

## APPENDIX A

### STAKEDOWN DUTIES OF FIELD INVESTIGATORS

The following information discusses the initial response of Regional staff to a major accident prior to the Go Team's arrival. There are two distinct areas of responsibility, those who go to the scene ("goers") and those who stay at the office or residence for phone coordination with all involved parties ("stayers"). Both are equally important and must function as a coordinated team.

#### GOERS

Immediate response is necessary. All Air Safety Investigators (ASIs) should have at the office a jump suit, suitable foot wear, and a packed bag of necessities for an overnight stay. Number one goer should take a mobile phone and, if possible, the video camera. The purpose of the video is twofold: 1) documentation of wreckage in the early stages of response and 2) training.

1. Upon arrival, contact the on-scene commander, introduce yourself as the NTSB representative pending arrival of the Go Team. Explain that the team is en route and state their ETA. Whoever initially establishes contact with the on-scene commander should remain the primary representative. If a change is appropriate ensure the on-scene commander is advised. Stay close to the command post.
2. Immediately after assessing the scene, call the number one stayer. Ask him/her to attempt to establish a conference call with Washington.
3. Attempt to make no media comments. If media pressure cannot be avoided mention only that the team is en route, their ETA, and the names of the assigned Board Member, public affairs officer, and IIC.
4. Work with local officials to document any wreckage manipulation for removal of bodies or rescue of survivors. Ensure that body removal is properly documented and photographed. This should be done as a team effort by local officials and the medical examiner. You are not expected to participate in this process. You are responsible to ensure that it is done properly.
5. Do not initiate your own investigation. Do not contract for any services unless specifically requested or approved by the IIC.
6. Thoroughly photograph the scene with still and video cameras. Often your pictures will be the only ones of the scene prior to body removal and the associated disturbance of wreckage. Make copies available to the IIC as soon as possible, preferably before the Organizational Meeting. Retain your negatives, unless they are specifically requested by the

## IIC.

7. Communicate frequently with the stayers. This is especially true if you are out of beeper range. The two groups must work together to keep headquarters aware of what is going on at the scene.
8. Put high priority on recovery of the CVR and FDR. Coordinate with the stayers and headquarters to get the recorders to the lab as soon as possible.
9. In the event of surviving crewmembers, make yourself aware of their location and pass that information to the IIC.
10. Determine if any hazardous material is involved. If so, protect yourself and brief the IIC.
11. Ensure that the designated media area is not too close to wreckage. If on an airport that has a public relations department, coordinate with them.
12. Attempt to meet the Go Team and debrief the Board Member and IIC on known facts, problems, and actions taken thus far. Introduce them to the on-scene commander, appropriate ARFF officials, and any other pertinent individuals at the scene. A smooth transition of command from the local NTSB to the Go Team is imperative. There should be no doubt in the on-scene commander's mind who is representing and leading the Safety Board at any given time.
13. Make sure that someone from NTSB is at the scene until relieved by the Go Team. If this becomes an extended period of time or conditions are intolerable, arrange shifts to share this responsibility. Do not work under extreme conditions too long.
14. A goer should attend the Organizational Meeting prepared to brief the team.
15. Do not commit to being a Group Chairman without coordination with local management.

## STAYERS

1. If after-hours, decide if duties can be performed at home or if they require use of the office. This will be based on the complexity of the accident, time of day, and number of people available. The regional director/field chief, or whoever is acting, will normally be the number one stayer. If necessary, stayer duties can be performed from either the regional office or the satellite office for any location in the region.
2. Document all phone calls in detail.
3. Coordinate with AS-1, AS-10, and AS-20 continually. One of these offices will become

your primary point of contact at headquarters.

4. Hotel:
  - A. Hotel reservations must be made immediately. Get estimates from headquarters regarding how many rooms for NTSB, FAA, and the parties.
  - B. Attempt to get a hotel as near to the scene as practical, within per diem, and with full-service restaurant and lounge on site. If unable to meet all of these needs, with coordination with AS-1 and AS-10, contact the Board Member or his/her special assistant to determine the Member's priorities.
  - C. The meeting room for the command post should have capacity for 50-100 people, depending on the nature of the accident.
  - D. Arrange for six phones, two of which will be designated for media, with phone numbers released as such. One should be designated for the IIC with a secure number only known to the IIC. A seventh phone line will be needed for the fax machine mentioned below.
  - E. Arrange for a copier, fax machine, laser printer, and personal computer ("486" with 100+ megabyte hard drive recommended) with a 3 1/2 inch floppy drive and WordPerfect 5.2 software installed.
  - F. Use all known assets in selecting the command post, since it is very difficult to change once established. Ask local residents, police officers, chambers of commerce, FSDO inspectors, etc.
5. Rental car arrangements may be delegated to you. If so, make sure no one from headquarters duplicates your efforts. If in doubt, ask AS-10.
6. Coordination with local authorities and headquarters regarding activities on scene could be the stayer's responsibility for up to four hours. Make yourself available. This may dictate opening the office in order to have access to several phone lines. In such cases, it will probably be a two-person job for the first hour of so.
7. For after-hours accidents, whoever takes the first call will be the primary point of contact until relieved by the number one stayer. Depending on the situation, this could be a few minutes or the duration of the initial response. Once you realize that you are taking notification on a potential Go Team accident, establish a conference call with the primary stayer through the FAA communications center (202-863-5100). Notification of headquarters will then begin with that conference call.

#### ATC TOXICOLOGY TESTS

Either stayers or goers may be called upon by the IIC or headquarters to assist in coordinating toxicology tests for ATC personnel. This responsibility could include taking custody of samples.

**APPENDIX B**  
**ON-SCENE ORGANIZATIONAL CHART**

## ON-SCENE ORGANIZATIONAL CHART

IIC \_\_\_\_\_

ACCIDENT # \_\_\_\_\_

|                  |  |  |  |  |
|------------------|--|--|--|--|
| Party →          |  |  |  |  |
| ↓ Group          |  |  |  |  |
| Coordinator →    |  |  |  |  |
| Operations       |  |  |  |  |
| Human Perf.      |  |  |  |  |
| Structures       |  |  |  |  |
| Systems          |  |  |  |  |
| Powerplants      |  |  |  |  |
| Maintenance Rec. |  |  |  |  |
| ATC              |  |  |  |  |
| Weather          |  |  |  |  |
| Aircraft Perf.   |  |  |  |  |
| FDR              |  |  |  |  |
| CVR              |  |  |  |  |
| Witnesses        |  |  |  |  |
|                  |  |  |  |  |
|                  |  |  |  |  |

### OTHER PERSONNEL

BOARD MEMBER  
ASSISTANT

\_\_\_\_\_  
\_\_\_\_\_

SPECIAL ASSISTANT  
PUBLIC AFFAIRS

\_\_\_\_\_  
\_\_\_\_\_

LOGISTICS

GOVERNMENT LIAISON  
OBSERVER

\_\_\_\_\_  
\_\_\_\_\_

OBSERVER

\_\_\_\_\_  
\_\_\_\_\_

OBSERVER

## APPENDIX C

### IIC's OPENING STATEMENT AT ORGANIZATIONAL MEETING

We are here to investigate the accident involving [airline, flight #, aircraft type] that crashed at [location], on [date]. I have distributed information that addresses several pertinent Safety Board procedures regarding the conduct of aircraft accident investigations. Please read this and make sure that you understand all of the information given. Everyone participating in this investigation must adhere to these guidelines throughout the conduct of this investigation. Please keep in mind, though, that these guidelines are not intended to be all-encompassing. If you have any questions concerning procedures during the investigation or believe that you will be unable to follow a procedure, please see me.

I would now like to discuss participation by parties to this investigation.

