{G_I}{G_R} \qquad \dfrac{27.28}{G_R}$

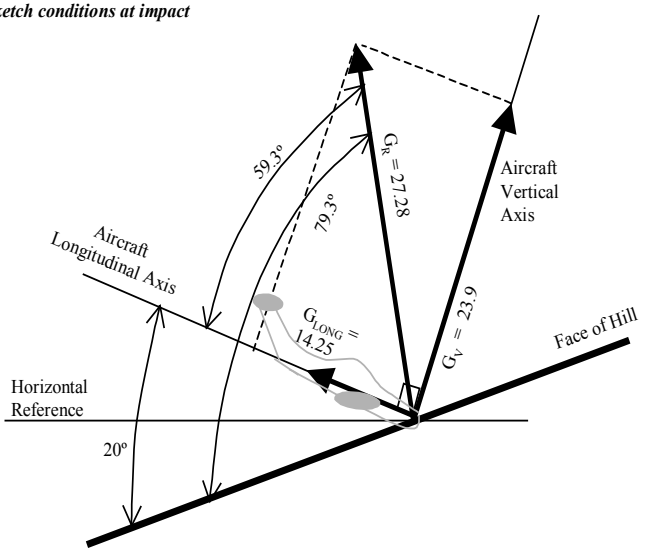
$G_R = \dfrac{27.28}{\sin 79.3^\circ} = 27.76$ G

Problem #5
(Based on Problem #4: An aircraft crashes against a 10-degree uphill slope. The impact angle is 20 degrees. At the time of the impact, the aircraft vertical velocity was 1,800 feet per minute. The airplane came to rest after sliding 80 feet. Maximum depth of the gouge was 1 foot, and inspection revealed that the airplane structure was crushed 1 foot vertically. There was no horizontal crushing of the structure.)
ADD: The longitudinal axis of the airplane is parallel to the flight path.

Find:
Longitudinal and vertical accelerations with respect to the aircraft axes.

(1) **Determine longitudinal and vertical accelerations with respect to the aircraft axes.**

a. Sketch conditions at impact



b. Determine from the sketch that the 27.28 G crash force resultant acts at an angle of 59.3 degrees
from the longitudinal axis of the airplane (79.3º - 20º = 59.3º)

Therefore, the mean longitudinal acceleration of the airplane is:

$G_{longitudinal} = (G_R)(\cos 59.3º) = (27.28)(\cos 59.3º) = \underline{\underline{13.927 \text{ ft/sec}}}$

And the mean vertical acceleration of the airplane is:

$G_{vertical} = (G_R)(\sin 59.2º) = (27.28)(\sin 59.3º) = \underline{\underline{23.456 \text{ ft/sec}}}$

APPENDIX Y

NIGHT VISION SYSTEMS CHECKLISTS

AB-1. AVIATION NIGHT VISION SYSTEMS

Enter required data by marking with an "X" or check, or fill in the blank with Y = Yes, N = No, U or UNK = Unknown, or other appropriate answer.

CASE NUMBER:_____

INDIVIDUAL COMPLETING FORM:_____

AIRCRAFT DATA

TYPE/TAIL NUMBER: _____

WINDSCREEN CONDITION: GOOD_____ MED_____ POOR____

WINDOWS: CLOSED____ OPEN____

DOORS: COCKPIT: CLOSED____ OPEN____ REMOVED____

CARGO: CLOSED____ OPEN____ REMOVED____

ENVIRONMENTAL DATA:
MOON: RISE_____ SET_____

% ILLUM_____ ANGLE_____

HORIZON: VISIBLE_____ OBSTRUCTED____ OTHER____

VISIBILITY: MILES_____ RESTRICTIONS: FOG_____MIST_____
SMOKE_____ RAIN_____OTHER_____

TEMPERATURE (Cent): _____

DEWPOINT (Cent): _____

HUMIDITY: _____

DESCRIBE TERRAIN: FLAT_____ ROLLING_____ MOUNTAINOUS_____

BACKGROUND REFLECTANCE: SAND___ DIRT___ GRASS___ WATER___
FOREST___

AREA: REMOTE___ POPULATED___ ISOLATED___SPARSELY POPULATED___

NVD's

	PILOT	COPILOT	CREW CHIEF
Type ANVIS (Include OMNI Version if possible)	_____	_____	_____
TUBES, NEW OR REBUILT	_____	_____	_____
TIME ON TUBES (Since Last Inspection)	_____	_____	_____
SERIAL NUMBER ON LEFT TUBE	_____	_____	_____
SERIAL NUMBER ON RIGHT TUBE	_____	_____	_____
SERIAL NUMBER OF NVD	_____	_____	_____
LAST INSP DATE OF NVD AND TYPE TEST SET USED (3895-UV, ALT-TP, HANDHELD)	_____	_____	_____
DATE OF LAST NITROGEN PURGE LEFT TUBE:	_____	_____	_____
RIGHT TUBE:	_____	_____	_____
RECORDS KEPT ON NVD's (Y/N)	_____	_____	_____
TYPE COUNTERWEIGHT (SOLID, NONE, UNK)	_____	_____	_____
WEIGHT OF COUNTERWEIGHT IN OUNCES	_____	_____	_____
DID COUNTERWEIGHT BREAK AWAY? (Y/N/U)	_____	_____	_____
DID COUNTERWEIGHT CONTRIBUTE TO INJURIES? (Y/N/U)	_____	_____	_____
DID NVD CAUSE OR CONTRIBUTE TO INJURIES? (Y/N/U)	_____	_____	_____
IF INJURIES OCCURRED, WERE THEY TO EYES/HEAD/FACE/OTHER?	_____	_____	_____

	PILOT	COPILOT	CREWCHIEF	Other Crewmember
WERE ANY EYEGLASSES WORN?				
WHAT TYPE OF EYEGLASSES? (GLASS/PLASTIC/ POLYCARBONATE)				
WAS LANYARD WORN AROUND NECK (Y/N/U)				
WERE BATTERIES REFRIGERATED BETWEEN USE? (Y/N/U)				
INDICATE TYPE BATTERY PACK (DUAL, ARTIC ADAPTOR, TRIPLE)				
TYPE BATTERIES INSTALLED IN NVD OR BATTERY PACK (LITHIUM, ALKALINE)				
DID CREWMEMBER RECEIVE A LOW BATTERY PER INDICATION? (Y/N/U/NA)				

Supplemental Lighting

NOTE: ENTER COLOR CODES

G = GREEN
W = WHITE
R = RED
B = BLUE
Y = YELLOW

NONE:				
FINGER:				
LIP:				
WRIST:				
FLASHLIGHT:				

LIGHTING DATA

FOR POSITION LIGHT: ENTER **S** (STEADY), **F** (FLASH)

FOR ANTICOLLISION LIGHT: ENTER **R** (RED), **W** (WHITE), **ST** (STROBE)

EXTERNAL: COMPLETED FOR LIGHTS ON. (Check as appropriate or enter data.)

POSITION/NAVIGATION: BRIGHT_____ DIM_____ UNK_____

ANTICOLLISION LIGHTS: TOP____ BOTTOM_____ SIDES____ UNK_____

INFRARED POSITION LIGHTS: BRIGHT_____ DIM_____ UNK_____

FORMATION LIGHTS: ON____ 1____ 2_____ 3_____ 4____ 5_____

LANDING LIGHT: INFRARED_____ VISIBLE_____ WATTAGE____
POSITION_____ RHEOSTAT____

SEARCHLIGHT: INFRARED____ VISIBLE____ WATTAGE____
POSITION____ RHEOSTAT____

BEAM WIDTH IN DEGREES: _____

LANDING LIGHT/SEARCHLIGHT: FOR POSITION, SPECIFY ANGLE REARWARD (R) OR FORWARD (F) IN RELATION TO VERTICAL AND AZIMUTH; LEFT (L) OR RIGHT (R) OF NOSE (10F/10R). IF LIGHT IS ON CENTERLINE OF NOSE, USE (C) FOR AZIMUTH; E.G., 90R/C (LANDING LIGHT IS STOWED AND ON CENTERLINE)

NVG MODIFICATIONS

YES_____ NO_____ MWO 1. _____
2. _____
3. _____

RED-LIGHTED COMPONENTS: YES_____ NO_____

TYPE:
1 - EYEBROW
2 - DIMPLE
3 - FLOOD
4 - BEZEL
5 - INTERNAL
6 - SUPPLEMENTAL

COLOR:
W = WHITE
R = RED
B = BLUE
Y = YELLOW
G = GREEN

NOTE: - CHECK OFF OR ON
- ENTER CODES FOR TYPE AND COLOR

PANEL LIGHTS/CONSOLE/OVERHEAD:	OFF____	ON____	TYPE____	COLOR____
AVIONICS LIGHTS:	OFF____	ON____	TYPE____	COLOR____
INSTRUMENT LIGHTS:	OFF____	ON____	TYPE____	COLOR____
MAP LIGHT/UTILITY:	OFF____	ON____	TYPE____	COLOR____
CAUTION/WARNING LIGHTS:	OFF____	ON____	TYPE____	COLOR____

NOTE: IF NEEDED, PUT COMMENT ON DA FORM 2397-3.

AB-2. GROUND NIGHT VISION SYSTEMS.

Enter required data by marking with an "X" or check, or fill in the blank with Y=Yes, N=No, U or UNK=Unknown, or other appropriate answer.

CASE NUMBER:_____

INDIVIDUAL COMPLETING FORM:_____

TYPE OF DEVICE _____

TYPE OF VEHICLE IN USE WITH DEVICE

WHEELED VEHICLE _____
TRACKED VEHICLE _____

INFORMATION FOR WHEELED VEHICLE

CONDITION AND CLEANLINESS OF WINDSCREEN _____
CONDITION AND CLEANLINESS OF DOOR WINDOWS _____
WERE BLACKOUT DRIVE LIGHTS IN USE _____

INFORMATION FOR TRACKED VEHICLE

WAS THE VVS-2 IN USE _____
WAS THE 50-FOOT FOCUS CHECK COMPLETED _____
WERE THE OPTICS CLEAN _____
WERE THERMAL SYSTEMS IN USE _____
DID TC USE NVGS _____
IF SO, WERE THEY MOUNTED (HELMET OR HEAD) OR USED LIKE BINOCULARS _____

ENVIRONMENTAL DATA:

MOON: RISE_____ SET_____
% ILLUM_____ ANGLE_____

HORIZON: VISIBLE_____ OBSTRUCTED____ OTHER____

VISIBILITY: MILES_____ RESTRICTIONS: FOG_____MIST____
SMOKE_____ RAIN_____OTHER_____

TEMPERATURE (Cent): _____
DEWPOINT (Cent): _____

HUMIDITY: _____

DESCRIBE TERRAIN: FLAT_____ ROLLING_____ MOUNTAINOUS_____

BACKGROUND REFLECTANCE: SAND___ DIRT___ GRASS___ WATER___ FOREST___

AREA: REMOTE___ POPULATED___ ISOLATED___ SPARSELY POPULATED___

OPERATOR INFORMATION

WERE ANY EYEGLASSES WORN? _____ _____ _____

WHAT TYPE OF EYEGLASSES? _____ _____ _____ _____
(GLASS/PLASTIC/POLYCARBONATE)

WAS LANYARD WORN AROUND NECK? (Y/N/U) _____ _____ _____

WAS SOLDIER TRAINED ON THE DEVICES IN USE _____
IF SO, HOW WAS THE TRAINING CONDUCTED _____

BYA QUALIFIED INSTRUCTOR PER Chapter 8, AR 600-55 _____

WAS NVD TRAINING CONDUCTED IN ACCORDANCE WITH TC-21-305-2 _____

HOW LONG AGO _____

NVG INFORMATION

ARE THE NVGS SERVICABLE _____

CONDUCT A HIGH AND LOW LIGHT RESOLUTION CHECK USING A TS4398 AND LIST RESULTS FOR EACH NVG

APPENDIX Z
CREW COORDINATION CHECKLIST

REFERENCE: TC 1-210, Aircrew Training Program.

