

NATIONAL TRANSPORTATION SAFETY BOARD  
INVESTIGATOR'S MANUAL  
VOLUME III - REGIONAL INVESTIGATIONS

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SELECTIVITY

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Transportation

National  
Safety Board  
Memorandum

Date: February 20., 1991  
To: All Regional Directors and Office Managers  
From: Director, Office of Aviation Safety  
Subject: Implementation of Selectivity Criteria Policy

At a recent management meeting a working group was formed to review our selectivity criteria. The following recommendations are based upon the findings of that group.

A review of our investigative activity has revealed that although the overall number of accidents are down, our number of field investigations remains relatively constant. Of more significance is the finding that many of these field investigations involve types of accidents that historically and predictably have no safety impact. They very seldom result in anything other than the determination of probable cause.

Accidents that involve experimental, amateur built and aerial application aircraft fall in this category. Because the FAA is required to investigate these accidents to satisfy their obligations, we developed an agreement with them to delegate the investigations when their workload permits. This delegation process has not always been consistent in the number and types of accidents delegated nor in the quality and timeliness of the completed reports and a more uniform application of delegations is needed. Therefore, in the future, no experimental, amateur built, or aerial application accident will be done as an NTSB field investigation unless there are unusual circumstances that the regional director feels justify the field investigation, and that action has been coordinated with either AS-1 or AS-2.

These accidents may be done as either limited investigations or as delegated investigations depending on the regional director's evaluation of which approach will obtain the necessary information in the most expedient manner. It is recommended that you treat all restricted category aircraft accidents in a similar manner by either delegating them or doing them as limited investigations, whenever possible.

When an accident is delegated to the FAA, it will be the

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regional director's responsibility to make sure the delegated accidents meet minimum quality control and timeliness standards. When the FAA incurs any direct expenses, such as for guard service or engine examinations, related to either a delegated accident or a limited accident where they do the on scene work, these expenses are the responsibility of the regional office, if they were approved by the regional office in advance.



Another accident category that seldom, if ever, yields a safety payback involves illegal activities. In the event that we become aware, from a credible law enforcement agency, that illegal activity was involved, we should investigate and document the accident only to the minimum extent necessary to determine probable cause. This procedure may be used to document damage to the aircraft and any known pilot involvement in cases of stolen aircraft or where illegal drug or drug residue is found in the wreckage and documented by law enforcement agencies. In the rare case where a safety issue emerges, a normal investigation may be pursued, at the discretion of the regional director.

While our mandate requires all civil aircraft accidents be investigated, it is our option to determine the level of investigation. It is the purpose of this memorandum to focus our field investigative efforts towards those accidents with the highest potential for safety benefits. Therefore, the following policy will become effective immediately:

A field investigation may be conducted if the mishap falls in any of the following categories:

1. Oversight/public confidence area (see attachment).
2. Circumstances are not apparent and/or mechanical malfunctions are reported.
3. Potential for safety issues exist.
4. Potential for widespread local or national media interest.

The purpose of these policy changes is to improve our efficiency which will allow us to concentrate our resources in those areas with the greatest safety payoff. One example would be special studies targeted at areas of suspected safety shortfalls. This type of endeavor has been extremely successful for the Office of Surface Transportation Safety, and is one that we should take full advantage of. Another spinoff of better utilization of time and resultant low backlog is more time available to develop safety proposals. I look forward to seeing the results of these positive changes.

(Signed February 20, 1991)

Timothy P. Forte'

**ACCIDENT SELECTION CRITERIA**

The Board investigates aviation, railroad, highway, marine, pipeline, and hazardous materials accidents. Under its accident selection criteria, the Board's investigative response will depend primarily on the following factors: 1) the need for independent investigative oversight of certain specified areas to ensure public confidence in the transportation system; 2) the need to concentrate attention and resources on the most significant and life-threatening safety issues; and 3) the need to maintain an adequate data base on which trends can be identified and projected.

Aviation

## 1. Oversight/public confidence:

- a. All Part 121 and 135 accidents includes: commercial passenger service, newly-formed airlines, FAA surveillance of air carrier operations and maintenance activities, and Part 135 operators with multiple accident histories).
- b. Foreign aircraft accidents involving U.S. airlines; U.S.-manufactured aircraft; or major U.S.-manufactured components (e.g., engines).
- c. Air traffic control operations.
- d. Accidents involving flight training or crew experience as potential factors.
- e. Midair collisions.
- f. Newly-certificated aircraft (first accident or less than 10 years old).
- g. Newly-certificated engines.
- h. In-flight fire.
- i. In-flight breakup.
- j. Aircraft accidents that expose the public to high risk, involve substantial property damage, or attract high public interest.

## 2. Selected emphasis areas:

- a. Part 91 accidents with elements common to Part 121/135 operations (e.g., aircraft typically used in Part 121/135 operations; Part 121/135 training flights, etc.).
- b. All fatal general aviation accidents.\*
- c. Commercial passenger flight incidents with safety improvement potential.
- d. Air traffic control incidents with safety improvement potential.

e. Aging aircraft.

\*

The Safety Board, through a letter of agreement with the FAA, delegates the investigation of all agricultural, home-built, and experimental category aircraft accidents to the FAA. However, for those cases in which the FAA does not accept a delegated accident, the Safety Board must perform the investigation. Additionally, other categories of Part 91 fatal aircraft accidents, with no apparent safety improvement potential, also may be delegated to the FAA.

## Overview

The procedures in this chapter apply to the investigations performed by the Office of Aviation Safety Regional Offices. Unlike the major teams from headquarters, the field IIC may be responsible for all phases of the investigation without being able to divide the work among a number of different groups. This requires a high degree of ingenuity and resourcefulness to complete investigations under the widely varying conditions found in the field. It falls on the field IIC to be a "generalist" with enough knowledge in all aspects of the investigation to directly determine the facts or to know how to obtain the specific expertise necessary to complete the task. Additionally, the field IIC is responsible for all administrative details associated with any investigation.

This position provides the field IIC with a unique opportunity to improve aviation safety. It also carries with it the responsibility to insure that government funds are well spent and all legitimate safety issues are addressed. The end objective is to produce actual improvements in aviation safety. This is done through thorough investigations that produce valid safety proposals and safety accomplishments.

Assignments within the field office will be in accordance with the investigator's position description and experience. A GS-9 ASI (limited) should not be routinely assigned standby duty or field accidents associated with full ASI's. This limitation does not restrict the ASI (limited) investigator from volunteering for either telephone duty or field accidents for developmental purposes.

The information listed in this section is meant to be a guideline, but does not address all contingencies. Remember, when in doubt ask your supervisor for guidance.

### Pre-Investigation Preparedness

Each field office will maintain a communication system that insures timely notifications of all aviation accidents and significant aviation incidents in their geographic area of coverage. This system will designate one person that is responsible to respond to all accident/incident notifications.

There shall also be a provision for a "backup" person for notification in case of a communications failure with the primary standby. The supervisor will design a standby system that is appropriate for his geographic area and staff. Whatever system is implemented, consistent with operational requirements, the minimum number of investigators should be on an immediate on-call status. The "standby" time requires that the investigator be available by telephone/radio during non-duty hours. When not available directly by telephone, the standby investigator will insure that they can be contacted immediately through the use of a pager and are capable of responding by telephone/radio within 15 minutes.

The standby investigator will maintain a "go-bag" that has the proper tools and clothing. This "go-bag" will be available to the standby investigator within 30 minutes of the launch notification. The "go-bag" should include a 35 mm camera, film, recording equipment, basic hand tools, and measuring devices sufficient to document the scene of a general aviation accident. The IIC will also have available a list of the telephone numbers of key duty personnel.

Each field office will maintain a current DCA "Go-Team" sheet as published by the NTSB headquarters on a weekly basis. The public affairs officer will be notified of any significant accident. These accidents should include, but are not limited to:

- (1) General Aviation accidents with four or more fatalities that occur in a residential area, or involve locally, regionally or nationally known individuals. This would include corporate aircraft accidents with passengers on board.
- (2) Air Carrier accidents or incidents involving turbulence, evacuations, uncontained engine failures, rapid decompressions, fires or when aircraft damage may be substantial.
- (3) Accidents occurring in states of special interest to Board Members.

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Notification of accidents to any of the Board Members should be done by the Regional Director, or on some occasions by a supervisory investigator. An attempt should be made to notify the Special Assistant first. If that fails the Board Member should be noticed directly. When it is necessary to notify the Chairman of an accident, an attempt to pass the information should be made in the following order - AS-20, Chief, AS-20, Deputy Chief, AS-2, AS-1, the Chairman's special assistant, the Chairman directly.

When a decision is made to investigate the accident as a headquarters major, the field investigator will "stake down" the scene and be prepared to brief the incoming IIC from DCA and turn over the investigation. As in all major accidents done by headquarters, the field IIC may be involved as a group chairman. This involvement will depend on the needs of the headquarters team and the approval of the Regional Director.

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## Notification of Accidents/Incidents and Initial Response

Investigations are classified in six general categories:

- (1) **Field Major:** These accidents may involve new or sophisticated aircraft, five or more fatalities, high public visibility, midair collisions, accidents involving extensive ATC problems, VIP involvement or significant safety issues. Designation of an accident as a field major will be done by the supervisor with the concurrence of AS. The accident identification number will use an "M" in lieu of an "F".
- (2) **Field:** These are on-scene investigations where the investigation is initiated and controlled by an NTSB investigator. Normally, the wreckage is secured until the NTSB investigator arrives at the accident site. (A priority ranking of accidents to be considered for field investigations is listed in this chapter under Oversight/Public Confidence and Selected Emphasis Areas). Supplements are filled out as specified by the current 6120.4 instructions. An analysis section will be prepared that includes a 200-word narrative, coding sheets, and an analysis/probable cause memo. The analysis memo and 200-word narrative may contain analytical statements which are based on the information in the factual report. They will not introduce any new facts not documented in the factual report.
- (3) **Limited:** These accidents are normally done by telephone and may possibly require travel. When these investigations involve extensive work they may be upgraded to "field" status to account for the additional workload. Limited investigation reports will include a 200-word narrative and coding sheets. An analysis memo is optional but encouraged when the investigation is complex or the reason for the coding is not readily apparent.
- (4) **Incident:** These occurrences do not meet the definition of an "accident" but can be investigated as an incident. This category may include an air carrier occurrence which did not cause substantial damage or have serious injuries but involved a potential safety issue. The death of either a passenger or crew member from "natural causes" will

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also be considered an incident. An NTSB form 6120.1/2 is not included in the factual report.

- (5) **Delegated:** These accidents may be delegated to the FAA for both the investigation and the report preparation. The accident will carry an NTSB number with an FAA identifier and all expenses incurred in the investigation will be the responsibility of the FAA. The field office will be responsible for both the timeliness and quality of all delegated reports. The field office will prepare an analysis section consisting of a 200-word narrative and coding sheets. An analysis memo is optional and may be included, as appropriate, on a case by case basis. Delegated accidents normally involve fatal or serious injuries and require an on-scene investigation. If the investigation can be done by telephone it will normally be handled as an NTSB limited. It will be the supervisor's option to decide, on a case by case basis, whether it is better to delegate an accident or cover it as a limited investigation.
- (6) **Public Use Aircraft:** Public Aircraft, as defined in the Federal Aviation Act of 1958, "Means an aircraft used exclusively in the service of any government or of any political subdivision thereof including the government of any State, Territory or possession of the United States, or the District of Columbia, but not including any government-owned aircraft engaged in carrying persons or property for commercial purposes." (See Volume IV). This definition has been refined further under Public Law 100-223 (See Volume IV which determined "used exclusively in the service of" means, for other than the Federal Government, an aircraft which is owned and operated by a governmental entity for other than commercial purposes or which is exclusively leased by such governmental entity for not less than 90 continuous dates." Additionally, Safety Board staff have taken the position that, for the Federal Government, exclusive use can be as brief as one leg of a flight. The Safety Board has taken the position that when a Public Agency requests the Board to perform the investigation with or without a letter of agreement, we would prefer to use the Board's normal procedures of making everything available to the general public, both the factual and the



determination of probable cause. When an agency has specific needs such as classified equipment or operation and the release of this information could have a detrimental impact on that agency's mission alternate reporting procedures may be acceptable, subject to the approval of the Regional Director in consultation with Headquarters staff. Costs associated with the investigation will be borne by the requesting agency (See Volume IV, USCS Letter of Agreement).

The Safety Board prefers that all investigations, public or civil, should be conducted in the same manner. That is the factual report should be made public and the Board should determine Probable Cause and release it to the Public. However, there are letters of agreement with certain agencies (See Volume IV) which the Board has agreed to investigate the accident, write one report, the factual, and deliver it to the agency. It should be noted that under Public Law 100-223 any public entity (other than the Armed Forces or Intelligence Agencies) operating an aircraft as a public aircraft must report an accident or incident to the NTSB in the manner prescribed by the Board. See Volume IV, Title 49, CFR, Part 830.20. Administrative procedures for processing these reports are described elsewhere in Volume III.

The Safety Board's ability to perform the investigation is based upon the availability of investigators when notification is received. The requesting agency will reimburse the Safety Board for all direct expenses such as wreckage security, wreckage removal, testing, and rental or equipment or aircraft.

The response to any given accident will depend on a variety of factors. These include the type of aircraft, damage to the aircraft and other property, injuries, type of operation, FAA involvement, oversight responsibilities, visibility, safety issues, public interest, location of occurrence, and the background of the pilot. The decision to do a field investigation will be made by the supervisory investigator based on a consideration of these factors. Occurrences meeting our public confidence/oversight and special emphasis areas will be given priority as full field investigations:

High visibility accidents should have an NTSB investigator on scene in a timely manner. This does not normally allow for delaying a launch to the scene until the

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following morning. Ultralight aircraft accidents will not normally be investigated, regardless of injuries or damage, unless they are related to the operation of certificated aircraft. Ultralights not meeting the criteria of Part 103 will be investigated as an unregistered experimental aircraft.

Although injuries are an important item in deciding to launch on an accident, they are not the sole criteria. Depending on resources available, it may be advisable to launch on a nonfatal accident involving a safety issue while allowing the FAA to do the field portion of a straight forward "limited" fatal accident. Likewise, it may be reasonable to do "serious" injury accidents involving critical injuries as fields while doing some straightforward "serious" injury accidents involving a broken foot as a limited investigation. The objective is to provide the largest safety improvements possible within current staffing and funding limitations.

All accident notifications are to be taken by the field office in a timely manner so that a decision can be made as to the appropriate response. Once this decision has been made, the standby investigator will inform the FAA and local authorities as to the NTSB actions. Even on limited investigations it is important to let all interested parties know that the NTSB will not be coming on scene or taking custody of the wreckage, and that wreckage does not need to be guarded for NTSB purposes. The operator should understand that the wreckage is released with whatever conditions the standby investigator attaches to that release. For example, the wreckage can be released under the condition that the engine not be disturbed until it has been examined by an NTSB or FAA representative.

On high visibility accidents that require status reports, the Initial Notification memorandum will be forwarded to AS via telecopier or electronically the morning of the second work day following notification of the accident. A Status Report memorandum will be forwarded to the AS via telecopier or electronically within five work days following notification. Both memorandums will be from the Regional Director and forwarded through the Director, AS to the Board. These initial and status reports do not eliminate the need for the 6120.19 report.

The Regional Office will insure that the FAA is informed of all aviation accident notifications which do not come through FAA sources. The opportunity for participation will always be provided to the FAA (except in the case of public

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use aircraft). However, the investigation will not be delayed unnecessarily waiting for the designation of an FAA coordinator (FAA IIC). If necessary, inform the FAA of your plans and proceed with the investigation. Even when the FAA does not participate in the investigation, a copy of the preliminary and final reports will still be sent to the FAA Flight Standards Office with geographic jurisdiction (with the exception of public use). When an FAA coordinator is not assigned to the accident and the NTSB investigator has determined that the aircraft was destroyed, the FAA district office needs to be notified of the aircraft's make, model, serial number, registration number, and the registered owner's name and address. The IIC will also try to honor specific requests from the FAA for any additional information, such as pilot and aircraft logs, obtained during the normal course of the investigation.

Original

### Prior to Departing for the Accident Scene

When an investigator has been notified of an accident and has an approximate location and the preliminary information, they should notify their supervisory investigator.

The best assistance offered to any investigator is the tool of communication. In the course of your preparation for the investigation, you will talk to many people who will offer advice, suggestions, etc., not in an effort to undermine your abilities as an investigator, but because it is human nature to become involved in a catastrophic trauma. People not directly associated with the investigation, but who have a need to know, feel important when you communicate the facts. This is an important concept and you should use it to your advantage during your investigation.

The order in which the items are listed below is arranged to save the investigator time and reduce the necessary telephone calls with which he may be inundated.

- (1) Get exact location of accident site: city, town, county, lot and block number, street address, geographic coordinates. The location of the accident will dictate the mode of transportation and arrangements required.
- (2) Check location of accident with a current map.
  - a. Take the map with you.
  - b. If you do not have access to a map, the FAA coordinator, or local official may be able to obtain a map in sufficient detail to portray the location and all features that may have played a factor in the accident. Ideally, a 1:63, 620 scale map of remote sights and city maps depicting street names is used.
- (3) Make preliminary arrangements for travel to the accident site by the following:
  - a. Jump seat authorization (NTSB FORM 7000-5).
    1. Ensure you have sufficient jump seat forms to complete your travel to and from the accident site.
    2. Board order #52 specifies procedures to be

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used in riding jump seat.

- b. Commercial Air - Use only the approved agent for all official use ticket purchases. Only coach class is authorized. Be prepared to provide the appropriate 24 digit code, e.g. A391FA\*\*\*\*\*2100FCC. Note that each trip requires a fund control number.
  - c. GTR (emergency use only).
  - d. Government car.
  - e. Rental car (compact unless unavailable or circumstances justify otherwise).
  - f. Privately Owned Vehicle (POV).
- (4) Contact the FAA coordinator.

The FAA coordinator usually is an important asset to the investigator. Do not take for granted, though, that he will know what to do. During your initial conversation with him you should be able to determine if that is the case. You will then have to give him specific instructions and guidance. He becomes doubly important, if he is familiar with the area of the accident. A telephone call to him may solve many logistical problems. However, even when you have the FAA coordinator make local arrangements for you, a call to the local authorities is desirable.

- a. Confirm site location
- b. Access to local transportation
  - (1) boat
  - (2) aircraft
  - (3) snow machine
  - (4) foot/ski/snowshoe
  - (5) horse
  - (6) dog-sled
  - (7) motorcycle
  - (8) car/truck
- c. Survival requirements and precautions in remote locations.

Original

Carry enough survival equipment compatible with the location and climate of the accident site to ensure your safety. Be aware of any local or state regulations requiring survival equipment. Be sure you understand the regulations involving the transportation and/or carriage of firearms for the area concerned. Some areas may require that you have a survival weapon. It is not the intent of the NTSB to authorize the carrying of concealed weapons by investigators! If firearms are outlawed within a state or local jurisdiction, then do not carry a firearm there. If, however, you are traveling to a remote sight, with no afforded protection, then consideration can be given to including a weapon as part of your survival equipment when it would be in compliance with all federal, state, and local laws and regulations.

(5) Contact local authorities

The local Law Enforcement/Rescue Constabulary can be a help or hindrance to your investigation. Some of these agencies may have never seen an aircraft accident and they may not know who the NTSB is or of our jurisdiction over the accident investigation. It is your job to promote the NTSB; you are a direct representative of "The Board". If the local agency is unaware of the NTSB, educate them directly, politely, and in a business like manner.

- a. Local authorities may include police, sheriff, troopers, military, or other appropriate regulatory agencies.
- b. Identify yourself and your purpose for interest in the accident.
- c. Explain the function of the FAA coordinator and what the coordinator is allowed to do prior to your arrival.
- d. Make officials aware, politely, that site security is imperative. Be sure they understand that no unauthorized individuals should be allowed into the accident scene.

NOTE: The Investigator must use judgment in

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determining whether wreckage may be moved prior to his arrival. Be sure to alert the officials that they may do anything they must to rescue survivors. However, when they remove the corpses, instruct them to document the wreckage with photographs prior to any disturbance. Offer to replace the film they used if you have to. If the wreckage is an obstruction or a public hazard you may want to instruct officials to move the wreckage after photographic documentation. If you are in doubt about movement of the wreckage, contact your office chief.

- e. If there were witnesses, ensure that the officials record at least the names, addresses, and phone numbers. Witnesses may be transient, and depending on your arrival time, may not remain at the accident site. Witnesses may be the only clue as to what occurred. If the authorities are in a position to take a basic statement, have them do so since it may have a bearing on the direction of your investigation.
- f. Arrange for transportation to the accident site.
- g. Once you have local transportation secured to a remote accident site, you may want to keep the transportation means available and at your disposal for the entire time you are on-scene for the accident team's safety and emergency use.
- h. Be sure when arranging for services you agree upon a price before hiring those services. These prices should be representative of the local area. The IIC is authorized to spend up to \$500 for the direct expenses of an accident. The supervisory investigator can authorize up to \$1,000 and the Regional Director up to \$3,000.
- i. Determine if special equipment may be needed and the availability of such.
- j. Determine disposition of bodies and request autopsies with split samples if necessary. You may have to carry your own toxicology kit.

Original

- k. Ensure you have sufficient information concerning the accident needed for notification to HQ.
- (6) Contact your supervisor or designated backup to notify them of the following:
- a. Your travel arrangements
  - b. Direction of the investigation
  - c. Assistance needed from DC
  - d. Basic facts concerning the accident
  - e. Discuss notification of DC
  - f. Point of contact at or near the accident scene
- (7) Coordinate with the appropriate AS division for use of specific functions. If, for example, you have a mid-air collision on a Victor Airway, with known Air Traffic involvement you may want Air Traffic assistance.
- (8) Be sure to have the following forms available"
- a. Parties to the Investigation Forms
  - b. Witness Statements
  - c. Pre-Addressed Envelopes/Labels
  - d. NTSB Form 6120.1/2
  - e. Passenger Statements
  - f. Wreckage Release Forks
  - g.. Accident Form Packet (6120.4)



Return Travel

When possible, the field investigator should copy the applicable flight timetables from the office copy of the Official Airline Guide to and from the nearest commercial airport. Ample times (approximately one hour) should be allocated for rental car return, baggage check-in, and jump seat check-in. The investigator should not sacrifice the quality of the investigation based upon return travel.

Original

### News Media Relations

The Safety Board is a public agency engaged in the public's business and supported by public funds. The work the Safety Board does is open for public review. The Safety Board believes that briefing newsmen factually during the on site investigation of an aircraft accident should be a normal operational part of the investigation. The field investigator should follow the guidelines established in the booklet, "Do's and Don't in Dealing With The News Media."

The field investigator should have an understanding of how the media functions, the need to release factual information, and the value the media can be to the agency. However, no AS employee is to accept an interview for any national television program without coordination with AS-1/2.

Original

Follow-Up Actions

- (1) Ensure that, if required, the Memorandum of Initial Notification to the Board has been completed by the morning of the second working day after the accident.
- (2) Complete the 6120.19A preliminary report within five working days. The investigator should attempt to complete the preliminary report within two working days so that the preliminary and initial reports will be combined.
- (3) Complete your travel voucher and overtime sheet soon after returning to the office. This is particularly important at the end of a fiscal year.

NOTE: Use of overtime should be consistent with the current policies issued by the Bureau of Field Operations.

- (4) Use of Rapidraft
  - a. The use of the Rapidraft during follow-up action is for payment of services received by the investigator. The Form 44 can be used for expenses exceeding \$1,000.
  - b. When using Rapidraft for travel vouchers, the person who signs the Rapidraft can not be the same as the person who signs the travel voucher.
  - c. If it is office policy that the Staff Assistant completes the Form 44, then ensure that they receive all copies of the bills for services in a timely manner.
- (5) Brief the Supervisory Investigator concerning the status of the following:
  - a. Summary of Accident
  - b. Investigative Costs
  - c. Overtime Costs
  - d. Status of Investigation
  - e. Teardowns Accomplished or Pending
  - f. Parties to the Investigation
  - g. Problems with the FAA or Local Authorities
  - h. Travel Costs

Original

- (6) Review all the Wreckage Release Forms to ensure that the wreckage released and/or retained coincides with the forms.
- (7) Arrange to complete necessary work such as:
  - a. Lab Analysis
  - b. CVR/FDR Analysis
  - c. Engine/Component Teardown
  - d. Instrument/Radio Testing or Teardown
  - e. Toxicological Tests

Whenever you are sending something to the NTSB laboratory in DCA, be sure to send along with the component a copy of the 6120.19a, a summary of the accident or conditions found at the accident site, and exactly what you are requesting. If you are using a laboratory other than DCA, do not send them a copy of the 6120.19a, but simply a factual summary of the accident outlining the facts, conditions and circumstances surrounding the accident and what you are requesting. Precede the shipping with a telephone discussion to ensure the laboratory's ability to accomplish the desired work. It may be advisable to follow up any previous requests to RE for help with a succeeding telephone call. When an outside lab is used for metallurgical testing, a copy of their report should be sent directly to the NTSB lab.

- (8) Compile the test results and complete the necessary forms from the forms packet.
- (9) Review all data to determine if a safety proposal or accomplishment is in order.
- (10) As a gesture of cooperation, make an attempt to contact the agencies that assisted you and thank them for their assistance during the particular portion of the investigation.

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Regional Investigation Procedures Outline  
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## Overview

Most of the procedures contained herein apply equally to investigations where a single investigator is present, and to those which will involve group chairmen, and numerous parties. The type of investigation to be conducted will be determined by the Regional Director and headquarters management. Additional information for setting up groups and conducting the appropriate meetings is provided in this section. At the time the investigator or the investigative team arrives at the scene of an accident, the situation is often one of great confusion. Therefore, a high degree of ingenuity and resourcefulness is essential to conduct a thorough and efficient investigation under the widely varying conditions found in the field. It is important that the investigator obtain the good will and active support of local authorities and all others involved in the investigation. The development of a spirit of cooperation and common effort will greatly facilitate the work to be accomplished.

Original

## Types of Investigations

### Single Investigator Investigations

This is the most common type of investigation which will be encountered by the Regional Office Investigator-in-Charge (IIC). This type of investigation does not necessarily mean that the investigation is less thorough; it does mean, however, that a single investigator must perform the duties for which each group chairman would be responsible on a major investigation.

Typical single investigator investigations involve most general aviation accidents/incidents, and some commuter and air carrier accident/incidents.

### Single Investigator and Group Chairmen (Field Major)

This type of investigation is usually a little larger in scope and requires additional Safety Board personnel either to complete the investigation in a timely manner or for technical expertise in a given area. Typically, an investigation of this nature will be a field major. The IIC can expect to have anywhere from one group chairman to several group chairmen. In either case, it is the IIC's responsibility to organize and oversee the investigation. The possibility also exists that a Regional Office investigator will be requested to act as a group chairman in either a DCA major investigation or a regional office major investigation.

### Participation in a DCA Major Investigation

When a major accident occurs and a "Go-Team" is launched from headquarters, an investigator will be launched from the respective regional office to "stake down" the site prior to the team's arrival. The major duties during this "stake down" period are to gather as much initial information as possible, ensue wreckage security and recover the CVR and DFDR. The Regional Office investigator should meet the team upon or shortly after their arrival and brief the "Go-Team" IIC on the events which have taken place up until that time. The Regional Office investigator may be requested to participate in the investigation as either a group chairman or a member of a group. This request should be discussed between the IIC and Regional Director. If the Regional Office investigator is not staying on as part of the team, he/she will be released by the IIC when their assistance is no longer needed.