National Transportation Safety Board rules limit party status in aircraft accident investigations to 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." We allow participation by parties in our investigations for two reasons. First, parties, can assist the Safety Board by offering technical expertise that it may lack. Consequently, all persons participating in this investigation must be in a position to contribute knowledge or skills that could be relevant to the investigation. As a result, you may be asked to describe the qualifications of the individuals you nominate to participate in this investigation.

Second, and more important, party participation enables a company or organization to have immediate access to facts concerning the accident should it need to quickly initiate preventive or corrective action. If a problem is discovered, safety concerns require that it is immediately remedied, often by the company.

A party coordinator will supervise the members of each party involved in this investigation. This individual should also possess sufficient authority within his or her organization to be empowered to make decisions on behalf of the organization during this on-scene phase. In addition, there is no such thing as an assistant or co-coordinator. A single individual speaks for a party. The party coordinator will be the NTSB's direct and official point-of-contact for your organization and, therefore, should be able to maintain contact with me at all times while we are here. Sometimes decisions will have to be made very rapidly and we cannot waste time trying to track each other down. Consequently, I request that any coordinator who is not present at the command post be available for contact by mobile phone, by beeper, or by other means.

Each evening we will convene a Progress Meeting to learn the facts that have been gathered during the course of the day, and to plan strategies for the next day. I would like the party coordinators to represent the parties at these meetings.

The Safety Board will disseminate to the public all information regarding the accident, either through our Board Member, public affairs officer, or myself. We will hold regular briefings to the press. Please refrain from discussing the accident in public, or giving information about it to the press. Any violation of this request will be considered a serious infraction of Board rules.

I hope I do not need to remind you that an airplane accident site can be a very dangerous environment. It may contain damaged but fully inflated tires or pressurized oxygen bottles, precariously balanced pieces of large heavy aircraft structure, razor-sharp torn sheet metal, scattered hazardous cargo, and the like. There may also be decaying organic material that can expose personnel to viruses such as hepatitis or AIDS. Please wear appropriate protective garb when working near the accident site, including rubber gloves with heavy leather gloves over them, strong boots, eye goggles, and the like. Lastly, from a psychological standpoint, please beware of the potential effects that a tragedy such as this accident can have on you. Working around scenes of death is not easy. The NTSB people in this room are accustomed to working in an environment like this. Most of you probably are not.

Are there any questions?

At this time, I would like to explain the NTSB group system of investigation.

Participants from the parties will be assigned to working groups led by NTSB specialists, called Group Chairmen, for the duration of the on-scene investigation. As a rule, we do not permit anyone who is unwilling or unable to remain with their assigned groups for the approximate \_\_\_\_ days of this on-scene phase to participate in the investigation.

The working groups are going to be as small as possible while maintaining the ability to accomplish their assigned tasks. Decisions as to who will be on the working groups will be made by the NTSB Group Chairmen. See me if you have questions about the Group Chairmen's decisions.

Each participant in the investigation will be given an identification badge allowing entry to the site and the command post. Please wear these at all times when working on the investigation during this on-site phase.

I know I have thrown a lot of information at you in just a few minutes. Please feel free now, or any time from now on, to ask questions. We will now identify party coordinators and assign individuals to working groups.

## APPENDIX D

### GUIDANCE FOR PARTY COORDINATORS AND OTHER PARTICIPANTS IN THE INVESTIGATION OF AIRCRAFT ACCIDENTS

As mentioned in the opening statement by the Investigator in Charge (IIC) during the organizational meeting for this accident, this guidance handout contains expanded information concerning your role as a party to the investigation and general Safety Board administrative procedures. Please keep in mind that these guidelines are not intended to be all-encompassing. If procedural questions arise during the investigation, the IIC is your best source of information.

#### 1. Role of Parties to the Investigation

The primary purpose of permitting the participation of organizations in an accident investigation is to assist the Board in developing a complete and accurate factual record of the accident. It likewise enables responsible safety officials whose product 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 a Party Coordinator or as a representative of a party to the investigation. Later, your organization may be designated as a party to any public hearing on the accident the Board may hold, provided it meets the Board's requirements. Participation in the investigation does not automatically guarantee party status at an NTSB public hearing, if one is held. Likewise, participation in the investigation is not a prerequisite to participation in a hearing.

All persons participating in the Safety Board's investigation must be in a position to contribute specific factual information or skills that would not otherwise be available to the Board. Also, no participating organization will be permitted to be represented by a person whose interests lie beyond the safety objective of the accident investigation. The Board's rules specifically prohibit any party from being represented by a person who represents claimants or insurers. Participants in the investigation shall be responsive to the direction of Safety Board personnel and may be expelled from the investigation if they conduct themselves in a manner prejudicial to the investigation or do not comply with their assigned duties. If you are a coordinator for your organization, you will also be required to sign a statement to ensure your complete understanding of 49 CFR Part 831.11 of the Board's regulations related to parties to the field investigation. During the on-scene phase of the investigation, party coordinators are responsible for the behavior of their employees or representatives.

#### 2. The Role of the Federal Aviation Administration in the Investigation

The National Transportation Safety Board is charged by Congress in accordance with Title VII of the Federal Aviation Act of 1958 with the responsibility of investigating civil aircraft accidents and to report the facts, conditions, and circumstances relating to each accident and probable cause thereof.

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

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 [Safety] 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 FAA on behalf of the DOT is the only party as a matter of right; no other organization is automatically entitled to participate in an NTSB investigation.

In certain occasions in the past, some individuals have been reluctant to talk to Safety Board investigative teams because some of the team members are employees of the FAA, the organization responsible for enforcement of Federal Aviation Regulations. To preclude such reluctance, Safety Board working policy permits an interviewee to request exclusion of FAA employees from investigative interviews. Be advised, however, if FAA personnel are excluded from the NTSB interview, the FAA will probably want to interview the person involved in the accident immediately following the NTSB interview. Also be aware that the substance of the NTSB interview will be made available to all of the parties, including the FAA.

### 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 CFR Part 845 of the Board's Rules of Practice in Aircraft Accident Inquiries. After the hearing, a transcript of the hearing will be prepared for inclusion in the public docket of facts relating to the occurrence. Public hearings are discussed in further detail later in this paper.

### 4. Recovery and Security of Wreckage

For the purposes of its investigation, the 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 Safety Board cannot assume responsibility for the recovery of deceased accident victims, crowd control, the recovery and removal of wreckage that may constitute a public danger or nuisance, or normal police, fire, and rescue services. Should special and unusual circumstances arise in this area, consultations with appropriate local government officials will take place. Following completion of the on site investigation or examination of the airplane, the site and aircraft wreckage will be released. Any further provision of security of the site or aircraft parts are not the responsibility of the Safety Board.

### 5. Handling of Accident Information Within the NTSB Investigation

The flow and dissemination of information during the course of a Safety Board investigation shall follow a distinct pattern: no individual or group will withhold information. Failure to follow this policy is grounds for dismissal from the investigation. Factual information obtained by group members assigned to the team will be brought to the attention of their respective Safety Board group chairmen. All information gathered by various groups during the investigation will be passed to the IIC by the group chairman. Each participating party will designate a party coordinator (spokesman) for its organization. Group members may pass factual information to their respective party coordinators after this information has been given to their group chairman. All of the factual information and developments of the investigation that are known to the IIC will be passed on to each of the party coordinators. Coordinators may relay information to their respective organizations provided the information is factual and in correct perspective. This information should be transmitted on a "need to know" basis for purposes of accident prevention, remedial action, or other similar reasons, and not for public release. The party coordinators should keep the IIC apprised of how the information will be put to use. Common sense and good judgment must predominate in this matter, to eliminate acting on preliminary information that later proves to be untrue.