AC-1. GENERAL. The intent of this appendix is to provide investigators with a tool to evaluate crew coordination. Currently, no unit crew coordination sustainment training program exists (may change in CY 2002). However, TC 1-210, Aircrew Training Program, as well as all individual aircraft ATMs, provides a list of 13 basic qualities of effective aircrew coordination.

AC-2. APPLICABILITY. The qualities of effective aircrew coordination apply to aviation and ground systems. They apply equally to any vehicle or piece of equipment that is operated by more than one person. While no equivalent ground manuals address crew coordination in the manner of the ATP/ATMs, ground investigators should also use this checklist to evaluate effectiveness of crew coordination.

AC-3. CREW COORDINATION DEFINED. Crew coordination is the interaction between crewmembers necessary for the safe, efficient and effective performance of tasks. It involves the effective utilization of all available resources: hardware, software, and live-ware.

- Crew coordination is a set of principles, attitudes, procedures, and techniques that transforms individuals into an effective crew. It is a vital part of the unit-training program. DA directives mandate that all air-crewmembers become crew-coordination qualified.
- Aviation units will conduct initial aircrew coordination qualification training according to TC 1-210 and the USAAVNC Aircrew Coordination Exportable Training Package.
- Other definitions include:
  - o Individual actions - these actions are the portion of a task that an individual crewmember must do.
  - o Crew-coordinated actions - these actions require crewmembers to communicate appropriately with each other and to perform their individual actions in the proper sequence and at the proper time to ensure safe and efficient task execution.

AC-4. QUALITIES OF EFFECTIVE CREW COORDINATION. Investigators should examine these qualities to determine if effective crew coordination existed or if poor crew coordination contributed to the accident (see TC 1-210, [http://155.217.58.58/cgi-bin/atdl.dll/tc/1-210/CHAP1.HTML - 9] for a detailed explanation of each category):

_____**(1) Flight/vehicle team leadership and crew climate are established and maintained.** This quality addresses the relationships among the crew and

the overall climate of the flight deck. Aircrews are teams with a designated leader and clear lines of authority and responsibility. The PC sets the tone for the crew and maintains the working environment. Effective leaders use their authority but do not operate without the participation of other crewmembers. When crewmembers disagree on a course of action, they must be effective in resolving the disagreement.

_____**(2) Pre-mission planning and rehearsal are accomplished.** Pre-mission planning includes all preparatory tasks associated with planning the mission. These tasks include planning for VFR, IFR, and terrain flight. They also include assigning crewmember responsibilities and conducting all required briefings and brief-backs. Pre-mission rehearsal involves the crew's collective visualization and discussion of expected and potential unexpected events for the entire mission. Through this process, all crewmembers think through contingencies and actions for difficult segments or unusual events associated with the mission and develop strategies to cope with contingencies.

_____**(3) Appropriate decision-making techniques are applied.** Decision making is the act of rendering a solution to a problem and defining a plan of action. It must involve composite risk assessment. The quality of decision making and problem solving throughout the planning and execution phases of the mission depends on the information available, time constraints, and level of involvement and information exchange among crewmembers. The crew's ability to apply appropriate decision-making techniques based on these criteria has a major impact on the choice and quality of their resultant actions. Although the entire crew should be involved in the decision-making and problem solving process, the PC is the key decision maker.

_____**(4) Actions are prioritized and workload is equitably distributed.** This quality addresses the effectiveness of time and workload management. It assesses the extent to which the crew, as a team, avoids distractions from essential activities, distributes and manages workload, and avoids individual task overload.

_____**(5) Unexpected events are managed effectively.** This quality addresses the crew's performance under unusual circumstances that may involve high levels of stress. Both the technical and managerial aspects of coping with the situation are important.

_____**(6) Statements and directives are clear, timely, relevant, complete, and verified.** This quality refers to the completeness, timeliness, and quality of information transfer. It includes the crew's use of standard terminology and feedback techniques to verify information transfer. Emphasis is on the quality of instructions and statements associated with navigation, obstacle clearance, and instrument readouts.

_____**(7) Mission situational awareness is maintained.** This quality considers the extent to which crewmembers keep each other informed about the status of the aircraft and the mission. Information reporting helps the aircrew maintain a high level of situational awareness. The information reported includes aircraft position and orientation, equipment and personnel status, environmental and battlefield conditions, and changes to mission objectives. Awareness of the situation by the entire crew is essential to safe flight and effective crew performance.

_____**(8) Decisions and actions are communicated and acknowledged.** This quality addresses the extent to which crewmembers are kept informed of decisions made and actions taken by another crewmember. Crewmembers should respond verbally or by appropriately adjusting their behaviors, actions, or control inputs to clearly indicate that they understand when a decision has been made and what it is. Failure to do so may confuse crews and lead to uncoordinated operations.

_____**(9) Supporting information and actions are sought from the crew.** This quality addresses the extent to which supporting information and actions are sought from the crew by another crewmember, usually the PC. Crewmembers should feel free to raise questions during the flight regarding plans, revisions to plans, actions to be taken, and the status of key mission information.

_____**(10) Crewmember actions are mutually cross-monitored.** This quality addresses the extent to which a crew uses cross-monitoring as a mechanism for breaking error chains that lead to accidents or degraded mission performance. Crewmembers must be capable of detecting each other's errors. Such redundancy is particularly important when crews are tired or overly focused on critical task elements and thus more prone to make errors.

NOTE: The two-challenge rule allows one crewmember to automatically assume the duties of another crewmember who fails to respond to two consecutive challenges. For example, the P* becomes fixated, confused, task overloaded, or otherwise allows the aircraft to enter an unsafe position or attitude. The P first asks the P* if he is aware of the aircraft position or attitude. If the P* does not acknowledge this challenge, the P issues a second challenge. If the P* fails to acknowledge the second challenge, the P assumes control of the aircraft.

_____**(11) Supporting information and actions are offered by the crew.** This quality addresses the extent to which crewmembers anticipate and offer supporting information and actions to the decision maker--usually the PC--when apparently a decision must be made or an action taken.

_____**(12) Advocacy and assertion are practiced.** This quality concerns the

extent to which crewmembers are proactive in advocating a course of action they consider best, even when others may disagree.

_____(13) Crew-level after-action reviews are conducted. This quality addresses the extent to which crewmembers review and critique their actions during or after a mission segment, during periods of low workload, or during the mission debriefing.

AC-5. Historical crew coordination errors identified by the USACRC/ARI Aviation Accident Analysis.

- Failure of the pilot on the controls (P*) to properly direct assistance from other crewmembers.
- Failure of a crewmember to announce a decision or action that affected the ability of other crewmembers to properly perform their duties.
- Failure of a crewmember to communicate positively (verbally and non-verbally).
- Failure of Pilot in Command (PC) to assign crew responsibilities properly before and during the mission.
- Failure of the P or other crewmembers to offer assistance or information that was needed or had been requested previously by the P*.
- Failure of the P* to execute flight actions in the proper sequence with the actions of the other crewmembers.

APPENDIX AA
DRIVER TRAINING CHECKLIST

Driver Training Assessment Checklist

This checklist provides an overview of the present Army policy on driver training program requirements.

1. Does the unit have written authority (provided by the installation) to train, test, and license non-commercial vehicle and equipment operators IAW AR 600-55, para 1-4,g(3)?
2. Is operator training, testing and licensing conducted at battalion level or higher (or the highest level possible if the unit or installation is smaller than a BN sized element) IAW AR 600-55, para 1-4,g(3)?
3. How is this communicated and executed?
4. Who at battalion has oversight of the driver's training program and what does the oversight entail?
5. Is guidance published and provided to subordinate commands for the driver's training program? If yes, describe the means (SOP, policy letter etc… and date).
6. Does guidance address roles and responsibilities as outlined in AR 600-55 and AR 385-55 for--
    a. Company commanders?
    b. Squad leader/first line leader/supervisors?
    c. Senior occupant?
    d. Licensed operators?
    e. Driving Instructors?
7. How does the oversight unit ensure the drivers' training program is executed IAW AR 600-55, AR 385-55 and local and civil laws?

Publications

8. Are the following publications on hand:
    a. AR 600-55?
    b. AR 385-55?
    c. Applicable TC's for the unit equipment?
    d. FM 21-305?
    e. TC 21-305-2?
    f. TC 21-306?
    g. Appropriate TM for NVD (model specific)?

Driver Selection

9. What is the policy for driver selection?
10. Are the candidates military record DA Form 2-1/ERB reviewed? What is it reviewed for? Who conducts the screening? Can this information keep a soldier from operating equipment? What circumstances would prevent a soldier from getting a license? Is this written policy?

11. Is the candidates DA Form 348 or ULLS-G compatible form reviewed? What is it reviewed for? Who conducts the screening? Can this information keep a soldier from operating equipment? What circumstances would prevent a soldier from getting a license? Is this written policy?
12. Are the candidate's medical records screened? What is it reviewed for? Who conducts the screening? Can this information keep a soldier from operating equipment? What circumstances would prevent a soldier from getting a license? Is this written policy?
13. Does the unit conduct a civilian DMV check on all candidates prior to licensing them to assess their driving history?
14. Who accomplishes records screening and how is the commander apprised of the screening?
15. Is each candidate interviewed? Who conducts the interview?
16. What does the interview assess? Is a written record of the interview maintained?
17. As part of the selection process, is each candidate given a physical evaluation to measure/test--
    a. Vision
    b. Field-of-vision
    c. Depth perception
    d. Color perception
    e. Foot reaction time
    f. Hearing
18. Who conducts this evaluation?

Training Program

19. Does the unit-training program include both academics and hands-on training and testing?
20. Are driver responsibilities part of the training academics? What are those responsibilities?
21. Are laws and regulations taught as part of the training academics? Does this include local and federal laws and regulations as well as Army standards?
22. Is vehicle maintenance training part of the academics? Is it tailored for the equipment the soldier is being licensed on? Describe what the training consists of?
23. Are soldiers instructed on various driving techniques? How is this accomplished?
24. Is NVD training part of the academics? What does it cover?

25. Is accident avoidance part of the academics? At what level is this taught (unit, installation, squad leader)? What materials are used to instruct this training? How often does a soldier receive this training?
26. Is hazard identification, assessment and controls part of the training? How is this accomplished?