Original

## Accident Scene Security

### Regional Office Investigations

An initial duty of the IIC following the notification of an accident is to ensure that the accident site and wreckage are properly secured in accordance with 49 CFR, Part 830.10. (See Volume IV). The twofold purpose of obtaining early scene security is to preserve evidence and to help eliminate injury to inexperienced personnel. Initial arrangements for security should be made upon notification of the accident and prior to the investigator's arrival. Typically, local or state law enforcement agencies will provide at least the initial site security until the investigator arrives. At times, the location of the wreckage will be such that immediate consideration must be given to its removal. It is the responsibility of the IIC to coordinate such removal with local authorities.

Upon arrival at the scene, the IIC should contact the local authority responsible for the personnel providing security for the wreckage. An understanding should be reached regarding the division of duties by the police, coroner, etc., and the responsible local authorities should be identified. In most cases, the wreckage will be secured by local/state police, local sheriff's office or the Civil Air Patrol. Assistance may also be obtained from military units near the accident site or local disaster and civil defense units. Occasionally, the need will arise to employ civilian guards. In this event, the hourly wages to be paid shall be agreed upon prior to services being rendered. Payment for security personnel should be made by rapiddraft. An invoice showing cost per hour and number of hours worked must be obtained.

The Safety Board is responsible for providing/arranging security for the wreckage until such time that the on-scene investigation is complete. Once the on-scene phase of the investigation is complete, wreckage security becomes the responsibility of the owner, operator, or insurer. Prior to departing the site, the IIC should make every attempt to contact local authorities to inform them of the location, of the wreckage and that the Board, having completed its investigation, is no longer responsible for the wreckage. (Reference Part 830.10, Preservation of Aircraft Wreckage, Mail Cargo, and Records in Volume IV).

Clear and explicit instructions should be given to those securing the wreckage with regard to which persons are allowed

Original



access to the accident site.

#### Field Major Investigations

Depending on the size of the investigative team and the location of the wreckage, it may be necessary to supply the group chairman, parties, and participants "access to wreckage" identification. If badges are available, they should be used. This information should be coordinated with personnel who are supplying security at the site.

The issuance of "access to wreckage" identification should be covered at the organizational meeting. Issuance of this identification may be delegated to each group chairman for his/her respective personnel. The access identification should identify the accident, the individual, and the group to which the individual is assigned. Participants must wear the identification conspicuously during their investigative activities. Participants should be required to wear their assigned identification badges to gain access to the accident site or to any progress meeting conducted by the IIC. A list of persons to whom identification has been issued should be maintained by the group chairman and a consolidated list should be maintained by the IIC. Identification issued to participants must be returned at the end of each person's active, on-scene participation.

#### Go-Team Major Investigations

Provide initial liaison with local media in accordance with Board policy and good judgment. Say no more to the media than is absolutely necessary.

Example: "NTSB investigators from the regional office have arrived on the scene and have assumed control of the investigation. A "Go-Team" has been launched from Washington, accompanied by Member \_\_\_\_\_, and is expected to arrive here at 0:00. Pending their arrival, we have closed off the site so as to preserve evidence. No press access will be granted until the "Go-Team" is here, and arrangements can be worked out by the Board's public affairs staff member who is traveling with the "Go-Team." In the meantime, any questions about procedures should be directed to our Washington office

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at (202) 382-6600 (after hours a recorder will provide home phone numbers of public affairs staff members).

Do not promise when or where the first press briefing will be, or when or where press access to the site will be granted. Under Board policy, only the Member, Public Affairs Representative, or IIC can speak to the media beyond what has been suggested above.

Original

### Organization of Investigation

This means of organizing an investigation will vary depending on the type of investigation and the number of participants. The IIC may or may not conduct formal organizational, progress, and debriefing meetings as would be done during a DCA major investigation. If formal meetings are not conducted, it remains the responsibility of the IIC to assure that all participants are aware of and understand the procedures and regulations under which the investigation will be conducted. The regulations and operating procedures which follow apply to every investigation; however, the degree to which formal meetings are conducted will vary with each investigation. A formalized opening statement should be read at the organization meeting during a field major investigation.

### Procedures and Regulations

This information will either be announced formally at an organizational meeting, or informally during smaller investigations.

- (a) Ascertain that no members of the news media, attorneys, insurers, or persons representing claimants are present during the investigation.
- (b) Introduce the IIC and any other Safety Board personnel.
- (c) Identify which companies/organizations are parties to the investigation, and who their representative(s) will be during the investigation. (See Volume IV). At this time, all party representatives will sign an attendance roster and the "Statement of Party Representatives to NTSB Investigations" Form. (See Volume IV). If group chairmen are present, members from the parties should be assigned to these groups depending on their area of expertise. If more than one representative from an organization or company is involved in the investigation, one person shall be designated as the coordinator.
- (d) The parties are not to release information to the public regarding the NTSB investigation. Information released to the public will come from the IIC, with the exception of communications

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between party members and their respective companies, agencies, or organizations. If a Board Member is present, he/she will conduct media briefings. Public Affairs persons normally will not conduct press briefings for the IIC.

- (e) Discussions regarding the investigation should be guarded and kept to a minimum when a public, or when non-parties are within hearing distance of the investigative team. This is to prevent those outside of the investigative team from overhearing conversations which could be misconstrued.
- (f) No one will publicly speculate as to the cause of the accident. The on-scene investigation is strictly to determine the facts surrounding the accident/incident.
- (g) Safety on the job should be stressed. Accident sites are full of dangers and can be hazardous to those who are not accustomed to working in this environment. If an unsafe condition is observed, the IIC should be informed. The IIC is responsible for safety.
- (h) All information regarding the accident/incident will be shared within the investigative team. No information will be withheld from any of the members. A copy of each group's field notes will be distributed to other members of the investigative team upon the conclusion of the on-scene investigation. Copies of all photographs taken will be made available to the IIC>

#### Daily Progress Meetings

These meetings will normally be held daily (as scheduled by the IIC) to discuss new information gathered since the last progress meeting, and to determine the direction of the investigation. These meetings should be free flowing with regard to sharing factual information within the investigative team.

#### Debriefing

Upon completion of the on-scene investigation, and prior to departure from the crash site all group field notes should be collected and distributed to each group. Findings

Original

determined during the investigation will be discussed and members of the investigative team should be cautioned regarding speculation of cause of the accident. Any planned follow-up work required should be assigned and coordinated at this time.

Original

### Parties to a Field Investigation

The Board has found the party system to be a valuable and useful technique to gather facts efficiently and to obtain needed technical expertise. It also provides a means of sharing safety information to persons in a position to make any required changes.

The careful selection of parties by the IIC on a case-by-case basis is an important step in the overall success of the investigation. Regulations do not require the IIC to designate interested parties to participate in the Board's investigation. Party participation may be removed for failure to comply with assigned duties or for acting in a manner prejudicial to the investigation.

Parties are limited to persons, Government agencies, companies, and associations whose employees, functions, activities, or products were involved in the accident, and/or can provide expertise the IIC determines is required. Private persons, companies, and associations have no right to participate in the investigation; only the FAA is entitled to participate in the investigation.

When talking to the potential party representatives, the IIC should bear in mind the obligation to make a decision as to what type of expertise should be provided. All parties must satisfy the IIC that their personnel are suitably qualified and will actually be of assistance. Approval is not automatic. If, for example, a potential party chose to be represented by a specialist and the need is for a different type of expertise, the potential party should be advised accordingly; and if the entity is unable to unwilling to provide the desired expertise, the IIC should decline to designate that entity as a party. Similarly, if an individual has demonstrated in the past an inability to follow Board direction or makes no contribution to the Board's investigative effort, the IIC should either not invite the entity he/she represents to be a party, or should seek the designation of someone else to represent that party. In sum, the determinations of whether to have any parties other than the FAA, and, if so, which organizations to grant party status to, are based on the needs of the Board and not on the needs or interests of private persons.

Section 831.11(c) prohibits participation of a party being represented by any person who represents claimants or insurers. To prevent such proscribed representation, all non-

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FAA party representatives must sign the "Statement Of Party Representatives To NTSB Investigation" Form.

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## Media

The National Transportation Safety Board, being a government agency, is responsible to the public for its actions. It is the Board's responsibility to keep the public informed about the progress of an investigation; however, care must be exercised in discharging this responsibility to insure that the public will not be confused or misled, or innocent parties damaged by information released. Each person who is authorized to release information shall assure that the preliminary information released is factual, and any information which is released during early stages of an investigation is clarified to avoid misunderstandings. The Safety Board's Public Relations Policy and Procedural Guidance is covered in full under Board Order 1210.1.

### Field Major Investigations

When a Board Member is present at the scene of an accident, he/she is the official spokesperson for the Safety Board. When a Board Member is not present, or leaves the scene, the representative from the Office of Public Affairs will serve as the spokesperson. If the Public Affairs representative is not present, the IIC will be the spokesperson.

During accidents attracting an abundance of media coverage, the Office of Public Affairs can be useful in handling inquiries even though a representative may not be on-scene. In such cases, it is the responsibility of the IIC and Regional Director to keep the Office of Public Affairs apprised of factual information available on at least a daily basis.

### Field Investigations

Press interviews at the accident site present a timely opportunity to report on the factual progress of the investigation and at the same time educate the public regarding the Safety Board and its mission.

The Office of Public Affairs has developed a Media Information pamphlet which may be distributed to news personnel. This pamphlet provides general information regarding the Safety Board, how investigations are conducted, and how to obtain Safety Board accident reports.

Since the amount of media coverage on each accident

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varies, the IIC must be flexible in dealing with the media. The majority of field accidents will involve local news reporters. In cases where the amount of media interest is small, the IIC can easily brief reporters on an as needed basis while on-scene.

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Field investigators may, however, become involved in accidents/incidents which attract a great deal of media attention, and along with that, a large number of reporters. In cases such as these, media briefing times may be scheduled and a group briefing may be conducted. Attempting to individually brief each reporter will become overburdening and will prevent the IIC from performing his/her investigation duties.

### Interview Guidelines

Any time media interviews are given, there exists the opportunity to be misquoted. The following guidelines will help alleviate misinterpretation of the facts.

- (1) Develop a standard background information speech regarding the structure and mandate of the Safety Board.
- (2) Provide only documented, factual information which will eventually be part of the public docket. Information related by others may be considered as factual; however, the source of that information should be established during the interviews, e.g., "A witness related..." Avoid engaging in the discussion of rumors.
- (3) Never provide speculation and do not fuel speculation on the part of the media.
- (4) Do not provide analysis of the facts.
- (5) Do not speculate, give opinion, or comment on cause. Explain that the IIC will provide only factual information and that the five Board Members will determine probable cause based on the factual report.
- (6) Provide clear information to prevent misinterpretation on the part of the media.
- (7) Do not provide names of fatally injured persons. Defer these questions to the coroner or law enforcement authorities.
- (8) Before releasing information to the media which may prove to be embarrassing to parties, brief the

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parties on the inevitable disclosure of the facts.

- (9) Do not withhold factual information. The media will most likely discover it anyway and speculation will run rampant as to why it was withheld.

- (10) Avoid speculation regarding any action which the Board may take as a result of the investigation.

Original

### Autopsies and Toxicological Testing

Autopsies shall be requested on the pilot, co-pilot, and/or any passenger who may have had access to the flight controls. Most states will automatically perform autopsies when an accidental death has occurred; however, it is the IIC's responsibility to assure that an autopsy is performed. This should be accomplished through coordination with the FAA, local law enforcement authorities and/or the medical examiner/coroner's office. The FAA has agreed to pay for the autopsy and associated costs for flight crew members only.

It is the IIC's responsibility to obtain a copy of the autopsy report. Procedures for obtaining the reports vary among the states. Some medical examiner/coroners offices will mail the reports with just a telephone request, others will require a written request. If there is any cost involved with obtaining the report, a rapidraft should be issued.

Toxicological tests shall be performed on all fatally injured crew members and passengers with access to the flight controls. Consideration should be given to toxicological testing of passengers when death was associated with an in-flight or post-crash fire. FAA accident coordinators typically are willing to coordinate the shipping of toxicological samples; however, it is the IIC's responsibility to assure that toxicological samples are obtained and handled properly. Shipping instructions for toxicological samples are included in the toxicological sample boxes.

The IIC will request through appropriate sources toxicological specimens from flight attendants, ATC personnel, airport personnel, mechanics, dispatchers, and other persons depending on the nature of the accident/incident. Toxicological samples should be requested from all ATC personnel who were communicating with, controlling, or supervising the control of an aircraft which was involved in an accident/incident where performance or judgment of the controller may be a factor. Requests for samples from ATC personnel must be made in writing to the appropriate supervisor.

Timeliness of the request for samples is essential in determining performance impairment. Requests should be made, and samples taken, within 24 hours of the accident/incident. The request for samples should include both blood and urine. However, since the giving of samples is voluntary, accept whatever samples are provided. Urine samples may be used to

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determine the presence of alcohol and drugs, but cannot be used to determine the extent to which performance may have been impaired at the time of the accident/incident. Many states have laws prohibiting the operation of aircraft while impaired by drugs or alcohol. In these states, either state or local law enforcement authorities can be helpful in obtaining toxicological samples through their "implied consent" laws. Denial of toxicological sample requests will be documented in the IIC's factual report.

Once an individual agrees to provide toxicological samples, the IIC must arrange for the collection, storage, and shipment of the samples.

- (1) The IIC will locate a medical facility which will take the toxicological samples. These arrangements will be made prior to sending the individual to the facility. The arrangements should include payment, handling and storage of the samples, and initiation of a chain of custody for the samples. Alcohol swabs should not be used during the drawing of blood. The blood samples must be sealed as "legal" evidence, preserved with Sodium Fluoride (NaF), and refrigerated. Note: State and local law enforcement authorities can be helpful in this area.
- (2) The individual will be directed to the appropriate facility.
- (3) The IIC must arrange for the shipment of samples to a testing facility. Tests may be performed at the medical facility if they have the willingness and capability to do so. If not, the samples should be shipped to either CAMI or the Center for Human Toxicology. In these cases, an FAA toxicological box can be used and the shipment should be made by Federal Express. Third party billing with the Safety Board Federal Express account number should be used. The facility to which the samples are shipped should also be contacted.

CAMI  
Forensic Toxicology Research Section  
AAM-612  
P.O. Box 25082  
Oklahoma City, OK 73125-5066  
(405) 680-4866

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Center of Human Toxicology  
417 Wakara Way  
Salt Lake City, Utah 84108  
(801) 581-5117

- (4) If a determination is made not to test the sample(s), the individual who gave the samples should be contacted. The samples should either be returned to the individual or destroyed. This should be documented both on the chain of custody letter and in the factual report.

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### Scene Documentation

Many clues regarding the circumstances of the accident/incident can be obtained during the initial viewing and documentation of the accident site. The majority of regional office investigations will involve wreckage sites which remain relatively intact until the investigator's arrival. Occasionally, there is the need to have the wreckage removed prior to the investigator's arrival. In these cases, the IIC should request photographs be taken of the site prior to any wreckage removal, and that someone be available to brief the investigator on the conditions of the wreckage prior to its removal. In either case, prior to making any evaluation of the site, the IIC should establish through the appropriate personnel what part of the wreckage, if any, was disturbed during rescue operations, or extraction of the bodies. The accident site can be very misleading if this information is not obtained.

A thorough viewing of the entire wreckage site will give the investigator an idea of the type of accident he/she is dealing with. Questions which should be answered during the initial scene documentation include:

- (1) What type of terrain and obstacles are involved?
- (2) What was the angle of impact?
- (3) What was the approximate airspeed at impact?
- (4) What was the aircraft attitude at impact?
- (5) Is the entire aircraft there?
- (6) Was the aircraft under control at impact?
- (7) Was there a fire? If so, was it in-flight or post-crash?
- (8) Was there engine power at impact?

Scene documentation should be accomplished with both photographs and a wreckage diagram prior to disturbing the accident scene. Photographs are invaluable as far as documenting the original condition and position of the aircraft and its components. Photographs from the initial point of impact along the wreckage path to the final rest area should be taken. In some instances aerial photographs may be desirable to obtain an overall view of the accident site, its relation with the surrounding area, and the impact sequence. If needed, an aircraft and a pilot can be rented for this purpose. Do not try to fly yourself and take photographs at the same time. Also, state and local law enforcement authorities may provide an aircraft for this purpose. Whenever possible, especially with close-up photographs, a

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size reference should be included in the photograph.

A wreckage diagram can range from elementary to complex depending on the type of aircraft and accident. Several methods of diagraming the accident site and wreckage distribution may be used. Regardless of the method, headings and distances must be documented. The IIC will have to determine how detailed the wreckage diagram will be; however, all of the aircraft's major structural surfaces and major components should be documented. In complex accidents, consideration to hiring a surveyor may be made.

Original

### Wreckage Recovery

Wreckage should only be recovered to the extent necessary for the team to investigate any pertinent facts, conditions, and circumstances that can't be determined with the wreckage in the field. The NTSB is not responsible for the recovery of bodies, crowd control for purposes of public safety, the recovery and removal of wreckage that may constitute a public danger or nuisance, or normal police, fire, and rescue services. The IIC should consult with local authorities regarding any special or highly unusual circumstances that arise in these areas.

The IIC will be faced with the complete gamut of wreckage scenarios ranging from wreckage in residential areas, on top of buildings, in the side of buildings, in hostile terrain, and under water. In all cases, good judgment is required to insure on-scene safety, address concerns of the local community, and meet the needs of the investigation.

On the majority of Regional Office investigations, however, the IIC will be able to complete the on-scene field phase of the wreckage inspection without any wreckage recovery being required. In these cases, once wreckage inspection is complete, the IIC should release the wreckage to the aircraft owner or aircraft owner's representative. In many cases this may be the insurance representative who has the hull insurance on the aircraft, a surviving relative who represents the estate, or local authorities until a representative of the estate arrives.

An NTSB Form 6120.15 (See Volume IV) should be executed in all cases and either given to the owner or representative at the scene or, as soon as practicable, mailed to the owner or his representative.

In cases where either the entire wreckage or partial wreckage removal is required, it is best to consult with local FAA or law enforcement authorities regarding capable and reasonable services available in the area. When contracting for these services, either a contract price for the required job should be established or a cost-per-hour should be established with a stop limit set at a certain price or number of man-hours. The IIC should never commit to an open ended contract.

The IIC is authorized to spend \$1,000 per accident for on-scene expenses including guard services, wreckage removal,

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and component testing. The Regional Director can approve up to \$3,000 for expenses per accident. Expenses high than that require the approval of the Director, Office of Aviation Safety. The expenses for on-scene services can be paid immediately by issuing a rapidraft, or an invoice can be obtained to be paid later. In all cases, an invoice for the exact services received must be approved by the IIC prior to any payment.

During any wreckage removal operation, whether of a component or the entire wreckage, the first step is to remove all unnecessary persons from the immediate accident site prior to commencement of the recovery operation. Only those persons absolutely necessary to advise the wreckage removal personnel should be present during the recovery operation. In any accident investigation the salvage operation can be the most dangerous and, therefore, limited exposure to all persons is paramount.

Usually, local personnel can be found who can accommodate the recovery efforts of most general aviation aircraft accidents than occur on land. The recovery of aircraft in the water requires special considerations and specialized recovery capabilities.

When an aircraft crashes in the water, several problems arise which vary in magnitude depending upon the nature of the body of water in which the accident happened (i.e., open ocean, lake, or river). first and foremost, the responsible authorities must launch and conduct search-and-rescue efforts to recover all survivors in the most expeditious manner. Usually, local law enforcement or, on larger bodies of water or the ocean, the U.S. Coast Guard will carry out these activities.

One of the most important steps the IIC must undertake is to locate on a chart, and have marked with buoys, the position where preliminary information indicates the aircraft disappeared. The IIC's contact with ATC facilities or Scott AFB and information obtained from them should be relayed immediately to local authorities or the U.S. Coast Guard. ATC specialists from NTSB headquarters should be contacted if necessary to determine whether they can supply information which will assist in locating the wreckage.

Also, an immediate effort must be launched to locate and interview witnesses who might be able to provide information as to the aircraft's flight path prior to impact with the

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water. In the event that the main wreckage area is not identified, the exact location of floating debris, bodies, or petrochemical slicks must be documented without delay. This information may prove invaluable in the subsequent location of the wreckage.

Once the suspected position of the wreckage is determined, there are many ways to locate the wreckage depending on the circumstances and type of body of water involved. Larger aircraft with flight data recorders can be located by using sonar to home in on the pingers. Many U.S. Coast Guard facilities have portable equipment or know of commercial vessels so equipped. Side-scanning sonar can be used to map the bottom of the suspected area to look for wreckage. Small recovery submarines or remote vehicles equipped with cameras and high intensity underwater lighting can assist in locating and developing a recovery plan.

Divers should not be employed without first having a very good estimate of where the wreckage is located. Free diving is still mostly limited to depths to 150 feet and hard hat divers must be contacted on an individual basis for their limits based on equipment and experience.

In many cases, local law enforcement agencies, or fire departments will have provided divers for recovery of bodies. Many times, these organizations will remove wreckage that is in shallow water to eliminate a public hazard.

In the event it becomes necessary to employ commercial divers, negotiations relative to their employment should be handled with caution. Many commercial divers do not own all the equipment required for a diving operation. The IIC may find that once he/she has contracted for the services of the divers only, you must then face further contracts relative to equipment, e.g., boats, compressors, barges, cranes, float equipment, etc. Again, make sure you are very clear in the services contracted for and the costs involved. In no case should the Board take on the responsibility for the safety of the operation. This is the responsibility of the persons for company.

Prior to the initiation of any recovery, make sure any documentation of the wreckage that you may need, such as underwater still pictures or VCR documentation, is accomplished. Irreplaceable evidence can be destroyed or damaged in any recovery operation.

Original

When divers are employed, discuss with the divers the best method of recovery to insure maximum safety and minimum damage to the evidence. It is helpful to use aircraft manuals, models and/or a full scale aircraft to familiarize the divers and establish the best recovery plan. Again, insure that all personnel not absolutely necessary to the recovery operation remain clear of all equipment and staging areas on vessels.

Original

### Component Testing

The need will often arise when testing, inspection, or teardown of a part or component is required. Depending on the part or component, the IIC will have to determine what can be accomplished at the accident site and what must be done elsewhere. Off-site testing should be performed at either the Safety Board laboratory, a repair station, or at the manufacturer. It is the IIC's responsibility to inform the parties to the investigation when and where additional off-site testing will be performed. All off-site testing will be overseen either by the IIC, group chairman, or an FAA employee designated by the IIC.

When parts/components are retained for testing, it is the Safety Board's responsibility to return the items to the owner or owner's authorized agent, in accordance with the instructions and understanding reached at the time the parts were retained. All parts retained by the Safety Board will be noted on a Release of Aircraft Wreckage, NTSB Form 6120.15. When the Safety Board has completed its examination/testing of the parts, they will be shipped back to the owner in such a manner as to preclude damage or mishandling. When appropriate, registered mail or air-freight which provides traceable means of shipment should be used. An updated Release of Aircraft Wreckage Form should be included in the shipment to be signed by the recipient and returned to the IIC for inclusion in the factual report.

When the determination is made to have the part/component examined at the Safety Board's laboratory, coordination should be made with the appropriate personnel prior to shipment of the part. Accompanying the part should be a copy of the Preliminary Report of Aviation Accident/Incident, NTSB Form 6120.19A along with a Request For Materials Laboratory Examination Form. (See Volume IV).

It is important for the IIC to obtain a cost estimate for part/component testing and teardowns prior to committing to having the work performed. Payment for services up to \$1000.00 may be made with rapiddrafts.

Original

### Witness Interviews

Witness interviews should be obtained as soon as feasible after the IIC's arrival at the accident site. Long delays between the witnesses' observations and the interviews increase inaccuracies in their statements. What may seem like insignificant information may become important when combined with facts discovered during the investigation.

Locating witnesses may vary from an overwhelming number of people volunteering statements to having to conduct a door-to-door search for witnesses. Typically, witnesses will make themselves known to someone; however, this is not always the case. Local authorities, newspapers, news media personnel, local residents, airport personnel, and passengers and crew members of other aircraft may be valuable witnesses or may aid in locating witnesses.

Regardless of the formality of the interview, the questioning of witnesses should not be conducted as an "interrogation." The interview should be conducted on a basis of courtesy, cooperation, and neutrality. Witnesses should be encouraged to freely relay everything they may have seen or heard regarding the accident. The witness should be urged to relate only their own observations and not those of other witnesses. It should be made clear to the witness that the purpose of the interview is to gather information regarding the accident/incident to prevent similar occurrences in the future. The Safety Board is not interested in court proceedings or punitive actions.

During Regional Office investigations, the formality of conducting interviews will vary. Witnesses will often show up at the accident site during the on-scene phase of the investigation. In such cases, the IIC will have to conduct a very informal interview. During field major investigations or when a large number of witnesses are available, a more structured setting for conducting the interviews may be desired. Regardless of the circumstances, the following guidelines will help achieve a successful interview.

- (1) The IIC should visit the accident site prior to interviewing witnesses. This will help the IIC in developing a list of areas to be covered during the interview.
- (2) The IIC should attempt to develop a positive rapport with the witness. The interview should not come as

Original

a surprise to the witness. If possible, prior arrangements should be made regarding the time and place of the interview.

- (3) The witness should be qualified regarding their knowledge and experience related to aviation.
- (4) If witnesses are interviewed by a group, one person (either the group chairman or the IIC) should act as the spokesperson and take control of the interview. The spokesperson should brief the group prior to the interview on how the interview will be conducted.
- (5) A model aircraft, maps, and charts are valuable tools which can be used during witness interviews.
- (6) Encourage the witness to share his/her recollections without interruption. Periods of silence, by the interviewer while the witness collects his/her thoughts, have been found to encourage the witness to expound more fully and avoid omissions. The interviewer's ability to be a good listener is essential in this phase.
- (7) After the witness has completed his/her narrative, the interviewer may ask specific questions. In forming questions, keep them simple and avoid aviation jargon or terminology with those not familiar with aviation. Specific questions from others in the group should be channeled through and asked by the spokesperson. Be cautious that the questions are not presented in a leading manner.
- (8) Note-taking during the interview is advisable; however, it should only be done with the consent of the witness and should be done in such a manner as not to be distracting.
- (9) A tape recorder can be a valuable tool but should only be used with the witness's consent.
- (10) When interviewing a witness under a doctor's care, always obtain permission from the attending physician prior to the interview. In these cases, limit the number of questions and also the size of the witness group.

Original



- (11) Following the interview, ask the witness to prepare or permit you to prepare a written statement including all the pertinent information given during the interview. Provide the witness with a "Statement of Witness" Form, NTSB Form 6120.11, and a self-addressed franked envelope. (See Volume IV). Encourage the witness to use sketches, drawings, photographs, and maps to supplement the statement. If a witness refuses to sign a statement, don't press the issue. Indicate on the statement in whose presence it was made and that the witness did not wish to sign it.
- (12) Always be courteous to the witness and treat him/her with the same considerations you would desire in his/her position. The investigator should leave a telephone number and an address where he/she can be reached should the witness recall additional information.