#### 6. Dissemination of Information to the Public

Contacts with news media regarding the facts and circumstances of the accident will be made only by the on-scene Member of the Safety Board or the on-scene Safety Board Office of Public Affairs representative. If neither a Board Member nor a representative of the Office of Public Affairs is available, such contacts will only be by the IIC. Contact with the media by party coordinators, NTSB group chairmen, or group members is not authorized and will be grounds for removal of those individuals or organizations from the investigation.

Following progress meetings, and at other unscheduled times when significant information comes to light, the Board Member, Public Affairs Officer, or IIC will brief the press on the facts collected by the team. In many instances, one or more parties to the investigation will be adversely affected by the release of factual information. This situation is unavoidable and often causes ill feelings on the part of the affected party. However, the Safety Board rules and procedures regarding release of information gathered during an investigation were designed to prevent parties with vested interests from "leaking" or releasing information that would adversely reflect on other parties. The Safety Board's independence and objectivity makes it the correct organization to make public announcements of the facts. If the facts are not released by the Safety Board, parties with something to gain will make unauthorized releases. Questions regarding these regulations and policies should be resolved in discussions with the Board Member, Public Affairs officer, or IIC to prevent unnecessary bad feelings amongst the investigation team members.

Party coordinators are authorized to allow their public affairs representatives to release general background information about their organization to the news media during the on-scene phase of the investigation. General information such as the number of employees in a company, the numbers and types of aircraft in a fleet, and the like, is releasable. When in doubt about releasing information, contact the IIC or the NTSB Public Affairs representative.

In closing, the guiding policy of the Safety Board regarding release of information may be summarized as follows:

The Safety Board is a public agency engaged in the public's business and supported by public funds. The work it does in the business of aviation safety is open for public review, and the Act under which it operates makes this mandatory. The Safety Board believes that briefing news media factually during the on-site investigation of an aircraft accident should be a normal operational part of that investigation.

Copies of 49 CFR Part 801, the National Transportation Safety Board's Procedural Regulations regarding public disclosure of aircraft accident information are available from the IIC for guidance in this matter.

#### 7. Assignment and Duties of Group Members

The IIC and group chairmen will assign and organize the various investigating groups. As this is done, please keep in mind that those selected as group members should have expertise in their proposed area of investigation and must be prepared to remain with the investigation until completion or until released by the group chairman and the IIC. The on-scene phase of an investigation requires the undivided attention of participants for up to two weeks. In extraordinary circumstances, any necessity to move or remove a person from any investigative group must be promptly brought to the attention of the IIC by the respective group chairman or the involved party coordinator. Party coordinators and key party personnel can expect to be involved in the investigation, perhaps intermittently, for between 6 to 9 months or longer.

##### a. Group Notes

Group notes are a compilation of factual findings discovered by the group during the on scene phase of the investigation. Under the direction of the Safety Board group chairman, one set of group notes will be developed for each group at the accident scene. Depending upon the group, the notes could contain interview summaries, wreckage diagrams, cockpit documentation lists, damaged component descriptions, photographs, video/audio tapes, and the like. Group notes are very important because they are the foundation for the group chairman's factual report. They are also important because witness memories can change with time, and the wreckage itself could be altered, if not destroyed, shortly after the on scene phase of the investigation is completed. Therefore, the group notes are the only official representation of conditions immediately after the accident.

Each group member will participate in a complete review of the group notes for technical accuracy and adequacy of the scope of the investigation and to provide feedback to improve the factual report. Before the group members are released, each group member will be given an opportunity to sign the group notes signifying that he/she has reviewed the notes and that any existing discrepancies reflected in these notes have either been corrected,

resolved, or annotated as dissenting opinions. Each group member will be provided with a copy of such group notes prior to release from the working group to which he or she is assigned. At a later date, copies of group chairman's final factual report will be provided to the participating group members. Group members will normally be provided an opportunity to comment on the reports before they are finalized. It should be understood, however, that the final factual report is the group chairman's responsibility and concurrence by the entire group is not required. Dissenting opinions should be provided to the group chairman.

#### 8. Observers

The Safety Board IIC may designate properly accredited members of aeronautical organizations, designated military personnel, or representatives of foreign governments as observers to the investigation. The sole purpose of the observer status is for training and familiarization with the investigative process. Observers should not have any self-interest in the investigation, and they will be permitted access to only those portions of the investigation deemed necessary by the IIC. Observer status must be coordinated and approved in advance. Personnel so accepted will be under the direct control of the IIC and will be given factual information on a "need to know basis." The restrictions concerning dissemination of accident information apply to all observers. Persons not qualified in these categories shall not be granted observer status during the on-scene phase of the investigation.

#### 9. Accredited Representatives of Foreign Governments

The Accredited Representative of a foreign government and his properly designated advisors will be afforded the courtesies and rights as outlined in Annex 13 to the Convention on International Aviation. The restrictions concerning dissemination of accident information to the public apply to accredited representatives.

#### 10. Safety Precautions During the Accident Investigation

Aircraft wreckage sites can be hazardous for many reasons other than possible adverse terrain and adverse climatic conditions. Personnel involved in the recovery, examination, and documentation of wreckage may be exposed to considerable physical hazards posed by such things as hazardous cargo, flammable and toxic fluids, sharp or heavy objects, and disease. An NTSB group chairman (normally the structures group chairman) will be assigned as the accident site coordinator. This individual is responsible for wreckage security and site safety. The Safety Board urges everyone to exercise good judgment, utilize available protective devices and clothing, and use extreme caution when working in the wreckage. Most importantly, do not exceed your physical limitations.

Before anyone is allowed on the site, the Safety Board, in conjunction with the aircraft operator and appropriate officials, will determine if hazardous materials were carried as cargo on the aircraft. In the event hazardous materials were identified on the flight manifest, decisions must be made regarding the type of material and the actions to be taken to either remove the material or to reduce the risk of contamination or injury. Once such a determination has

been made, work at the site will be permitted.

The wreckage of an airplane involved in an accident may contain bloodborne pathogens. Bloodborne pathogens are microorganisms in human blood that can cause disease in humans. They could include, but are not limited to, the hepatitis B virus (HBV) and the human immunodeficiency virus (HIV), which causes AIDS. These viruses do not die upon contact with oxygen, or when they dry out. Current studies, in fact, show that certain climatic conditions may prolong the infectiousness of HIV. The Safety Board urges anyone who will work on or in the wreckage to use extreme caution concerning bloodborne viruses. At a minimum, heavy leather work gloves over nonpermeable rubber gloves should be worn when touching the wreckage. Under certain conditions, such as enclosed spaces within the wreckage where investigators may be splashed with blood or human remains, particulate masks or full face masks should be worn over the nose and mouth, protective goggles should protect the eyes, and disposable overalls should be worn.

The Safety Board will not assume responsibility for any personal injuries incurred during the course of an investigation by any representative of an organization participating in the investigation as a party or by an authorized observer. Nor can the Board provide protective and equipment to team members. Again, all participants are urged to use extreme care and to provide for their own needs on site. Safety concerns should be promptly expressed to the respective group chairman or the IIC.

11. Signing of Attendance Roster

Attendance rosters will be circulated during the organizational meeting and nightly progress meetings held as part of the investigation. Please ensure that you have signed the roster prior to the end of the meeting. Include both local and office phone and fax numbers on the roster. Your signature on the attendance roster of the organizational meeting will signify that you understand and agree to adhere to the guidelines set forth in this information sheet. Failure to do so could lead to dismissal from the team. Copies of the attendance rosters will be distributed to all party coordinators.