Training Qualification

27. Who is responsible for ensuring the soldier has been trained in all areas of academics? List position with specified area.
28. Who determines the candidate is ready to be tested?
29. What does the test include?
30. Do all candidates receive a written examination tailored for specific equipment?
31. Once the candidate passes the written exam, does the candidate receive a road test IAW the appropriate TC (off road, on road, etc.) for the equipment the candidate is being licensed on? Who conducts the road test?
32. Is this individual (examiner/tester) certified and designated in writing by the commander?

Driver Instructors

33. What policy or procedure is in place for identifying and selecting instructors for the driver's training program?
34. Are instructors and assistant instructors appointed in writing IAW AR 600-55, para 4-5a(1)?
35. Do the instructors have a valid license for the equipment they are instructing and testing personnel on?
36. Is there a system in place to evaluate the instructor's technical knowledge and experience? If so, what are the criteria?
37. Are there any special requirements for instructor selection such as completing Instructor Qualification Course? If so, what are the requirements?

NVD Training Program

38. What does the unit NVD training program consist of?
39. What does unit policy say about operating vehicles at night in blackout conditions?
40. What does unit policy say about use of NVDs?
41. How are soldiers informed of the policy?

Training Program - NCO Role

42. Does unit policy address NCO responsibilities for NVD training?
43. Does it include enforcement of the program?
44. Does it outline the NCO role in enforcing speed limitations for all modes of driving?
45. Have the NCO's been trained on the devices and understand their limitations?
46. Do NCOs ensure personnel are qualified and that refresher training is conducted IAW AR 600-55?
47. Do NCOs ensure qualification and refresher training is properly annotated on the soldiers DA Form 348 or ULLs compatible form?

Instructor Qualifications

48. Does the instructor training comply with the TC's and AR 600-55 chapter 8?
49. Are instructors qualified on specific NVD and vehicles they are designated to instruct on?
50. Are instructors designated in writing by the commander as a certified instructor for the specified NVD?

Instructor Role

51. Does the unit have written policy that outlines the instructor's responsibility?
52. If so, are the following tasks designated as a responsibility of the instructors:
    a. Implement the commander's program?
    b. Conduct qualification and refresher training?
    c. Administer road tests?
    d. Keep the commander informed of the overall status of the unit NVD profile?
    e. Document qualification and refresher training on OF 346 & DA Form 348 (sections I & III)?

Academics

53. At minimum does the training consist of:
    a. Intro to NVD model?
    b. Device limitation awareness?
    c. Depth perception, visual acuity and field of vision?
    d. Illumination requirements?
    e. Speed restrictions?
    f. Scanning techniques?
    g. Emergency procedures?
    h. Driver/assistant driver responsibilities?
    i. Self-imposed stressors?
    j. Care and security of NVDs?
54. Does the unit have a written POI for this instruction?
55. Is the instruction conducted in five phases?
56. Are the phases conducted sequentially?
57. Does the operator receive hands-on training while under the supervision of a qualified NVD instructor, equipped with NVD's during the night driving phase?
58. As part of the training, does the operator receive hands-on instruction in:
    a. Driving the vehicle in daylight to familiarize the operator with the terrain and route?
    b. Driving the route at night with headlights on without use of NVDs?
    c. Conducting a pre-operations check of the NVD?
    d. Checking for proper wear and fit and focus?
    e. Conducting vehicle PMCS w/NVDs and then refocus prior to operating the vehicle?

f. Driving the previous route with NVDs on in blackout conditions?
    (1) Identifying markers, signs and terrain?
    (2) Distinguishing between shadows and terrain features?
g. Performing vehicle after operations PMCS with NVD's on?
h. Performing post-operations check on NVD?

59. Is an AAR conducted after Phase V?
60. Does unit policy require soldiers to be licensed and current on the vehicle they are receiving NVD training on?
61. Are soldiers required to complete the academics and driving phases before they are considered eligible for testing on NVDs?
62. Does the unit require soldiers to successfully complete an NVD performance test given by an NVD-qualified instructor as part of the qualification?
63. Does the unit have a refresher training program for NVDs?
64. What does the refresher training consist of?
65. Who administers the refresher training?
66. How is refresher training tracked?
67. How often is refresher training conducted for each soldier?

Records

68. Is a DA form 348 or ULLG's compatible form maintained on every person who operates equipment?
69. Who/where is the form maintained?
70. Are all of the operator qualifications, performance measures and tests recorded on the DA Form 348?
71. Is refresher/sustainment training and remedial (when applicable) training annotated on the 348?

APPENDIX AB
Deliberations Worksheet

Deliberations Worksheet

Materiel

Code	Anomalies (Deficiencies & failures)	Reference

Human

Code	Anomalies (Errors - Failures - Deficiencies)	Reference

Environment

Code	Conditions (Unforecast or unavoidable)	Reference

P&C	Present and contributing
PBNC	Present but not contributing
P&C S/D	Present and contributing to severity of injury or damage
O	Observation
F	Feedbee

Generic COMMAND OUT-BRIEF Format

Command Outbrief
UH-60A XX August XXXX
Company, Aviation Regiment
Location

The briefing should start with the appropriate greeting, "Good morning or good afternoon, sir" and an introduction of yourself. Continue by stating, "This will be an information briefing on the aircraft or vehicle accident that took place at ***(location)*** on ***(date***)." Continue with your slides from this point.

This introductory slide will include:
- Aircraft, vehicle, equipment or task involved in the accident.
- Classification.
- Location.
- Date.

BACKGROUND

- **UNIT:** B Co 1st BN 123 Avn, 35th Div
- **EQUIPMENT:** UH-60L
- **DATE/TIME:** xx/xx/xxxx 23:45L
- **LOCATION:** 38S ZZ 8352 1792
- **RESULTS:** 6 Fatalities, Aircraft Destroyed
- **COST:** $7.2M
- **MISSION:** Cargo/Passenger Transport

The CG may be familiar with much of the information on this slide. He will certainly know the unit, equipment, date and location. Be brief.
However, he may not know the extent of injuries and total cost.
The total cost should be the amount listed on DA Form 2397-1, block 10a(6) or block 10b, as applicable.
The total number of fatalities and injuries is listed in Block 19 on DA Form 2397-1.

Summarize the mission or task. Often, this will provide you an opportunity to talk at the macro level as a lead-in to your next slide.
Example: The mission was to conduct multi-ship, day VFR cross country to Camp Roberts and return. The pilots were going to meet members of the ____ for an informal OPD.
Originally a two-ship mission scheduled for the week prior. Other unit unable to make the meeting so it was postponed until 15 August.
In addition, CW4 ____ was in the process of training CW2 ____ in cross-country flight.

PRE-ACCIDENT

DATE: XX AUG XX

- **1500 Crews report for duty**
- **1600 Crews conduct pre-flight.**
- **1800 Crews receive mission up-date from company commander, completed mission brief, threat assessment and weather briefing.**
- **1830 Flight departs for 5 hour mission.**
- **2230 Flight departs Cairns for Lawson.**

Similar to the written history paragraph, this slide begins to frame the accident. Include data that is relevant to the accident.

You may have used the previous slide to discuss the mission or task at the macro level. Or, you may need to add a macro level slide that shows when training occurred (or didn't occur), some important personal or unit history, etc.

Talk through the sequence of events until the accident occurs, this will make a good transition into the next slide.
Example:
•0937 – Departure from ___ in formation
- •Green Route around cantonment area
- •West on White Route
- •Flight sees unit vehicles
- •Comment "somebody should say hello"
- •Chalk three says they'll fly by the vehicles
- •Flt Ld doesn't hear the call
- •Right descending turn. . . . . .

ACCIDENT SITE
MACRO PHOTO

View of the crash site looking generally north. Aircrew entered a right descending turn from which they could not recover. "X" marks initial impact.

A series (2-4) of photographs should start with the big picture and narrow down to a close-up of the accident. Identify relevant data in a lower block on the photographs. From this photo, begin to show more detailed photographs of the accident site.

Use accident site photographs, to include aerial photographs, which will allow the briefing audience to get a very clear picture of the site. Additionally, the photographs should orient the audience to the direction of travel and impact angle.

You may insert other sketches, diagrams or drawings. Make the determination if they belong here or in the analysis section.

TIP: Reduce your photos before inserting them in the briefing (see App P for instructions on reducing digital photos). Also, you may need to adjust the color of the box at the bottom based on the photo.

OMIT background graphics from the slide so you can fill the entire slide with the photo.

ADDITIONAL PHOTO SLIDES

DETAILED ACCIDENT SITE

View of the crash site looking generally north. Aircrew entered a right descending turn from which they could not recover. "X" marks initial impact.

Insert accident site and accident vehicle/aircraft photographs, as necessary, to give a clear picture of the sequence of events and the resulting accident. You may show photographs that highlight materiel failures or malfunctions.

Examples are a photograph showing the position of power control levers after an engine failure where the crew pulled off the wrong power control lever during the emergency, or a photograph showing a bolt that had failed and caused the mishap. Again, determine if they should be placed here or in the analysis.

TIP: If the photo shows "what happened" put it here. If it shows "why it happened" save for analysis.

POST ACCIDENT SEQUENCE

DATE: XX AUG XX

- **~2055 2 passengers regain consciousness**
- **Both pilots attempt to locate missing crewmembers for approx. 20 minutes**
- **2138 Marine FA-18 picks up "MAYDAY" radio call**
- **2156 TAC refining accident location/initiating SAR**
- **2214 2 Marine AH-1 Cobras launch from Dobbins to locate crash site**
- **~2226 SAR aircraft notifies TAC aircraft on the ground with survivors**
- **2255 MEDEVAC sister ship arrives on-scene**

Post-Accident Synopsis. Normally used to show how well or poorly the unit or installation reacted to the accident. MEDEVAC timelines are usually highlighted.

ANALYSIS

- **ENVIRONMENTAL: Not Present and Contributing**
- **MATERIEL: Not Present and Contributing**
- **HUMAN: Present and Contributing**

The bottom line of the investigation.

Identify the present and contributing findings. Options include:

- Identify specific failure (Leader Failure etc.)
- Contributed
- Did Not Contribute

Don't spend an inordinate amount of time on this slide. You will use subsequent analysis slides to present sufficient analysis to support the findings and recommendations.

FINDING 1 (Present and Contributing: Human Error – Individual Failure):

While conducting an unaided single-aircraft ATM training flight during the period of illumination transition, approximately 49 minutes after sunset, in an area of limited contrast, the PC did not accurately judge the amount of control inputs to properly control the aircraft. That is, while performing a visual meteorological conditions (VMC) takeoff over an area of very minimal contrast, the PC applied a collective input abruptly, contrary to TC 1-237, Task 1040, Perform a VMC takeoff. The Board concluded this action induced the "elevator illusion." The PC reacted by applying excessive forward cyclic and reduced collective. These actions compounded his disorientation. As a result, the aircraft crashed into the ground and was destroyed. Four crewmembers and one passenger received fatal injuries.