On-Scene Investigation Outline  
Table of Contents

- I. Overview
  - A. Structures
    - 1. Walk Around
    - 2. Photographs
    - 3. Wreckage Distribution
    - 4. Detailed Examination
  - B. Systems
    - 1. Cockpit Documentation
    - 2. System Documentation
  - C. Powerplants
    - 1. Reciprocating Engines
    - 2. Jet Engines
  - D. Fire
    - 1. In-flight vs. Post Impact
    - 2. Ignition Characteristics
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    - 1. Items Reviewed
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    - 1. General Information
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    - 1. Aircraft Documentation
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Original

3. Police Response
4. Medical Response
5. Crash/Fire/Rescue
6. Crash Kinematics
7. Cockpit and Cabin Crew
8. Passengers
9. Disaster Preparedness

- K. Human Factors
1. Personal Information
  2. Operational Information
  3. Job History
  4. Operating Procedures
  5. Operator History
  6. Task Profile
  7. Equipment Design

## On-Scene Investigation

### A. Structures

#### 1. Walk Around

- Absence of Airframe Sections
- Impact Attitude
  - Heading
  - Bank
  - Pitch
  - Yaw
- Terrain
- Specific Irregularities in Airframe Components
  - Failures
    - Impact
    - Pre-impact
- General Wreckage Distribution
- Evidence of Fire
  - In-Flight
  - Post Impact

#### 2. Photographs

- General - Eight Compass Points
- Ground Scars and Surrounding Terrain
- Position of Controls
- Flight Control Surfaces
- Fracture Points

#### 3. Wreckage Distribution and Diagram

- Identify Centerline of Wreckage Path
- Identify Parts - Tag or Mark With Grease Pencil
  - Identify Part and It's Location Along the Wreckage Path. Mark Parts in Succession or Number Their Positions Along Opposite Sides of the Wreckage Path Centerline (i.e., 1L, 2L, 1R, 2R, etc.)
- Ground Scars
  - Length
  - Depth
  - Headings
  - Correlation with Airframe Components

4. Detailed Examination (Detailed Notes and/or Sketches)

Original

- Additional Photographs May Be Taken During the Detailed Examination of the Aircraft
- a) General Airframe (Fuselage, Wings, Empennage)
  - Note Position of Part as it Came to Rest
  - Note Where on the Airframe the Failure(s) Occurred
  - Identify the Type of Failure(s)
    - Fatigue
    - Overload
    - Flutter
  - Identify Evidence of Fire (Take Soot Samples)
    - In-Flight
    - On Ground
  - Identify Evidence of Material Transfers
    - i.e., Paint, Metal, Rubber, Fluid, etc.
- b) Flight Controls
  - Document Position of Flight Control Surface(s)
    - Use Both Surface and Actuator Positions
  - Examine Movable Mechanisms (Attach Points) for Integrity
  - Establish Control Cable Continuity from Cockpit Control to the Control Surface
  - Measure Travel of Control Surfaces
  - Examine Integrity of Balance Tabs and Weights

## B. Systems

### 1. Cockpit Documentation

- Allow no one to enter the cockpit until system documentation is completed.
- Do not move or change position of controls, levers and switches until documentation is completed.
- Use diagrams from appropriate manuals to identify controls, levers, switches.
- Describe the actual conditions in specific terms.
- Document Following Positions, Settings and Readings:
  - All Switches
  - Engine Controls
  - Flight Control Levers and Trim Settings
  - All Instruments
  - All Avionics

Original

- Circuit Breakers

## 2. System Documentation

The priority and degree to which system documentation should be done will vary with each accident. If a particular system and/or component is suspect a more detailed examination may be required. This may include either a bench test and/or teardown. In such cases, caution must be used in removing the components from the aircraft to protect their integrity as found.

- Use schematic diagrams to trace systems and their components.
- Do not move or change the position of system components until they are documented.
- Describe in specific terms the actual location and condition in which the component is found.
- Be specific in describing points of measurements of actuator extended lengths.
- Record the following information for each component when necessary:
  - Name of Component
  - Manufacturer
  - Part Number
  - Serial Number
  - Position and Description

### a) Hydraulic System(s)

- Reservoirs
  - Amount of Fluid
  - Sample of Fluid
  - Condition of Filter(s)
  - Auxiliary Reservoirs
- Hydraulic Pumps - Engine Driven, Auxiliary, Electric
  - Make, Model, P/N, S/N
  - Fluid Sample(s)
  - Condition of Pump(s)
    - External
    - Internal
- Accumulators
  - Condition
    - External
    - Internal

Original

- Fluid Sample(s)
- Air Preload
- Pressure Regulator
  - Condition
  - Settings and Operation
- Pressure Relief Valve(s)
  - Conditions
  - Settings and Operation
- Bypass Valve(s)
  - Condition
  - Operation
- Flow Control Valve(s) to Hydraulic Systems
  - Condition
  - Position
  - Operation
- Actuators
  - Position
  - Condition
  - Operation
- Filters
  - Condition
- Fittings, Lines, Hoses
  - Condition

b) Electrical System

- Engine Driven Generator(s), Alternator(s), Inverter(s)
  - Condition
    - External
    - Internal
  - Evidence of Operation
  - Bearing Condition
  - Test for Shorts and Grounds
  - Functional Test
- Voltage and Frequency Regulators
  - Test for Operation
- Constant Speed Drives
  - Condition

- External
  - Internal
  - Functional Test
- Circuit Protectors
- Relays and Solenoids
- Transformer-Rectifier Units
- Buses, Wiring, Switches, Terminals
- Battery(s)
- Light Bulbs
  - Operation
  - Filament Analysis
- c) Instruments
  - Visual Inspection of Indications
  - Internal Inspection for Evidence of Operation at Impact
  - Bench Test if Needed
  - Pitot Static System
    - Pitot Heat Operation
    - Pitot Tube Blockage
    - Static Source Heat Operation
    - Static Source Blockage
    - Integrity of Tubes, Hoses, and Fittings
    - Cockpit Selector
  - Flight Instruments
    - Internal Examination for Evidence of Operation
    - Bench Test if Needed
  - Integrated Flight Instruments (Flight Director, HSI, ADI Angle of Attack, etc.)
    - Electrical Continuity
    - Internal Examination for Continuity
    - Bench Test if Needed
  - Communication Equipment and Navigation Instruments (VOR, DME, ADF, RMI, DCI, Marker Beacon)
    - Electrical Continuity, Servos

Original



- Frequency Selection
- Internal Examination for Continuity
- Bench Test if Needed
  
- Engine Instruments (EPR, EGT, Tachometer, Fuel Gauges, Pressure Gauges)
  - Mechanical Continuity
  - Electrical Continuity
  - Calibration
  
- Electrical Instruments
  - Readings
  - Bench Test if Needed
  
- d) Autopilot
  - Document Cockpit Selector
  - Components Which Can be Bench Tested
    - Amplifier
    - Servo Motors
    - Servo Rate Controls
    - Mach Trim System
    - Yaw Damper
  
- e) Pneumatic System
  - Ducting
  - Flow Control Valves
  
- f) Ice and Rain Protection
  - Cockpit Controls
  - Ducting
  - Flow Control Valves
  - Combustion Heaters
  - Windshield Wipers
  - Windshield Chemicals
  - De-icer Boots
  
- g) Environmental Systems
  - Turbo-Compressors
  - Cabin Superchargers
  - Outflow Valves
  - Emergency Depressurization Valves
  - Emergency Depressurization Handle
  - Ducting
  - Temperature Control Valves

Original

- Air Conditioning Packs
  - Primary and Secondary Heat Exchangers
  - Expansion Turbines or Air Cycle Machines
  - Freon Compressor and Motor
  - Freon Condenser and Evaporator
  - Cabin Mixing Valves
  - Flow Control Valves
  - Cooling Fans
- Combustion Heater
- Cockpit Controls

#### h) Oxygen System

- Crew and Passenger
  - Bottles
  - Pressure
  - Lines
  - Regulators
  - Valves
- Portable Bottles
  - Condition
  - Pressure
  - Valves

#### i) Fire Detection and Protection

- Fire Detection System
  - Detector Units, Type and Condition
  - Detector Relays
  - Wiring
- Fire Extinguisher System
  - Bottles
  - Pressure
  - Lines to Engines
  - Type of Agent
  - Discharge Indicators
  - Cockpit Controls
- Portable Extinguishers
  - Condition
  - Pressure
  - Type of Agent
  - Operability

### C. Powerplants

#### 1. Reciprocating

##### a) Cowls

Original

- Impact or In-flight Separation
- Evidence of an Uncontained Failure
- Evidence of In-Flight Fire
- Integrity and Security of Cowl Latching Mechanisms
- Measure Actuator Shaft Extension for Cowl Flap Position

b) Fuel System

- Integrity From Fuel Tank(s) Through Engine Fuel Lines
- Position of Main Engine, Fuel, Crossfeed, and Firewall Shut Off Valves
- Fuel Sample(s) From Engine (Line, Carburetor, Fuel Flow Divider, Strainer)
- Integrity of Fuel Tanks
- Presence of Fuel in Lines, Carburetor, Flow Divider
- Condition and Operability of Boost Pump(s)
- Carburetor - Make/Model, P/N, S/N
- Security, Rigging, and Position of Carburetor Linkages
- Integrity of Fuel Selector Valve
- Condition of Fuel Filters and Intake Air Screens
- Operation of Fuel Injection Master Control, Vapor Vents Boost and Venturi Suction
- Condition of Flow Divider(s)
- Fuel Leaks and Security of Fuel Line Fittings
- Operation and Security of Fuel Discharge Nozzles

c) Lubricating System

- Condition of Oil Filters
- Oil Pressure Relief Valve
- Oil Sample
- Integrity of Oil Lines
- Magnetic Sump Drains
- Condition of Oil Pump
- Condition of Oil Sump and Cooler, Installation and Condition of Vents
- Position of Oil Dilution System Control Solenoids

d) Electrical System

Original

- Condition of Spark Plugs
- Condition of Electrical Harness
- Condition and Operability of Magnetos

e) Propellers

- Determine Blade Angles
- Blade Damage; i.e., Leading/Trailing Edge, Chordwise Scratching, Gouges, Bending, Torsional Twisting
- Inspect Propeller Governors for Rotational Scoring

f) Induction Section

- Condition of Air Filter
- Linkages and Operability of Alternate Air Source
- Condition of Impellers on Turbocharged Engines
- Evidence of Impeller Rotational Scoring
- Indications of Oil Leakage at Impeller Seals and Inside Intake Pipes

g) Combustion Section

- Cylinder Damage
- Crankshaft Rotation
- Cylinder Compression
- Remove Rocker Box Covers and Rotate Engine to Observe Valve Action
- Valve and Rocker Arm Conditions
- If Necessary, Remove Cylinders
- Condition of Pistons and Piston Rings
- Cylinder Wall Damage

h) Exhaust Section

- Condition of Exhaust Manifold
- Condition of Exhaust Stacks

i) Accessory Section

- Gear Action with Crankshaft Rotation
- Condition of Drive Gears

2. Jet Engines

Original

a) Inlet and Compressor Section

- Degree and Direction of Blade Bending, Leading and Trailing Edge Breakage, Rub Marks on Blade Edges
- Debris and It's Distribution Within the Inlet Area
- Inlet Guide Vane Damage, If Engine had Variable Guide Vanes Check Inlet Case for Impact Markings to Determine Stator Position at Impact
- Anti-Ice Valve Positions and Plumbing
- Nose Cone Damage and Condition of PT2 Probe
- Oil Leakage at Front Bearing
- Compressor Rotation

b) Engine Bleed System

- Examine Bleed Systems for Evidence of Debris to Provide an Indication as to the Minimum Speed, EPR, and Thrust, by Relating Individual operating Schedules to the Bleed Locations Where the Ingested Material is Found
- Boroscope Compressor Section for Integrity
- Surge Bleed Valve Position

c) Turbine Section

- Condition of Visible Blades and Stators
- Evidence of Overheat in First Stage Nozzle Guide Vanes
- Damage to Pressure and Temperature Exhaust Probes, Cones and Struts
- Oil Leakage in Area of Rear Turbine Bearing
- Debris in Fan Discharge Ducts
- Boroscope Compressor Exit Guide Vanes, Combustion Area and Visible Turbine Area
- Degree of Turbine Rotation
- Twisting or Bending of Shaft

d) Accessory Section

- Integrity of Attached Components
- Integrity of Accessory Gear Box and Tower Shaft (Rotate N<sub>2</sub> Rotor by Means of the Stator Drive Pad)
- Condition of Fuel and Oil Filters
- Oil Sample
- Condition of Fuel Control Leakage

- Damage to Plumbing, Electrical Wiring and Pneumatic Ducts
- Condition of Engine Mounts

#### D. Fire

##### 1. In-Flight vs. Post Impact

- In-Flight Fires Burn More Intensely Than Ground Fires
- In-Flight Fires Create Smoke Patterns Which Follow the Air Slip Stream. Note Clean Areas on Aft Side of Rivet Heads, Skin Splits, and Plumbing
- Note Direction of Molten Metal Deposits

##### 2. Ignition Characteristics of Engine Materials

###### a) Magnesium

- Magnesium Chips and Thin Sections Burn More Readily Than Thick Sections
- Requires an Intense Fire to Ignite
- Turns Molten - 1050° to 1200° and May Ignite
- Burns With an Intense White Flame
- Typically Cannot be Extinguished With Usual Aircraft Extinguishing Systems
- Good Source of Re-ignition of Other Flammables
- Magnesium Fires are Typically Self Sustaining
- Oxide Deposits Vary Between White and Black

###### b) Aluminum

- Not Self Sustaining
- Melting Point - 1200°
- Ignition Point - 1250°

###### c) Titanium

- Titanium Chips and Thin Sections Burn More Readily Than Thick Sections
- Melting Point - 3100°
- Ignition Point - 2500°
- High-Speed Rubbing Between Titanium Parts May Cause Ignition
- Burn Smoothly With Little Sparking
- Requires High Oxygen Concentration to Continue Burning

- Discolors; Tan, to Light Blue, to Dark Blue, to Gray

d) Steel

- Discolors - 800? to 900?  
Tan, to Light Blue, to Dark Blue, to Black
- Melting Point - 2700?
- Ignition Point - 2750?

e) Zinc Chromate

- Turns Tan at 450?, Brown at 500?, Dark Brown at 600? and Blacken at 700?

f) Rubber

- Neoprene Blisters - 500?
- Silicone Blisters - 700?

g) Brass

- Melting Point - 1600? to 2000?

h) Copper

- Melting Point - 2000?

3. Ignition Sources

- Prime Sources; Hot Gases, Hot Engine Cases and Bleed Air Ducts, Electrical Components

4. Flammable Liquids

- Generally Require Temperatures Over 800? for Ignition
- High Air Flow Reduces Likelihood of Ignition but Produces More Damage When Fire Does Occur

E. Maintenance Records

- Instruct Operator to Collect and Hold All Maintenance Records for the Aircraft

1. Items to be Reviewed

Original

- Company Flight Manual for Aircraft Involved
- Operation Weight and Balance Regulations
- Aircraft Flight Log
- Manufacturer's Flight and Maintenance Manuals
- Mechanical Irregularity Reports
- Complete Overhaul and Inspection Reports for Engine, Propellers, and Equipment
- Pre-flight Inspection Records
- Maintenance and Repair Records
- Flight Log Prepared by the Crew
- Flight Operations Bulletins and Newsletters
- Applicable AD's and Compliance Therewith
- Service Difficulty Reports (SDRs)
- Manufacturing Service Bulletins
- Airworthiness Directives
- Aircraft Logs and Records
- Maintenance Practices of the Operator
- Engineering Changes and Modifications

## 2. Maintenance Management

- Standards and Procedures
- Quality Assurance
- Equipment and Facilities
- Personnel and Training

## F. Operations

- Obtain a Signed Statement From Persons Interviewed
- Persons Interviewed Have a Right to Legal Representation if so Desired

### 1. General Information

- Flight Plan
- Flight Plan Log
- Dispatch Flight Release
- Weight and Balance
- Flight Inspection Report
- Charts Used
- Operations Specifications
- Aircraft Flight Manual
- Operator's Operations Manual
- Operator's Training Manual
- Operational Contracts
- Airport Diagrams and Airport Master Log
- Cargo and Weight Manifest
- Fuel and Oil Record

Original



- Company Radio Transmissions
- Airport Certification

## 2. Flight Crew Information

- Employment History
- Date Updated to Captain (Accident Aircraft)
- Training Records (Initial and Recurrent)
- Total Pilot Time
- Total Pilot Time Last 30, 60, 90 Days
- Total Pilot Time in Type
- Total Pilot Time in type Last 30, 60, 90 Days
- Total Instrument Time
- Total Instrument Time in Type
- Total Instrument Time Last 30, 60, 90 Days
- Total Instrument Time in Type Last 30, 60, 90 Days
- Total Night Time
- Total Night Time Last 30, 60, 90 Days
- Certificates and Ratings Held and Dates Acquired
- Proficiency Checks
- Line Checks
- En Route Inspections
- Letters of Reprimand or Commendations

## 3. Flight Attendants

- History of Employment
- Initial and Recurrent Training
- Training in Accident Aircraft

## G. Flight Data Records and Cockpit Voice Recorders

### 1. Appearance

- FDR and CVR are Commonly Painted Bright Orange or Red, Few may be Painted Bright Yellow
- Should Have Reflective Tape and the Words "FLIGHT RECORDER-DO NOT OPEN" on the Outer Surface
- Required to be Mounted as Far Aft in the Aircraft as Possible
- FDR 5"x8"x21"
- CVR 5"x8"x13"

### 2. Handling Recorders

- UNDER NO CONDITIONS SHOULD ANY ATTEMPT BE MADE TO REMOVE OR PLAY A TAPE FROM A FDR OR CVR IN THE

Original

FIELD. THIS CAN DAMAGE AND/OR ERASE THE TAPE

- Protect the recorder from strong magnetic fields. This includes x-ray transmitters at airport security stations. If recorder is mailed, mark the package "SENSITIVE FLIGHT RECORDING WITH CRITICAL DATA. DO NOT EXPOSE TO X-RAY RADIATION OR MAGNETIC FIELDS."
- DO NOT open the recorder. DO NOT remove the tapes or solid state memory unit under any circumstances.
- If the recorder is dry and undamaged, use a shipping container obtained from the operator involved. Otherwise package it carefully for shipment. It is not necessary to package an undamaged recorder if it is hand-carried.
- If the case is damaged, DO NOT remove the tape or solid state memory unit. Wrap the entire recorder and its contents in polyethylene or similar material before packaging for shipment. Questions? - Call Engineering Services Division
- If the tape reels or solid state memory boards are separated from the unit, wrap them in polyethylene or paper before applying sealing tape. Never apply tape directly to recording medium. Never remove the recording medium from the reels or enclosure.
- Do not wrinkle or crease any recording tape separated from its recorder. Carefully wrap it on a spool or cardboard tube. Wrap the tube in polyethylene or paper and pack it carefully. Include all fragments of the tape no matter how small.
- If recorders are from a major accident, get them to headquarters by the quickest most secure means possible. If a team from headquarters travels to the scene on an FAA airplane, and the airplane is immediately returning to DCA, arrange to ship the recorders on it. Otherwise, the recorders must be hand-carried back to headquarters by an NTSB employee or a person designated and approved by senior NTSB management. Circumstances may

Original

require the recorder be transported back to DCA on a non-stop commercial flight in the custody of the flight crew. If transported this way, it is imperative that the transfer be coordinated by the IIC and the lab, and that the recorder be picked up at the destination by NTSB personnel. If the recorder is from a non-major accident or incident in which quick return is not essential, it may be shipped (properly packaged) by registered mail overnight express, a commercial shipping service or hand-carried.

- If the recorder(s) are from a Regional Office investigation complete the "Request for Flight Recorder Readout" NTSB Form 6120.20. (See Attachment K). The completed form should accompany the recorder to headquarters.
- If the recorder is found in water, DO NOT attempt to dry it. Rinse it in fresh water, preferably distilled, then arrange to ship the recorder immersed in water to the lab in a watertight container. Make sure the recorder stays immersed until its arrival in headquarters. Ship by fastest means available.

#### H. Weather

- Weather data may be collected from the FAA, military, and/or private services. Depending on the circumstances surrounding the accident, interviews may be required of forecasters, briefers, technicians, etc.

#### Information to be Gathered

- Hourly Weather Sequences
- Weather Radar Reports
- Weather Radar Photographs
- Pilot Reports
- Surface Observations
- Location of Meteorological Sensors
- Barograph Trace
- Precipitation Records
- Wind Records
- Ceilometer Records
- Moon and Sun Data
- TelAutograph or Electrowriter Records (RVR)

Original

- Information)
- Transmitter Record and Tables
- Visibility Reference Charts
- Surface Synopsis Charts
- Upper Air Charts
- Winds Aloft Observations
- Weather Briefing Statements
- Weather Observer's Statement
- Area Forecasts
- Terminal Forecasts
- In-flight Advisories (AIRMET or SIGMET)
- Aviation Severe Weather Forecast
- Winds and Temperatures Aloft Forecasts
- Prognostic Charts
- Weather Satellite Photographs
- Operator Produced Weather Information
- Low Level Wind Shear Alert System Data and Records
- Lightning Information
- Rainfall Records

## I. Air Traffic Control

### 1. FAA Reference Handbooks

- 8020.11 - Aircraft Accident Notification Procedures and Responsibilities
- 7210.3E - Facility Operation and Administration
- 7110.65B - Air Traffic Control Handbook
- 7110.80 - Data Communications Handbook
- 7110.10E - Flight Services Handbook

### 2. Obtaining ATC Information

- Coordinate through the FAA accident coordinator to have either the ATC facility chief or quality assurance specialist contacted regarding requested information. (See Attachment L)
- Request any facts known at that time
- Request copy of all communications as soon as possible
- Request copy of any available transcripts

### 3. Information Available

- Personnel Statements
- Pertinent Facility Tape Recordings
- Transcript of Recorded Voice Transmissions

Original

- Daily Record of Facility Log, FAA For 304
- Flight Progress Strip, FAA Form 7230.8
- Facility Operations Letter of Agreement
- Operational Error Reports
- Diagram of Facility Layout
- Copy of Flight Plan Record, FAA Form 7233.3
- Airways Facility Sector Certification Reports, Maintenance Log(s), FAA Form 6030.1
- If Pertinent, Previous Flight Check Reports of NAVAIDS
- Copy of Instrument Approach Procedures
- A Print Out of any Recorded Radar Data (NTAP, ARTSIII (Key Board Entries, MSAW Alerts, Conflict Alerts, Tracking Data), DART Log Sort, DART Log Track)
- CDTSO Tape (Hard Disk Data)

#### 4. Controller Interviews

- Should be Arranged Through FAA Accident Coordinator
- Controller Status in Facility
- CTO Certificate (Tower Controllers)
- Health Profile
- Weather Observation Certificate (Tower Controllers)
- Area Rating Records (Center or Tracon)
- Training Records Including, OTS Evaluation Report

#### J. Survival Factors

##### 1. Aircraft

- The Condition and Operability of the Following Items Should be Noted
- Exterior
  - Cockpit and Fuselage/Cabin Damage
  - Direction, Degree, and Location of Deformation
  - Thermal Damage
  - Blocked Exits
- Interior
  - Instrument Panel
  - Flight Controls
  - Windshield, Window(s), Escape Hatches
  - Crew Life Support Systems
  - Condition of Seats and Restraints

Original

- Lose Objects (Luggage, Flight Bags, Cargo, etc.)
  - Emergency Exit Operability
  - Emergency Systems
    - P.A. System
    - Equipment (Flashlights, First Aid Kits, O<sub>2</sub>, etc.)
    - Emergency Lighting
    - Evacuation Alarm System
    - Emergency Escape Slides
    - Life Rafts
2. Injuries
- Interview passengers and crew to determine what injuries were sustained during the accident.
  - Obtain autopsy and toxicological reports from coroner to determine what caused fatal injuries.
3. Police Response
- Interview Department Personnel as Needed
  - Number of Units Responding, Pertinent Times and Number of Persons
  - Obtain Police Report
4. Medical Response
- Were Local Hospitals Placed on Alert, if so, When
  - Did Medical Personnel Respond to Scene
  - What Services Were Provided, i.e., Ambulance, Helicopter
  - How Many Were Admitted to Hospital(s), Released, DOA
5. Crash/Fire/Rescue
- a) Search and Rescue
- Interview Personnel Involved
  - Number and Types of Units and Number of Persons Involved with the Search
  - Number of Persons Rescued Alive
  - Obtain Reports on Ground and Air Searches from Participating Organizations
- b) Fire Response
- How and By Whom Department(s) Were Notified

- Time to Complete Firefighting/Rescue Operation
- On-scene Commander and Command Post Information
- Type(s) of Communications Network(s) Used
- Difficulties Encountered
- Type and Amount of Firefighting Agents used
- Origin and Intensity of Fire

#### 6. Crash Kinematics

- Horizontal Velocity (Ground Speed) fps
- Vertical Velocity (Descent Rate) fps
- Terrain Angle
- Flight Path Angle
- Impact Angle
- Attitude at Impact
- Magnitude of Velocity Component
- Stopping Distance
- Measure Fuselage/Airframe Deformation
- Measure Ground Scars

#### 7. Cockpit and Cabin Crew

- Duties and Responsibilities During Evacuation
- Efforts Made to Assist Passengers
- How and When Crew Egressed from Aircraft
- preparation of Passengers for Impact and Evacuation

#### 8. Passengers

- How Passengers Egressed from Aircraft
- Difficulties in Egress
- Observations of CFR Response
- How Passengers Were Injured

#### 9. Disaster Preparedness

- Airport Disaster Plan
- Local Community Disaster Plans
- Recency of Disaster Drill
- Obtain Copies of Response Reports

### K. Human Factors

#### 1. Personal Information

- 72 Hour History
- Work Performance

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- Behavioral Attitude
- Behavior on the Day of the Accident
- Activity Pattern (Eating, Drinking, Social Activities)
- Family Information
- Education
- Future Plans
- General Health
- Nutrition
- Vision Problems
- Hearing Problems
- Medication Being Taken
- Smoking Habits
- Sleeping Habits

2. Operational Information

- General Training (Amount, Type)
- Specific Training (Amount, Type)
- Experience

3. Job History

- Types of Jobs Held
- Frequency of Job Changes

4. Operating Procedures

- Duties
- History of Performance

5. Operator History

- Operator History
- Recent Changes in Operator Established Policies
- Size of Operation
- Personnel Procedures
  - Payment of Salaries
  - Personnel Selection
  - Promotions
  - Rewards or Penalties
- Company Morale

6. Task Profile

- Duties Performed
- Responsibilities
- Attention Diversions



- Workload
- Difficulty of Tasks Performed
- Time Constraints on Performance of Tasks

7. Equipment Design

- General Layout of Cockpit
- Restrictions Within Cockpit
- Communication Restrictions Within Cockpit
- Illumination Within Cockpit
- Noise Levels Within Cockpit
- Instruments and Equipment
  - Size
  - Shape
  - Color
  - Illumination
  - Direction(s) of Movement
- Control Design and Characteristics
- Seat and Restraint Design and Characteristics

NATIONAL TRANSPORTATION SAFETY BOARD  
Office of Aviation Safety

1. Opening the Meeting

- a. Call the meeting to order.
- b. Introduce Investigator-in-Charge and explain, briefly, what an IIC is.
- c. Excuse all members of the news media, attorneys, insurers, and persons presently representing claimants.
- d. Have an NTSB person distribute attendance roster(s) and have that person be responsible for their collection.