12. Follow-on Activity Concerning An Investigation

Following the approximate 1 to 2 week on-scene phase of the investigation, a tentative schedule of follow-on events will be established by the IIC. Items on this schedule include:

a. Work Planning Meeting

This is an internal meeting of the Safety Board group chairmen and senior staff, chaired by the IIC. During the work planning meeting, the staff decides what remains to be done concerning component teardowns, follow-on interviews with witnesses or survivors, and the like. The report writing schedule is discussed during this meeting.

b. Factual Report Due Date

This date, decided upon during the work planning meeting, is the date the IIC expects the group chairmen to have their final factual reports completed. At this point, the IIC can begin consolidating the reports into the factual portion of the Board's final report. The non-NTSB investigative group members will have been provided an opportunity to review and comment on the draft factual reports prior to this date.

c. Factual Reports Mailed to Parties

The IIC will approve and mail copies of all the finalized factual reports directly to the coordinators, with some exceptions. If a public hearing is to be held, you will not receive the CVR transcript or other reports that use direct quotes from the CVR recording. By law, these can only be released on the day of the public hearing. Other procedures concerning CVR-related reports will apply if no public hearing is held. Also, on occasion, some complex reports cannot be completed by the time this mass mailing occurs. In these cases, you will receive these additional reports in time to use them for the public hearing. The reports you receive prior to the hearing are sometimes referred to as hearing exhibits and will be the final, IIC-approved versions. All preliminary or draft versions in your company's possession should be discarded or very clearly marked as drafts, to avoid future confusion. These factual reports and amendments that may be produced later, along with the transcript from the public hearing, should be the only basis for your party submissions to the Safety Board (see item i).

d. Prehearing Conference

Parties to the NTSB public hearing will attend a prehearing conference held either at the site of the public hearing or in Washington, DC, about one or two weeks prior to the first day of the public hearing. At this meeting, ground rules for conduct and questioning during the hearing will be outlined. Also, the areas of questioning and the witnesses to be questioned will be discussed. This will be the last opportunity for parties to request that certain areas be explored, certain witnesses be questioned, and new exhibits be included in the record during the hearing.

e. Public Hearing

An NTSB public hearing is another step in the Safety Board's fact gathering process. It is usually held in a city near where the accident occurred and is a proceeding where witnesses are questioned under oath by the NTSB group chairmen (called the Technical Panel) and a Board of Inquiry. Each of the party spokesmen is afforded an opportunity to question the witnesses after their initial questioning by the Safety Board technical staff. These witnesses might include FAA policy makers, surviving crewmembers or passengers, air traffic controllers, fire and rescue personnel, and manufacturer's design engineers. The hearing is under the overall direction of the Presiding Officer (an NTSB Board Member). Administrative matters for the hearing are controlled by the NTSB hearing officer, who is usually the IIC of the investigation.

On the morning of the first day of the public hearing (usually a Monday), all the factual reports generated to that date, including the CVR transcript and reports using direct quotes from the CVR recording, are entered into the public docket for this accident. The public docket is the formal collection of documents relating to the investigation, and is open to public review. The CVR information is also released to the party spokesmen at that time. Generally, no witnesses related to CVR information are questioned on this first day, so that the parties will have time to include CVR information into their lines of questioning of the witnesses. Sometimes, witnesses dealing with issues not pertinent to CVR information (rescue personnel, for example) are heard on the first day. During this session the Presiding Officer reads an opening statement concerning hearing protocol and the IIC also reads a statement concerning facts gathered to date into the public record.

Since this will be the first opportunity for the media to have access to written factual information concerning the accident, parties should be prepared for press inquiries. The CVR transcript often becomes the focus of their interest and crew comments in that transcript are often taken out of context. As always, the NTSB is prepared to field any or all press questions, but the hard and fast rule on media contact that the Board enforced on-scene no longer applies. In other words, since the factual reports have been released, if a party feels a need to talk to reporters, the NTSB would not object to the disclosure of accurate information of a factual nature.

The remainder of the three or four days of the hearing is used to question witnesses. Depending upon the complexity of their testimony, four to seven witnesses are usually questioned each day. Testimony and statements during the hearing are transcribed by a court reporter and transcripts can be obtained from the court reporter about one month after the hearing.

Parties to the public hearing will receive further information from the hearing officer once the decision to hold a hearing is made.

f. Report Outline Issued

The IIC will make up a detailed report outline for the entire consolidated final report soon after the public hearing. It is for our internal use to ensure that no issues are left out.

g. Report Planning Meeting

This is an internal meeting to discuss and modify the aforementioned report outline, if required.

h. Analytical Report Due Date

This is the date that the group chairmen have agreed to furnish the IIC with their analysis of the facts they have gathered in their areas of expertise. The parties may have input to the analytical reports via their continued contact with the NTSB group

chairmen and the IIC. The parties may also have input to the Safety Board's analysis through the "party submissions". However, the analytical reports themselves are for Safety Board use and will not be released to the parties or the public. As with the factual reports, the IIC and the report writer will consolidate the analytical reports in the final version of the report of the investigation.

i. Party Recommendations as to Findings, Recommendations, and Probable Cause (Party Submissions)

Any party to the investigation is encouraged to submit to the Safety Board written recommendations as to the proper findings and conclusions to be drawn from the evidence produced during the course of the investigation (see 49 CFR 831.14). The Safety Board believes that, after the completion of the investigative activities relating to the accident and before determination of probable cause is made, it is the responsibility of each party to the investigation to make known to the Safety Board its interpretation of the findings and conclusions to be drawn from the evidence. If a party chooses to furnish the Safety Board with a submission, copies of the submission are required to be provided to the other parties to the investigation. The party submissions will become part of the public record of the investigation.

Submissions will be due to the IIC within 30 days after the copies of the public hearing transcript become available or on a date selected by the IIC if no hearing is held. These party submissions are extremely important because they are the only way the parties can officially inform the IIC, senior NTSB staff, and the Board Members of their beliefs and opinions concerning the accident issues.

There is no set format for party submissions. Some parties simply write a letter expressing their views. Others follow the NTSB report format. The choice is up to the party, and the choice to submit something is voluntary. Please contact the IIC if you have any questions concerning the party submission process.

j. Technical Review Meeting

The parties to the investigation may be invited to an optional technical review meeting in Washington, DC. NTSB personnel who attend this meeting are the IIC, the group chairmen, and mid level NTSB supervisors. Only party coordinators and party specialists assigned to investigative groups may attend. Each factual report written by the group chairmen will be offered up for final technical review. The goal here is to make sure that each factual report is accurate and complete. Such things as grammatical editing or the tone or style of the reports are not the focus of this meeting.

For an accident investigation of lesser scope, the parties may be invited to review the first draft of the factual section of the final investigation report through the mail. In this case, this review will serve as the technical review by parties for the investigation.

k. Initial Draft Distributed

The IIC will distribute an internal initial draft of the entire

report to the group chairmen and mid-level NTSB supervisors for their review and comments. The entire document is not made available to the parties, although the factual portion might (as mentioned above).

l. Directors' Draft Distribution

After comments and corrections from the group chairmen (and the parties through their submissions to the Safety Board) have been added to the initial draft, it becomes the Directors' draft. This internal draft is then given to the Directors of our Office of Aviation Safety, Office of Safety Recommendations, Office of Research and Engineering, General Counsel, and the NTSB Managing Director for their comments and corrections.

m. Directors' Review Meeting

Once they have finished their review of the Directors' draft, the NTSB Office Directors will schedule an internal meeting to discuss such things as report content and organization. It is an internal meeting for NTSB staff.

n. Notation Draft Distribution

The internal Notation draft is the final version of the report that is presented to the five Safety Board Members. They then review the draft in preparation for the Board Meeting.

o. Board Meeting

Following review of the report by the Board Members, a public Board Meeting will be held in Washington, DC. This is sometimes referred to as the "Sunshine Meeting". The NTSB staff (the IIC, the group chairmen, and others) will present and comment on the report before the Board. Party representatives are welcome to observe this meeting. However, all dialogue is between the NTSB staff and the Board Members.