FINDING: (Present and Contributing: Human Error - Training Failure):

While transitioning from low level to NOE at 120 KIAS using the aircraft NVS during a capstone training exercise, the AH-64A pilot failed to use proper crew coordination in violation of TC 1-214, Task 1035, Terrain Flight Operations. The pilot released the controls and focused his attention on the radio, which left no one flying the aircraft. As a result, the aircraft entered 90-foot trees at approximately 90 KIAS and crashed. The aircraft was destroyed resulting in one fatality.

The pilot's failure to use proper crew coordination was a result of his lack of experience in the back seat, coupled with the high task load of the demanding mission.

You may need to condense the findings and recommendations to fit them on the page. However, you must ensure that sufficient information is on the slide to enable the command to use the briefing as an execution document after you leave.

TIP: Allow the CG to finish reading the words before you talk. After he reestablishes eye contact, summarize what he read.

RECOMMENDATION 1:

a. Unit Level Action: Commander,____ Company :

(1) Brief all assigned and attached personnel on the facts and circumstances surrounding this accident.

(2) Ensure all crewmembers adhere to all current flight regulations and command guidance.

(3) Train all crewmembers on visual and vestibular illusions and methods to recognize and mitigate their affects.

b. Higher Level Action: Commander, _____ Aviation Brigade:

(1) Ensure all assigned and attached personnel are briefed on the facts and circumstances surrounding this accident.

(2) Ensure all pilots adhere to all flight regulations and command guidance.

c. Army Level Action: Commander, U.S. Army Combat Readiness Center, publish the facts and circumstances surrounding this accident in FLIGHTFAX

Unlike the finding, you should cover each recommendation on this slide to ensure that the General Officer understands the intent of the recommendation.

These (recommendations) are the most important slides in the entire briefing!

These will be what the General Officer uses to implement corrective actions after the board departs. They must be detailed enough to serve as an execution document.

Present and Contributing to the Severity of Injuries Findings & Recommendations

The following findings did not directly contribute to the causal factors involved in this accident; however, they did contribute to the severity of the injuries.

Self explanatory.

Present But Not Contributing Findings & Recommendations

The following findings did not contribute to this accident; however, if left uncorrected, could have an adverse effect on the safety of future operations.

Establish that the following findings were present and need to be addressed, but did not contribute to the accident.

Finding 6 (Present But Not Contributing):

The Board found that the ____Company SOP and Risk Assessment Worksheet were not in accordance with AR 95-1 and these documents did not accurately convey the level of risk to the approval authority. Additionally, the company's published mission approval process, to include the minimum risk approval levels, was not IAW AR 95-1, dated 3 FEB 06, or the 123 Aviation Brigade Operations SOP

See instructions for findings.

RECOMMENDATION 6:

a. Unit Level Action: Commander, _____Company:

(1) Ensure all missions are approved by the appropriate final approval authority IAW AR 95-1 and the 123 Aviation Brigade Operations SOP.

(2) Develop and implement a new Risk Assessment Worksheet IAW AR 95-1 which accurately depicts the final approval authority.

(3) Reevaluate and publish aviation numerical risk values commensurate to the actual risk.

b. Higher Level Action:

(1) Commander, 123 Aviation Brigade, ensure the Risk Assessment Worksheet is seen and approved by the appropriate risk approval authority to ensure Company remains IAW with AR 95-1 and the 123 Aviation Brigade Operations SOP.

(2) Commander, 34th Div: Conduct a standardization assistance visit for the 123 Avn Bde to ensure compliance with regulations and command guidance.

c. Army Level Action: None

FINDING 6

Present but not Contributing

The Board found that the NRCM seats are mounted to the bulkhead facing rearward. The non-rated crewmember seats do not allow them to face the gunner's station window. This does not allow them to adequately perform airspace surveillance tasks resulting in most NRCMs using an improvised seat; i.e. water cooler, ammunition box or portable field expedient chair.

SPECIAL/OTHER OBSERVATIONS: Those items discovered by the board which are not related to the accident but require action in order to be corrected. If special observations are included in the report, they are the last paragraph of the analysis.
Note: If the observation has Army-wide implications, a PBNC would be more appropriate.

Other use may be for good comments.
At this point, highlight the actions and the individual, agency or organization that were particularly helpful in the conduct of the investigation.

QUESTIONS
OR COMMENTS

Questions - Inform the senior officer being briefed that this concludes your briefing and ask them if they have any questions or comments they would like to make.

Recorder must take good notes of questions and/or comments.

APPENDIX AD
Ground Interview Checklist
INDIVIDUAL INFORMATION SHEET

Name: _____ Grade: _____ SSN: _____AGE:____

Unit/Organization Name and Address_____

Date assigned unit: _____ Duty phone: _____

Primary MOS_____ Duty MOS_____

Years experienced in duty MOS/Position_____

Date entered service: _____

Activity during accident _____Location at time of accident_____

Local address: _____

Home phone: _____

Health

Were you hungry or thirsty at the time of the accident? Yes _____ No _____

Were you under a lot of stress at the time of the accident? Yes ____ No _____

Date last leave ended: Year ___ Month ___ Day ___ Type ___ # Days ___

Hours continuously awake PRIOR to accident: Past 24 hrs ___Past 48 hrs____
Past 72 hrs ____

Duty hours remaining had accident not occurred: _____

Hours slept SINCE accident: Past 24 hrs ___Past 48 hrs ___Past 72 hrs _____

Do you have Sleep Apnea or a sleep disorder? Yes _____ No _____

Do you awaken frequently at night? Yes _____ No _____ If Yes, then why?_____---____

Do you snore? Yes _____ No_____ If Yes, then for how many years:_____

Do you frequently take naps during the day? Yes _____ No _____

Date of last physical exam: Year _____ Month _____

Glasses: Prescription / Clear / Tinted Req Yes _____ No _____ Worn____

Have you had vision corrective surgery? Yes _____ No _____ If yes, then what type? _____

Medications: Yes _____ No _____ If Yes List them:_____
_____

Over the Counter Medications: Yes _____ No _____ If Yes List Them:____
_____

Date started taking medications _____

Do you have any medical conditions? Yes _____ No _____ If yes, what type:_____

Do you suffer from seasonal or environmental allergies? Yes _____ No _____

Have you ever had surgery? Yes _____ No _____ If yes, what type:_____
_____

Smoke/tobacco: Yes _____ No _____ If yes, # cigarettes per day: ___
Cigars per day: ___ Times you dip per day: _____

PPE

ACH/Kevlar	Required	Yes _____	No _____	Worn	Yes _____	No _____
Gloves	Required	Yes _____	No _____	Worn	Yes _____	No _____
Eye PRO	Required	Yes _____	No _____	Worn	Yes _____	No _____
Googles	Required	Yes _____	No _____	Worn	Yes _____	No _____
IBA neck piece	Required	Yes _____	No _____	Worn	Yes _____	No _____
IBA DAP	Required	Yes _____	No _____	Worn	Yes _____	No _____
IBA groin piece	Required	Yes _____	No _____	Worn	Yes _____	No_____
IBA SAPI plate	Required	Yes _____	No _____	Worn	Yes _____	No_____

Accident History
Previous Tickets Civilian / Military in past 5 years _____
_____

Number and date of previous accidents: _____
Were you injured during accident: Yes_____ No_____
If Yes, describe the injury_____
_____

APPENDIX AE

Accident Investigation Condensed Checklists

I. Briefings & Data Collection
   Initial Board Briefing
   Initial Crash Site Actions
   Wreckage Diagram
   Witness Interviews
   Human Factors Team
   Materiel Factors Team
   Deliberations
   Command In-brief
   Collateral Officer Brief
   PAO Briefing
   Witness Briefings
   Accident Reporting
II. Aircraft Measurements
III. Human Factors Analysis

Initial Board Briefing

Discuss As Necessary

1. Introductions - Names and phone numbers.
   Complete board member data forms.
2. Ensure board is qualified per AR 385-40 (TI, Maintenance Officer, MD).
3. Dedicated to investigation for duration of 10 - 14 days or longer. On orders from Division or higher commander for investigation.
4. Explain mission of investigation board.
   a. Accident prevention only.
   b. Determine human/materiel/environmental causes.
   c. Recommend remedial actions to prevent future accidents.
5. Recap date/time/summary of accident.
6. Briefly explain task errors/system inadequacies
7. Review AR 385-40.
8. Guidelines in investigator's handbook
9. Explain data collection phase.
10. Assign workgroups/Leaders.
    a. Human factors (MD, SP, Psychologist, etc.).
    b. Materiel factors (Maintenance officer, TI).
11. Briefly describe deliberation phase and use of data.
12. Briefly describe report preparation (Covered in detail later).
13. Assign responsibility for report sections.
    a. Narrative (History, Personnel, Materiel, Analysis).
    b. Findings and recommendations.
    c. 2397 series forms.
14. Establish daily meeting times.
15. Discuss relationship with technical advisors on the board.
16. Discuss release of information outside of board. (PAO and Board President).
17. Discuss relationship with collateral investigation board.
18. Collection of all notes and investigation materials at end of investigation.
19. All board materials treated as confidential and will not be discarded in trash bin.
20. Board advisor requirements.
    a. Share all information with board. Work with both teams as necessary.
    b. Keep recorder and president informed of developments.
    c. Preliminary report due to recorder prior to departure.
    d. Set suspense for final report to be sent to USASC.
    e. Record parts required for detailed analysis

Initial Crash Site Actions

Preparations for Investigation

1. Area cordoned off with single entry/exit point and controlled.
2. Site evaluated for composite material hazards. If hazard exists:
   a. composite material Safety Kit issued to team.
   b. Respirator, gloves, & suit in use if composites have been burned.
   c. Gloves required to handle all composite materials.
   d. Wreckage sprayed with fixant (polyacrylic acid)
3. Disposable latex gloves used for bio-hazards

General Instructions to Board

1. Remain outside the crash site until the initial area photography is completed.
2. Do not move any parts, pieces,or controls.
3. Do not disturb ground scars.
4. All photos taken are property of the investigation board
5. Take plenty of photos to document all facts

Guidance for Human Factors Team

1. Determine crewmember locations and injuries
2. Record possible injury mechanisms (panels, cyclic, consoles, etc.)
3. Document seat stroking, displacement, failures, etc.
4. Document function of seat restraint systems
5. Document use of ALSE in post accident phase
6. Determine whether occupiable space was maintained
7. Review personal gear for medications

Guidance for Materiel Factors Team

1. Assist with crash diagram as necessary (See recorder)
2. Systematically inventory aircraft parts/components for accountability.
3. Establish continuity of drive train
4. Document damage to rotor systems, drive train, transmissions, engines
5. Establish engine status at time of accident
6. Record the following
   a. Instrument readings
   b. Control positions
   c. Switch positions
   d. Avionics equipment settings

Wreckage Distribution Diagram

Considerations

1. Determine if facility engineers are available for plotting wreckage.
2. Gather wreckage distribution plots initiated by unit.
3. Wreckage distribution indicates post crash location of components relative to flight path of aircraft just prior to impact. Components measured from main wreckage.
4. Wreckage distribution plot shows all terrain marks made by aircraft in crash sequence. (i.e. earth gouge depth, length, and width; plowing of earth or snow)
5. Create table to document wreckage and component distribution with description, azimuth, and distance. Centerline technique can be used if more advantageous.
6. Create plane and profile view.
7. Indicate the following elements on the wreckage distribution diagrams as necessary.
    a. Movement of aircraft over terrain (depicted by arrows)
    b. Aircraft components.
    c. Terrain marks/ground scars.
    d. Witness locations.
    e. Obstacles.
    f. Significant terrain features.
    g. Major and secondary impact points.
    h. Locations of all occupants following accident.
    i. Flight path over ground.
    J. Ground slope in degrees and direction.
    k. Winds speed and direction.
    l. Exact location using 6 digit grid.
8. Other data to complete kinematics.
    a. Aircraft attitude prior to impact.
    b. Flight path, terrain, and impact angles.
    c. Lateral and longitudinal attitudes prior to impact.
    d. Speed at impact.
    e. Distance of travel since impact.
    f. Structural displacement of aircraft or vehicle.
    g. Manner of flight after impact (straight, cartwheel, flip).