2. Introductions

- a. Member of the Board and Special Assistant
- b. Public Affairs Officer
- c. NTSB Group Chairmen and other NTSB personnel
- d. Other U.S. government agency representatives
- e. Foreign government representatives
- f. State and local government representatives
  1. Consider having one of the above briefly present preliminary information gathered.

3. Opening Speech

We have available a paper containing guidance information regarding some of the Safety Board's more pertinent procedures regarding aircraft accident investigation. We ask that each person designated to participate in the investigation read this paper sometime today or tomorrow and adhere to these printed instructions for the duration of the on-scene phase of this investigation. Please keep in mind though that these guidelines are not intended to be all-encompassing. If procedural questions arise during the investigation, the Investigator-in-Charge is your best source of information. By signing the attendance roster you are attesting that all NTSB guidelines will be followed.

Please keep in mind that our procedures, with periodic minor changes in the interest of efficiency, have stood the test of time. Without a doubt, we are the most experienced governmental aviation accident investigation body in the world. We investigate hundreds of

Original

catastrophic accidents every year and although our investigative protocol may seem strange and perhaps strict, it does work.

#### 4. The Party System

The NTSB allows participation by various interested parties in our investigations for two main reasons. First, parties, whether they operators, manufacturers, unions, or other groups, assist the Safety Board by offering technical expertise that the Board may lack. We are a small organization and are not expected to be knowledgeable in every facet of every phase of the aviation industry. All persons participating in this investigation must be in a position to contribute specific factual information or skills which would not otherwise be supplied. National Transportation Safety Board Rules of Practice (49 CFR, Part 831.9) limit party status in aircraft accident investigations to only those organizations or agencies "whose employees, functions, activities, or products were involved in the accident or incident and who can provide suitable qualified technical personnel to actively assist in the field investigation."

If your organization desires party status, please be prepared to describe the qualifications of the individuals you want to participate in this investigation when we ask for people to man the specialized groups.

Second, party participation is solicited by the Safety Board because it enables a company or organization to have immediate access to facts concerning the accident from which they may immediately initiate preventive or corrective action should a product or procedure be found lacking. We do not want companies to wait for NTSB recommendations. If a problem is discovered, we hope that it is remedied immediately by the company. This does not always happen, however, and this is the reason that the Federal Aviation Administration is, by law, always a party to our investigations. They can mandate immediate fixes.

The conduct of each party involved in this investigation will be managed by an organization or company party coordinator. This individual should be of enough stature within your company to be able to make decisions on behalf of the company during this on-scene phase. The party coordinator will be the NTSB's direct and official point-of-contact for your company, and therefore, should

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be immediately available to me at all times while we are here. We also desire that during our nightly progress meetings, the party coordinator be the single individual that speaks for that party. In addition, there is no such thing as an assistant or co-coordinator. A single individual speaks for the party.

Lastly, no participating organization will be allowed to be represented by an individual whose interests lie beyond the basic safety objectives of this investigation. The Safety Board has the ability to remove from the investigation any individual who fits this description. You will find that we're flexible by necessity, but a basic set of standards must be adhered to.

#### 5. The Group System

Participants from the selected parties, excluding the party coordinators, will be assigned to working groups led by NTSB specialists for the duration of the on-scene investigation. As a rule, we do not solicit the help of anyone that is unwilling or unable to remain with their assigned groups for the entire on-scene phase of the investigation. Also, if you are assigned to a specific group, you will be required to remain with that specific group for the duration.

One of our goals will be to investigate this accident efficiently. This means that the working groups are going to be as small as possible and still be able to accomplish their assigned tasks. It is not necessary or desirable, for instance, for a flight attendant to be on the Power Plants working group. It is not necessary for an engine specialist or a pilot to be represented on the Survival Factors working group. It may not be necessary for anyone other than the NTSB specialist to be working on a group such as Weather. Decisions as to who will be on the working groups will be made by the NTSB group chairman and the Investigator-in-Charge. These decisions, of course, are not cast in stone simply because at this stage we do not have enough facts to positively determine how much help we will need. We believe though, that it is better to start small and add people to the groups at a later date. Do not feel that you will miss out on information because you, as a party, are not involved in every working group. All pertinent information from all groups will be disseminated at the nightly progress meeting where the Party Coordinators

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will take copious notes.

Also, concerning participation by organizations or companies, we cannot tolerate individuals considered to be "floaters" being directly involved in the on-scene investigation. In other words, if you are not a party coordinator or assigned to a working group, you will not be issued an entry badge and will not be allowed to attend the nightly progress meetings. Exceptions to this rule will be routinely made for representatives of pertinent domestic and foreign government investigative organizations and rarely made in other instances.

Lastly, and this is most important, we desire that all contact with the press concerning the activity of this investigative team, be made by \_\_\_\_\_ (1. Board Member, 2. Public Affairs representative, 3. IIC).

We will now identify party coordinators and assign individuals to working groups.

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NATIONAL TRANSPORTATION SAFETY BOARD  
OFFICE OF AVIATION SAFETY

INFORMATION FOR THE GUIDANCE OF THE PARTIES  
TO THE INVESTIGATION OF AIRCRAFT ACCIDENTS

1. Responsibilities of the Board and Designated Parties to the Investigation

To preclude any misunderstanding concerning the responsibilities of the National Transportation Safety Board and the Federal Aviation Administration, you are referred to Title VII of the Federal Aviation Act of 1958, as amended which sets forth the responsibilities for the investigation of aircraft accidents and the Transportation Safety Act of 1974, which sets forth duties of the Board.

The National Transportation Safety Board is charged by Congress in accordance with Title VII of this Act with the responsibility of investigating civil aircraft antecedents and to report the facts, conditions, and circumstances relating to each accident and probable cause thereof.

Section 701(g) of the Act states, "In order to assure the proper discharge by the Secretary of Transportation of his duties and responsibilities, the Board shall provide for the appropriate participation of the Secretary of Transportation and his representatives in any investigations conducted by the Board under this Title: Provided, that the Secretary of Transportation or his representatives shall not participate in determination of probable cause by the Board under this Title." The Board is providing appropriate participation for the Federal Aviation Administration.

2. Role of Parties to the Investigation

The purpose of permitting the participation of organizations is to assist the Board in developing a complete factual record. It likewise enables responsible safety officials whose products or services might be involved to have immediate access to facts regarding the accident from which they may initiate preventive and/or corrective action. You will participate initially during the field phase of the investigation as Parties to the Investigation. Later you may be designated as a Party

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to a Hearing, providing you meet the Board's requirements. All persons participating in this investigation must be in a position to contribute specific factual information or skills which would not otherwise be supplied. No participating organization will be permitted to be represented by a person whose interests lie beyond the safety objective of the accident investigation. Party participants may be removed for failure to comply with assigned duties for acting in a manner prejudicial to the investigation. As coordinator for your organization, you will also be required to sign a statement to ensure your complete understanding of 49 CFR Part 831.9 of the Board's Regulations related to Parties to the field investigation.

3. Public Hearing

Should circumstances dictate that a public hearing be held in conjunction with this accident, you will be notified. Public hearings are conducted in accordance with Part 845 of the Board's Rules of Practice in Aircraft Accident Inquiries. Subsequent to the hearing, a formal report will be prepared for public release which will include the pertinent findings and probable cause.

4. Recovery and Security of Wreckage

For the purpose of its investigation, the National Transportation Safety Board requires only the recovery of certain portions of the aircraft wreckage and protection of the accident site from interference by unauthorized parties. The Board cannot assume responsibility for the recovery of bodies, crowd control for the purposes of public safety, the recovery and removal of wreckage that may constitute a public danger or nuisance, or normal police, fire, and rescue services. Should special and highly unusual circumstances arise in this area, consultations with appropriate officials will be considered.

5. Handling of Identification Information

The flow and dissemination of information will, in essence, follow this pattern: No one will withhold information. All information obtained by group members will be brought to the attention of their respective group chairman. All information ascertained during the investigation by the various groups will be passed to the

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Investigator-in-Charge by group chairman. Each participating party will designate a coordinator (Spokesman) for their organization. Group members may pass factual information to their respective coordinator after this information had been made known to their group chairman. All of the factual information and developments of the investigation that are made known to the Investigator-in-Charge will be passed on to each of the coordinations. Coordinators may relay information to their respective organizations provided the information is factual and in its right perspective. This information should be transmitted on a "need to know" basis of prevention, remedial action, or action, or other similar reasons. The coordinators will keep the Investigator-in-Charge apprised of information so relayed. Common sense and good judgment must predominate in this matter.

6. Dissemination of Public Information

Copies of Part 801, the National Transportation Safety Board's Procedural Regulations regarding disclosure of aircraft accident information, are available here for your guidance in this matter.

Contacts with news media will be made by the Member of the National Transportation Safety Board and the Office of Public Affairs of the National Transportation Safety Board. If neither a Board Member nor a representative of the Office of Public Affairs is available, such contacts will be made by the Investigator-in-Charge.

The guiding informational policy of the Board may be summarized by stating that:

The Board is a Public Agency engaged in the public's business and supported by public funds. The work we do in the business of Safety is open for public review; the Act under which we operate makes this minatory. Today the Safety Board believes that briefing news personnel factually during the on-site investigation of an aircraft accident should be a normal operational part of that investigation.

7. Assignment and Duties of Group Members

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We will assign and organize the various investigating groups. As we do so, please keep in mind that those selected group members must be prepared to remain with the investigation until completion or until released by the group chairman and the Investigator-in-Charge.

It should be re-emphasized that under the direction of the National Transportation Safety Board Group Chairman, one set of group notes will be developed; each group member will have in his possession a copy of such group notes prior to his release from the working group to which he was assigned. Each group member will have participated in a complete review of the group's notes for technical accuracy and adequacy of the scope of the investigation in his/her particular area of technical expertise. The group chairman will obtain each group member's signature signifying that the group member has reviewed the notes and that any existing discrepancies reflected in these notes have either been corrected or resolved. Courtesy copies of group chairman's final reports will be provided to the participating group members.

#### 8. Safety Precautions During Accident Investigation

Access to the wreckage site may be hazardous because of terrain and climatic conditions. Persons and equipment involved in the recovery, examination, and documentation of wreckage may be exposed to considerable physical exertion, hazards posed by flammable or toxic fluids, and likelihood of injury from jagged metal or falling objects. We urge everyone to exercise good judgment, utilize available protective devices, and use extreme caution when working in the wreckage area. Do not exceed your physical limitations.

In addition, before anyone can enter the accident site, we must determine if hazardous materials were on board the aircraft. In the event hazardous materials were on board, we must determine the type of material and what actions must be taken to either remove the material or to reduce the risk of contamination or injury. Once we have determined that it is reasonably safe to enter the accident site, work at the site will be permitted.

The Board will not assume responsibility for any personal injuries incurred during the course of an investigation by any representative of any organization participating

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in the investigation or by an authorized observer for such.

9. Signing of Attendance Roster

An attendance roster is being circulated. Please ensure that you have signed this roster prior to leaving this room. Please include both local and home office phone numbers. Your signature on the attendance roster of this organizational meeting will signify that you have read, understood, and agree to adhere to the guidelines set forth in this information sheet.

If you have questions regarding your role and responsibility in the conduct of this investigation, please consult the Investigator-in-Charge.

10. Observers and Accredited Representatives

The Investigator-in-Charge may designate properly accredited members of aeronautical organizations, current operators of like equipment, designated military personnel or representatives of a foreign government as observers to the investigation. Personnel so accepted will be on the headquarters staff and will be given factual information on a "need to know" basis. The restrictions outlined in Subsection 5 above, "Handling of Accident Information," applies to all observers.

Although observers may be authorized to attend the initial organization and final "wind up" meetings, they will not be authorized to attend any progress meeting which the Investigator-in-Charge might convene. The observers will be given factual information by the Investigator-in-Charge. The accredited representatives of a foreign government will be afforded the courtesies and rights as outlined in Annex 13 of ICAO.

Persons not qualified in the above categories shall not be granted observer status during the investigation phase of the inquiry. This restriction does not apply to Congressional aides or other government agencies with a "need to know."

11. Party Recommendations as to Findings and Conclusions

Any party to this accident investigation may submit to the Safety Board written recommendations as to the proper

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findings and conclusions to be drawn from the evidence produced during the course of this accident investigation. (See Safety Board rule 49 CFR 831.12). The Safety Board believes that, after the completion of the investigative activities relating to the accident and before the Board has made its determination of probable cause, it is the responsibility of each party to the investigation to make known to the Board its interpretation of the findings and conclusions to be drawn from the evidence relating to the accident. These written submissions should also be served on the other parties to the investigation.

## Overview

Human performance investigation centers on the six areas charted in Figure 1 (see following page). In some cases, the work of the human performance specialist may parallel that of an operations or air traffic control specialist except that the human performance specialist examines certain evidence in greater depth. In other cases, such as medical and equipment design issues, the human performance specialist may be the lead collector of evidence for an investigation.

Human performance attention can be addressed toward any individual involved in the accident, usually cockpit crew members, air traffic controllers, or maintenance personnel. Human performance attention is also directed at larger system issues, such as company policy issues, training issues, and issues of design.

### Activities of the Human Performance Investigator on a Major Investigation

A human performance investigator normally launches on every major investigation as part of the initial team at the accident site. The human performance investigator is attached as a specialist to another group -- especially the Operations Group and/or the Air Traffic Control Group -- until such time as a formal Human Performance Group is formed. Even after a Human Performance Group is formed, there may be important interviews (such as interviews of surviving crew members) for which the Human Performance investigator alone joins another group in order to minimize the number of persons present in the room.

As a member of the team at a major aviation accident, the human performance investigator has specific areas of responsibility during the on-site investigation and in the weeks to follow. Like other investigators, the human performance investigator focuses at first on the collection of "perishable" information which would include arrangements for toxicological testing and collection of information and witness statements regarding the 72-hour history. As the investigation proceeds, the human performance investigator can focus more on the "less perishable" information which would include general background statements and information from public records. Specific areas of human performance involvement would include the following:

- (1) Arrangements for analysis of the toxicological samples. Most toxicology specimens -- including urine and blood -- should be drawn as soon as practical after the accident to provide useful samples for toxicological testing. These samples are typically drawn by hospital personnel (for living subjects) or pathologist (for deceased subjects) before the investigator arrives on-site. It is the responsibility of the human performance investigator to oversee that samples are collected and tested properly. When first notified of the accident, and before leaving for the accident site, the investigator should check that timely requests are made through the proper authorities for toxicological samples from all relevant air traffic and surviving aircrew personnel. After arriving on-site, the human performance investigator interacts with the proper medical and laboratory authorities to track and assist with proper protection and

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testing of the samples. Activities include locating and documenting the available samples, assisting as needed in arranging for laboratory testing, assisting as need in preserving a proper chain-of-custody, giving input to the laboratories on desired tests, and obtaining and interpreting the toxicology results. It is the responsibility of the human performance investigator to oversee the toxicology testing effort to insure that this very perishable information does not become lost through oversight or miscommunication.

- (2) Requesting air traffic voice tapes. All Federal Aviation Administration (FAA) air traffic control facilities in the United States (and most private air traffic facilities) record air-to-ground communications on large audio tapes on a continuous basis. Upon request, the FAA normally provides to the investigation a copy on an audio cassette tape of the communications directly involved in the accident. In some cases, a human performance investigator may also be interested in recordings of the pilot's earlier flight legs to examine the pilot's earlier performance or to have a sample of the pilot's speech under routine conditions. Such material can normally be obtained from the FAA only if the request is made within 15 days after the accident. It is a responsibility of the human performance investigator to request appropriate voice tapes from the FAA representative in as timely a manner as possible.
- (3) Obtaining information for the 72-hour history. A critical part of the human performance investigation is to trace the activities prior to the accident of the pilots, controllers, or other individuals of importance to the investigation. The purpose of this history is to determine such information as sleeping and eating history, purpose and preparation for the accident trip, unusual activities or events, mood, crew interaction, and other information that could prove critical to understanding the accident. The time period of 72 hours is typical, but other time periods are examined at the discretion of the investigator.

Information related to the 72-hour history is considered "perishable" since memory tends to become

less accurate and less detailed over time (and since some witnesses become difficult to locate with the passage of time). Those witnesses who are of prime interest would include: the last person to talk with the individual; anyone with professional contact during the 72-hour period; anyone with whom the individual lived; anyone with whom the individual was having a romantic relation; immediate family, and anyone in the general public who came in contact with the individual, including taxi drivers, hotel staff, and neighbors. These individuals are so central to the 72-hour history that it is usually worth interviewing them even if they feel their exposure was modest and they indicate that everything seemed routine. Simply knowing that everything seemed routine can be of tremendous value to the investigation.

- (4) Examining all material from the wreckage related to human performance. The human performance investigator should examine and document all material found in the wreckage with relevance to human performance, including paperwork, personal effects, and any medications (counting the number of pills in the container in the case of medication).
- (5) Obtaining general background information on the individual. When human performance failures occur in an accident, it is often possible to find problems in the individual's background that foretell the problems of the accident. A careful human performance investigation would develop information related to issues such as previous accidents and professional difficulties, approach to flying, personality characteristics, and major life events including medical, financial, and emotional changes in the recent past.

A principle source of background information is interviews with persons familiar with the individual. These interviews may take place during the on-site investigation or during the weeks following. Background information is considered "perishable" but less so than information related to the 72-hour history (which is often obtained from the same individuals). Those witnesses who are of prime interest would include: close family members; supervisors; professional colleagues with whom the

individual worked; personal physicians; previous employers, and close friends. When individuals are deceased, the family members are normally not interviewed until after the funeral, although this can vary at the discretion of the interviewer. Some background interviews can be completed by telephone at the discretion of the investigator.

- (6) Background records. A human performance investigation would normally include the obtaining of available background records. These include records of previous accidents/incidents airman records. The investigator would obtain personnel, training, and medical records from the employer to establish previous job history, discipline record, training strengths and weaknesses, and medical issues. The investigation may also include checks of the National Crime Information Center (NCIC) records maintained by the FBI. In the case of medical records and NCIC records, there may be confidential material which is not appropriate for public reports but is a valuable at suggesting areas for further investigation.



Activities of the Human Performance Investigator as Agency Resource

Investigators in the Operational Factors and Human Performance Division (AS-30) are available for consultation on human factors issues to all other investigators in the agency. such consultation includes assistance in the interpretation of medical or toxicological results, assistance in assessing the possible importance of fatigue or unusual factors in the history of a subject, and researching the current state of knowledge on human performance issues important to the investigation. Human performance investigators can advise of human performance safety issues of special current attention to the agency, and can be available for detailed follow-up investigation in support of other investigators as determined by the Division Chief. The Operational Factors and Human Performance Office has authority to conduct searches of the National Driver Records (NDR) and the FBI National Crime Information Center records and can initiate these searches on behalf of any investigator in the agency.

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### Checklist of Human Performance Questions

A short checklist of common human performance questions is supplied at the end of this section for use by investigators at interviewing individual witnesses. Additional excellent questions are often suggested by the details of the specific accident. By listening closely to witness descriptions, and by asking simple questions to reach a "common sense" understanding of the accident, the investigator can often generate additional areas for greater human performance understanding.

Human performance interviews normally begin with very general questions that allow witnesses to describe what they know at length and without influence from the interviewer. As the interview progresses, more pointed questions are normally asked to focus the witness on topics that were not fully addressed.

More extensive checklists are available from the Operational Factors and Human Performance Office (AS-30). These include material related to interviews focused on training issues and management issues.

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## HUMAN PERFORMANCE SHORT CHECKLIST

## I. Activities in Last 72 Hours

- A. When was the last time you (the pilot, the controller, etc.) worked before the accident?
- B. When did you work during the previous three days? What were your other activities during this period?
- C. When did you go to sleep the previous night (or previous three nights)? When did you wake up? Did you feel well rested?
- D. What is your normal work schedule? When are days off, vacations? When was your last vacation?
- E. Describe your activities on the day of the accident up to the accident. When/what did you eat? Any rest breaks?
- F. Was this an unusual schedule?

## II. Accident History

- A. Have you been involved in any previous accidents? Have you been disciplined for your performance? Have you received commendations for your performance?

## III. Life Changes

- A. In the past year:
  - (1) Have you had major changes in your health (good or bad)?
  - (2) Have there been major changes in your financial situation (good or bad)?
  - (3) Have there been major changes in your personal life (e.g., separation, divorce, birth, death, changes in the health of immediate family/close friends)?

## IV. Medical/Drugs

- A. How is your health?

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- B. What is the name/address of your personal doctor?
- C. How is your vision? Do you wear corrective lenses?  
Name of eye doctor? Prescription?
- D. How is your hearing? Do you wear a hearing aid?  
Name of doctor?
- E. Do you take prescription medicine? What, how often?  
When was the last time you took it before the accident?
- F. Do you drink alcohol? When/what was your last drink  
before the accident?
- G. Do you smoke tobacco? Last use before the accident?
- H. Do you use illicit drugs?
- I. In the 72 hours before the accident, did you take  
any drugs, prescription or non-prescription that  
might have affected your performance?

#### V. Workload

- A. How was workload on the day of the accident?
- B. How was workload affected by the weather?

#### VI. Environmental

- A. Any problems with the vehicle?
- B. Any problem with noise, vibration, temperature?
- C. Any problems with visibility (instruments, signals,  
etc.)?

#### VII. Mood

- A. What was the mood of the other crew members before  
the accident? During the accident? After the  
accident?
- B. Had the crew members flown together before?
- C. Did the crew members get along personally? Did they

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see each other socially?

D. What did they talk about?

E. How did the pilots get along with passengers/flight attendants?

## VIII. Background

- A. What was the pilot like personally?
- B. Was he married? Any children? What were his living arrangements?
- C. What level of education did he complete?
- D. How did the pilot get interested in aviation? Where did the pilot get training? What were previous jobs?
- E. What did the pilot like about flying? About this job? About the aircraft?
- F. How familiar was the pilot with the accident route? With the accident airport?
- G. What was the deadline for completing the trip?
- H. What were the pilot's greatest strengths as a pilot? Were there areas in which the pilot could have improved?
- I. Did anyone ever complain about flying with this pilot?
- J. Did the pilot ever complain about the company or equipment?
- K. Did the pilot experience any emergency/incident/problem during a previous flight? What happened?
- L. Did the pilot receive training in cockpit resource management?

Original

### Regional Investigations

When requested by a regional investigator, the Board's professional meteorological staff prepares complete weather studies consisting of a summary of meteorological factors pertinent to the accident as well as a package of the documents used in the studies.

In the event that a professional weather study is not requested, and there is some weather involvement in the accident under investigation, the regional investigator will be required to collect certain pertinent weather information. Normally, based on the regional investigator's judgment, the information to be collected will be selected from the outline provided below under Central Team investigations. In most cases, the weather data will be solicited from the National Weather Service (NWS) or the FAA Flight Service System. FAA and NWS personnel will provide certain factual data on a routine basis and should not be asked for interpretation or analysis of the data. Additionally, as a practical matter, it must be recognized that all NWS offices will not be able to provide complete documentation for a particular case. Some data or charts are available only from the National Meteorological Center in Washington (Camp Springs, MD).

Whenever a question arises concerning weather problems, the investigator should not hesitate to consult with the meteorological staff in Washington.

Original

### Central Team Investigations

The Weather Group, under the chairmanship of one of the Board's professional meteorologists, will collect and review all available weather data pertinent to the accident. Depending on the circumstances of the accident, the Group activity also may include interviews with such personnel as weather observers, radar meteorologists, electronics technicians, weather briefers, and forecasters. The Weather Group may also examine the dispatch function as it relates to weather. If an involved air carrier maintains its own meteorological department, it may be necessary to collect weather data from that source and to interview appropriate company personnel. There might also be cases where data will be requested from and interviews conducted with personnel of private weather services (other than airline) or with personnel of the U.S. Air Force, Air Weather Service, Naval Oceanography Command, or Coast Guard.

The functions of the meteorologists are:

- (1) to define the environment in which the accident vehicle was operating, and
- (2) to evaluate the products and services of the various agencies involved in the accident.

To accomplish this the following outline is suggested:

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**DEFINING THE ENVIRONMENT**

## I. Data Sources

- A. National Weather Service
- B. Federal Aviation Administration
- C. Private Weather Companies
- D. Airline Dispatch Offices
- E. Airline Meteorological Offices
- F. TV and Radio Stations
- G. Utility Companies
- H. Universities
- I. Department of Defense
- J. Air Quality Monitoring Networks
- K. Witnesses - Ground and Airborne
- L. Flight Data Recorder - Cockpit Voice Recorder
- M. Meteorological Operational Tests
- N. Computer Graphics and Weather Analysis System  
(McIDAS)

## II. Data

## A. National Weather Service

- (1) Surface Weather Observations
- (2) Weather Radar Data
- (3) Upper Air Data
- (4) Satellite Data
- (5) Wind Gust Recorder Records
- (6) Triple Register Records
- (7) Barograph Records
- (8) Rotating Beam Ceilometer Records
- (9) Lightning Data
- (10) Transmissometer Data
- (11) Rainfall Records
- (12) Surface and Upper Air Charts
- (13) Severe Weather Reports
- (14) Location of Meteorological Sensors

## B. Federal Aviation Administration

- (1) Surface Weather Observations
- (2) Transmissometer Records
- (3) Low Level Windshear Alert System Data
- (4) Pilot Reports
- (5) Air Traffic Control Radar Data (Weather Echoes)
- (6) Data From Flight Service Station

Original

- C. Private Weather Companies
  - (1) Weather Radar Data
  - (2) Locally Produced Data
- D. Airline Meteorological Offices
  - (1) Weather Radar Data
  - (2) Pilot Reports
  - (3) Locally Produced Data
- E. TV and Radio Stations
  - (1) Weather Radar Data
  - (2) Wind Data
  - (3) Temperature Data
  - (4) Rainfall Data
  - (5) Barometric Pressure Data
  - (6) Local Weather Observations
- F. Utility Companies
  - (1) Lightning Data
  - (2) Wind Data
  - (3) Rainfall Data
  - (4) Weather Radar Data
- G. Universities
  - (1) Lightning Data
  - (2) Weather Radar Data
  - (3) Local Observations
  - (4) Wind Data
  - (5) Pressure Data
  - (6) Rainfall Data
- H. Department of Defense
  - (1) Surface Weather Observations
  - (2) Weather Radar Data
  - (3) Upper Air Data
  - (4) Lightning Data
  - (5) Wind Data
  - (6) Rainfall Data
  - (7) Pressure Data
  - (8) Transmissometer Data
  - (9) Satellite Data
  - (10) Pilot Reports

Original

- I. Air Quality Monitoring Networks
  - (1) Wind Data
  - (2) Temperature Data
  - (3) Pressure Data
  - (4) Upper Air Data
  
- J. Witnesses - Ground (Includes ATC, NWS, Airline Personnel)
  - (1) Wind Information
  - (2) Cloud Height Information
  - (3) Rainfall Information
  - (4) Pressure Information
  - (5) Lightning Information
  - (6) Information on the Type of Clouds
  - (7) Visibility Information
  
- K. Witnesses - Airborne
  - (1) Turbulence Information
  - (2) Icing Information
  - (3) Winds
  - (4) Windshear
  - (5) Visibility
  - (6) Cloud Tops and Bases
  - (7) Lightning
  - (8) Types of Clouds
  - (9) Airspeed Fluctuations
  - (10) Vertical Speed
  - (11) Acceleration Information
  - (12) Weather Radar Echoes
  - (13) Temperature
  - (14) Precipitation
  
- L. Flight Data Recorder
  - (1) Turbulence
  - (2) Temperature
  - (3) Winds
  - (4) Airspeed Fluctuations
  - (5) Accelerations
  
- M. Cockpit Voice Recorder
  - (1) Weather Observations of Crew
  - (2) Rain Intensity

Original

- (3) Hail Intensity
- (4) Turbulence
- (5) Lightning

N. Meteorological Operational Tests

- (1) Weather Radar Data (Doppler)
- (2) Lightning
- (3) High Resolution Surface Data
- (4) Upper Air Data (Profiler)

## EVALUATING WEATHER PRODUCTS AND SERVICES

## I. Products

## A. National Weather Service

- (1) AIRMET
- (2) SIGMET
- (3) Center Weather Advisory
- (4) Meteorological Impact Statement
- (5) Area Forecast
- (6) Terminal Forecast
- (7) Aviation Weather Watch
- (8) Convective SIGMET
- (9) Local Airport Advisory
- (10) Forecast Upper Winds
- (11) Special Weather Statement
- (12) Public Warnings
- (13) Verbal Issuances
- (14) Post Accident Checks of Equipment
- (15) Visibility Reference Charts
- (16) Upper Air Charts and Surface Charts

## B. Private Weather Companies

- (1) Locally Produced Forecasts, Advisories, and Warnings
- (2) Verbal Issuances

## C. Department of Defense

- (1) Locally Produced Forecasts, Advisories, and Warnings
- (2) Verbal Issuances

## D. Airline Meteorological Offices

- (1) Locally Produced Forecasts, Advisories, and Warnings
- (2) Verbal Issuances

## E. Airline Dispatch Offices

- (1) Verbal and Written Issuances

## F. Federal Aviation Administration

- (1) Briefing Information Provided to Pilot

Original

## II. Services

### A. National Weather Service

- (1) Meteorologist (Aviation Forecaster, Public Forecaster)
- (2) Meteorological Technician (Upper Air, Radar, Weather Observer, Electronic)
- (3) Meteorological Intern (Upper Air, Radar, Weather Observer)
- (4) Center Weather Service Unit Meteorologist

### B. Federal Aviation Administration

- (1) Weather Coordinator (Center)
- (2) Air Traffic Control Specialist (Flight Service Station)
- (3) Controllers
- (4) Supervisors
- (5) Personnel at the Central Flow Control Facility, Washington D.C.