At this meeting the Board may adopt the report in its entirety, adopt the report with changes that are discussed during the meeting, or require further investigation or rewriting before approving the report. After considering the accident report, the Members will discuss and vote on the findings, recommendations, and probable cause of the accident. Media representatives will be present at this meeting and usually conduct interviews after the meeting.

As soon as possible after the meeting, usually within an hour, the Board's Office of Public Affairs releases the last few pages of the report that was just adopted, with changes made during the meeting. These pages contain the Board's conclusions, probable cause, and safety recommendations. Parties can be expected to be questioned on this material by the press that day.

Once changes decided upon during the Board Meeting are

included in the report, a camera-ready copy is sent to the printer. Bound copies become available about three weeks later. The publishing of the final report is normally the final step in the NTSB investigative process.

p. Request for Reconsideration of Probable Cause

Although the publishing of a final report is the final step in the investigative process, NTSB investigations are never formally closed. Parties to our investigations can petition the Board to reconsider and modify the findings and probable cause of an accident for two reasons:

- The party believes the Board's findings are erroneous and the Board made a mistake in its analysis during its original assessment of probable cause.
- The party discovers new evidence that would require modification of the original findings and probable cause.

Parties can petition the Board to reconsider the findings and probable cause at any time after the Board Meeting. However, petitions for reconsideration from parties that do not send submissions to the Safety Board during the investigation will not be entertained.

## **APPENDIX E**

### **ON-SITE SAFETY**

The information in this appendix has been gathered from many sources: NTSB investigators, U.S. Army, U.S. Navy, U.S. Air Force, Public Health Service, Centers for Disease Control, Federal Bureau of Investigation, National Institutes of Health, and others. It includes discussions on safety precautions that should be taken prior to leaving for an investigation, standard safety precautions that should be taken during the investigation, and specific hazards and situations that may be encountered and precautions that should be taken at an aviation accident site.

#### **1. PRECAUTIONS BEFORE AN ACCIDENT**

The first step in ensuring the safety of yourself and your group members begins at the office prior to any accident. Proper planning requires that investigators be aware of the potential hazards at an accident site and take standard precautions in preparation for responding to an accident, namely equipment and health precautions.

##### **1.1 Equipment**

Most experienced investigators recommend maintaining two bags: a large one that contains just about everything you could ever need and a smaller bag or backpack for essential items in case you have to hike some distance to the wreckage site. Regardless of what items investigators take to the site, the bag should always include safety equipment. The following list of safety and protective equipment is based on suggestions from experienced field and headquarters investigators.

- Summer and winter weight jumpsuits
- Winter weight jacket with hood
- Rain suit
- Work boots with steel toes and shanks
- Boots suitable for mountainous terrain
- Head cover (baseball cap or winter hat)
- Goggles
- Dust Masks (2 strap type)
- Assorted gloves
  - leather palm work gloves
  - rubber gloves
  - latex surgical gloves
- Explosion proof flashlight
- Compass
- Thermal blanket
- Knives
- Miscellaneous items:



- Yellow Fever Good for 10 yrs.
- Meningitis Good for 3 yrs.
- Typhoid 1 initially and a booster 1 month later
- Polio Booster Take within 2 weeks before trip
- Diphtheria/Tetanus Good for 10 years  
If injured, get tetanus booster
- Gamma Globulin 3 - 5 days before trip (for travel to extremely unsanitary location)

Inoculations are available at the U.S. Public Health Service, commercial immunization labs and clinics, military bases, and agency clinics, although many of this last group do not have some vaccines.

If going overseas, check with the State Department to find out if any health warnings have been issued for areas to which you will be traveling and for which shots are required or recommended. Another excellent source for such information is the Center for Disease Control. By calling (404) 332-4565, investigators can receive updated information 24 hours a day on health advice on a multitude of illnesses and diseases. The function is completely automated and information is provided either over the phone or by FAX.

## **2. STANDARD PRECAUTIONS ON SITE**

While engaged in the investigation, NTSB investigators have a responsibility to inform and educate the other investigators on the known and potential hazards at an accident site. In addition to the somewhat obvious hazards of an accident site, investigators should understand the importance of energy conservation and communications and be aware of the psychological factors that affect participants during an investigation

### **2.1 Energy Conservation**

The investigation will be completed more quickly and efficiently when the IIC and the group chairmen take steps to conserve the energies of the participants. As soon as the investigation is under control, try to adhere as much as possible to a regular workday. This not only allows for controlled expenditure and restoration of energy, it provides the opportunity to consolidate, document, and prioritize each day's work and to coordinate activities for the next day.

Try to stay with a normal eating and sleeping routine. Eat a nourishing breakfast and carry snacks and fruit with you. Eat when you have the opportunity. Limit the use of alcohol. Don't try to do too much at one time. Remember to prioritize your tasks, stick to your

plan, and delegate duties to others.

Once you have completed the on scene investigation, don't forget safety in your hurry to go home. Don't drive or fly jumpseat if you are tired (Board Order 52-A). Either stay an extra day or purchase a ticket.

## **2.2 Communications**

Once at the accident scene, investigators must resist the urge to immediately set off without discussing and providing some means of communication. Radios or cellular phones may be necessary. In hostile environments, a buddy system should always be used to ensure that no investigators become isolated.

## **2.3 Psychological Factors**

An accident can have a disruptive effect on all investigators, regardless of experience level, but more likely might affect those who have never been exposed to the confusion and emotions caused by an aviation disaster. As an investigator, you may at times work with Safety Board staff or party representatives who have never seen an accident or who have personal involvement with the victims. One common defense against the traumatic experience is the irresistible urge to take action, even when human lives are no longer at stake. This need for activity may seek expression without regard for endurance, personal safety, or the safety of others, and without apparent rationale. Although their actions may not be rational, their motivation is noble. For this reason, use great discretion when attempting to guide the activities of such a person into proper channels. Calm, competent behavior and firm, understanding leadership by NTSB investigators can prevent frantic or ill-advised action.

Participants in an investigation might not realize how physically, mentally, and emotionally draining an investigation can be. Some may not be able to cope with it. Be alert for warning signs such as alcohol or smoking in excess, lack of sleep, loss of appetite, absences for long periods of time for no apparent reason, obsessive behavior, forgetfulness, crying, and other signs of sensory overload. You may need to remove the person from the investigation, either directly or through the party coordinator. Make it clear that there is no stigma associated with the removal, that it is in the best interests of the individual as well as the investigation. NTSB investigators should also be honest with themselves when evaluating how they might have been affected by an accident investigation.

## **3. HAZARDS AT THE ACCIDENT SITE**

As an investigator becomes more familiar with the hazards found at an accident site, it is easy to overlook the lack of experience on the part of those who may assist in the investigation. The IIC or a designated NTSB safety officer should always brief non-NTSB personnel on all known and potential hazards and established safety practices that should be followed. Request the support of the fire department, as necessary. In the event that hazardous materials may be involved, local officials or hazmat specialists should brief the entire investigative

team.

Always evaluate the situation. What are the real and potential hazards? What expert assistance is needed to minimize risks or neutralize hazards? Remember that your job is to investigate the accident, not to fight fires or to remove hazardous materials. Let the experts in those areas do that.

This section addresses three types of hazards that an investigator might be exposed to at an accident site:

1. Wreckage hazards
2. Communicable diseases
3. Hazardous materials

### **3.1 Wreckage Hazards**

Most wreckage hazards are "mechanical" in nature. They can injure through lacerations, crushing, fire, explosion, and asphyxiation. Other wreckage hazards include those posed by composites and fiberglass.