Witness Interviews

Witness interview considerations are as follows:

1. Place the witness at ease. The individual's good will is a distinct asset.
2. Explain the purpose of the investigation, the value of the statement, and the confidentiality promise if appropriate.
3. Read a witness's written statement before the interview, use it to get questions or verify his credibility.
4. Explain that you will be recording his statement unless he objects.
5. Only one investigator should ask questions at a time.
6. Do not embarrass a witness by reacting to obvious errors.
7. Do not show impatience.
8. Do not lecture the witness on correct procedures or requirements.
9. Avoid collective interviews (interviewing more than one witness at a time).
10. Have a mental outline for areas of questioning.
11. Permit witness to tell the story in his/her own words (do not interrupt).
12. Keep on the subject and avoid leading questions.
13. Do not insist on a yes/no answer.
14. Ask one question at a time.
15. Do not assist witness in answering questions
16. Avoid revealing to witness items discovered during investigation.
17. Be unobtrusive in taking notes.
18. Interview, do not interrogate.
19. Remember: Be friendly. The witness does not even have to talk with you.
20. Respect the emotional state of the witness.
21. Listen to the questions asked and the responses given. Avoid repeating questions except for clarity.
22. Avoid asking a series of questions on a narrow focus. The witness may give an answer he feels is "expected".
23. Do not take a witness's statement for absolute truth, particularly those most directly involved in an accident. The closer someone is to the blame line the more tendency there will be to protect oneself from blame and to fill in the memory blanks with logical, usually the text book response for an action. Everyone has his own version of the "truth". Always try to substantiate statements with other means.

    Normally, the interview will begin by asking the witness's name, duty position, and location during the accident. Then ask the witness to tell everything that he remembers about the accident. Other questions may include items from history of flight/events, human factors, or materiel factors checklists. Usually, it is advantageous to move from general to specific questions. Also, get his opinion on what caused the accident.

    The board must be careful not to believe a witness based solely on his interview. Substantiate or refute his information with other sources.

Human Factors Team

Record All Anomalies

1. Crew qualification and training
   See checklist in section V of bluebook
2. Personal readiness issues (Family problems, deaths, illnesses, finances, etc.)
3. Command climate (Worksheet)
4. NVG - Goggle limitations and condition. Human limitations. (Worksheet)
5. Situation Awareness/Spatial disorientation
6. Injury mechanisms (Source of injuries)
7. ALSE (Inventory, currency, operational, record keeping)
   Role in preventing or producing injury
   Clothing, helmets, radios, vests, etc.
8. Post accident response (Crash rescue, fire department, police, MEDEVAC, etc)
9. ATC (Tapes, transcripts, logs, flight strips)
10. Aircraft performance - validate PPC or recompute based on conditions
11. Crew briefed and conducting mission per the brief
12. Crew medically fit to fly

HF Review

1. References: DA PAM 385-40 and AR 385-40
2. Narrative outline in chapter 6 of Investigator's Handbook
3. Forms and instructions
   2397-8, Personal Data
   2397-9, Injury/Occupational Illness Data
   2397-10, Personal Protective/Escape/Survival/Rescue Data
   2397-11, Weather/Environmental Data

Administrative Support

1. Example of narrative paragraph 2
2. Electronic copy of narrative paragraph 2
3. Substantiating data for findings
   Copy of manuals/TMs/ARs/TCs etc. (appropriate page and cover of document)

Investigation Data and Materials

1. Do not discard in trash.
2. Treat information as confidential.
3. Do not discuss investigation issues outside of board.
4. All notes provided to recorder at end of investigation.

Material Factors Team

Record All Anomalies

1. Engines (power settings, cables, fuel control, DECU download, etc.)
2. Coordinate engine tear down analysis with AVIM for tools and personnel
3. Rotor systems (Damage consistent with power settings)
4. Drive train (Continuity)
5. Landing gear (Stroke, damage, etc.)
6. Document source of all oil/fuel leaks

See Material Checklists in Section IV

Records

1. All maintenance properly documented
2. All maintenance procedures completed IAW manuals
3. Maintenance procedures verified as correct (2028 if not, retain a copy for report)
4. Document parts that failed (QDR)
5. ECOD completed for all damaged equipment/facilities (See TB in bluebook)
6. Review all aircraft maintenance records (-12, -13, -14, -17, -18, -5, six month file)
7. Weight and balance verified (Data provided to HF team)

MF Review

1. References: DA PAM 385-40 and AR 385-40
2. Narrative outline in Chapter 3 DA Pam 385-40
3. Forms and instructions
   2397-6, Terrain Impact, Crash Damage Data
   2397-7, Maintenance and Material Data

Administrative Support

1. Example of narrative paragraph 3
2. Electronic copy of narrative paragraph 3
3. Substantiating data for findings
   Copy of manuals/TMs/ARs/TCs etc. (appropriate page and cover of document)

Investigation Data and Materials

1. Do not discard in trash.
2. Treat information as confidential.
3. Do not discuss investigation issues outside of board.
4. All notes provided to recorder at end of investigation.

Deliberations

Brief board personnel concerning the following items prior to beginning deliberations.

1. Brief the deliberative process.
2. Categories of Findings
   a. Present and contributing.
   b. Present and contributing to the severity of injury or extent of damage.
   c. Present but not contributing.
   d. Observation.
   e. Freebees.
3. Guidelines for categorizing specific deficiencies.
4. Submission of completed report.
5. Disposition of completed report.
6. Role of board members at the outbrief.
7. Minority report

Process

1. All board members must bring every anomaly to the board's attention.
2. List anomalies on chalkboard or butcher paper.
3. Use outline provided in investigator's handbook to ensure all issues are covered.
4. Complete event chart for all events prior to and after the accident.
5. Discuss and assign finding category to each anomaly.
6. Determine system inadequacies per DA PAM 385-40, page 16, for human error events.
   a. Support failure
   b. Standards failure
   c. Training failure
   d. Leader failure
   e. Individual failure
7. Board president writes analysis, findings, and recommendation.
8. Board members assemble to review analysis, F & Rs prior to staffing.
9. Copy of history, analysis, findings and recommendations forwarded to USASC.

CAI Staffing With The USACRC

1. Coordinate for speaker phone.
2. Time established for conference call with center.
3. All board members present with analysis, finding and recommendations available.
4. Board president chairs staffing.
5. Board members do not interrupt unless directed to comment on specific subject.
6. Final changes made to findings and recommendations.
7. All copies of report and notes collected from board members for destruction.

* History, analysis, F&Rs sent to USACRC at least 24 hours prior to staffing time.

Command Inbrief

1. Introduction of board president (and recorder if available)
2. Provide office phone number where board may be reached.
3. Briefly explain investigation board's mission.
   a. Accident prevention only:
      Findings of the safety investigation cannot be used in UCMJ action.
      Reference AR 385-40, par. 1-7, a , (4), (a)
   b. Accident causes
      Environment
      Materiel
      Human
   c. Categories of findings
      Present and Contributing
      Present and Contributing to severity of damage/injury
      Present But Not Contributing
      Observations
      Anomalies
4. Explain what services / equipment / personnel / facilities that the board requires to
   perform the field investigation.
5. Inform the commander that an outbriefing will be conducted prior to your departure.
   The outbrief will be coordinated through the POC/Safety Office.
6. Courtesy inbrief to the chain of command
   a. Battalion and Brigade commanders.
   b. Inbrief may be conducted telephonically.
   c. Purpose is to explain the board's mission.

Collateral Officer Brief

1. Log collateral officer's name and phone numbers.
2. Collateral officer will not discuss accident with any board members other than recorder and president.
3. Establish time for exchange of material.
4. Copies of materials and data provided as a courtesy.
5. Photos provided when developed.

COLLATERAL BOARD INFORMATION

1. Reference AR 385-95:
   a. The Collateral Board's investigation is secondary to the accident investiga tion. Collateral board members will not interfere with the accident investi gation at any time.
   b. Witnesses may not appear before a Collateral Board until they have been released by the Accident Investigation Board
2. The following information may be provided the Collateral Investigation Board.
   a. All information contained on the left side which includes all factual data but is not limited to the following items:
      (1) Photographs
      (2) Teardown and analysis
      (3) Fuel and oil analysis
      (4) ECOD
      (5) Maintenance records
      (6) Flight plans
      (7) Medical records
      (8) Accident reports
      (9) Autopsy reports
      (10) Weather reports
   b. Information that will not be given the Collateral board is:
      (1) Witness statements
      (2) Findings and recommendations
      (3) Any other analysis or assumptions derived at by the Accident Investigation Board.

Public Affairs Officer Brief

1. When asked "What caused this accident?" the answer must be:
   An investigation is being carried out right now to determine the cause.
2. Do not speculate on the cause.
3. Dual accident investigation system

   a. **Safety investigation:**
      Has priority over the collateral investigation. (AR 385-40, para. 1-8)
      Used only for accident prevention purposes.
      Basis for equipment and training improvements at all echelons.
      Final report released after MACOM review.
      Report may take up to 6 months before it is releasable.

   b. **Collateral investigation:**
      Used to collect & preserve evidence for use in litigation, claims, disciplinary action, or adverse administrative action.
      Designed to establish legal accountability or fix liability.
      Use leagal procedures and standards as proof.
      Is the source for releasable information.
      Final report released locally, is comprehensive, and is available earlier.

4. Safety and collateral investigations are conducted separately.
   Safety investigation boards provide factual information to the collateral.
   Findings, recommendations, analysis and witness interviews are withheld.
5. Do not promise the media or family access or copies of the safety investigation.
6. Freedom of information act (FOIA) for safety investigation reports:
   a. Request made in writing to Staff Judge Advocate office of the USACRC.
   b. Board findings, recommendations, analysis, and confidential witness statements are exempt from release.
7. Public affairs information packet available for reference.

General Witness Information Instructions

To be used in "General Use" investigations and "Limited Use" investigations when a promise of confidentiality is NOT offered.

1. This accident investigation board has been convened under the provisions of AR 385-40 for the purpose of conducting a safety investigation.

2. This may be one of a number of investigations being conducted regarding this accident. A collateral or legal investigation may be going on as well. Those investigations are entirely separate from a safety investigation, and are also required to inform you of their purpose and of your legal rights.