### C. Private Weather Companies

- (1) Meteorologist

### D. Airline Meteorological Office

- (1) Meteorologist

### E. Airline Dispatch Office

- (1) Dispatcher

### F. Department of Defense

- (1) Forecaster
- (2) Observer
- (3) Air Traffic Control Personnel

Original

Pertinent data collected by the Weather Group will be utilized as exhibit material for the Public Docket and reproduced as necessary for public hearings or the taking of depositions, in which case the Weather Group Chairman will recommend appropriate witnesses. The weather data collected will subsequently be analyzed by the Weather Group Chairman in order to determine the adequacy of weather facilities and services and to indicate those meteorological factors which may have contributed to the probable cause of the accident.

Close coordination is maintained by the Weather Group with other investigative groups such as Operations, Witnesses, and Air Traffic Control, since information relative to communications, pilot reports, and lay witness weather observations is of interest to the Weather Group while the data it has collected may be of immediate importance to the other groups. In many cases, wind information is needed by the groups concerned with wreckage distribution, while upper wind and temperature data may be vital to the work of the Power Plants Group and others. Information is exchanged frequently with the Flight Data Recorder and Cockpit Voice Recorder Groups.

Original

The Air Traffic Control (ATC) System is a complex operation. The following material is intended to assist the investigator in determining what ATC data are available, and what information is needed for a particular investigation.

Contact the ATC facility responsible for preparing the ATC accident package, which is generally the facility that had control jurisdiction of the aircraft at the time of the accident. Speak with the manager of the facility or his representative and arrange for a complete briefing of all of the facts surrounding the accident including the involvement of other facilities. A complete briefing is a necessity because, at this point in the investigation, various FAA employees have a considerable amount of knowledge surrounding the accident. The object for you is, through the briefing, to quickly become knowledgeable of the situation so that the course of the investigation may be planned.

The purpose of group members is to assist you in the investigation. However, as a regional investigator you probably won't have the extra help usually available on a major investigation. The best source of assistance for local procedures is someone from the Quality Assurance Office of the facility. In most cases this individual may also be the one responsible for assembling the ATC package for the facility.

After the briefing, the next step is to listen to the original facility recording. In addition to listening for content, the investigator should also observe the digital clock to determine if there are any breaks in the time sequence. After accomplishing this, decide which controllers should be interviewed, and what data should be requested from the FAA. Communicate this request for interviews and information to both facility personnel and the FAA Coordinator. This request should be written in order to prevent any misunderstandings. However, if practicable, before initiating controller interviews, a thorough review should be conducted of each involved controller's training records, and a copy of all facility ratings, position, and equipment certifications, proficiency checks, and training for the previous 12 months should be requested.

Initially requested data should include the following:

- (1) A copy of a "working" or "rough" transcript.
- (2) A copy of a "working" cassette, with times on one of the channels.

Original



The documents that are included in the ATC package represent the minimum data required from the ATC facility or facilities involved in the accident. **Don't rely on the ATC package to fulfill your investigative needs.** Because of procedural provisions within the FAA, it would be unusual for you to receive your copy of the ATC package in less than two weeks. Field experience has shown that it sometimes takes two months to receive this package. The answer to the problem is to obtain copies of those documents that are important to you before you conclude the initial field phase of the investigation. The following checklist will assist in determining what items should be requested for a complete investigation. As many as possible of the requested items that you think you'll need should be in your possession before you return to your home office, or arrangements should be made to have them sent directly to you.

- (1) Pertinent facility voice communication tapes. (AT)
- (2) Transcripts of recorded voice transmissions. (AT)
- (3) Radar control settings. (AT)
- (4) FAA Form 7230-4, Daily Record of Facility Operation. (AT)
- (5) FAA Form 8020-6, Report of Aircraft Accident. (AT)
- (6) FAA Form 7230-8, Flight Progress Strips. (AT)
- (7) Notes of controllers' interviews. Until ATC package is released, FAA generally permits reading of controller statements and will not issue copies.
- (8) Letter of Agreement. (AT)
- (9) Diagram of facility layout. (AT)
- (10) Copy of Flight Plan Record - FAA Form 7233.3. (AT)
- (11) If applicable, Controller Memory Chart of Flight Path. (AT)
- (12) Data on controller status in facility, qualifications, rating held, dates of last proficiency check, medical certificates, pilot ratings, etc.
- (13) ATIS Information. (AT)

Original

- (14) ARTCC Copies of Radar Data. (AT)
  - a. NTAP (list 3 is complete)
  - b. Track Sort
  - c. Log Sort
- (15) Terminal Copies of Radar Data. (AT)
  - a. ARTS CDR BT (complete, raw)
  - b. ARTS CDR TD (processed)
  - c. ARTS CDR RO (primary)
  - d. CDR Listing of Keyboard Functions
- (16) FAA Form 7110-2, Pirep Forms. (AT)
- (17) FAA Form 8020-3, Facility Accident Notification Record. (AT)
- (18) FAA Form 7230-10, Position Logs. (AT)
- (19) Copy of Video Map. (AT)
- (20) Facility SOP. (AT)
- (21) FAA Form 8020-9, Aircraft Accident/Incident Preliminary Notice. (AT)
- (22) FAA Form 7230-4, Reverse Side, Personnel Log or "Sign-on" Log. (AT)
- (23) List of pertinent controller operating initials. (AT)
- (24) Visibility Checkpoint Chart
- (25) Binders known as Sign and Initial, Area Binder, Position Binder, Reading Binder. (AT)
- (26) For terminal facilities having ARTs III Discpak: CDTSO tape. (AT)
- (27) Facility and Regional Index of Orders. (AT)
- (28) Data on post-accident certification checks of facility equipment by AFS technicians. FAA Form 6030.11, formerly

Original

FAA Form 406C, Facility Maintenance Log. There should be one log for each piece of equipment checked.

(AI)

- (29) If pertinent, previous flight check reports of the NAVAID. (AT)
- (30) If pertinent, copies of NOTAMS relating to NAVAID operation, or weather.
- (31) Post-accident flight check report. (AFS)
- (32) Copy of Instrument Approach Procedure. (AT)
- (33) Original flight check certification of NAVAID. (AF)
- (34) LLWAS data. (AT)
- (35) HIWAS data. (AT)

The Airways Facilities Sector (AFS) should be contacted to review and obtain copies of the facility maintenance logs and ground recertification checks (FAA Form 6030.1, old Form 406C) for any navigation aids or ATC equipment which is relevant. Additionally, flight check data should be obtained if the failure of a navigational aid may have contributed to the accident.

Sometime during your visit, have the ATC Facility Manager or his representative show and explain each operating position to you, especially those which provided service to the accident aircraft.

There are two FAA Handbooks that the investigator should study to acquire a better understanding of facility procedures and responsibilities. They are: (1) Handbook 8020.11 - "Aircraft Accident Notification Procedures and Responsibilities;" (2) Handbook 7210.3 - "Facility Operation and Administration;" knowledge of 8020.11 should enable you to chart an appropriate course of action and to conduct an efficient and productive investigation. Other important FAA references are: (1) Air Traffic Control Handbook, 7110.65; (2) Data Communications Handbook, 7110.80; (3) Flight Services Handbook, 7110.10; (4) FAA Handbook 7220.2, Operational Position Standards; and at locations where appropriate, (5) Handbook 7110.84, Oceanic Air Traffic Control. Such handbooks should be obtained by each Office Division/Regional Office from FAA Publications. Request current publication of basic handbook by letter designator when ordering.

Original

Various U.S. Military branches currently provide ATC Service to U.S. Civil aircraft within the National Airspace System (NAS). For the most part, services are provided in accordance with published FAA ATC Procedures. However, each branch of the military operates/administers the internal operations of their ATC facilities in accordance with appropriate service regulations which are similar in nature to FAA Handbook 7120.3.

Written personnel statements usually cannot be obtained until the ATC package is released. The FAA processes them through legal channels before they can be released. However, there usually is no objection to your reviewing the statements and taking notes.

Original

Generally, the FAA accident coordinator can resolve any problems you might encounter in obtaining any of the requested materials or in obtaining the final ATC accident package, but you may have to contact him more than once to achieve satisfactory results.

Original

## Overview

The philosophy of questioning witnesses to aircraft accidents is based on the "interview" rather than the "interrogation." Interview connotes a meeting where the interviewer approaches the interviewee on a cooperative and neutral basis. The cooperation of the interviewee is sought, and he is encouraged to tell his story freely and informally (rather than through intimidation).

The investigator interviews aircraft accident witnesses in the interest of obtaining from them a factual account of everything they may have seen or heard which might have a bearing upon the accident. Witnesses should be urged to relate only their personal observations and refrain from passing on information they have derived from some other source. At the outset of any interview, it is imperative that the person being interviewed be made aware of the fact that you represent the Board, which is the agency vested by law with the responsibility for determining the cause of civil aircraft accidents.

The individual supplying the statement should be advised that the purpose of our investigation is the determination of probable cause of the accident and the prevention of similar accidents in the future. We are not interested in court proceedings and punitive action.

Interview statements should be obtained as soon as feasible after arriving on the scene. Long delays between observations and relating the observations are conducive to inaccuracies. The experienced investigator also realizes that bits of seemingly insignificant information may take on great importance when combined with other investigative findings.

Original

## Procedures

An investigator should be properly equipped before approaching any witness. Suggested equipment for your kit should include an example supply of witness statement forms, aircraft model (one of a mall dime store variety will suffice for general purposes), compass, angle measuring equipment, watch with sweep second hand, and appropriate charts and maps on which to plot witness locations. The latter will probably have to be obtained after arrival on the scene.

The investigator may find either an overwhelming number of witnesses who are eager to volunteer statements, or he may find that witnesses must be located through door-to-door canvassing of a wide, sparsely populated area. Usually witnesses will make themselves known to someone; however, this is not always true, particularly if they are not aware that what they witnessed culminated in an accident. A concerted effort should be made to locate and interview all witnesses who may be able to contribute pertinent information to the investigation. Sources for locating witnesses might include any or all of the following: local authorities, newspapers, news media personnel, rescue personnel, local residents and residents along the probable flightpath, airport terminal personnel, public service personnel who may have been in the area, and flightcrews and passengers of aircraft flying in the area. At the end of each interview, ask the witness if he knows of other persons who may also have information regarding the flight.

The investigator should have visited the accident site prior to interviewing witnesses. This action will assist him in preparing a list of questions or areas to be covered when questioning witnesses. Observations at the scene such as magnitude of impact, indications of power (or lack thereof), impact attitude, fire, and wreckage scatter might be used as the basis for areas of questioning involving unusual sounds, engine noise, flight maneuvers, in-flight fire, in-flight structural failures, etc. It should be re-emphasized that this list of questions should be utilized as a checklist or reminder and that the asking of leading questions should be avoided.

The amount of information derived from a witness is often directly proportional to the skill of the investigator in establishing rapport. The interview should not be a surprise. If feasible, prior arrangements should be made with the witness for the time and place of the interview. When a

Original

witness is interviewed by a group, better results can be achieved by appointing one member as the spokesman. The spokesman should introduce himself to the witness and show his credentials. Introduce the witness to members of this group. Allay any concerns the witness may have relative to submitting a signed statement; set the stage; place the witness at ease, and control the witness group.

Successfully interviewing the aircraft accident witness primarily involves the use of common sense. Show the witness the same courtesy and consideration that you would appreciate if the situation were reversed. Encourage the witness to tell his story in his own way without questions, comments, suggestions, or interruptions from the interviewer. Periods of silence by the interviewer, while the witness collects his thoughts, have been found to encourage the witness to expound more fully and avoid omissions. The interviewer's ability to be a good listener and keep the witness talking is essential in this phase.

Note-taking by the interviewer during the initial narration by the witness is advisable. The note-taking should be done only with the consent of the witness and should not be done to the extent that it is distracting to the witness. Explain to the witness that the notes are used to remind you of areas in his narration that may require further amplification.

A tape recorder is a very valuable tool and can be used effectively, but should be used only with the consent of the witness.

After the witness has completed his narrative, you usually will have some specific questions to ask him relative to areas you have in your notes. In forming your questions keep them simple and avoid aviation jargon or terminology that could be foreign to the witness. Questions from witness group personnel subsequent to the narration by the witness should be channeled through the designated group spokesman. The advantages of this procedure far outweigh the disadvantages.

Following the interview, ask the witness to prepare or permit you to prepare for him a written statement including all the pertinent information elicited during the interview. Occasionally it will be beneficial to suggest to the witness that his observations follow a chronological sequence. Encourage the witness to use drawings, sketches, or photographs to supplement and complement the written

Original



statement. Permit the witness to add omissions at the end of the statement rather than rewrite the entire statement. If a witness refuses to sign a statement, don't press the issue. Indicate on the statement that it was made in the presence of the investigative group and the witness did not wish to sign it.

Courtesy is also important in concluding the witness interview. Thank the witness for his cooperation and time in providing you with the information and the signed statement. The investigator should leave a phone number and address where he can be reached should the witness recall additional information that he failed to include in his statement.

In questioning injured witnesses under a doctor's care, always obtain permission from the attending physician prior to the interview. In these cases, limit questions to those considered essential under the given circumstances. During these interviews keep the witness group small. In all cases, if possible, insure that you are accompanied by at least one member of the witness group.

In addition to obtaining the information, you should establish the witness qualifications regarding his/her aviation or related experience.

There are as many variations in witness types as there are types of people. There are many procedures and techniques that can be employed to elicit information from these witnesses. Develop and adopt these procedures and techniques that you find most effective in obtaining the vital information needed in accident investigation. Be flexible.

Original

### Crew Members Rights

Under Part 831.6 of the Board's Procedural Regulations, "Any person interrogated by authorized representatives of the Board during the field investigation...shall be accorded the right to be accompanied, represented or advised by counsel or any duly qualified representative." Sometimes an interviewee will ask to be represented by more than one person. The rule allows a single representative only and the person to be interviewed should be asked to select the representative he/she prefers.

Interviews of crew members and air traffic controllers during a field investigation should not be unnecessarily delayed. At the time that post-accident interviews of air traffic controllers, flight crew members, or flight attendants are scheduled, the investigator should communicate these crew members' rights through their association or employer, so as to expedite the investigation.

In the event a flight attendant or other crew member appears for an interview and is unaccompanied by counsel or other representative, the individual will be advised of his/her right to such representation.

Original

Advance Notice Items

Ensure that NTSB Regional Office Personnel secure the following for the Operations Investigation to the extent practicable.

- (1) Cockpit Crew Flight Cases and Overnight Luggage.
- (2) Flight Papers/Documents Found In the Cockpit and Surrounding Area.
- (3) Cargo and Passenger Baggage - If these items must be removed prior to the arrival of the Washington-based team, document their condition and location in the aircraft and retain them in a secure area. Be aware of hazardous cargo.
- (4) Eye Witnesses - Name, Address, Telephone Number.

Original

## Initial Organizational Meeting

### Retrieval of Flight Papers/Documents/Manuals

During the initial organization meeting, inform the participants to pick up any papers, documents, or manuals from the accident site and forward them to the Operations Group. The Operations Group will review this material for its relevancy to the investigation.

### Weighing of Cargo and Passenger Baggage

Coordinate with the Systems and Structures Groups in documenting the identification, location, and weighing of the cargo and passenger baggage on board the aircraft. To the extent possible, return the material to its pre-accident condition before weighing.

### Documenting of the Cockpit Environment

Coordinate with the Systems and Structures Groups in documenting the cockpit environment. Confirm that the cockpit area will not be moved or violated pending its full documentation. To document the cockpit area, enlist the assistance of representative from the airline, the aircraft manufacturer and the FAA, who are qualified and proficient in the design/structure of the aircraft.

- (1) Take copious notes of the observations and have the participants sign in agreement.
- (2) Take photographs, if possible.
- (3) Obtain aircraft flight manual for reference.
- (4) Obtain and document the contents of the cockpit crew's flight cases and personal/overnight luggage. Have a representative of the airline, union (if applicable), and the FAA present during this activity.

Original

### History of Flight

The following information should be collected in order to document the history of the flight:

- (1) Name(s), address, and telephone number of owner and operator of aircraft.
- (2) Type of aircraft.
- (3) Registration number and serial number.
- (4) Flight number(s).
- (5) Type of operation (CFR -121, -125, -129, -135).
- (6) Date, time, and location of accident site (latitude, longitude, and elevation). Distance from departure or destination.
- (7) Last point of departure. Obtain block in/out and takeoff time.
- (8) Intermediate stops. Obtain block in/out and takeoff time.
- (9) Point of intended landing.
- (10) Diversionary landing site, if applicable.
- (11) Dispatch release. Review original and obtain a certified copy.
- (12) Weather information provided to crew. Review original and obtain a certified copy. Request statement of weather briefing given, if applicable.
- (13) Flight plan filed with FAA. Review original and obtain a certified copy.
- (14) Clearance received. Obtain certified transcript. Listen to original recording if no ATC group assigned.
- (15) Route and altitude actually flown and normally flown/assigned. Crew familiarity with each route.
- (16) En route company and ATC radio contacts (facility

Original

and frequency). Obtain certified transcripts and recordings.

- (17) Flight plan log. Review original, if available, and obtain a certified copy.
- (18) Aircraft maintenance log. Review original and obtain certified copies as required of write ups entered during previous 72-hour period. Checking for conditions that could affect the performance of the aircraft and/or the ability of the flightcrew to perform their duties. Maintenance records groups will view more extensively.

Weight and Balance (W & B)

- (1) Weigh the cargo and passenger baggage if applicable.
- (2) Weight and Balance Form. Review original document and obtain a certified copy. Perform manual W & B and compare with automated results. Validate the authorization for actual v. standard weights.
- (3) Cargo manifest. Review for type, labeling, placement, and means of securing cargo, especially hazardous cargo as applicable to the situation. Review original documents and obtain certified copies.
- (4) Passenger manifest.
- (5) Fuel and oil record. Review original documents, if available, and obtain a certified copy. Compare data with quantities verified or stated to be on board the aircraft. Check with airport authorities for previous problems with fuel and/or the fueling facility. Security of fuel samples of future analysis. (See aerodrome section).
- (6) Method of MAC or C.G. computation. Verify by manual and automated method, if applicable.
- (7) Weight and balance manual used by airline. Compare with manufacture and FAA approved data.
- (8) Aircraft limitations. Compare airline, manufacture and FAA approved data.

Original

Aircraft Performance

Per evidence and company Standard Operating Procedure (SOP) determine the following:

A. For Takeoff and Landing

- (1) Flap and trim settings.
- (2) Reference V speeds. (atmospheric adjustments)
- (3) Takeoff and go-around EPR.

B. En route

- (1) Engine power schedules for climb, cruise, and descent.
- (2) Airspeed (indicated) schedules for climb, cruise, and descent.

Original



Air Carrier Information

The following information regarding the air carrier should be collected:

- (1) Size and scope of operation.
  - a. Number of personnel, aircraft and size of route structure.
  - b. Standardization of aircraft fleet.
- (2) Copy of operations certification.
- (3) Copy of operations specifications. Waivers and amendments to the operations specifications.
- (4) Operations manual. Compare with operating procedures of the airline with the procedures recommended by the manufacturer and the FAA.
- (5) Aircraft flight manual. Compare the checklist in the company flight manual with the checklist actually used by the flightcrew and the one published by the manufacturer.
- (6) En route, star/sid, terminal, and approach charts used by flightcrew. Determine if each crew member was provided with their own.
- (7) Training program. Obtain training program and syllabus. Confirm FAA approval of training program. Indicators that assist in determining the quality and effectiveness of the program include the establishment of a training directorate within the airline, programs incorporating stabilized approach criteria, and cockpit resource management (CRM). Compare the policy and procedures of the operations manual with the training manual/program for continuity. Document the background and qualifications of company training personnel.
- (8) Does the airline have a safety office/directorate? Determine its authority and ability to impart safety enhancements to the flight operations. In the absence of such an entity, what person and/or department is delegated this responsibility? Conduct interviews.

Original

- (9) Company pilot bulletins or reading file. Review for data that may be relevant to the circumstances surrounding the accident/incident.
- (10) Dispatch and/or flight following. Determine size and scope of the dispatch or flight following function. Compare the duties and responsibilities of this function as stated in company documents with the FRAs. Background and qualifications of dispatch/flight following personnel. Compare with the FAR's. Dispatch/flight following procedures.
  - a. Weather briefings.
    - 1. Review original data provided. Obtain certified copies.
    - 2. Determine source of data and method provided.
  - b. Flight planning forms.
  - c. Computer flight plan.
  - d. Fueling record.
  - e. Method of flight following. Advisories issued.

Flight Crew Information

- (1) Confirm the extent of the pre-employment checks that were performed on the flightcrew members.
- (2) Request and obtain FAA "blue ribbon" certification and medical packages, and violation data. Confirm that the human performance group or specialist has requested the state driving records of the flightcrew.
- (3) Review company personnel files and employment history for trends (both positive and negative) that may be relevant to the investigation. This includes violations and commendations, absenteeism, and extended period between employment. Obtain name, address and telephone number of previous employers and physician(s) used for FAA medical and possibly non-flight related events. Obtain certified copies.
- (4) Obtain copies of FAA pilot certificates and ratings held from company files.
- (5) Obtain copies of medical certificates and related information from company files. Compare to FAA data.
- (6) Training records
  - a. Review the training records initially for the previous two-year period. In the review you are checking for the quality and quantity of training given and remarks noted on the forms by the instructor. Have the instructor and pilot sign and date the forms attesting to the training given. On occasion, you may find it prudent to compare the signatures of the pilot and instructor and the training documents with other sources such as payroll records and driver's license.
    1. Review the training records for initial, line (en route), six months proficiency, and annual/recurrent including ditching and emergency. Obtain certified copies.
    2. Initial focus should be on specific areas of training that on the surface may appear

Original

to be relevant to the investigation.

Original

3. Information which should be available and obtained from the personal, training, and flight records of each cockpit crew member includes:
  - (a) Date employed.
  - (b) Date upgraded to present position.
  - (c) Date upgraded to present position in particular equipment.
  - (d) Total pilot time.
  - (e) Total pilot time (flight and duty) last 24 hours, 72 hours, 30 days, 60 days, and 90 days.
  - (f) Total instrument time, if available.
  - (g) Total instrument time in type, if available.
  - (h) Total night time, if available.
- (7) Recency of experience with aerodrome and approach procedure.
- (8) Previous experience of cockpit crew in flying with one another.

Original

Aerodrome Information

- (1) Obtain latest copy of airport master record (Form 5010) and airport planning chart.
- (2) Latest report of FAA annual inspection.
- (3) NOTAMS (class D, L, and FDC).
- (4) Construction on airport property and surrounding area.
- (5) Inspection results on the condition of airport surface(s).
- (6) Local obstructions.
- (7) Waiver of Part 77.
- (8) Condition of airport lights and radio aids.
- (9) Aerial photos, topographic charts.
- (10) ATC information if no group assigned.
- (11) Weather information, if no group assigned.
- (12) Obtain fuel specimens for analysis.

In the absence of a survival factors group, the following crash and rescue activities will be addressed in addition to those listed above:

- (1) Time and method notified.
- (2) Response time.
- (3) Number and types of units responding.
- (4) Fire fighting time.
- (5) Rescue activities.
- (6) Pictures of accident scene and cabin.
- (7) Problems with terrain/visibility/route to accident.
- (8) Problems with access to wreckage/passengers and crew.
- (9) Type and quantity of fire fighting compounds used.
- (10) Security established: how? when? by whom?
- (11) Crowd control problems.
- (12) Facility station log.
- (13) Last disaster drill.
- (14) Accident report from fire station(s) and security.

Original

Federal Aviation Administration Information

- (1) "Blue Ribbon" medical and pilot certificate records.
- (2) Violation and other certificate actions on flightcrew and airline. Obtain certified copies.
- (3) Inspections performed on the airline during the previous 12 month period including base, ramp, en route, ground and flight training program, crew member; dispatcher records (including flight and rest), trip records, dispatch center/flight following/flight/locating facility. Obtain certified copies.
- (4) Latest regional inspection performed. Obtain a certified copy.
- (5) Latest national inspection performed. Obtain a certified copy.
- (6) Frequency of surveillance. Compare the number and types of inspections performed with regional and national inspections guidelines.
- (7) Workload of POI.
- (8) Background and qualifications of POI.
- (9) Authorized and current staffing level of district office.
- (10) Most recent pre-accident/incident flight inspection and post flight inspection results of pertinent en route and approach facilities/aids. Obtain certified copies.
- (11) Most recent pre-accident/incident airways facility inspection and post inspection or pertinent en route and approach facilities/aids. Obtain certified copies.