#### **3.1.1 Mechanical Hazards**

When you enter, handle, move, or disassemble wreckage, there is always a hazard from sharp edges. Always wear gloves when working around the wreckage. When checking for splintering or frayed cables, use gloves and a rag or cotton balls instead of your bare hand.

Wreckage removal is inherently dangerous. Cables and chains can break and parts can shift. When moving wreckage, always use professionals and keep your team completely away until the wreckage has been properly secured. Do not allow anyone to work under partially suspended wreckage. Heavy lifting equipment should be operated and managed by qualified operators under the overall guidance of NTSB personnel. Only the IIC or his/her representative, the wreckage removal team, and fire fighters should be near the wreckage during removal. Stay upwind during the moving of wreckage to limit your exposure to soot, dust, and other airborne materials.

Some specific wreckage hazards include flares, pressure bottles, tires, and accumulators. These items should be rendered safe and removed from the site, since they can explode when handled or can become projectiles around the site. Pressure containers include such things as propane bottles, oxygen bottles, evacuation slide inflation bottles, fire extinguishes, LOX bottles, and protective breathing equipment. Also, solid state chemical oxygen generators can reach temperatures of 700° F when they are activated.

Other hazards include the following:

*Tire rims* -- May be damaged during a hard landing. The tires may explode anytime. Always approach tires from the front or rear, never from the sides. Deflate tires as soon as possible.

*Propellers* -- Some have spring-loaded hubs. If the hub is cracked, it can violently pop off. Do not attempt to probe inside a propeller assembly. Rely on the expertise of the propeller manufacturer to oversee such inspection, at a properly equipped facility.

*Batteries* -- Remove batteries from the wreckage; don't merely disconnect them. Sparks from a battery can ignite spilled fuel and other flammable materials. Use caution -- disconnecting and removing batteries can cause sparks.

*Confined spaces* -- Soot and insulation material are hazardous if you are working inside a confined space such as a cabin or a cargo bin, especially after a fire. Use respiratory and eye protection.

*Flammable liquids and gases* -- Can ignite or be hazardous if skin contact is made or if vapors are inhaled. Have the airplane defueled before going near it and record the amount of fuel that is removed. Instruct personnel that smoking will not be permitted at the accident site.

*Firearms/Ammunition* -- Firearms and ammunition could be onboard some aircraft. Have experts remove these from the site.

*Military aircraft* -- Some military aircraft contain exotic or heavy metals, hydrazine, etc., which may be hazardous when burned. Military aircraft may have ejection seats, armaments, pyrotechnics and munitions. Have experts de-arm and remove these from the site.

*Depleted Uranium* -- This material may be used as counter-balance weights in larger aircraft. Can be hazardous if outer protective coating is breached.

### 3.1.2

#### **Composites and Fiberglass**

Composite materials and fiberglass are a nuisance at an accident and can be hazardous to your eyes, skin, and respiratory system, especially if the wreckage

has been damaged by fire. Composite materials, which typically consist of carbon/graphite or boron/tungsten, are found in many parts of an aircraft including structural skin, control surfaces, access panels, cabin materials, cabin seats, and rotor and propeller blades. Small micron-sized filaments from composites are similar to other objects in the air we breathe. Most are expelled in sputum. Fiberglass is found in soundproofing blankets, home insulation, cockpit and cabin panels, access panels, cargo bin liners, and other aircraft furnishings. Although studies indicate that composite fibers pose no more danger than fiberglass particles, they can cause short-term skin, eye, and respiratory irritation.

When dealing with composites or fiberglass in the wreckage, the following safety precautions apply.

- Stay upwind when handling the materials.
- Disposable coveralls may be needed. Wash clothes separately that may have become contaminated.
- Beware of splinters from fractured fiberglass panels and composites.
- Wet the materials if they have been damaged by fire. (Spray it down on site and again in the hangar or lab if necessary. A 50/50 solution of acrylic floor wax and water works well, and is available at most Naval Air Station ARFF facilities.)

### **3.2 Communicable Diseases**

Several communicable diseases that present a particular hazard for investigators include meningitis, hepatitis, and the Human Immunodeficiency Virus (HIV). Meningitis, which can be caused by a virus or a bacterium, is an infection and inflammation of the membranes covering the brain and spinal cord. Symptoms include high fever, headaches, stiff neck, nausea, confusion, and light sensitivity. Early diagnosis for the type of meningitis (i.e., viral or bacterial) is essential. Viral meningitis, which can be contracted through fecal-oral and oral-oral routes from such things as drinking, eating, and handling infected items, is generally more common but less serious and cannot be helped by antibiotic treatment. Bacterial meningitis, which can spread from person to person through exchange of respiratory and throat secretions (i.e., through coughing, sneezing, kissing), is quite severe and can result in permanent brain damage or death. Prompt medical attention and antibiotics can cure the disease.

There are several forms of hepatitis. Due to the current lack of information about every type of hepatitis, only hepatitis A, B, and C viruses are discussed here. The hepatitis A virus is transmitted through the fecal-oral route, which means that the disease can be contracted if anything contaminated with the virus is placed in the mouth. Gamma globulin, if given within two weeks of exposure, can prevent infection.

The hepatitis B virus is a bloodborne pathogen. It is found in body fluids and tissue and can enter your system through an opening in the skin. The virus is not transmitted by stool contamination of food or beverages. The virus is not fragile and is harder to destroy than HIV. It is more readily transmittable than HIV and requires a smaller amount to infect you.

There are two types of hepatitis B -- acute and chronic. In an acute infection, your body develops antibodies that overcome the virus. These antibodies remain in your system for the rest of your life and protect you from future infection. Symptoms of an acute infection appear in nine to sixteen weeks. The symptoms include tiredness, loss of appetite, taste changes, and yellow eyes and skin. In a chronic infection, your body does not develop antibodies. You may become a chronic carrier for the rest of your life. Often there are no symptoms. Your body adapts to the infection. Over time, a chronic hepatitis B infection can cause liver damage. Yearly exams help to determine if you have become infected.

Three types of inoculations are available to fight hepatitis B. Each has a slightly different use. General Gamma Globulin is a booster that is used to fight an existing infection. Hepatitis B Immune Globulin (HBIG) is used when there has been an exposure to contaminated blood, such as from a needle prick or by a surgeon cutting himself. HBIG prevents, or at least lessens the seriousness of, an infection. The third type of inoculation, Hepatitis Immunization, is designed to protect you from infection before any exposure occurs. It consists of a series of three injections. The immunization is safe and very effective. Some Health Maintenance Organizations (HMO's) provide hepatitis immunization.

Like hepatitis B, the hepatitis C virus is also a bloodborne pathogen and may result from exposure to blood or body fluids than contain the infection. There is currently no known treatment for the hepatitis C virus.

The HIV virus is also a bloodborne pathogen. Risk of contracting the disease from blood, body fluids, and tissue of infected persons is very low -- but precautions are always necessary. A cut on your skin can allow the pathogen to enter your system. Persons with HIV are also likely to have hepatitis B and other communicable diseases.

The HIV virus is relatively fragile and susceptible to disinfectants, drying, and heat. For example, household bleach in a 1:10 solution with water will destroy the virus in about one minute, as will 70 percent alcohol. (NEVER MIX BLEACH WITH ALCOHOL OR WITH AMMONIA. THE MIXTURE RELEASES TOXIC VAPORS.) The virus can also be destroyed by use of an autoclave, fire, gamma rays, and x-rays.

Note for Materials Lab personnel: Use the same precautions in the lab as on scene. Even if blood and tissue have been removed from an article, there is no guarantee that it is free of infection.