3. This safety investigation is being conducted for accident prevention purposes only. Within the military, pursuant to Army Regulation 385-40, it cannot be used for any other purpose, to include any future disciplinary actions against any individuals. Therefore, the interview your are being asked to provide will be used by the Army in the interest of safety and accident prevention only.

4. The chain of command will review the final accident report, which may include a summary of your interview, but the chain of command may only use the investigation report and the interviews for safety and accident prevention purposes. The interview summary may be released to the public pursuant to a Freedom of Information Act request.

5. If you ever have knowledge that your witness interview was used by the Army for anything other than accident prevention purposes (for example, disciplinary action against an individual), you should consult with your local Judge Advocate Defense Counsel Office, and request that the Command Judge Advocate, U.S. Army Combat Readiness Center, be notified at DSN 558-2924 or commercial (334) 255-2924.

Limited Use Witness Information Instructions

To be used in "Limited Use" investigations when a promise of confidentiality is offered.

1. This accident investigation board has been convened under the provisions of AR 385-40 for the purpose of conducting a safety investigation.

2. This may be one of a number of investigations being conducted regarding this accident. A collateral or legal investigation may be going on as well. Those investigations are entirely separate from a safety investigation, and are also required to inform you of their purpose and of your legal rights.

3. This safety investigation is being conducted for accident prevention purposes only. Within the military, pursuant to Army Regulation 385-40, it cannot be used for any other purpose, to include any future disciplinary actions against any individuals. Therefore, the interview your are being asked to provide will be used by the Army in the interest of safety and accident prevention only.

4. Non-confidential witness interviews may be released to the public pursuant to a Freedom of Information Act request.

5. Whether your interview is confidential or not, the chain of command will review the final accident report, which may include a summary of your interview, but the chain of command may only use the investigation report and the interviews for safety and accident prevention purposes.

6. If you ever have knowledge that your witness interview was used by the Army for anything other than accident prevention purposes (for example, disciplinary action against an individual), you should consult with your local Judge Advocate Defense Counsel Office, and request that the Command Judge Advocate, U.S. Army Safety Center, be notified at DSN 558-2924 or commercial (334) 255-2924.

7. The promise of confidentiality is available to you if you desire it. Do you desire it?

Army Accidents - Peacetime

Notification & Reporting Requirements & Suspenses

Acdt Class	Notification	Reporting	
	Telephonic Wksht	DA Form 2397	AAA Report
A	Immediate – To USACRC (Telephonic notification – no hardcopy notification required)	CAI/IAI 90 calendar Days	Aircraft ground accidents only – 90 calendar days
B	Immediate – To USACRC (Telephonic notification – no hardcopy notification required)	CAI/IAI 90 calendar Days	Aircraft ground accidents only – 90 calendar days
*C	Immediate *– To USACRC (Telephonic notification – no hardcopy notification required)	N/A	90 calendar days
D	N/A (Unless SOF issue is involved or suspected)	N/A	10 calendar days
E	N/A (Unless SOF issue is involved or suspected)	N/A	10 calendar days
F	N/A (Unless SOF issue is involved or suspected)	N/A	10 calendar days
Sent	Class A-C: Telephonically Immediately Class D, E, F – If SOF	Mail	Type/hand printed AAA reports by mail/FAX/Courier, message format/electronic.

USASC: DSN 558-2660/2539/3410, Com 334-255-2660/2539/3410

Army Accidents - Combat

Class	Notification	Reporting
A	Same as Peacetime to USACRC or Safety Rep Fwd	(Only when Cdr determines DA Form 2397 investigation/report is not feasible) Submit as soon as conditions/situation permit – Do not exceed 60 calendar days
B	Same as Peacetime to USACRC or Safety Rep Fwd	(Only when Cdr determines DA Form 2397 investigation/report is not feasible) Submit as soon as conditions/situation permit – Do not exceed 60 calendar days
C	Same as Peacetime to USACRC or Safety Rep Fwd	Same as Peacetime
D, F, E	Same as Peacetime	Same as Peacetime

*** The commander who first becomes aware of any Class A or B Army accident or Class C Army aviation (flight, flight related, or aircraft ground) accident will, through their existing chain-of-command, immediately notify the USACRC (AR 385-40)**

* Includes Program Youth and/or Student Assistance Program Employees
1 Non-flight crew member fatality
2 Flight crew member fatality
3 Total costs, including days involving lost time and days hospitalized
4 For civilian employees, use actual worker compensation costs when available
5 Includes costs for days involving lost time

Cost Standards Table (AR 385-40)

	Submarine &/or Flying Officer	Other Officer	Enlisted Personnel, Cadets	Civilian[4] Employees	Foreign * Nationals
Fatality	$1,100,000	$395,000	$125,000[1] $270,000[2]	$460,000	$270,000
Perm/Total Disability[3]	$1,300,000	$845,000	$500,000	$385,000	$390,000
Perm/Partial Disability[3]	$210,000	$145,000	$115,000	$250,000	$180,000
Lost Time Case	$425/day	$425/day	$375/day	$350/day	$300/day
Days Hospitalized[5]	$466/day	$466/day	$466/day	$466/day	$466/day
No Lost Time Case	$120/day	$120/day	$120/day	$120/day	$120/day

Army Accident Classifications

Class A - Army accident in which the resulting total cost of property damage is $1,000,000 or more; an Army aircraft or missile is destroyed, missing, or abandoned; or an injury and/or occupational illness results in a fatality or permanent total disability.

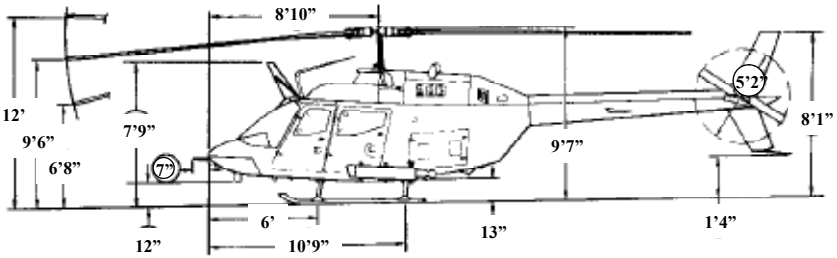
Class B - Army accident in which the resulting total cost of property damage is $200,000 or more but less than $1,000,000; an injury or occupational illness results in permanent partial disability, or when three or more personnel are hospitalized as inpatients as the result of a single occurrence.

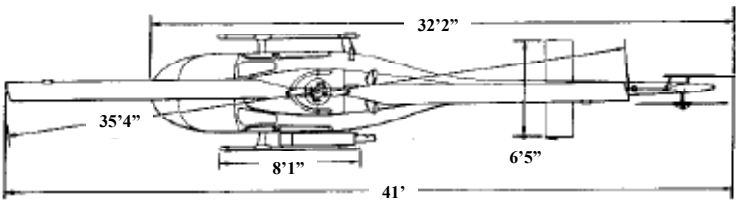
Class C - Army accident in which the resulting total cost of property damage is $20,000 or more but less than $200,000; a nonfatal injury that causes any loss of time from work beyond the day or shift on which it occurred; or a nonfatal occupational illness that causes loss of time from work or disability at any time.

Class D - Army accident in which the resulting total cost of property damage is $2,000 or more but less than $20,000.

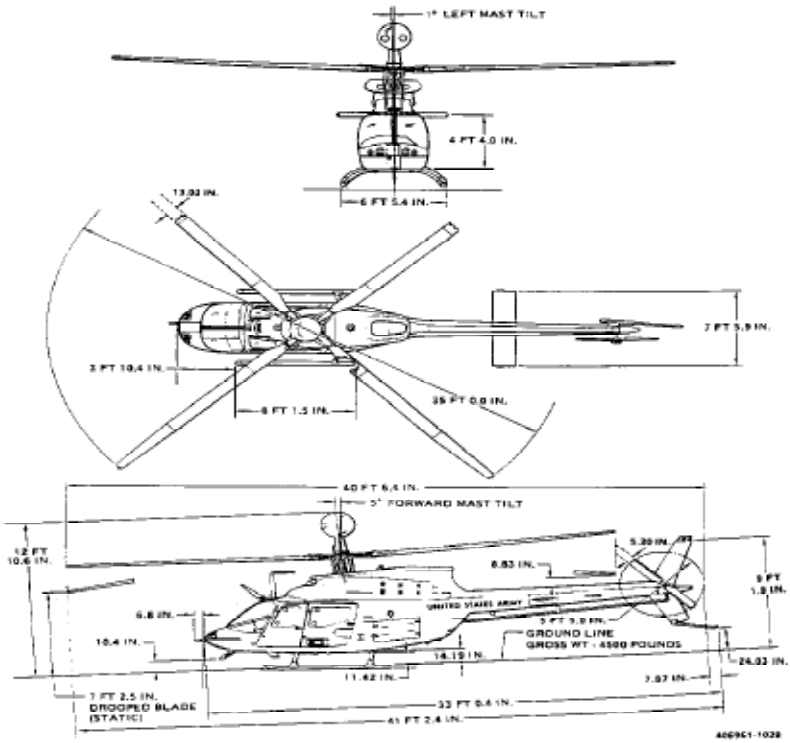
Class E - Army accident in which the resulting damage cost and injury severity do not meet the criteria for a Class A-D accident.

OH-58A/C



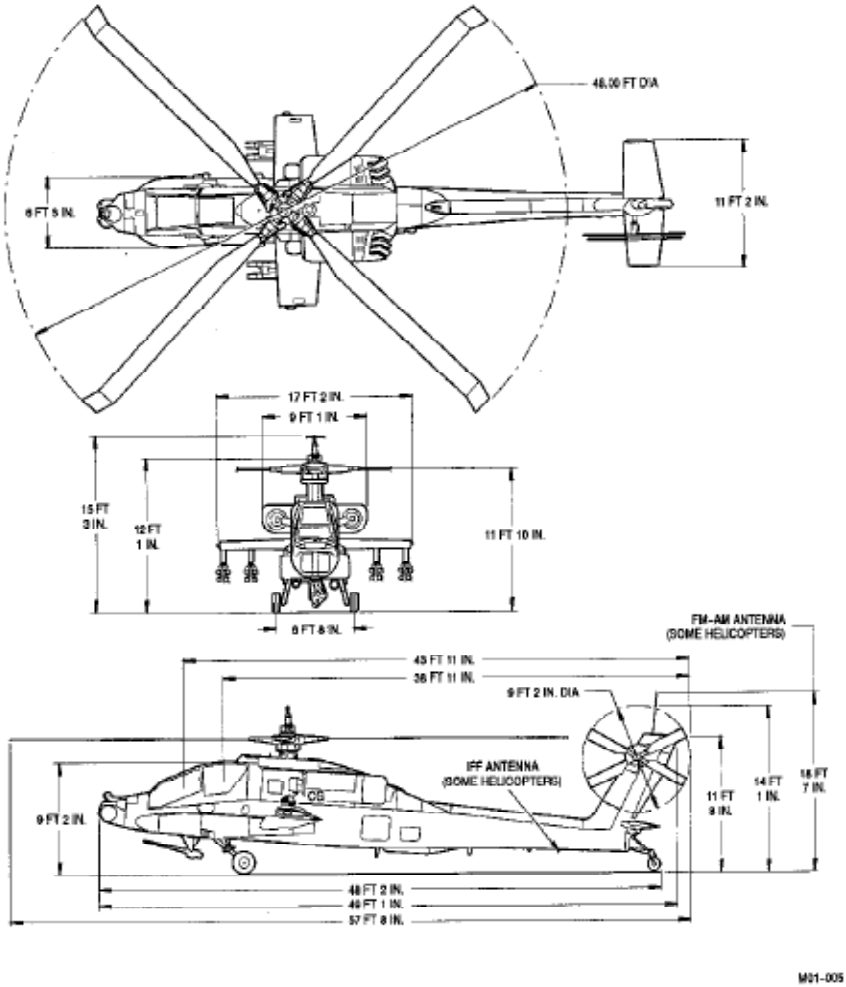


OH-58D



Hazards on site:
Munitions: rockets, missiles, 50 cal rounds, squibs.
MMS: beryllium in optics.
Composites: blades and panels