Original

## Interviews

An interview can be extremely stressful and intimidating. Consequently, the size of the investigative staff involved in his process should be limited to the number of people necessary to obtain all pertinent information without jeopardizing the quality of the interview.

If the individual to be interviewed has been hospitalized, be sure to obtain the attending physician's concurrence before attempting an interview. Obtain from the physician the condition of the individual and the time constraints, if any, placed on the interview. Verify the medication the individual is under and whether it will affect the quality of the interview. Such knowledge will enable you to better plan and organize your question area(s) in a more concise and logical manner.

Generally, the NTSB Operations Group Chairman will conduct the interview and the Human Performance Specialist and Operations group member will record notes of responses. An opportunity for members to ask a limited number of questions as follow-up should be provided. This will avoid the impression that the whole group is engaged in the investigation.

If at all possible, provide the interviewee with a model of the aircraft and maps of the location involved in the mishap.

Once the interview begins, do not interrupt the interviewee. After the individual has finished telling his/her story, you can go back and obtain more specific, detailed information.

On occasion, the circumstances of the event and value of the individual being interviewed will warrant recording the interview by electronic means. Be sure to obtain permission from the interviewee prior to doing so.

Upon completion of the interview it is advantageous to have the interviewee sign a summary of interview while in your presence. When this is not possible, write down the salient points of the interview you want contained in the signed summary. The interviewee can use this as a guide in completing his/her statement.

Questions Relating to Flightcrew:

Original



- a. Events leading up to the flight in question.
- b. History of the flight.
- c. Operating procedures and techniques.
- d. Training.

Regardless of whether or not the human performance or aircraft performance group participates in these interviews, the following information should be obtained.

- (1) Seat belt and shoulder harness security before and after impact.
  - (2) Difficulty in releasing restraints.
  - (3) Seat adjustment position.
  - (4) Seat security after impact.
  - (5) Difficulties during egress.
  - (6) Aid given to flight attendants and passengers.
  - (7) Meals taken during the previous 24 hours.
  - (8) Off duty activities during the previous 24 hours.
  - (9) Description of injuries and how they were attained.
  - (10) All of the above as applicable to the flight attendants.
- e. Cabin crew.
  - f. Other crew members who have flown with the accident crew.
  - g. Crews operating in the vicinity of the accident flight.
  - h. Families of the cockpit crew members.
  - i. Dispatchers/flight following personnel.
  - j. Other flight operations personnel who came in contact with the flight and/or cockpit crew.
  - k. Ramp personnel, counter personnel, etc.
  - l. Flight (cockpit) personnel who flew the aircraft prior to the crew involved in the mishap.
  - m. ATC controllers if no group assigned.
  - n. Training instructors and check airmen.
  - o. FAA POI.
  - p. Witnesses, if no group assigned.
  - q. Passengers, if no group assigned.

Original

The Aviation Engineering Division (AS-40) is housed in Washington D.C. within the Office of Aviation Safety. The division provides engineering technical assistance in support of regional, headquarters, and foreign aviation accident and incident investigations, and in support of special studies or special investigations. AS-40 resources include engineers and other specialists capable of performing in-depth technical investigations in the airworthiness specialties: structures, systems, power plants, maintenance records, and helicopter airworthiness. AS-40 staff are primarily tasked with determining the pre-impact structural, system, and power plant integrity and function of an accident or incident aircraft. Their work also routinely results in in-depth investigation into records that would attest to the adequacy of certification, manufacturing, and maintenance practices applicable to the circumstances of the accident. The primary products of these specialists are comprehensive, technical, factual, and analytical reports of their findings, safety recommendations, and technical input to Board products including major investigation reports, special studies, and special investigations.

AS-40 staff routinely assume standby positions for structures, systems, and power plants group chairmanship on aviation "Go-Teams". As group chairman, these specialists will supervise representatives of the parties to the investigation and use that collective expertise to gather the technical data or history necessary to analyze their respective part of the investigation. On some investigations, these investigative groups may be combined to form an "airworthiness" group. Response to the requirements of assigned major investigations and associated public hearings demands a high priority and a substantial portion of their time. However, accidents and incidents assigned to regional office IIC's are also taken very seriously, particularly when the known issues of the occurrence suggest a need for Board safety recommendations of a airworthiness nature. AS-40 specialists will respond to regional investigations when personnel are available and the circumstances or complexity of the investigation create a need for their involvement. (In some cases involving light general aviation airplanes, headquarters engineering support will be provided by AS-20). When AS-40 specialists are unavailable to respond to the regional office investigation on-site, they may join the investigation team at the follow-up activity or provide guidance from headquarters. AS-40 will provide support in the prompt development of appropriate airworthiness safety recommendations following regional investigations when they

Original

are alerted to the circumstances of the accident and the relevant findings early in the investigation process. Requests for assistance on-site should be made through the procedures established by the Director, Office of Aviation Safety. Requests for assistance in connection with the development of appropriate safety proposals or recommendations should be made through the Chief of the Aviation Engineering Division.

Specialists assigned to the Aviation Engineering Division will produce factual and analytical group chairman investigation reports which will be reviewed for accuracy by group members, approved by the division chief, and forwarded to the IIC. Reports will normally be in the format described elsewhere in this document. (NOTE: These reports are not normally in the ICAO format used in the Board's report).

Investigation outlines have been developed for structures, systems, power plants, and maintenance records investigation groups. These outlines, contained within the major investigations section of the NTSB Investigation Manual, are not all inclusive. Neither is it mandatory that investigators document all of the items outlined on each investigation. The outlines are to be used as guidelines and applied according to the individual circumstances of the assigned accident or incidents.. The outline will be updated periodically. suggested changes are welcome and should be addressed to the Chief of the Aviation Engineering Division.

In carrying out their investigative duties, As-40 specialists are responsible both to the IIC and their division chief. Any conflicts should promptly be brought to the attention of the division chief.

Original

## Overview

The Survival Factors Division (AS-60) can provide assistance to Regional Directors and Field Chiefs when issues have been identified that affect occupant survival and protection. The survival factors issues that can be addressed are contained in the Survival Factors Checklist and the Factual Report Outline (both found in this section).

The extent of AS-60 assistance will be mutually agreed upon by the Regional Director/Field chief, AS-10, and the Chief, AS-60. In some cases, assistance can be provided without traveling to the scene. Some examples include obtaining hospital/autopsy reports and passenger seating information, and thereafter developing an occupant injury chart; mail Passenger Statement Forms and Passenger Questionnaires and summarize the response; interview flight attendants and evaluate their training; and arrange for tests of safety/evacuation equipment.

The extent of factual and analytical reports will also be mutually agreed upon before an investigator from AS-60 is assigned to an investigation.

Original

### Survival Factors Investigation

The Survival Factors Group is responsible for among other things developing and documenting the following: (1) impact and occupant dynamics including crash injury mechanisms, (2) evacuation and post-evacuation survival, (3) search and rescue, (4) collecting and reviewing reports and written records, (5) aircraft interior configuration, (6) cabin training crew, and (7) post-mortem examinations and toxicological analyses of fatalities.

As a member of the Survival Factors Group, the Safety Board expects that you will comply with the following guidelines so that the group can function as effectively as possible:

- (1) Group members should refrain from discussing the accident in public and, in particular, the work of the Survival Factors Group. We will be working at times in extremely sensitive areas of the investigation (body recovery and identification, personal effects, injuries sustained by survivors and fatalities, etc.). Conversations, if overheard by the press, insurance representatives, or relatives of passengers and crew, could cause unnecessary grief and could be misinterpreted or misquoted.
- (2) If, at any time, the work of the Survival Factors Group is of such a nature that a group member would prefer to be assigned to another task within the group or to another group, the Group Chairman is to be notified. Group members will remain until the completion of the on-scene investigation; however, in the event that a group member must leave before the field investigation is completed, the Group Chairman is to be notified immediately so that a replacement can be assigned to the group.
- (3) Group members will be required to take notes during their group duties. Original notes and photographs taken by group members are to be turned in to the Group Chairman at the conclusion of the field investigation. The notes will be consolidated into one set of group notes by the group under the direction of the Group Chairman. Each group member will then be given a complete set of group notes. Each group member will then initial the group notes

Original

thus signifying that they agree that the notes represent accurately the

- (4) All group members will be issued badges that will permit access to designated control areas during the investigation. These badges must be returned to the Group Chairman before group members can be released from the group and before they receive copies of group notes.
- (5) Because of the amount of work which the group must accomplish within a relatively short period of time, it will be necessary for group members to confine all of their investigative activity exclusively to this group. Each person will be assigned specific duties to complete before their participation in the investigation can be considered complete. When a Group Chairman will personally release that member from the group and notify the IIC of his action.
- (6) The group Chairman relies on group members to keep him/her informed and up-to-date on the members' progress and findings. The Group Chairman in turn must keep the IIC continually informed of the group's progress. Consequently, you are to inform the Group Chairman of your findings first and then your coordinators.
- (7) Progress meetings will be convened by the IIC for the express purpose of disseminating information and the findings of each group to all the parties to the investigation. During these meetings, the Group Chairman may call upon group members to present certain detailed findings which they were responsible for developing or documenting.
- (8) The Survival Factors Group Chairman will convene daily group meetings to review the group's progress. These meetings will afford the Group Chairman opportunity to learn of any difficulties the members may be having in developing certain information. Finally, based on the group's progress, the Group Chairman will reassign group members to the other tasks.
- (9) The Investigative Outline and Checklist below details the scope of the work. Obviously, some of the items are not relevant to every accident, and

Original

they will be left blank.

- (10) Each group member will be assigned specific checklist items to accomplish individually or, in some cases, with one or more persons for the more complex items. The Group Chairman will maintain an up-to-date master copy of the checklist which will provide an indication of progress in gathering the required information.
- (11) Upon completion of assigned tasks, the group Chairman may reassign members to other tasks as required in order to complete the investigation in a timely manner.
- (12) The final group activity will be the writing of the group notes of the investigation. Group members may be assigned to write portions of the report. Each group member will initial the notes to show their agreement and will receive a copy of the initialed notes before being released from the group. The notes will be revised as necessary by the Group Chairman and draft copies of the Survival Factors Factual Report will be entered into the public record at that time. If no hearing is held, the report will be placed in the public docket along with other reports in our Washington Headquarters.

Original

SURVIVAL FACTORS INVESTIGATION/REPORT OUTLINETable of Contents

- I. ACCIDENT
- II. SURVIVAL FACTORS GROUP
- III. SUMMARY
- IV. DETAILS OF THE INVESTIGATION
  - A. Aircraft Configuration
  - B. Crew Information
    - 1. Cockpit Crew Interviews
    - 2. Medical Histories
    - 3. Cabin Crew
    - 4. Training
    - 5. Interviews
  - C. Passengers
  - D. Aircraft Damage and Description of Crash Site
    - 1. Description of Site
    - 2. Damage of Aircraft
      - a. Exterior Damage
      - b. Interior Damage
      - c. Cockpit
      - d. Cabin
      - e. Emergency Systems/Equipment
  - E. Medical and Pathological
    - 1. Injury Table
    - 2. Survivor Injuries
    - 3. Fatal Injuries
    - 4. Toxicological Analyses
  - F. Crash/Fire/Rescue (CFR) Response
    - 1. Search and Rescue
    - 2. Aircraft Rescue and Fire Fighting (ARFF)
    - 3. Law Enforcement Response
    - 4. Medical Response

Original



5. Disaster Preparedness

G. Survival Aspects

1. Aircraft Kinematics

2. Evacuation

a. Cockpit Crew

b. Cabin Crew

c. Passengers

V. ATTACHMENTS

A. Passenger List

B. Passenger & Crew Statements

C. ARFF & Police Reports

D. Disaster Plans

E. Test Reports

F. Toxicology Reports

G. Safety Card

H. Injury Chart

I. Passenger Statements and Questionnaires

Original

NATIONAL TRANSPORTATION SAFETY BOARD  
Washington, D.C. 20594

Report

Date:

I. ACCIDENT

Operator(s) :  
Aircraft :  
Location :  
Date :  
Time<sup>1</sup> :  
NTSB No. :

II. SURVIVAL FACTORS GROUP

	Mailing
Telephone	
<u>Name</u>	<u>Address</u>
<u>Business</u>	
Chairman NTSB	
Members	

III. SUMMARY

A synopsis of the flight will be provided by the IIC. Significant aspects of the survival factors investigation will be summarized.

IV. DETAILS OF THE INVESTIGATION

A. Aircraft Configuration

Use an interior arrangement diagram that shows seating configuration, galleys, exits, etc.

Describe the location of emergency equipment including the location and type of exits, PBE, megaphone, etc.

B. Crew Information

(1) Cockpit Crew Interviews

Flightcrew interviews are conducted by the Operations Group. The Survival Factors Group

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<sup>1</sup>All times herein are local time and based on the 24-hour clock unless otherwise noted.

Original

Chairman will coordinate with the Operations Group Chairman to develop the following Survival Factors - related information whether we participate in these interviews or not:

- a. Seat belt and shoulder harness security before and after impact
- b. Difficulty releasing restraints
- c. Seat adjustment (position)
- d. Seat security after impact
- e. Difficulties during escape
- f. Aided flight attendants/passengers
- g. Description of injuries and how they were sustained
- h. How crew evacuated aircraft
- i. Describe emergency training/date of most recent training and extent of hands-on training on the use of exits, evacuation slides, etc.
- j. Use of O<sub>2</sub>, PBE, etc.

(2) Medical Histories

Outline crew members' medical and professional histories. Coordinate with the Operations and Human Performance Groups to avoid redundancies and inconsistent reporting.

- a. The following chart presents data relative to crew medical certification:

Name	DOB	Class Medical Cert.	Date of Last Physical AME Company	Waivers/ Last EKG Limitations
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Capt.

Original

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F/O

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S/O

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OBS

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- b. Most recent hospitalization
- c. Known to be taking medication (physician, medication, reason)
- d. Request medical records from Company and CAMI's Medical Records Branch (8) 749-4821 (FTS), (405) 686-4821 (Comm). Coordinate this with Operations Group. (Ref. 14 CFR 67.13, 25 or 17)

2. Cabin Crew

Obtain flight attendant training and personnel records for (Initial, Transition and Recurrent Training). Describe extent of hands-on training using training devices and actual aircraft.

(5) Interview (Conducted by Survival Factors Group)

Request permission to tape record the interviews. If a recorder is used, the interviewer and interviewee will identify themselves as well as the date, time, and location of the interview and others present.

- a. Name and address (trips/flights in last 24-72 hours - 30 days).
- b. Position occupied.
- c. Observation of flight including pre-flight duties. Location of children, elderly, obese, handicapped, mobility impaired.

Original

- d. Pre-impact precaution by flight attendant or passenger.
- e. Description of impact forces.
- f. Security of cabin furnishings, debris, galleys, carry-on baggage, hat racks, seats, emergency lighting.
- g. Security of seat after impact.
- h. Security of seatbelt/shoulder harness before and after impact, difficulty releasing same (note any failures).
- i. Behavior of other passengers.
- j. Description of F/A's pre and post accident activities.
- k. Difficulty opening door, deploying and inflating slides, using O<sub>2</sub>, rafts, etc.
- l. Observations of trapped passengers.
- m. Description of rescue/fire fighting activities.
- n. Description of injuries and how they were sustained.
- o. How F/A evacuated.
- p. Were infant restraints used - seat location.
- q. Trouble with passengers during flight.
- r. How much liquor was served.
- s. Was any emergency equipment used, i.e., flashlights, megaphones, O<sub>2</sub>, PBE.
- t. Observations of floor path emergency lights.

C. Passengers

List the number of males, females, children, infants and handicapped. List the age ranges for each.

Original

- (1) Obtain passenger names, addresses, and telephone numbers from carrier.

Have sufficient numbers of Passenger Statement Forms and Passenger Questionnaires for distribution to each passenger. It will be necessary to mail these forms to passengers who have left the area. Every attempt should be made to interview these passengers by telephone.

- (2) Passenger Interviews (General Instructions)

- a. Prior to interviewing hospitalized survivors permission will be obtained from the hospital administrator and the personal physician.
- b. It may not always be possible for the Group Chairman to attend all passenger interviews. Consequently, group members will be asked to conduct these interviews or attend interviews conducted by the Operations or Witness Groups as the Survival Factors representatives.
- c. The purpose of these interviews will be to elicit Survival Factors oriented information and to secure a signed statement of the interviewee's observations at the conclusion of the interview.
- d. Before the interview, group members will decide on the questions to be asked and who will take notes. The questions to be asked will be approved by the Group Chairman prior to any interviews. The Group Chairman, if present, will conduct the interviews. The person taking notes should make every effort to record only pertinent information; continuous writing can inhibit the interviewee from being completely candid.
- e. A technique which has been successful in interviewing survivors is to permit the interviewee to discuss his observations without interruption. The person

Original

designated as note-taker only jots down pertinent information. At the conclusion of the interviewee's statement, some specific questions are asked to clarify certain areas of interest. Minimum notes are taken again. At the conclusion of the questions, the interviewee is asked to write and sign a formal statement on the NTSB Form 6120.9 provided. The previously taken notes will aid in assuring the statement contains all the necessary information. If the interviewees cannot or will not write a statement, a statement may be written for him/her. If the interviewee refused to sign the statement, this will be included in the notes of the interview and/or the prepared statement form and the statement will be signed by the interviewer(s).

- f. It is not suggested that every passenger interviewed be tape recorded because of the time necessary to review and summarize these interviews during the on-scene investigation.
- g. Each surviving passenger will be given a questionnaire (NTSB Form 6221.1) and requested to complete the necessary information as soon as possible; arrangements should be made to collect the questionnaires during the on-scene investigation.

(3) Passenger Interviews (Specific Information)

- a. Name, address, age, weight, height, handicapped, mobility impairment, etc.
- b. Seat number - if in exit row, was passenger briefed/read exit opening instructions.
- c. Read safety card, watch F/A safety demo, watch safety video
- d. Note location of exits other than one used to board aircraft

- e. Seat numbers of traveling companions
- f. Location and storage of carry-on baggage
- g. Observations of flight until accident, brace position
- h. Security of seatbelt (before and after impact)
- i. Security of seat (after impact)
- j. Description of impact forces - direction, magnitude
- k. Description of cabin - location and type of debris
- l. Description of escape (time, difficulties, smoke, fire, egress routes, etc.)
- m. Description of fire fighting operations (location of fire, smoke, etc.)
- n. Description of rescue operations
- o. Description of injuries and how they were obtained
- p. Obtain interviewee permission for the release of medical records
- q. Description of other passengers after the accident and during egress
- r. Use of child safety seats and restraint of children/infants not in child safety seats

D. Aircraft Wreckage/Damage

(1) Description of Site

The following information will be obtained by coordination with the Structures Group Chairman. Coordination will be necessary to assure accurate documentation while avoiding redundant or conflicting information. (The Structures



Group may document this information, eliminating any need for the Survival Factors Group to cover the same information.)

- a. Distance, heading, and relative bearing of ground scars and A/C components from main wreckage.
- b. Description of group scars: (Length, width, depth, distance, bearing, and heading along impact path and to main wreckage site)
- c. Description of obstacles/structures struck: (Height, construction)
- d. Description of terrain: (Elevation, slope/grade, soil)

(2) Damage to Aircraft

Describe aircraft damage as it relates to fire pattern, egress, fuselage and wing crush, etc.

a. Exterior Damage

Describe external cockpit and fuselage/cabin damage supplement with photographs, sketches, drawings, etc.

1. Direction, location, and dimensions of structural deformation
2. Location of seats and cabin equipment outside the aircraft
3. Description of thermal and smoke damage
4. Condition of windshields, wipers, etc.
5. Blocked exits, deployed escape slides, and ropes
6. Evidence of fire fighting/rescue activity

b. Interior Damage

Describe the internal condition of the cockpit and cabin and summarize the results of any systems and component examinations. Supplement with photographs, sketches, drawings, etc.

Original

## Overview

This section discusses the methods for handling Cockpit Voice Recorders (CVR's) and Flight Data Recorders (FDR's) and related matters.

The Flight Recorder Section is divided into nine parts:

- (1) General - Background and Requirements
- (2) Field Procedures - Handling Both Types of Recorders
- (3) Obtaining Readouts - Both Types of Recorders
- (4) Flight Data Recorders - Lab Procedures
- (5) Cockpit Data Recorders - Lab Procedures
- (6) Readouts for Foreign Investigations - Procedures
- (7) FAA and Military Requests - Procedures
- (8) Accredited Representatives - Considerations
- (9) Other Recordings - Maintenance and Digital Avionics

## General - Background and Requirements

Flight Data Recorders and Cockpit Voice Recorders are required on board certain aircraft by regulations set forth in Parts 91, 121, 125, and 135 of Title 14 of the Code of Federal Regulations (CFR) for the purposes of accident investigation and prevention. They are required under 49 CFR 830 to be preserved by the operator for exclusive NTSB use to determine the facts, conditions and circumstances relating to an accident or reportable incident. The regulations further state that information recorded from CVRs is to be used to assist in determining the cause of accidents or occurrences in connection with investigations under Part 830, and is not to be used by the FAA for enforcement action. Flight recorders found optionally installed on aircraft not requiring them are also required to be preserved for NTSB use.

### Regulations for Flight Data Recorders

Flight Data Recorders are required on all 14 CFR 121 and 125 air carrier aircraft in the United States. As of October 11, 1991, many 14 CFR 91 and 135 aircraft are also required to be equipped with FDR's. The FDR requirements differ based on the number and type of engines, number of passengers, and date of manufacture.

All 14 CFR 121 and 125 aircraft are required to be equipped with an FDR that records 25 hours of information in a digital format. Further:

- (1) Recorders on aircraft certified prior to September 1969 and manufactured before October 11, 1991, must record 5 parameters until May 1994 when the recorders on such aircraft will be required to record 11 parameters;
- (2) Recorders on aircraft certificated after September 1969 and manufactured before October 11, 1991, must record 17 parameters; and
- (3) Recorders on aircraft manufactured on or after October 11, 1991, must record 28 parameters.

All existing 14 CFR 135 multi-engined, turbine-powered aircraft that are capable of carrying 20 or more passengers must, as of October 11, 1991, be retrofitted with FDRs that record"

Original

- (1) 11 parameters if type certificated before October 1, 1969,
- (2) 17 parameters if type certificated on or after October 1, 1969, and
- (3) 28 parameters if manufactured on or after October 11, 1991.

All 14 CFR 135 multi-engined, turbine-powered aircraft that are capable of carrying 10 to 19 passengers and are manufactured on or after October 11, 1991, must be equipped with FDRs that record 17 parameters for a duration of eight hours.

All 14 CFR 91 multi-engined, turbine-powered aircraft that are capable of carrying 10 or more passengers and are manufactured on or after October 11, 1991, must be equipped with FDRs that record 17 parameters for a duration of eight hours.

#### Regulations for Cockpit Voice Recorders

Cockpit Voice Recorders are required on all 14 CFR 121 and 125 air carrier aircraft in the United States. As of October 11, 1991, many 14 CFR 91 and 135 aircraft are also required to be equipped with CVR's. The CVR requirements are different for different aircraft and are as follows:

- (1) All 14 CFR 121 and 125 aircraft are required to be equipped with a CVR that records 30 minutes of audio information on four channels;
- (2) All 14 CFR 135 multi-engined, turbine-powered aircraft capable of carrying 20 or more passengers and requiring two pilots are required as of October 11, 1991, to be retrofitted with CVR's that record a minimum of 30 minutes of audio information on four channels; and
- (3) All 14 CFR 91 and 135 multi-engined, turbine-powered aircraft capable of carrying six or more passengers and requiring two pilots are required, as of October 11, 1991, to be retrofitted with CVR's that record a minimum of 15 minutes of audio information on four channels.

#### Public Disclosure of the CVR Transcript

Original

The recording from a CVR is treated differently from other factual information developed during the course of an investigation. Because of the sensitive nature of the oral communications within the cockpit, and the considerable media attention given to the transcript of a CVR tape from a major accident, Congress has bestowed special status on CVR information. As amended in 1990, section 306(c) of the Independent Safety Board Act (49 U.S.C. section 1905(c)) prohibits the Board from ever releasing any parts of the CVR tape of oral communications. In addition, this legislation governs the content and timing of the release of the CVR transcript. The Board is not required to release a verbatim transcript instead, the transcript includes only those portions the Board deems "relevant and pertinent." The Board generally does not release to the public a transcript of the entire tape (about 30 minutes), and the Board may characterize portions of the conversations without providing a full transcript of the conversations. The transcript is to be released to the public at the public hearing, but if no hearing is held, it is released when a majority of the other factual reports are made public.

49 U.S.C. section 1905(c) provided in pertinent part:

(C) Public Disclosure of Cockpit Voice Recorder Recordings and Transcriptions.

(i) **General Rule** - Notwithstanding any other provision of law, the Board shall withhold from public disclosure cockpit voice recorder recordings and transcriptions, in whole or in part, of oral communication by and between flight crew members and ground stations, that are associated with accidents or incidents investigated by the Board.

(ii) **Exception** - Portions of a transcription of oral communications described in paragraph (1) which the Board determines relevant and pertinent to the accident or incident investigation shall be made available to the public by the Board -

(A) if the Board conducts a public hearing with respect to such accident or incident, at the time of such hearing; and

Original

- (B) if the Board does not conduct such a public hearing, at the time when a majority of other factual reports regarding the accident or incident are placed in the public docket.
- (iii) References to Cockpit Voice Recorder Information in Safety Recommendations. Nothing in this section shall restrict the Board at any time from referring to cockpit voice recorder information in making safety recommendations.

An important consequence of the special treatment accorded CVR data by Congress is the need to assure a high degree of security for the CVR tape and its transcript. Therefore, party access to the recording and transcript and NTSB staff access to the recording and transcript are strictly controlled to prevent unauthorized disclosure.

The law specifically prohibits public disclosure of the tape recording of oral communications. However, it does not prohibit the NTSB from making public use of other sounds, such as clicks, snaps, aural warnings from aircraft systems, engine sounds and such, from the CVR recording at any time.

## Field Procedures for Handling Both Types of Recorders

### Exterior Appearance

Flight data recorders and cockpit voice recorders are most commonly painted bright orange or red although a few are painted bright yellow. Reflective tape should have been applied and the words "FLIGHT RECORDER\_DO NOT OPEN" may appear on the outside surface in one or more languages. Both voice and data recorders are required to be mounted in airplanes as far aft as practical, but there is no similar requirement for helicopters. The FDR is a standard one-half ATR rack long unit (5"x8"x21") and the CVR is one-half ATR short unit (5"x8"x13"). Obviously if the accident involves high impact forces or fire, or both, the recorders may be deformed or discolored or both.

### Procedures for Handling Recorders

The FDR and the CVR must be handled in accordance with the following instructions.

CAUTION: UNDER NO CONDITIONS SHOULD ANY ATTEMPT BE MADE TO REMOVE OR TO PLAY A TAPE FROM AN FDR OR CVR IN THE FIELD. THE TAPE COULD BE ERASED OR DAMAGED.