Although HIV and Hepatitis B may be the most notorious communicable diseases that you will face as an investigator, they are not the only ones. The guidelines below will help you protect yourself from communicable diseases in general during an accident investigation.

- Be careful searching luggage, the accident scene, or debris since used hypodermic needles may be present but hidden.
- Allow wounds to bleed freely, then clean with alcohol. Carry packaged alcohol swabs in your Go Bag.
- If administering CPR, use a device with a one-way valve and a shield that covers the victim's face.
- Wear surgical or rubber gloves under your leather lined gloves.
- Be careful when searching through blood-soaked clothing.
- Don't reuse or rinse surgical gloves. Discard them after use. You can decontaminate household or heavy-duty rubber gloves, but you should discard them if torn, discolored, or cracked.
- Don't handle your personal items such as pens, pencils, wallet, etc., with soiled gloves.
- Always wear new, clean gloves when using your camera, notebook, or other investigative equipment.
- Once the gloves have become contaminated, don't touch your equipment until you have removed the gloves, washed your hands, and put on new gloves.
- Wash your hands thoroughly even if you have worn gloves. Liquid soap in dispensers is preferable to bar soap for communal use at an accident scene.
- Disinfect shoes and boots with household bleach solution. Decontaminate cameras, tools, etc., with alcohol or bleach solution.
- When large amounts of blood are present, use disposable, waterproof coveralls. Change them frequently.
- Before sending aircraft parts to the lab that you believe may be contaminated with tissue, blood, or other body fluids, decontaminate them using bleach, alcohol, x-rays, or gamma rays.
- Do not remove needed evidence during cleaning. Completely air dry the part before shipment, wrap it in plastic, and note how the item has been disinfected.
- Do not participate in body removal or attend autopsies unless it is necessary for your investigation. If you observe an autopsy, wear protective clothing (e.g., mask, fully disposable coveralls, booties, gloves, and eye protection).

### 3.3

#### **Hazardous Materials**

Safety regulations limit the type and quantities of hazardous materials that may be legally transported aboard aircraft. 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. Exposure to hazardous materials can result in corrosive damage to body tissues, thermal injury, asphyxiation, radiation, disease, absorption of poisons or toxins by inhalation or through the skin, or mechanical injury (from explosive fragments or the failure of stressed containers).

When hazardous materials are suspected or reported to be onboard the aircraft, the IIC should take immediate steps to identify any safety hazards posed by a release of the materials before investigators enter the site. The following persons or organizations should be able to provide information on the physical, chemical, and hazardous properties of the materials:

- local emergency response personnel
- shipper or manufacturer of the materials
- CHEMTREC (Chemical Transportation Emergency Center) at 1-800-424-9300, 24 hours a day
- Department of Energy (radioactive materials)
- State Health Department

NTSB personnel should not direct emergency response activities; this is the responsibility of the emergency response personnel. Check the credentials of anyone offering information about the hazardous properties of dangerous goods involved in an accident. The accident site should be entered only after the IIC, based on guidance from hazmat specialists, is satisfied that hazardous materials do not pose a risk to personal safety. The need for preserving evidence should be explained to personnel directing any hazmat clean-up.

Information on hazardous materials can be found in 49 CFR Part 172 and in the ICAO manual, "Technical Instructions for the Safe Transport of Dangerous Goods by Air" (Document 9284-AN/905). Additional guidance is provided in the ICAO manual, "Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods" (Document 9481-AN/928). Generally, hazardous materials are described by the following classifications:

Explosives  
Flammable gas  
Non-flammable compressed gas  
Poisonous gas  
Flammable and combustible liquid  
Flammable solid  
Spontaneously combustible material  
Dangerous-when-wet material  
Oxidizer  
Organic peroxide  
Poisonous materials (liquid or solid)  
Infectious substance (etiologic agent)  
Radioactive material  
Corrosive material (liquid or solid)

Any accident involving agricultural operations has the potential for exposing investigators to hazardous materials in the form of pesticides or insecticides. FAA Advisory Circular AC 137-1 is a good source of information on these and other hazardous products used in agriculture. It describes precautions for pilots and ground workers. Determine the name of the product carried on the aircraft and alert CAMI (Civil AeroMedical Institute) to test for it in the toxicological analysis on the pilot.

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

Shipping documents

Name, hazard classification, and quantity of material

Location stored on aircraft

Chemical, physical, and hazardous properties of material

Shipping container type, markings, labels, and areas of mechanical failure or damage

Damage directly related to the release of the hazardous material (look for evidence that might indicate the pre-impact release of hazardous materials)

Notification to Captain

Relevant crew or witness observations.

For the safety of everyone involved, the following guidance is provided for dealing with hazardous materials.

1. Prior to your departure for the accident scene, have the operator determine whether the aircraft carried any hazardous materials and, if so, what type (chemical, biological, radioactive, explosive, corrosive, etc.). Request that the operator FAX shipping forms to your attention to the onscene command post. Ask the operator to identify information about the materials such as that listed above.

2. When you arrive at the command post, confirm information about the materials with the aircraft operator. If any new information is received, contact the Hazardous Materials Division for guidance and, if needed, assistance. Pass along any new information to local officials and hazmat specialists on the scene. Determine the current status of the materials and when the accident site will be safe to enter. The operator and local officials may be able to help you determine whether the materials were properly packaged, labeled, and in the proper cargo compartment.

When the transportation of hazardous materials onboard an aircraft is believed to be causal or contributory to an accident, the

Hazardous Materials Division of NTSB should be contacted immediately. The Division can then assign a group chairman to the investigation.

3. Prior to entering the accident site, have local officials brief investigators who will be on-scene on the type and status of hazardous materials onboard the aircraft. Everyone should be informed that undeclared, improperly labeled, or improperly packaged materials may remain undetected in the wreckage and at the accident site. If such materials are found during the investigation, order investigators away from the site immediately and contact local officials. Do not return to the site until local officials declare it is safe. Ask local officials to photograph and document the packaging and labeling of these additional or unexpected materials before removing them from the site for disposal.

4. Personal hygiene precautions for a hazardous materials incident include the following: stay upwind when the materials are removed; wear protective clothing/equipment; don't transfer contaminants to the car, hotel, etc. (discard or disinfect clothing and equipment), or leave at; and have water and soap at the site. Showering at the site may even be necessary.

#### **4. SPECIAL PRECAUTIONS**

In addition to the standard safety precautions that should be taken before and during any accident investigation, certain accidents will require special safety precautions because of such things as location, extreme weather, indigenous plants/animals/insects, or specific operations necessary to support the investigation. The following may present specific hazards to investigators:

- Environmental/natural hazards
- Helicopter operations
- Water operations
- Urban areas and airports.

#### **4.1 Environmental/Natural Hazards**

Environmental and natural hazards include those posed by such things as extreme weather; mountainous terrain; deserts, jungles, and swamps; and poisonous plants, dangerous animals, and insects. When working in hostile environments such as these, always use a buddy system and carry a survival/medical kit.

##### **4.1.1 Extreme Weather**

Investigators may be faced with extremes of heat and cold depending on the terrain and the time of year. Investigators expecting to spend a few hours at a

remote site could find themselves spending the night if their transportation is unable to return for them. Check current and forecast local conditions before departing.

In cold weather, the following procedures should be used:

- Be aware of the dangers of frostbite, hypothermia, and white out (disorientation that can occur during a snowstorm or otherwise uniformly bright and white surroundings).
- Protect against the danger of wind chill by wearing layered clothing that will absorb perspiration.
- Bring sunglasses and sunblock -- even in the winter a sun burn/wind burn is possible.
- Protect yourself from becoming dehydrated (even in cold weather).