AH-64D



Hazards on site:

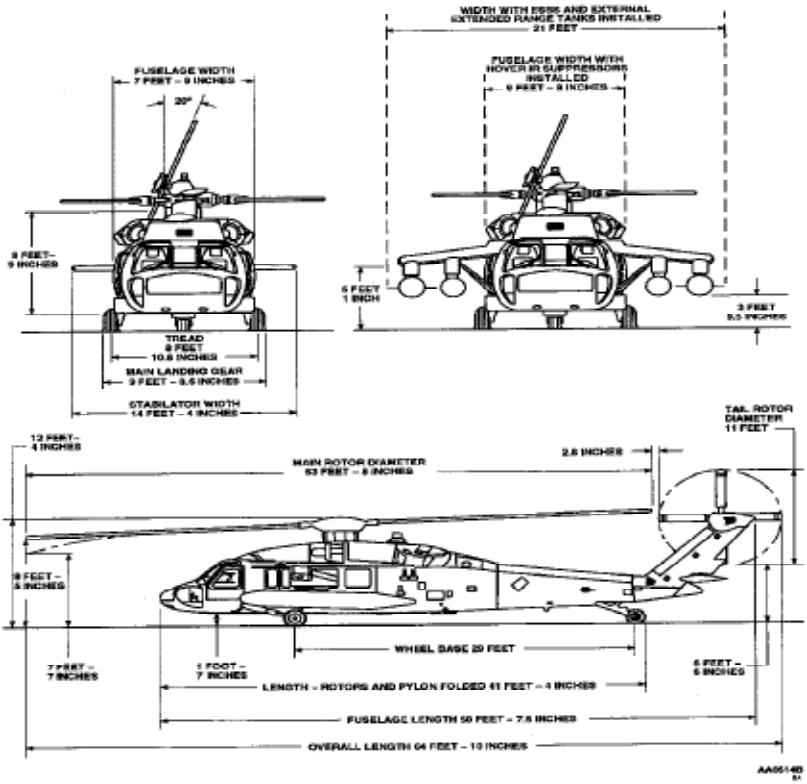
Munitions: rockets, missiles, 30mm rounds, squibs.

Canopy jettison system.

TADS: beryllium in optics.

Composites: blades and panels.

UH-60A/L

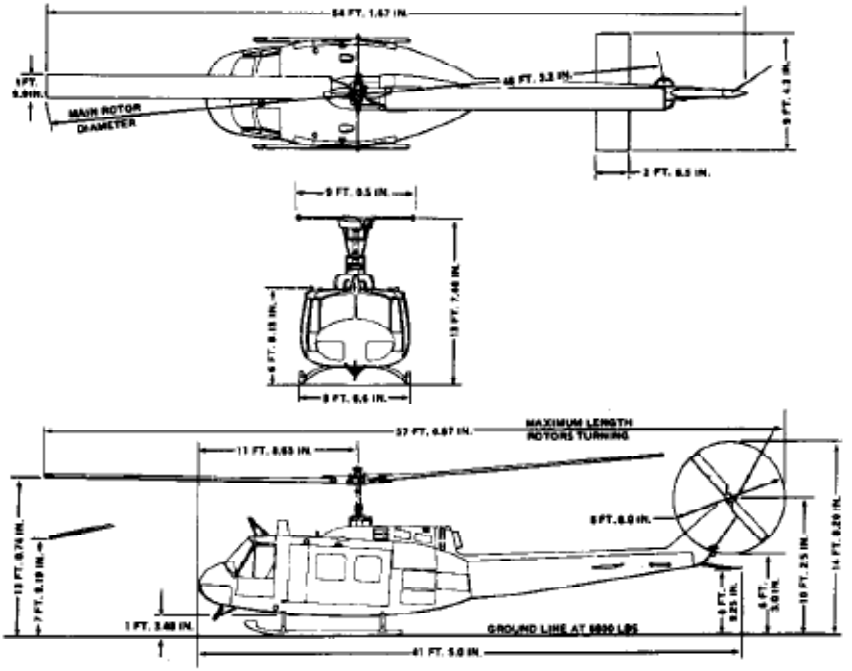


Hazards on site:

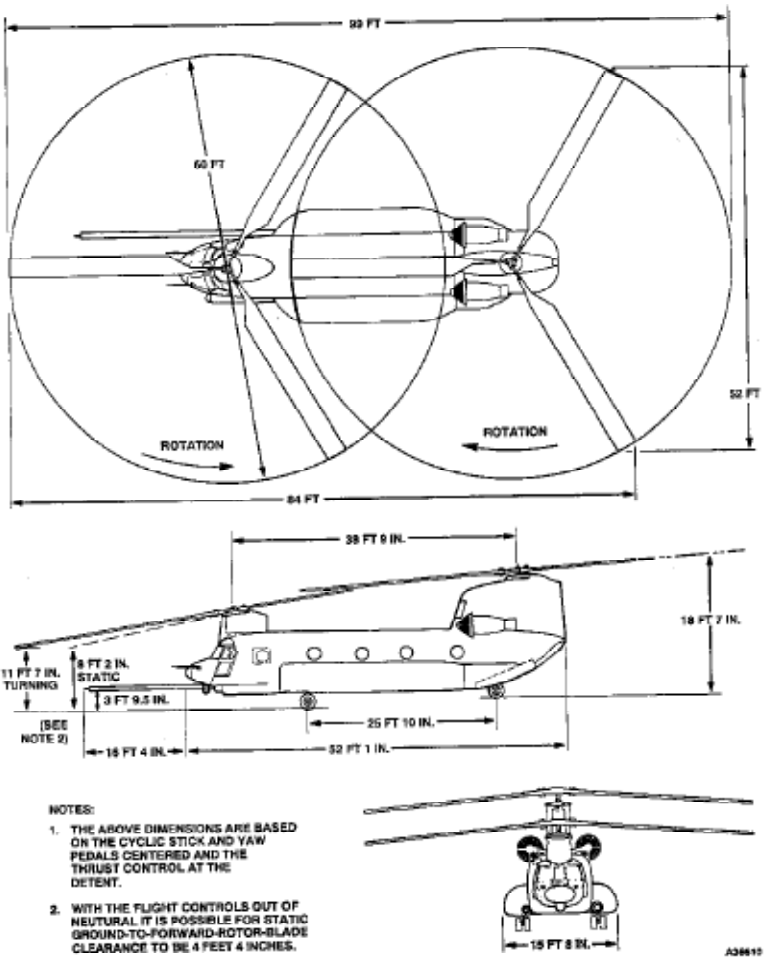
Composites: blades and panels.

ERFS: external tank fractures

UH-1H


MAIN ROTOR DIAMETER
MAXIMUM LENGTH ROTORS TURNING
GROUND LINE AT 8800 LBS

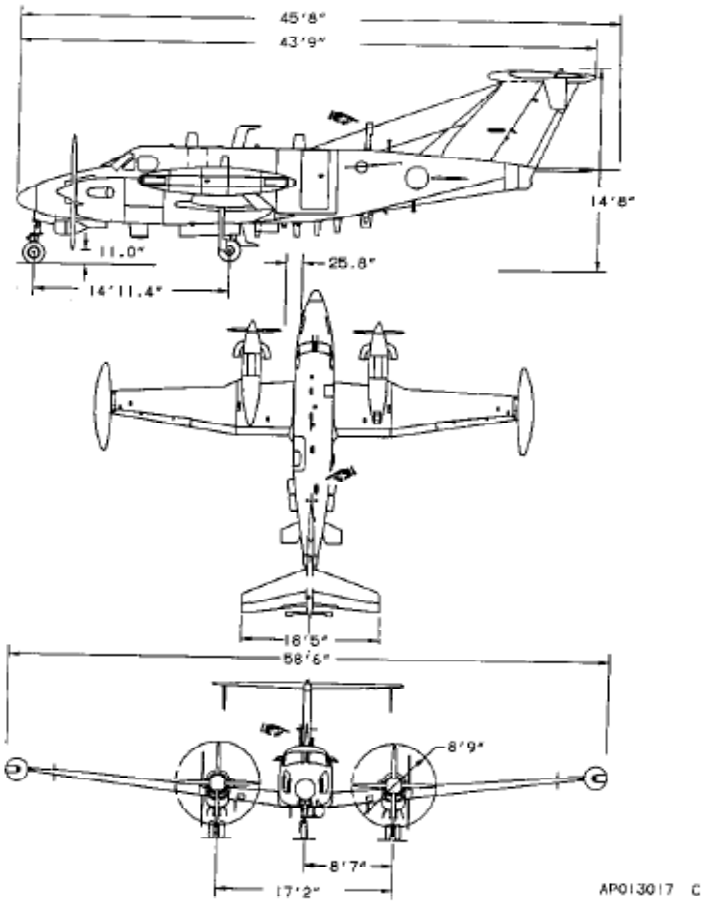
CH-47D



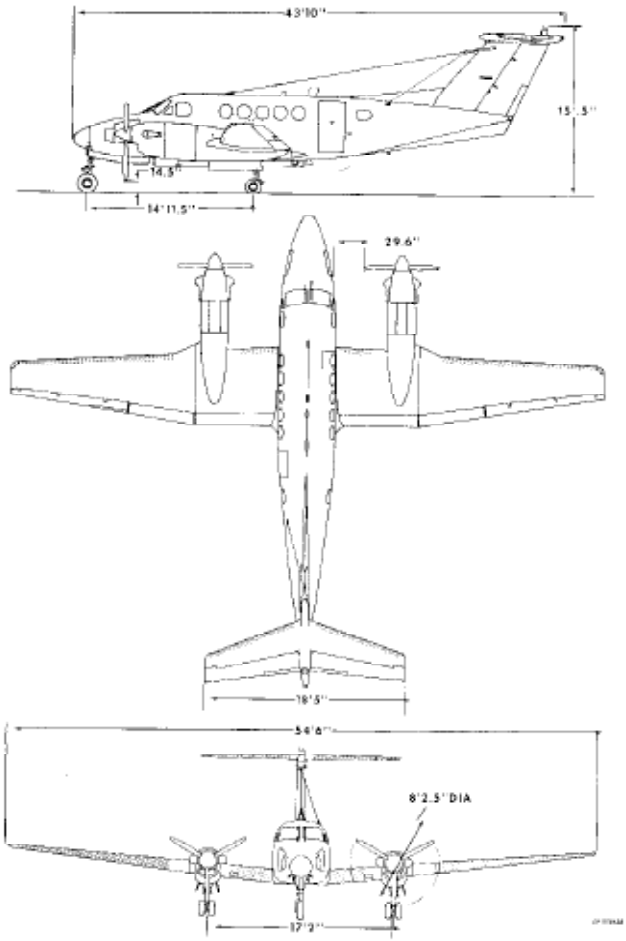
NOTES:

1. THE ABOVE DIMENSIONS ARE BASED ON THE CYCLIC STICK AND YAW PEDALS CENTERED AND THE THRUST CONTROL AT THE DETENT.
2. WITH THE FLIGHT CONTROLS OUT OF NEUTURAL IT IS POSSIBLE FOR STATIC GROUND-TO-FORWARD-ROTOR-BLADE CLEARANCE TO BE 4 FEET 4 INCHES.