- (1) Protect the recorder from strong magnetic fields. Remember that an X-ray transmitter at an airport security station may damage the data. If a recorder, tape, or solid state memory unit is mailed, please mark the package "SENSITIVE FLIGHT RECORDING WITH CRITICAL DATA. DO NOT EXPOSE TO X-RAY RADIATION OR MAGNETIC FIELDS."
- (2) Do not open the recorder. Do not allow anyone to remove the tapes or solid state memory unit under any circumstances.
- (3) If the recorder is dry and undamaged, use a shipping container obtained from the operator involved in the accident or incident, if possible. Otherwise package it carefully for shipment, unless it is to be hand-carried; it is not necessary to package an undamaged recorder for hand-carriage.
- (4) If the case is broken, do not remove the tape or solid state memory unit from the device. Wrap the

Original



entire recorder and its contents in polyethylene or similar material or heavy paper before packaging for shipment. If you have any questions about what to look for, e.g., how many internal subassemblies exist, etc., please contact the Engineering Services Division.

- (5) If the tape reels or solid state memory boards are separated from the unit, wrap them in polyethylene or paper before applying sealing tape. Never apply sealing tape directly to the recording medium. Do not remove the recording medium from the reels or enclosure.
- (6) If the recording is a tape and it is found separated from the recorder, try not to wrinkle or crease it. Carefully wrap it on a spool or cardboard tube or something similar. Wrap this in polyethylene or paper and pack it carefully. Enclose all fragments of tape, no matter how small. Never stuff the tape randomly into a box or container. Data are easily degraded; creases and wrinkles can cause electronic noise and permanent data loss.
- (7) If the recorder is from a major accident, get it to the Engineering Services Division lab by the fastest, most secure means possible. If an investigation team travels to the scene via the FAA airplane, and the airplane is returning to Washington immediately, arrange to ship the recorder on it. Otherwise, the recorder must be hand-carried back to headquarters by an NTSB employee or a person designated and approved by the Director, Office of Aviation Safety. Circumstances may require that the recorder be transported back to Washington on a non-stop commercial flight in the custody of the flight crew. If transported this way, it is imperative that the transfer be coordinated by the IIC and the lab, and that the recorder be picked up at the Washington, D.C. area airport by NTSB personnel. If the recorder is from a non-major accident or incident in which its quick return is not essential, it may be shipped (properly packaged) by registered mail overnight express, commercial shipping service or hand-carried.
- (8) If the recorder is found in water, do not attempt to dry it. Observe the following instructions:

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Rinse it in fresh water, preferably distilled, then arrange to ship the recorder immersed in water to the lab in a watertight container. Make sure the recorder stays immersed in water until it arrives at the laboratory. Pack it very securely. If the recording medium is tape, it must not be allowed to dry out under any circumstances.

**Note: Ship by fastest means available.**

#### Obsolete Flight Recorders Used by Some Foreign Operators in the United States

While all FDR's in use in the United States are required to record data in a digital format, there are obsolete types of oscillographic (foil) FDR's in use by some foreign operators flying into and out of this country under 14 CFR 129. Most of these are externally identical to current FDR's. However, one model, the Lockheed model 109C, looks like a big bright yellow or international orange metal ball. If older foil type FDR's are encountered during an investigation, please call the Engineering Services Division for special instructions.

#### Underwater Recovery Techniques

Flight data recorders and cockpit voice recorders must have an approved device to assist in locating them under water (underwater locator beacon or ULB's). These devices are ultrasonic beacons that operate at 37.5 khz. They are cylindrical in shape (1-3/8"x4") and are usually mounted on the face of the recorder.

ULB Receiver kits are available from the manufacturer (Dukane Corporation, 2900 Dukane Drive, St. Charles, Illinois, 60174, (312) 584-2300), and can either be purchased or rented. In addition, several U.S. Navy and Coast Guard facilities have Dukane kits available. Call the lab if your diving team needs help in locating one.

Further, the ULB is supposed to operate for 30 days. However, searchers should be keenly aware that operation for a full 30 days is not assured. There are several circumstances that may adversely affect operating life. (See Laboratory Services Investigative Note LS-IN-81-1, April 20, 1982, for details).

Original

Because locator beacon battery operating time is limited, and because flight recorders containing vital accident data deteriorate in a water environment, they should be given a very high priority in the recovery operation.

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### Obtaining Readouts For FDR's and CVR's

The Engineering Services Division of the Office of Research and Engineering is responsible for recovering data from these recorders to support NTSB investigations. It is very important to secure these recorders as soon as possible after an accident or incident and deliver them intact to the Engineering Services Division's laboratory at Washington headquarters so that the laboratory may obtain the best possible recovery of the relevant data in a controlled atmosphere using an experienced staff.

All requests for CVR and FDR readouts must be made to the Chief, Engineering Services Division. The Chief or acting Chief is almost always available by phone or by beeper. The following information will be needed:

- (1) Type and condition of recorders
- (2) Circumstances of the accident or incident
- (3) Arrangements for method of shipping

For flight data recorders, the following information is required to facilitate the data readout:

- (1) Local altimeter setting at time of occurrence
- (2) Elevation at accident/incident site
- (3) Accident runway, if applicable
- (4) Location of previous takeoff, runway used, and field elevation
- (5) Local altimeter setting at time of takeoff
- (6) Flight number
- (7) Coordinated Universal Time of departure
- (8) Coordinated Universal Time of accident
- (9) A flight itinerary, if the recorder is not pulled immediately after the event.

When accepting custody of a recorder from airline personnel or others at an accident site, complete an NTSB Form

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6120.15, Receipt of Aircraft Wreckage, enclosing one copy in the shipping container. This should provide the Board with information on how to return the recorder to the owner as well as provide documentation on the Board's receipt of the recorders from the owner. A copy of the 6120.19A should also be enclosed, if one is available.

**Address all shipments to:**

**National Transportation Safety Board  
Office of Research and Engineering, RE-20  
490 L'Enfant Plaza East, S.W.  
Washington, DC 20594**

Original

## Flight Data Recorders - Lab Procedures

The required parameters recorded by the FDR's for each aircraft type are detailed in the applicable FAR's but many operators record additional information. Because of the large variation in recording parameters among aircraft operators, the FDR laboratory of the Engineering Services Division maintains a computer system to catalog the decoding software.

There are two distinct types of FDR's in existence. By far, the vast majority of these is composed of the magnetic tape recorder, referred to at times as the Digital Flight Data Recorder (DFDR). The other, an extremely new technology recorder, is the Solid State Digital Flight Data Recorder (SSDFDR). The two are functionally equivalent and are visually similar. The SSDFDR has the advantage of having no moving parts and should, therefore, prove more reliable in extended use.

Regardless of the type of recording medium, magnetic tape or solid state memory, the FDR is required to record a minimum of 25 (or 8) hours of data. Most accident investigations will be satisfactorily served with 25 (or 8) hours of recorded data available. However, in investigations of some incidents, the NTSB must take timely possession of the FDR, or pertinent flight information may be lost. Likewise, if FDR's from aircraft not involved in the accident or incident need to be examined, and if the appropriate FDR's are not withdrawn from service within 25 (or 8) hours, pertinent data will be lost. For those cases, expeditious notice to the airlines to remove and hold those recorders is necessary to prevent the required data from being overwritten.

### The Flight Recorder Readout

The Engineering Services Division laboratory is prepared to give accident investigation FDR readouts the highest priority. That includes investigative support around the clock, seven days a week, if necessary. Laboratory staff will begin to prepare for the readout of an FDR before its actual arrival at NTSB headquarters. Upon notification of an FDR readout request, lab staff will begin collecting the necessary documentation to decode the FDR. As soon as that information is collected, the IIC will be provided with the parameter list. This could occur almost immediately if the lab has the documentation on hand; provision of the list to the IIC could take a day or two if the lab does not have the documentation on hand. Because the notification of an FDR readout request

Original

generally precedes the arrival of the FDR in the lab by a like amount of time, the day or two delay is generally not a problem.

Upon receipt of the FDR in the laboratory, it will be inspected, disassembled if necessary, and its condition documented. The specialist assigned will then perform a preliminary readout. Any significant information developed, such as discovering a malfunctioning FDR yielding no data, or information, such as a flaps up indication on a takeoff accident, will be immediately transmitted to the IIC. Work on the readout will progress whether or not an FDR group is expected to convene.

#### FDR Group

Not every investigation will require an FDR group to be convened. Obviously, a major "Go-Team" type accident will usually involve an FDR group; however, field investigations may also result in the formation of a group. With the growing complexity of aircraft systems being reflected in the increased complexity of the FDR recorded data, formation of FDR groups for non-major investigations is occurring more often. The Engineering Services Division staff specialist assigned will recommend to the IIC the advisability of forming an FDR group. The group, if convened, will be comprised of those parties who can provide specific technical assistance (generally one representative for each such party). The type of expertise required generally includes a knowledge of the method of data recording and the relationships of the recorded variables to the aircraft systems.

The group will work until the group chairman is satisfied that the preliminary readout of the pertinent parameters is obtained. During the process of recovering data from the recorder, the data will be examined in sufficient detail to determine if the parameters appear reasonable and to provide for timely delivery of relevant information to the IIC. Dissemination of preliminary data to party representative not actively participating in the group effort will be coordinated with the IIC and will be based on their ability to assist the NTSB in understanding the accident and for prevention purposes. If a party is requested by the NTSB to examine the FDR data, and that party has the capability to directly read the FDR tape, the FDR group chairman may make a copy of that tape for the party to use. However, the group chairman will not release any copies of the original FDR tape recording to any parties until the group has finalized the preliminary

Original

readout and is preparing to disband. In the event the FDR has a Solid State memory instead of a tape, no copy can be made.

As soon as the group has prepared a preliminary readout, the IIC and the group members will be provided with a copy.

Copies of the original FDR tape, disk, or tape copies of the reduced data, may then be made available to parties with a need to know and with permission from the IIC.

The FDR group will not be dismissed until the IIC is consulted and authorizes the FDR group chairman to do so.

#### The FDR Factual Report

The FDR Factual report is a document that details the factual aspects of the recovery of the FDR data, and presents the FDR data in the form of a tabular listing or plots, or both. The FDR Factual Report will not interpret the data. While the assigned specialist may provide interpretation in the internal, confidential Analysis Report, the optimal use of the FDR data and the most effective presentation of the derived information as it relates to other areas of the investigation is in the form of related studies.

#### FDR Related Studies

An aircraft flight path reconstruction is necessarily the product of detailed interpretation of the FDR data. Likewise, the determination of how an aircraft's system performed often relies heavily on an interpretation of FDR data. If an IIC needs the FDR data interpreted, or placed into context with other factual data, that need should be discussed with the Chief, Engineering Services Division. The FDR specialist will not include such interpretations within the FDR Factual report, although that specialist (or another specialist) may be assigned to prepare the related study.

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Cockpit Voice Recorders - Lab ProceduresProcedures to Initiate a CVR Readout

## (1) Major Investigations

Early in the on-scene phase of a major investigation, the IIC will usually establish a CVR group. The group will be chaired by an NTSB CVR specialist in Washington D.C.

The IIC, in coordination with the CVR specialist, will decide which parties the Board needs for direct CVR group participation. In addition to the group chairman, generally the CVR group will include one representative each from FAA, the operator, the pilot organization union, and the aircraft manufacturer. The need for additional members with other qualifications will be determined by the group chairman in coordination with the IIC. The IIC should ensure that only one representative be appointed for each party invited to participate on the CVR group, unless special circumstances, such as our need for assistance in multiple disciplines from one party, dictate otherwise.

It is desirable that these representatives meet as many of the following criteria as possible:

- (a) Qualified and current in the type of aircraft involved in the accident,
- (b) Personally know the flight crew members' voices,
- (c) Has detailed knowledge of the accident flight's planned operation, and
- (d) Has detailed knowledge of the aircraft's systems and procedures.

The IIC will inform appropriate party coordinators of the place and time the group is to be convened and will advise the CVR group chairman of the names and affiliations of the designated members. The IIC must inform all persons assigned to the CVR group that they will

be required to remain with the group until its activity has been completed. No one will be admitted to the group activity unless the IIC has forwarded the names directly to the CVR group chairman.

The IIC will inform the appropriate party coordinators of the extremely sensitive nature of the CVR data, the special CVR readout procedures, and security program to be followed by the CVR group.

(2) Non-Major Investigations

In non-major investigations, the CVR readout may be conducted less formally; however, it can be conducted exactly as done in a major investigation. If the IIC and the CVR specialist jointly determine that CVR investigative needs can be served without, for example, a full transcript and corresponding group activity, then an abridged procedure will be followed. The IIC will discuss with the specialist those areas of recorded information that he or she wishes to be transcribed or processed. The specialist may prepare a short transcript of selected areas, or the CVR information retrieved may be solely non-verbal, such as sound spectrum data. If any party desires to come to Washington for the readout or study, the party must request participation from the IIC and not the CVR specialist. The specialist will advise the IIC on the need or desirability for that participation.

Initial CVR Information Processing

Upon receipt of the recorder in Washington, the CVR group chairman will prepare the original tape for the reproduction of necessary copies. Because damage to the recorder may be extensive, cutting tools or other special equipment may be needed to retrieve the recording medium and the assistance of several laboratory employees may be necessary. This phase of the CVR processing is not considered to be part of the group activity.

The initial audition of the tape and the preparation of working copies may be attended only by the Directors of the

Original

Office of Research and Engineering and the Office of Aviation Safety (or their designees). The CVR group chairman shall be in complete charge during the initial audition and preparation of the working copies of the CVR tape. The CVR group chairman shall be free to take all necessary actions to prevent degradation of information on the original recording. All subsequent work will be done using a copy tape unless special circumstances, such as a need to enhance the quality of an area of interest with a poor signal-to-noise ratio demonstrated.

#### CVR Data to the IIC

Upon hearing the tape, the Director, Office of Aviation Safety (or designee) will telephone the on-scene command post to relay any critical CVR information to the IIC. The tape will not be played over the telephone. Under no circumstances should a portable (cellular or satellite) telephone be used to discuss this information.

#### CVR Group

Upon arrival of the CVR group members at NTSB headquarters, the CVR Group Chairman will meet with them to discuss the sensitivity of the CVR, purpose of the group activity, party system, security procedures, NTSB investigation procedures and objectives, and duties of group members. No notes are to be kept and no personal audio recorders will be permitted. If the purpose of the CVR group is to prepare a transcript, the group chairman will stress that only one copy of the transcript will be prepared. The group will then be told to follow NTSB security procedures and not to discuss the group's work with the press or with anyone except their respective coordinators. Copies of 49 CFR 831, "National Transportation Safety Board Aircraft Accident/Incident Investigation Procedures," will be distributed; group members will be told to note especially paragraphs 831.11(b) and 831.13(b), respectively which state:

"Participants in the field investigation shall be responsive to the direction of the appropriate Board representative and may be relieved from participation if they do not comply with their assigned duties or if they conduct themselves in a manner prejudicial to the investigation."

"All information concerning the accident or incident obtained by any personnel participating in the field

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investigation shall be passed to the Investigator-in-Charge, through appropriate channels. Upon approval of the Investigator-in-Charge, parties to the investigation may relay to their respective organization information which is necessary for purposes of accident prevention or remedial action.

Under no circumstances shall accident information be released to, or discussed with an unauthorized person whose knowledge thereof might adversely affect the investigation."

Each CVR Group member will be required to sign a "Statement of Representative of Party to NTSB Investigation" and a "CVR Nondisclosure Agreement."

#### CVR Information Processing (Transcript)

If the purpose of the CVR group is to prepare a transcript as soon as a suitable tape is available, the group will prepare the transcript and determine event timing while working in the laboratory's audio room. The group will work until the preliminary transcript is complete.

For major accidents, a complete, unabridged transcript will be prepared. For non-major accidents in which a transcript is to be prepared, the scope of the CVR data to be transcribed will be determined by the CVR group Chairman and the IIC.

The transcription will be punctuated. The punctuation will be performed on all oral communications, including the radio transmissions received by the aircrew. Where there is ambiguity in inflection, for any particular word or phrase, resulting in failure of the group to reach agreement as to punctuation, special notation will be used to reflect that. Every statement, or abbreviated statement segment, must end with a punctuation mark. Absence of punctuation will not be used to imply the existence of any type of punctuation by default.

Upon completion of the transcript, the CVR group chairman will brief each group member on the sensitive nature of the material and emphasize the absolute confidentiality of the material, and collect and destroy any notes that were made. The CVR group chairman will retain the master copy of the transcript in a locked receptacle in the audio laboratory. Group members will not be permitted to take a copy with them.

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The CVR group will not be dismissed until the IIC is consulted and authorizes the CVR group chairman to do so.

#### CVR Information Processing (No Transcript)

If the CVR group is to conduct a sound spectrum or other non-verbal study, the work will be done in the audio lab under the same security procedures used to prepare a transcript.

The Engineering Services Division has the capability to perform sound spectrum and other acoustical studies. Therefore, all such work should be expected to be performed in the audio lab. If however, the CVR specialist learns of a technique available only at another facility, the group may reconvene at that facility. Because of the extreme sensitivity of the CVR tape, only techniques that provide for data enhancement unattainable in the NTSB CVR lab will provide grounds for reconvening at an outside facility. The Directors of the Office of Aviation Safety and the Office of Research and Engineering must approve any activity that requires work on the CVR recording at any outside facility.

The CVR group will not be dismissed until the IIC is consulted and authorizes the CVR group chairman to do so.

#### Surviving Crew Members

Surviving flight crew members will not participate as CVR group members. Surviving flight crew members will be allowed to listen to the CVR tape and review the draft CVR transcript. This opportunity will be made at least once, but the flight crew may be granted additional auditions from the IIC upon request. The flight crew may be accompanied by one person of his or her choice, provided that person is part of the CVR group. After reviewing the draft transcript, the flight crew members may submit comments concerning the transcript. If the flight crews' comments are deemed by the CVR group chairman to be of a potentially substantive nature, the CVR group chairman, in consultation with the IIC, may require the group be reconvened to review them. The transcript may be revised to reflect any altered interpretation of the CVR tape based on these comments, but any altered interpretations must be based entirely on that which can be heard by the group. Following any revision, the IIC may advise the flight crew and allow a follow-up audition.

#### Disposition of the CVR Group Chairman's Factual Report

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(With Transcript)

The CVR group chairman will destroy the original preliminary transcript, all copies, and all corrected pages of the typed document when the content of the transcript is finalized. Until this occurs, all copies must be kept in a locked drawer or cabinet in the CVR lab.

The completed CVR group chairman's factual report (the transcript will be an attachment to the factual report) is to have a cover sheet that notes in all capital letters at the top and bottom of the sheet: "PRELIMINARY--DUPLICATION OF THIS DOCUMENT IS PROHIBITED." It shall also contain a statement of the CVR caveat: "Warning: The reader of this report is cautioned that the transcription of a CVR tape is not a precise science but is the best product possible from an NTSB group investigative effort. The transcript or parts thereof, if taken out of context, could be misleading. The attached CVR transcript should be viewed as an accident investigation tool to be used in conjunction with other evidence gathered during the investigation. Conclusions or interpretations should not be made using the transcript as the sole source of information."

The group chairman's complete factual report will be reviewed by the Directors of the Office of Research and Engineering and the Office of Aviation Safety at this time. The Directors will take into consideration the recommendations of the IIC, the CVR group chairman, the Chief of the Major Aviation Investigation Division or Regional Operations and General Aviation Division, in determining what portions, if any, of the transcript are deemed non-pertinent and to be deleted; deletions will be labeled accordingly.

Restrictions on report duplication and report access will be removed when the report is officially released to the public through the Director, Office of Aviation Safety. The note -- "PRELIMINARY -- DUPLICATION OF THIS DOCUMENT IS PROHIBITED--" on the transcript pages will be removed before the public release, but the CVR caveat on the cover sheet will remain as part of the CVR report. The manner of the public release of the transcript is dependent on the Safety Board's decision to hold a public hearing.

If the Safety Board convenes a public hearing, the CVR group members will be permitted, upon request, to return to Washington to review the transcript in final form. This review will be scheduled to take place approximately one week

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prior to the pre-hearing conference.

A copy of the transcript will be made available to each of the party coordinators and to the public on the first day of the public hearing, at least six hours prior to its being convened.

If no hearing is convened, the transcript will be made available when a majority of the other factual reports regarding the accident or incident are placed in the public docket. The CVR group members will be permitted, upon request, to return to Washington to review the transcript in final form. This review will be scheduled to take place approximately one week prior to the opening of the public docket. Copies of the final transcript will be made available to the party coordinators one calendar day prior to the opening of the public docket.

#### Disposition of CVR's and Original Tapes

Public release of the CVR transcript generally marks the completion of Safety Board effort concerning the CVR tape. However, there may be circumstances requiring additional investigation that cannot be completed before the public release date. There also may be unresolved controversies about the accident that require the Safety Board to maintain continued control of the original recording. Therefore, after the public release of the transcript, the Board may elect to provide a high quality copy of the CVR tape to the owner rather than the original tape. After the Safety Board has adopted its final report, the original tape will be returned to the owner if it has not already been returned. Return of the original tape following the public release of the transcript will be determined jointly by the Directors of the Office of Aviation Safety and the Office of Research and Engineering. If the Board decides to keep the original, the owner and the other parties will be advised of the reasons for such determinations.

#### Request to Hear the CVR Tape or Review the Preliminary Transcript

Requests from NTSB specialists and group chairmen, and Federal Aviation Administration officials who have a need to hear the tape or review the transcript should be made directly to the IIC. If the IIC concurs with the need for such a request, the request will be forwarded to the Directors of the Office of Aviation Safety and the Office of Research and

Original

Engineering for their approval. The Directors will decide who will hear the tape or review the transcript and provide a written list of names of approved reviewers to the Chief, Engineering Services Division, who will then arrange for the tape or transcript to be reviewed in the lab. Board members, and the Investigator-in-Charge, may audition the CVR tape and review the preliminary transcript at any time.

A group chairman other than the CVR group chairman may determine the need for his or her group to audition the tape. Auditions by an entire group may be approved by the Directors of the Office of Aviation Safety and the Office of Research and Engineering, but such requests will not be considered for approval until after public release of the CVR transcript.

The CVR group chairman will keep a log of all reviewers of CVR tapes and preliminary transcripts. This log will note the date of the review, the name of the reviewer and whether the review included an audition of the tape, a review of the transcript, or both. For those accidents involving more than one CVR, separate entries in the log will be required for each CVR tape and transcript review.

Original



### Readouts For Foreign Investigations

The Engineering Services Division may be called upon to provide readout services for foreign investigations. The NTSB may provide for readout services as the State of Operator, State of Registry, or State of Manufacture for ICAO signatories upon coordination through appropriate channels. Coordination of these readouts will be performed by the U.S. Accredited Representative of the NTSB in consultation with the Chief of the Engineering Services Division.

The NTSB may also provide recorder readout services to foreign governments under situations not covered by ICAO agreement, if it is in the best interests of the Safety Board to do so. Arrangements for such services will be coordinated by the Office of Aviation Safety in consultation with the State Department Aviation Liaison and the Office of Research and Engineering. The services may be provided directly by NTSB technical staff, resources permitting, or the NTSB may effect the requested services through an outside party. If accomplished through an outside party, any service charges applicable will be submitted to the requesting country.

Whether the NTSB is actively participating in a major foreign investigation or assisting in a readout, the IIC (or his representative) from the responsible country is to remain in control of the recorder and readout activity. Lab specialists, coordinating with our U.S. Accredited Representative, will work at the IIC's (or his representative's) direction. The recorders, recordings and all data recovered are to be given to the IIC (or his representative) and not retained by the lab.

Original

## FAA and Military Requests

### FAA Requests

The NTSB and the DOT have formally agreed on certain procedures for FDR readouts for the FAA by the NTSB. This agreement is contained in the 1976 Reimbursable Memorandum of Agreement as amended in 1986. The substance of the entire agreement is contained in NTSB Board Order NTSB 1700.2 but the three most important points are:

- (1) The NTSB will provide the FAA copies of every FDR readout produced.
- (2) The NTSB will provide readouts of FDR's produced by the FAA for safety related purposes only. The NTSB will not provide readouts for FAA certificate actions or litigation.
- (3) The FAA must provide a qualified person to witness the readout because NTSB personnel cannot be called on to be expert witnesses.

### Military Requests

The NTSB frequently is called upon to assist the U.S. military in their investigations. Sometimes this assistance consists of CVR and FDR readouts. The NTSB has no agreement, formal or informal, with any branch of the military but staff will cooperate with DOD personnel and provide assistance on an ad hoc, resources permitting basis. Coordination of such requests and work performed will be conducted by the Office of Aviation Safety in consultation with the Office of Research and Engineering.

Original

### Accredited Representatives

Accredited representatives and designated advisors from other countries sometimes participate in our CVR and FDR readouts. In the spirit of ICAO Annex 13, they are to be permitted access to all factual information derived in the investigation. Further, any requests by the NTSB for technical assistance from foreign manufacturers or operators in recovering data from flight data recorders or cockpit voice recorders, or in interpreting such recovered data, must be made through these representatives. However, all transfer of data to foreign governments must be consistent with the transfer of data within the NTSB party system and must be approved by the Directors of the Office of Aviation Safety and the Office of Research and Engineering.

Original

### Other Recordings

Many aircraft in service today have recordings other than CVRs and FDRs. These recordings are not required by regulation, nor are they crashworthy. Nonetheless, valuable information may be recovered from them if they are not damaged. They generally fall into two categories; maintenance recorders and non-volatile memories from digital avionics systems, engine fuel controls, and other components.

Maintenance recorders are used by the operators to track the health of the aircraft and its various systems. They sometimes record information far in excess of what is required on the FDR. These recorders may be referred to as quick access recorders (QAR's), airborne information data systems (AIDS) recorders or airborne information management system (AIMS) recorders. The NTSB is not capable of reading these recorders, but the operators will provide an expeditious readout using their maintenance facilities under our direction or supervision.

Non-volatile memory units from digital avionics systems may also provide valuable information if they are not damaged. Non-volatile memory may exist for autopilot systems, flight management systems, electronic engine controllers, navigation systems and so on. The NTSB can't extract data from these either, but the manufacturers probably can.

There is little specific guidance we can provide on what to look for on any particular aircraft, but the Engineering Services Division will provide advice and assistance to the extent it can. As a general rule, you should ask the appropriate party if there is a quick access or maintenance recorder on board. Determining the existence of non-volatile memory is more difficult, because you will have to ask the supplier of that specific subsystem about it, and usually a representative is not on scene.

Original

Overview

Avoid any discussion of pending Board safety recommendation. However, all parties should be encouraged to express their views with respect to any corrective actions they feel may be necessary.

In certain accidents, the draft factual portion of the Board's formal report of the accident may be forwarded to the parties for their review and written comment, in lieu of a Technical Review meeting.

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INVESTIGATION OUTLINE - AIRCRAFT PERFORMANCE

- I. The Performance Group Will Be Responsible for:
- A. Determining and developing factual aircraft performance information as relates to:
    - (1) Flashpath and trajectory
    - (2) Touchdown/rotation points
    - (3) Runway braking/acceleration
    - (4) Flight characteristics in normal and abnormal regimes
  - B. Correlation of various factual data:
    - (1) CVR/DFDR correlation to a common time reference
    - (2) ATC radar data and voice communications
    - (3) Site evidence such as scar marks, impact damage, etc.
    - (4) Video
  - C. Visibility Studies
  - D. Trajectory Studies
- II. Group Participation
- A. Parties shall be invited by the IIC with representation based on investigative need as determined by the Performance Group chairman. Every effort should be made to limit group participation to those representatives who are absolutely essential to the development of factual performance information.
  - B. The Performance Group chairman should visit the scene, if necessary, to insure that factual crash data be documented adequately for the needs of the performance group. Group members may be identified and accompany the Performance Group chairman on scene, although normally the group will not be convened to perform on-scene duties. Generally, the group should not be delayed even though the Performance Group requires data that may not be developed for several weeks, such as final CVR transcripts and FDR data.
  - C. The purpose of group participation is to elicit the

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necessary assistance to get the job done. As the factual report is developed, parties are urged to comment; however, the decision as to the content of the report will remain with the Group chairman.

Original

### III. Simulations and Flight Tests

In the event that the Performance Group determines that simulations or flight tests are required to develop the necessary factual information, this need will be transmitted to the IIC who shall coordinate the request for such activity.

The actual tests or simulations shall be supervised by the Performance Group chairman.

### IV. Visibility Studies

Determination of the need for visibility studies should be made early in the investigation. There is much work required to prepare for a visibility study, such as acquisition and processing of ATC radar data, processing of flight recorder data, and acquisition and computer digitization of the appropriate cockpit binocular photographs. The lead time to perform all these tasks is considerable.

### V. Determination of Need for a Performance Study

- A. A Performance Group shall be convened for any major aviation accident.
- B. A Performance Group should be convened for accidents involving transport and commuter category aircraft in the following situations:
  - (1) Runway overruns
  - (2) Landing undershoots
  - (3) Windshear events
  - (4) Any accident or incident where a nonperformance-related causal factor is not immediately identified or any event for which a performance factor might be involved

Original



Terminology for Component Failures/Malfunctions/Conditions

1. **Accordioned:** Crushed into pleated layers. Usually associated with crushed sheet metal or other material with high capacity for plastic deformation.
2. **Battered:** Damaged by repeated blows or impacts.
3. **Bent:** A deviation from the original line or plane usually caused by lateral force; associated term "bowed".
4. **Binding:** Restricted movement such as a tightened or sticking condition, resulting from high or low temperature, foreign object jammed in mechanism, etc.
5. **Brinnelled:** Small indentations pressed into a surface by contact with other objects.
6. **Buckled:** Bent, warped or crumpled. Usually used to denote deformation by heat, or column buckling.
7. **Bulged:** Localized convex or concave distortion usually caused by excessive local heating and/or differential pressure.
8. **Burnished:** Frictional polishing of a smooth metallic surface by contact with another smooth metallic surface.
9. **Catenary:** The curve assumed by a chain, heavy cord, or the like hanging between two points of support.
10. **Charred:** Frictional wear damage usually caused by two parts rubbing together with limited motion.
11. **Chipped:** A breaking away of the edge, corner, or surface usually caused by heavy impact (not flaking).
12. **Compression Fracture:** Occurs in two general forms - block compression and buckling. Block compression is generally found in heavy, short sections where buckling is found in long, lighter sections. When buckling occurs in such a way that a whole piece buckles, it is referred to as column buckling.
13. **Cracked:** A narrow fissure or rupture caused by fracture of the material; partial separation of material which may progress into a complete break.

Original

14. **Crimped:** Bent or pressed into ridges or folds.
15. **Crippled:** Normally used to denote a local deformation in a thin wall structure which has been overloaded but not fractured. The local buckling typical of short column failures as contrasted to the general bowing failure of a long column.
16. **Dented:** A surface indentation with a rounded bottom usually caused by impact of a foreign object; parent material is displaced, seldom separated.
17. **Deposit:** A build-up of material on a part either from foreign material or from another part not in direct contact.
18. **Disintegrated:** Separated or decomposed into fragments. Excessive degree of fracturing as with disintegrated bearings. Complete loss of original form.
19. **Distorted:** Extensive deformation of the original contour of a part usually due to impact of a foreign object, structural stresses, excessive localized heat or any combination thereof.
20. **Exfoliated:** A type of corrosion that progresses approximately parallel to the outer surface of a metal, causing layers of the metal to be elevated by the formation of corrosion products.
21. **Failed:** Distortion, break, or deterioration which results in the affected part failing to perform satisfactorily the function for which it was designed.
22. **Fatigued:** The progressive fracture of a metal by means of a crack which develops and spreads under repeated cycles of stress.
23. **Flaking:** To form into flakes; to chip or peel off in flakes or to become spotted with flakes.
24. **Fracture:** The creation of new surfaces by a rupture which produces a crack or results in complete separation into two or more parts.
25. **Frayed:** Worn into shreds by rubbing actions.

Original

26. **Fretting or Fretting Corrosion:** Action that results in surface damage, especially in a mildly corrosive environment, when there is repeated or vibratory relative motion between solid surfaces in contact under pressure.
27. **Fused:** Parts or materials jointed by solidification after they have been subjected to melting.
28. **Gouged:** Scooping out of material usually caused by a foreign object.
29. **Grooved:** Smooth, rounded furrow or furrows of wear, usually wider than scoring, with rounded corners and a smooth bottom.
30. **Melted:** Changed by heat from a solid to a liquid or semi-liquid state.
31. **Necking:** Localized reduction in cross-sectional area during deformation under tensile loading.
32. **Nicked:** A sharp surface indentation caused by impact of a foreign object. Parent material is displaced, seldom separated.
33. **Peened:** Deformed or dented by numerous hammer-like blows.
34. **Pitted:** Small irregular-shaped cavities in the surface of a material usually caused by corrosion, chipping, or heavy electrical discharge.
35. **Ruptured:** Breaking apart of material, usually caused by high stresses, differential pressure, locally applied force, or any combination of these.
36. **Scored:** Deep scratches in an object made by contact with sharp edges of foreign particles.
37. **Shredded:** Dividing a body by cutting action, i.e., division of a body so as to cause its parts to slide relative to each other in a direction parallel to their plane of contact.
38. **Spalled:** Sharply roughened area characterized by progressive chipping away of surface material. Usual causes are surface cracks, inclusions, or any similar

Original

surface injury causing a progressive breaking away of the surface under load.

39. **Stripped:** A condition usually associated with threads or insulation. Involves removal of material by force.
40. **Tearing (Shear):** Occurs when the applied forces are acting out of the plane of the surface. The failures are characterized by a lipping of material on the edges of the sheet and by scoring lines on the fractured surface. The concavity of the scoring can be used to tell the direction of tearing. The direction of tearing is from convex to concave. Sometimes, if there is a heavy paint film, the saw toothed breaking of the paint film can be used to tell the direction of tearing.
41. **Tearing (Tensile):** Occurs when the material tears under tensile forces. Except in thin materials, examination of the fracture will disclose "herringbone" marks with the head of the herringbone pointing back to the origin of the tear.
42. **Tensile Fracture:** Part of all the fractured surface is usually made up of a series of planes inclined approximately 45-60 degrees to the direction of loading. Considerable local deformation or "necking" with a reduction of cross-sectional area is also generally evident in ductile materials. If the fracture is pure tension alone, the two halves of the fractures will part cleanly and there will be no evidence of rubbing.
43. **Torsional Fracture:** Similar to the shear failure. Evidence of the direction of torque can be seen on the fractured surface by observing the scoring marks. Most parts retain a permanent twist. In tubing members or a large open section, like a wing, torsion failures often as instability failure in a buckling manner.

Investigation Outline - Structures

EFFECTS OF FIRE

1. Glass cloth fuses at 1200°F.
2. Cadmium plating starts to discolor at 500°F.
3. Melting temperatures in °F:

Pure Aluminum	1175
Titanium	3100
Stainless Steels	2700
Copper	2000
Brass Bearings	1600-2000
Aluminum Alloys	1250
Magnesium Alloys	1250
Lead	625

4. Neoprene rubber blisters at 500°F.
5. Silicone rubber blisters at 700°F.
6. Zinc Chromate paint primers in °F:

Tan	450
Brown	500
Dark Brown	600
Black	700

7. Titanium discolors from tan, to light blue, to dark blue, to gray with increasing temperature.
8. Titanium has a high affinity for gases when heated and a scale will begin to form at 1100°F. This scale increases thickness with time at temperature.
9. Stainless Steel discolors starting at 800°-900°F from

Original

tan to light blue, to bright blue, to black with increasing temperature.

10. Delamination of ends of a piece occurs when part is heated to eutectic melting temperature (lowest melting point of alloying constituents) and then loaded. Failure occurs selectively along grain boundaries, which produces the unusual delaminated appearance.

Eutectic melting temps: 7178 alum - 890°F

11. Soot will not attach itself to surfaces which are over approximately 700°F.
12. Skydrol will sustain a fire at temperatures of 425°F or greater.
13. Parts with large mass may retain sufficient heat to discolor the edges of their fracture surfaces.
14. Flame temperatures of postcrash fire in which fuel, etc., is being burned in still air are generally in range of 1600-2000°F.
15. Flame temperatures of in-flight fires may be in excess of 3000°F due to forced draft.
16. Damage from arcing is very localized and will have an eroded appearance. There may be metal splatter similar to that produced in arc welding.

## Overview

Accident investigations should include inquiries about the transportation of hazardous materials cargo (dangerous goods) aboard an aircraft. An unintentional release of hazardous materials from a container may be causal or contributory to an accident.

Safety regulations limit the type and quantities of hazardous materials that may be legally transported aboard aircraft and some hazardous materials are prohibited in any amount. The captain of an aircraft must be informed, in writing, of any hazardous materials cargo loaded aboard the aircraft and air carriers should have a record. However, undeclared hazardous materials may be hidden in general freight or passenger luggage and the possibility should always be considered in accident investigations.

### Safety Precautions

When hazardous materials are reported to be onboard an aircraft involved in an accident, the Investigator-in-Charge should take immediate steps to identify any safety hazards posed by a release of the hazardous materials before investigators enter the accident site. The investigator should ask for documents that identify the hazardous material, quantity, emergency response information, and name and telephone number of the shipper and manufacturer.

The accident site should be entered only after the IIC is satisfied that hazardous materials do not pose a risk to personal safety. Exposure to hazardous materials may result in corrosive damage to body tissues, thermal injury, asphyxiation, radiation injury, disease, absorption of poisons or toxins by inhalation or through the skin, or mechanical injury (fragments from explosives or from the failure of stressed containers).

Guidance should be sought from the emergency response incident commander to assess the possibility of hazards to personal safety. Don't take chances. Check the credentials of anyone offering information about the hazardous properties of dangerous goods involved in an accident. Satisfy yourself that there are no threats to your safety. The following persons or organizations should be able to provide information on the physical, chemical, and hazardous properties of materials:

Local Emergency Response Personnel  
 Shipper or manufacturer of the hazardous materials  
 CHEMTREC (1-800-424-9300) (Chemical Transportation  
 Emergency  
 Center)  
 Department of Energy (Radioactive Material)  
 State Health Department

Do not direct emergency response actions or activities to clean up a hazardous materials release. This is the responsibility of emergency response personnel who may take action to mitigate dangerous conditions or who may require the shipper or carrier to take actions to clean up a hazardous materials release. The need of preserving evidence should be explained to personnel directing any hazardous materials clean-up and a request should be made for care to preserve evidence during clean-up activities. However, safety comes first. Do not become a part of the accident.

Original



Identification/Documentation of Hazardous Materials Involvement

Hazardous materials may pose a variety of threats to the safe operation of an aircraft if unintentionally released. Specific hazard classifications and descriptions can be found in Title 49 CFR 173.1 and 173.2, IATA Dangerous Goods Regulations, and ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air. Generally, hazardous materials are described by the following classifications:

- (1) Explosives
- (2) Flammable gas
- (3) Non-flammable compressed gas
- (4) Poisonous gas
- (5) Flammable and combustible liquid
- (6) Flammable solid
- (7) Spontaneously combustible material
- (8) Dangerous when wet material
- (9) Oxidizer
- (10) Organic peroxide
- (11) Poisonous materials (liquid or solid)
- (12) Infectious substance (etiologic agent)
- (13) Radioactive material
- (14) Corrosive material (liquid or solid)

The following evidence should be documented when hazardous materials are found to be transported onboard an aircraft involved in an accident:

- (1) Shipping documents
- (2) Name, hazard classification, and quantity of material
- (3) Chemical, physical and hazardous properties of material
- (4) Shipping container type, markings, labels, and areas of mechanical failure or damage
- (5) Notification to Captain
- (6) Location stored on aircraft
- (7) Damage directly related to the release of the hazardous material
- (8) Relevant crew or witness observations

Look for evidence that may indicate the unintentional release of hazardous materials before any crash forces.

Original

### Hazardous Materials Division Support

The Hazardous Materials Division should be contacted whenever hazardous materials cargo is determined to be transported aboard an aircraft that is involved in an accident. The Division can provide guidance and/or technical support as needed in the identification and documentation of safety issues.

When the transportation of hazardous materials aboard an aircraft is believed to be causal or contributory to an accident, the Division should be contacted immediately. The Division can then assign a group chairman or IIC, as appropriate, to the investigation.

Original

## Overview

General aviation activities are those other than certificated air carrier and supplemental air carrier operations. These activities include student instruction, executive/corporate-type flying, aircraft demonstrations, sightseeing flights and aerial photography, etc.

Certain general aviation accidents will be investigated as team efforts. In such cases the procedures relative to submission of group chairman/specialist reports are to be found in Volume III of this manual. When so directed by the Director, Office of Aviation Safety, the Investigator-in-Charge of a general aviation accident investigation shall submit his report in the standard ICAO format. In all other cases, NTSB Form 6120.4, Factual Report Aviation Accident/Incident, will be used by the IIC for reporting general aviation accident/incident investigations.

A dedicated number is assigned to each accident investigation and reflects the type of investigation conducted on each occurrence. The number system is found in Board Order NTSB 41E. Each Regional and Field Office should carry a detailed log of all the accidents that the offices are investigating.

Pilot/Operator Aircraft Accident Report NTSB Form 6120.1/2 shall be required for general aviation accidents and air carrier accidents in order to obtain the necessary information to complete the NTSB Form 6210.4 and supplements. Operators of public-use aircraft are also required to submit a NTSB Form 6120.1/2.

If the pilot or operator fails to submit NTSB Form 6120.1/2 as required, the required information should be entered in the factual report under the Additional Information Section. A copy of the certified receipt from the post office should be attached to the report. Once the report (including coding, 200-word narrative and sequence of events) is completed and quality controlled, it will be forwarded by the Regional Office to the Analysis Staff (AS-20). On NTSB investigated general aviation accidents, the NTSB IIC will prepare the NTSB Form 6120.4. NTSB IIC's will forward to the FAA coordinator a copy of the completed NTSB Form 6210.4, with attachments, to include photocopies of photographs included in the investigator's report. Board investigators are encouraged to discuss all aspects of an accident with the FAA coordinator before preparing the report. This will resolve any

Original

differences of opinion that might be present and will allow the FAA coordinator an opportunity to contribute to the end product.

On accidents investigated by the FAA for the NTSB, the FAA investigator will submit NTSB Form 6120.4, with attachments, to the NTSB respective office. If NTSB Form 6120.4 or any part of the accident file is considered incomplete or inadequate to the point where any analysis and probable cause cannot be determined, the report is to be returned by the NTSB Office to the originating FAA writer. Again, personal contact is suggested by telephone in order to point out the deficiencies, and the Board investigator is encouraged to assist the writer in the form of suggestions and solutions.

Toxicological findings are made a part of the factual report and the results, if necessary, should be addressed under the headings Medical and Toxicological.

The autopsy protocol (pathological examination reports) will not be included in the factual report. When they have a significant bearing on the probable cause, pertinent excerpts will be included in the narrative portion of the factual report along with identifying information, place and date of the examination, as well as the names and addresses of the doctors and/or laboratories that produced the reports.

Medical records should not be included in the factual report unless they are pertinent and related to the cause/factor/safety recommendation.

NTSB Form 6210.15 "Wreckage Release Form" should be an attachment to the factual report. A short statement as to the particulars of the release should be contained under "Additional Information." Special emphasis should be made to document the disposition of parts retained for further studies.

Original

### Memorandum Reports (Analysis)

Other pertinent information for use by the Board in determining the probable cause, and related information for which the accident report forms made no provisions for reporting, may be forwarded as a memorandum to the Chief, Regional Operations and General Aviation Division, AS-20, included in a separate folder marked "FOR OFFICIAL USE ONLY."

The investigator's comments, opinions, or analysis which might be of help to the Board in making the determination of probable cause may be forwarded in this manner, but shall not be a part of the factual report of the investigation. Do not introduce new facts into the analysis.

Autopsies and medical records, if necessary, should be included in the same folder marked "FOR OFFICIAL USE ONLY" (See sample label at the end of this section).

The following documents should be included in the "FOR OFFICIAL USE ONLY" folder:

- (1) A 200-word narrative of the investigation detailing the highlights of the accident.
- (2) A statement of probable cause prepared by the investigator typed or printed on a plain piece of paper, and
- (3) A coding sheet created following the instructions contained in the NTSB Coding Manual.

Original

Completing NTSB Form 6120.4

The basic requirements are depicted with a circle. However, any other data fields that are related to cause or factors should be completed. An example would be blocks 57 and 58, which refer to engine time and time since inspection/overhaul. If a power loss was coded as a cause or factor, those blocks should be completed even though they are not circled. Similarly, one can still use any supplement determined to be pertinent.

Narrative Statement of Facts, Conditions and Circumstances Pertinent to the Accident/Incident

It is only necessary to address pertinent data not found in the remainder of the report. The only exception to this are issues that involve cause or factors. That information must be included in the narrative. Often such related data is included in an enclosure. In that case, the enclosure can be briefly summarized and referred to for closer review at the discretion of the reader. Additionally, it is not necessary to discuss things that were unrelated to accident circumstances.

The report of an investigation will contain:

- (1) A properly signed original NTSB Form 6120.4, with appropriate supplements, and originals of all exhibits comprises the Factual Report of Investigation. NTSB Form 6120.3, Accident File Contents will be placed at the beginning of the file to identify all items of the factual report. The original of the factual report for field investigations will be placed in a red pressboard binder, size 8-1/2" x 11" - NSN 7510-00-281-4309. A file label will be placed on the upper left-hand corner of the file folder (with the binding edge of the folder on the left-hand side).
- (2) For limited investigations, use a Kraft folder with 1-4/8" prong fastener - NSN 7530-00-926-8978. File label will be placed on the upper left-hand corner of the file folder (with the open part of the folder up).
- (3) For analysis folder, use a Kraft folder with 1-4/8" prong fastener - NSN 7530-00-8978. Use

Original

type of label identical to the label on the factual report folder. It will be placed on the upper left-hand corner of the file folder (with the open part of the folder up).

The reports on accidents involving two or more occupied aircraft (intent of flight) shall be submitted in a single folder and titled using the make, model, and registration of both aircraft, and a single accident number followed by the letter A or B to identify each particular aircraft. One analysis folder will be used in this case.

When it is necessary to submit a supplemental report after the initial report has been forwarded to the Washington Office, a folder will not be used. A new NTSB Form 6120.3 reflecting any changes should be included.

The first item in the factual report folder should be the Accident File Contents sheet, NTSB Form 6120.3. The rest of the report should consist of those items which are applicable as listed on the attached Accident File Contents sheet. Form samples are at the end of this section.

The Accident File Contents sheet and the Narrative of the Factual Report of Aviation Accident/Incident (block 16) must be typed. The remainder of the NTSB Form 6120.4 and supplements may be hand printed neatly in black ink. The narrative for the Factual Report of Aviation Accident/Incident for field investigations shall be written in ICAO outline. If a particular subject is not pertinent to the accident, do not list or address the area. For example, if communications were not a factor in the accident, do not address that area.

The narrative portion of the report will be used to describe the details and to explain the relationship to the accident of the pertinent blocks entered in the form, for example:

- (1) If the terrain had a bearing on the accident, give details in the narrative report.
- (2) If the aircraft weight or c.g. are of significance in the accident, list the computations.
- (3) If the quantity of fuel is a factor, how was the quantity of fuel aboard determined?

Original

The narrative portion may also be used to document other factual data that is pertinent, but not called for, in the NTSB Form 6120.4. The narrative portion of the report should be concise chronological sequence of events and details of environmental conditions at the time of the occurrence. This information should be completely factual and in no way analytical in content.

The narrative for the Factual Report of Aviation Accident/Incident for limited investigations shall include the standard synopsis paragraph followed by the History of Flight from the initiation of the flight to the accident. The ICAO format need not be used.

All times recorded will be based on the 24-hour clock. The time zone is indicated on page 1, block 15, of the NTSB Form 6120.4 and should not be repeated throughout the report. Investigator's name, either typed or printed and signature, should be at the bottom of page 1 of NTSB Form 6120.4.

Photographs must be mounted on bond paper and numbered with captions for each photograph. Negatives should be included only for those photographs which are being submitted with the report. The negatives should be cut and placed in small envelopes (2-1/2" x 4-1/4"). The envelopes should be numbered to correspond with the appropriate photograph and should be attached to the reverse side of the bond paper with the corresponding photograph.

For those accidents in which weather may have been involved, the Operational Factors Division (AS-30), Washington, D.C., may be requested to make a partial weather analysis or complete study as needed. The fact the pilot continued into adverse weather is only part of the cause consideration. The investigator must establish whether the pilot received a weather briefing. Records of such briefings are retained for six months by the National Weather Service, but for only 15 days by the FAA. It will be necessary to establish the adequacy and completeness of the briefings. Consideration should be given to the following list of possibilities:

- (1) Was the briefing complete and adequate and were the forecasts accurate?
- (2) Was the pilot misled as the result of an inaccurate forecast or inadequate or incomplete briefing?

Original



- (3) If a weather briefing was not obtained or if it is not known if one was secured, the report must include:
  - (a) The available weather information which the pilot could have obtained, and
  - (b) The accuracy of the available weather reports.

An air carrier turbulence occurrence in which a weather study is requested will also require the Investigator-in-Charge to secure the flight recorder (DFDR).

Engineering Services Division will provide a copy of the tape readout to Operational Factors personnel for their use in preparation of the weather study when necessary. Always consider if the support requested is really necessary, or perhaps an abbreviated weather study or a short metallurgical report will suffice.

Original

### Reporting Foreign Accidents

Accidents involving U.S. registered aircraft in a foreign country should be documented by completing NTSB Form 6120.19A with the available information. These accidents will be designated with a "W" (no travel), or an "R" (travel to the foreign country or travel associated with the accident). The letter should be entered in the sixth position of the Accident/Incident number. No other public report will be required by the field for the completion of the accident investigation. Only pages 1 through 3 of the Preliminary Report will be completed; page 4 should not be completed.

The information in the narrative should contain an agency name and/or a person to contact for further information pertaining to the investigation. A statement should be made that the report is for information purposes only and contains only information released by, or obtained for, that country.

The Preliminary Report will be released to the public; therefore, use the standard procedures to complete the NTSB Form 6120.19A; a sample copy is attached to this section.

Original

\* \* \* SAMPLE ONLY \* \* \*

Transportation

National  
Safety Board  
Memorandum

Date:

To: Public Inquiries Staff, RE-51

Thru: Chief, Field Operations and General Aviation Div.,  
AS-20  
Director, Office of Aviation Safety, AS-1

From: Regional Director, Miami Regional Office

Subject:

The attachment listed below is transmitted for inclusion with the

/ / Factual Portion

/ / Official Use Only Portion

of the report of the subject accident which was mailed from this office on \_\_\_\_\_.

Jorge A. Pallezo

Original

Attachment

Original

\* \* \* SAMPLE ONLY \* \* \*

NATIONAL TRANSPORTATION SAFETY BOARD  
Washington, D.C. 20594

"FOR OFFICIAL USE ONLY"

GROUP CHAIRMAN'S ANALYSIS OF INVESTIGATION

A. ACCIDENT

(Location - date - time - aircraft)

B. (Insert name of Group) GROUP

C. ANALYSIS

1. (Give full opinion as to what each fact means and what bearing and weight such fact or evidence has to the occurrence.)

2.

etc.

D. FINDINGS

1. (State the principal findings briefly and concisely.)

2.

etc.

E. CONCLUSION

1. (Give your opinion on the relevancy of the findings to a probable cause of the accident or as contributing factors to the accident.)

2.

etc.

Chairman) (Name and Signature of Group

(Date of report)

Original

\* \* \* SAMPLE ONLY \* \* \*

## Preparation of Drafts of Board Reports

### General

Personnel may be called upon to write narrative aircraft reports according to the ICAO format.<sup>2</sup> The ICAO format is the Safety Board's basic framework for major aviation accident reports. Accordingly, this section is written to set down "dos," to follow in structuring an accident report by ICAO format.

ICAO format has proven to be well structured and assures that complete investigatory information is presented in a standardized way. Member States concluded that by using a common format, the effective accident prevention could be obtained from the others' reports.

Within the Board, ICAO format provides uniformity of aircraft accident reports written by various personnel. It also serves as a check for complete coverage of the areas of investigation of an accident.

### The Synopsis

The Synopsis of the aircraft accident report is a summation of the accident. It states briefly the who, when, where, what and why of the accident. The why, of course, is the probable cause. After the probable cause, a sentence should be added indicating to whom recommendations were directed.

### The Investigation Section

The Investigation section is composed of 16 subsections. These subsections cover the major areas of investigation in a uniform manner and in a logical sequence.

Make this section factual.

Give the reader a good understanding of the accident.

Stress the area of the accident investigation bearing on the causal consideration.

---

<sup>2</sup>Refer to ICAO standards and procedures outlines in Part 1.

Original

Establish a complete and substantive basis for the analysis and conclusions section of the report.

Stress the areas which form the basis for corrective measures.

Original



The Investigation section may, at times, present problems as to where to put certain factual material peculiar to a specific accident. No format can be derived to avoid these contingencies, and they can be handled without unduly compromising the format or the quality of the report.

Select the subsection logically suited to the special material. If flight preparation and flight preparation procedures are pertinent, add them to 1.1 History of the Flight under subsections 1.1.1, 1.1.2, etc.

Borrow from voice recorder and other subsections only when necessary.

Put material about evacuation and rescue under survival aspects. This is the subsection for which this information is intended. Fire information belongs in 1.14 "Fire."

Include pertinent eyewitness information under the appropriate heading.

Include pertinent flight recorder and voice recorder information under their designated subsections.

Put detailed examination of wreckage under 1.12 Wreckage, not under 1.3 Damage to Aircraft.

Put only crew and aircraft information which is substantive to the accident under their respective subsections. Put detailed information in Appendixes B and C, respectively.

### Analysis, Findings, and Probable Cause

This section of the report is intended to present an analysis of the facts of the investigation. It should show the Safety Board's interpretation of the facts, conditions, and circumstances upon which the probable cause is based.

State reasons and evidence for conclusions.

Do not introduce new facts into the Analysis.

Make the analysis lead up to the probable cause. A reader should be able to anticipate the causal factors from the analysis.

Original

Make the analysis "accident prevention-worthy" not blameworthy.

Make sure the conclusions can be supported by the facts and that they are not those which the writer simply believes.

#### INSTRUCTIONS

#### AVIATION INVESTIGATION MANUAL

#### VOLUME 3

INSERT HUMAN PERFORMANCE FACTOR GRID AFTER PAGE 3-72

INSERT TYPICAL FRACTURE APPEARANCE DIAGRAMS AFTER PAGE  
3-160

INSERT SAMPLE NTSB FORM 6120.19A, REPORT LABELS AND NTSB  
FORMS 6120.3 AFTER PAGE 3-174