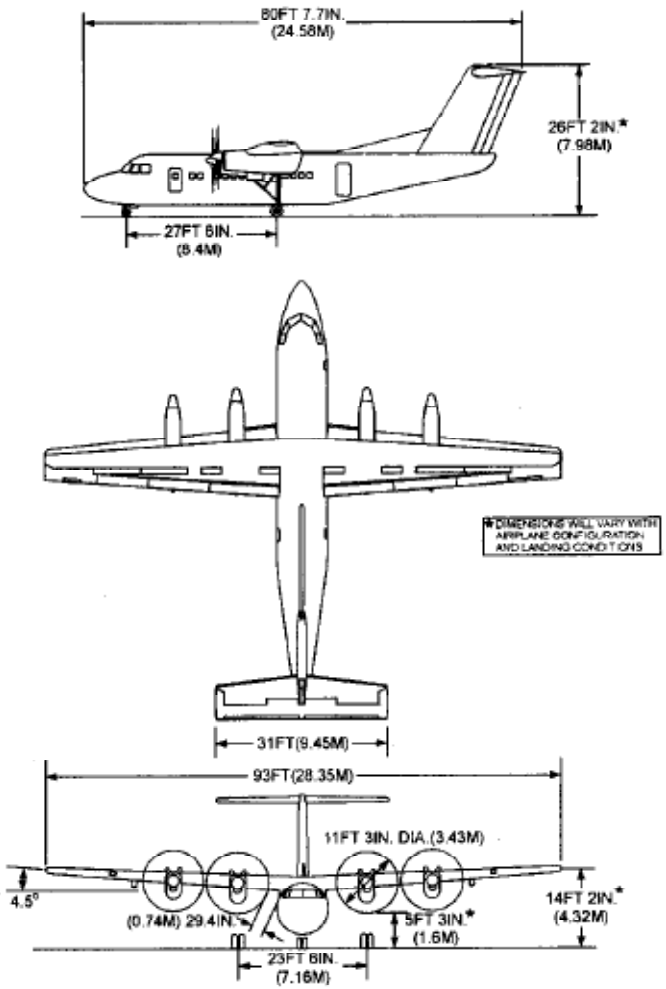
RC-12



C-12



DHC-7


80FT 7.7IN.
(24.58M)
26FT 2IN.*
(7.98M)
27FT 6IN.
(5.4M)
*DIMENSIONS WILL VARY WITH AIRPLANE CONFIGURATION AND LANDING CONDITIONS
31FT(9.45M)
93FT(28.35M)
11FT 3IN. DIA.(3.43M)
4.5°
(0.74M) 29.4IN.
5FT 3IN.*
(1.6M)
14FT 2IN.*
(4.32M)
23FT 8IN.
(7.16M)

Human Factors Analysis & Classification System (HFACS)

I. **Unsafe Aircrew Acts** (Active conditions)

A. **Errors:**

1. **Skill-based** – Errors in execution of a response that has become highly automated, unwittingly deviate from planned behavior:

-- **Attention failures** – breakdown in attention to the task at hand; e.g. breakdown in visual scan, inadvertent operation of a control, fail to see and avoid.

-- **Memory failures** – breakdown in sequential actions normally executed from memory; e.g. omitted items in checklist, place losing or forgotten intentions.

-- **Execution failures** – inadequate or inappropriate application of reflex flying skills, e.g., overreacting/under-reacting or over-controlling/under-controlling the aircraft in a situation which has little time for deliberate thought, but also can occur in situations with sufficient time for reaction, but inexperience leads to overreacting/under-reacting or over-controlling/under-controlling of the aircraft, AKA Monkey skills failure.

2. **Decision** - Intentional (deliberate) behavior that proceeds as intended, yet the chosen plan prove inadequate to achieve the desire outcome; e.g., wrong deliberate response to emergency, poor decision, improper use of flight controls, exceeded ability, improper procedure: -

- Procedural decision errors – "rule-based mistakes", occur in situations for which procedure is available, during highly structured tasks, e.g., situation is not recognized or is misdiagnosed & wrong procedure is performed/incorrectly performed. -- Choice decision errors – "knowledge-based mistakes", requires a choice to be made among multiple response options, occurs particularly when there is insufficient experience or time to determine which option is best.

-- **Problem solving errors** – formal procedures and response options are not available, problem is ill defined and requires invention of a novel solution.

3. **Perceptual** – Misinterpretation of some sensory input, (e.g., spatial disorientation (Type II – aware), visual illusions, misjudging distance, altitude, or airspeed)

B. **Violations** (Willful disregard for rules and regulations):

1. **Routine** (Tend to be habitual by nature constituting part of individual's behavioral repertoire, e.g., driving consistently 5-10 miles over speed limit) [NOTE: Often routine violations are perpetuated by a system that tolerates such departures]

2. Exceptional (Isolated departures from authority, not necessarily indicative of individual's typical behavior pattern nor condoned by management)

II. Preconditions of Unsafe Acts (latent conditions)

A. Substandard Conditions:

1. Adverse mental states (e.g., loss of situational awareness, task saturation, cognitive effects of sleep loss and circadian dysrhythmia, personality traits and pernicious attitudes such as overconfidence, complacency, and misplace motivation and/or undue sense of urgency)
2. Adverse physiological states (e.g., physical fatigue, illness, medication effects)
3. Physical/mental limitations (necessary visual or aural info not available due to limitations inherent within sensory system, e.g., spatial disorientation (Type I – Unaware), situations with insufficient reaction time; visual limitation seeing other aircraft, power lines and other obstacles due to size or contrast of object in visual field; individual's inherent aptitude or intelligence is incompatible with characteristics or requirements of task)

B. Substandard Practices

1. Crew Resource Management (CRM):

-- Supervisory – individual directly responsible for the operation fails to coordinate and/or supervise operations appropriately (e.g., failed to communicate/coordinate/conduct adequate brief) [Note: reserved for aircrew who function during the flight as aircraft commanders, flight leaders, section leaders, etc.: also, differs from "unsafe supervision", since those generally involve individuals in positions of higher authority detached from direct conduct of operations.]

-- Crew - individual crewmember inadequately or inappropriately accomplishes assigned crew coordination duties (e.g., failure to scan due to being inside cockpit, failure to notify other pilot of developments which could hinder accomplishment of mission, etc.)

-- Rank Gradient – when the ranking individual fails to correct a procedure violation or other deviation from the safe flight (e.g., failure by a company/battalion commander to correct an IP/PIC who is flying faster/lower than SOP/mission allows/requires or outside of parameters set during the mission brief [for IMC, etc.], etc.

2. Non-supervisory tolerance of unsafe acts – When aircrew members and non-aircrew members not in the chain of command of a pilot know about high risk/unsafe actions during flight by that pilot but do not take appropriate action to report/correct the situation; e.g., aircrew member or non-aircrew member aware of "hot-dogging", unauthorized aerial aerobatics but fail to report incidents, crewchiefs who "white knuckle during flight" without mention to offending pilot or chain of command.

3. Personal Readiness:

-- Readiness violations - disregard for rules, regulations and instructions that govern individual's readiness to perform, e.g., violation of crew rest requirements.

-- Poor Judgment – exhibited by aviators when it comes to readiness, but when they do not necessarily violate existing instructions of SOP, e.g., running 10 miles before piloting aircraft may impair physical/mental capabilities of

individual enough to degrade performance and elicit unsafe acts; however, there may be no rules governing such behavior, other than reasonable judgments.

III. Unsafe Supervision (latent conditions)

A. Unforeseen (Those unsafe management and/or supervisory practices that go unnoticed, yet are not result of negligence or adverse behavior – pertains to middle management (not CEO or higher organizational level):

1. Unrecognized Hazardous Operations {i.e., "loss of supervisory situational awareness"} – includes those instances when unsafe conditions or hazards exist yet go unseen or unrecognized by the untrained or over tasked supervisor.
2. Inadequate Documentation/Procedures (i.e., standards failure) – most often identified after-the-fact by an accident or incident

B. Known (Unsafe management of operations which were a direct result of supervisory action or inaction [NOTE: "known" in this instance does not imply that supervisor intentionally did something wrong, rather it refers to those instances in which the supervisor erred in managing a known aspect of the operation]

1. Inadequate Supervision (Management of the individual on a personal level, e.g., failed to provide guidance/training/leadership)
2. Planned Inappropriate Operations (Management of the individual as an asset among many other (i.e., a "cog in the wheel") e.g., battle-rostering issues, inadequate/inappropriate Risk Management, mission not IAW SOP/provided inadequate time to prepare/improper manning)
3. Failed To Correct Know Problem (Deficiencies among individuals, equipment, training or other safety related areas are know to supervisor yet are allowed to continue uncorrected, e.g., failed to initiate corrective action, identify at-risk aviator)
4. Supervisory Violations (Existing rules, regulations, instructions or SOP are not adhered to by supervisors when managing assets, implies a willful disregard for authority)

IV. Organizational Influences (Latent conditions) – fallible decisions of upper-level Management

A. Resource Management – management, allocation and maintenance of organizational resources:

1. Human – Management of operators, staff, maintenance personnel (e.g., selection, training, manning/staffing)
2. Monetary – Excessive cost cutting, lack of funding for proper and safe equipment and resources.
3. Equipment/facility – Equipment design, including purchasing of unsuitable equipment, inadequate design of work spaces and failure to correct known design flaws.

B. Organizational Climate:

1. Structure – Chain-of-command, delegation of authority & responsibility, communication channels, and formal accountability for actions.

2. Policies – Course or method of action that guides present and future decisions. (e.g., use of safety equ9ipment; when policies are illdefined, adversarial or conflicting, safety may be reduced)
3. Culture – Unspoken or unofficial rules, values, attitudes, beliefs and customs of an organization.

C. Operational Process (Formal process by which things get done in an organization)
1. Operations (OPTEMPO, time pressures, schedules, etc.)
2. Procedures (Performance standards, objectives, documentation, instructions, etc.)
3. Oversight (Management's monitoring of resources, climate, and processes to ensure safe and productive work environment {risk management, establishment and use of safety programs, etc.)