In hot weather, the following procedures should be used:

- Provide for personal drinking water needs.
- Don't wait to get thirsty; by the time you feel thirsty you are already dehydrated.
- Drink at least 1 quart of water or fruit juice per hour in extreme situations of high humidity and exertion.
- Know the symptoms of heat stress and heat exhaustion. Pace yourself to compensate for heat and humidity. Wear a wide brim hat and loose fitting clothing. Sunblock may be required.

#### **4.1.2 Mountainous Terrain**

Local rescue teams are good sources of information about working in mountainous terrain. Pace your activities and conserve energy. Be aware of the danger of altitude sickness and alert to its symptoms in yourself and others. Altitude sickness is characterized by dizziness, headache, loss of appetite, difficulty sleeping, aches and pains, pale complexion, and loss of energy. Acute cases can last several months. If you suspect altitude sickness, have the person sit or lie down. In severe cases, the individual will have to immediately descend to improve his/her condition. You may have to have him/her removed from the scene. If the individual feels better and remains on scene, assign a buddy to keep an eye on the person.

The following safety precautions are recommended for working in mountainous terrain and high elevations:

- Limit exertion above 8,000 feet.
- Keep your hands free for steep climbing.
- Rest frequently.
- Have oxygen on hand for high-altitude climbing.
- Drink plenty of water or fruit juice -- dehydration can happen quickly.
- Protect your skin from the sun with sunblock, sunglasses, and hat. You can sunburn quickly, especially at higher elevations.
- Seek advice from local mountain-climbing experts; preferably, they should accompany you. Don't involve yourself in body removal unless necessary.

### 4.1.3

safety precautions.

### **Deserts, Jungles, and Swamps**

Accident sites located in these environments require certain

#### ***Deserts***

- Wear a wide brim hat, loose fitting clothing, sunglasses, sunblocking lotions, and goggles, if necessary.
- Drink plenty of water. You may need to carry several (5-6) quarts of water.
- Limit activity during the heat of the day.
- Arrange for shelters from the sun, preferably open-sided with some protection from blowing sand.
- Let professionals do the driving. Navigating sand dunes and unmarked roads, even in a four wheel drive vehicle, can be hazardous.
- Have appropriate clothes and shelter for temperature decrease at night.

#### ***Jungles***

- Ensure that adequate communications with others are maintained.

- Put rubber bands or string around the bottom of your trouser legs and over the tops of your boots to protect against leeches, insects, etc.
- Limit activity to compensate for the heat and humidity. Carry only those items that are absolutely necessary.
- Drink plenty of water. You may need to carry several (3-5) quarts of water.
- Wear appropriate footwear (fast-drying canvas jungle boots with lug soles are good).

#### *Swamps*

- Take care to prevent swamp water from contacting open cuts and sores. Swamp water can be highly contaminated.
- Watch for tree roots and deep holes when walking in water.
- Use a tall walking stick to find level footing and water depth. Keep your hands free except for the walking stick.
- Chest waders may be necessary, even though they are hot and awkward to use. Never jump into water higher than your waders.
- Swamp boats may be the only means of transportation. Wear a life jacket and ear plugs. Don't travel or work at night unless absolutely necessary.
- Beware of mud ponds with a few inches of water on the surface; they can be very deceptive.
- Keep your sleeves rolled down and shirt collars buttoned. You may need a wide brimmed hat with mosquito netting. Prepare for dealing with insects, leeches, and snakes. Also beware of alligators and crocodiles.

#### **4.1.4 Poisonous Plants, Dangerous Animals, and Insects**

The level of danger from plants, animals, and insects depends on several factors--terrain, weather, elevation, time of year, etc. Listen to local officials. They can advise you on what to expect and on particular preventive actions that you should take.

Poisonous plants vary with location. Learn to identify poison ivy, poison oak, and poison sumac. In the winter, poisonous plants may lose their leaves, but remain dangerous and even harder to spot. Stay away from smoke that may contain residue of

poisonous plants.

Dangerous animals might include anything from poisonous snakes to rabid raccoon to bears. Poisonous snakes can be found in all states. Listen to precautions from local authorities. Learn to recognize poisonous snakes. A snake bite kit should be part of your Go Bag. Even relatively domesticated animals can present certain hazards. Horses can bite and buck. Animals may even be part of the cargo of the aircraft involved in the accident.

Know what allergies you have to trees, grasses, plants, and insects. Carry appropriate medication with you. It may be difficult or impossible to obtain at or near an accident site. An "Epi-Pen" containing epinephrin or ephedrine is available by prescription and can counteract some allergic reactions.

Fire ants, wasps, bees, and spiders can all cause painful bites and, in some people, allergic reactions. With the exception of mosquitos and certain ticks, insects are more of a nuisance than a danger. Repellents such as "Deep Woods Off" are useful items in your Go Bag. Some people swear by Avon's "Skin So Soft" as an effective repellent against chiggers, ticks, and mosquitos (although scientific studies have not proved or disproved this). A commercially available product called "Permanone Tick Repellent" has been shown to be very effective. A 6 oz. spraycan can protect two sets of clothing for two weeks, including two washings. Eating garlic may also repel mosquitos (from odors emitted through the skin). Mosquitos and ticks present special problems because both can carry infectious diseases.

### *Mosquitos*

Mosquitos have been the mode of transmission for malaria and yellow fever. U.S. Army sources have recommended "Deep Woods Off" as an effective, commercially available mosquito repellent. Any product that contains "DEET" in a 25 to 30 percent solution should be effective. Two cautionary notes: first, concentrations of "DEET" higher than 30 percent can irritate skin; second, mosquito repellents of this type contain a solvent that may melt or scar plastics found on cameras, watches, small tools, etc.

### *Ticks*

In the United States, the highest concentrations of ticks are along the East Coast and in southeastern, southcentral, northcentral, and midwestern states. The lowest concentrations are in the extreme West and in the Plains states. Ticks can carry Lyme disease and Rocky Mountain spotted fever. Lyme disease is a bacterial infection caused by the bites of certain, very small, infected ticks. The two most likely carriers of Lyme disease are the deer tick in northeast and north central states and the western black-legged tick in western states. The deer tick is usually a suburban creature. It likes transition zones -- the edges of roads fields and forests. It is not frequently found in deep forests or in open fields. Although the deer ticks that carry the disease are slowly expanding into new areas, there are three areas where the risk of getting the disease is greatest:

- East-coastal states of Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania, Maryland, and Delaware;
- northcentral states of Wisconsin, Minnesota, and Michigan; and
- northern California.

Lyme disease and the ticks that carry it are rare or non-existent in the Rocky Mountain states, Hawaii, and Alaska.

Deer ticks can be smaller than the head of a pin, and are therefore difficult to find. Finding the tick is important since the longer the tick stays attached, the more likely the disease will develop and the more serious it can be. Some research indicates that chances of contracting the disease increase greatly if the tick stays attached for more than 24 hours.

The first sign of Lyme disease is usually a large, red skin rash, which may be accompanied by "flu-like" fever, headache, fatigue, and vague aches and pains in muscles and joints. Most persons treated with the appropriate antibiotics at this stage will have a quick and complete recovery. The characteristic rash expands outward from the site of the bite beginning 3 to 30 or more days after the bite. The rash will be flat and circular and usually reach a size of at least 2 inches in diameter. As the rash expands, the central portion partially clears, while the outer edges redden, which gives the rash a "bull's-eye" appearance. The rash may appear in multiple places on the body and then fade away before any other symptoms appear. Patients who don't receive early treatment for Lyme disease can develop further problems involving the heart, joints, or nervous system as the disease progresses. Lyme disease responds well to oral antibiotic treatment, but is often mistaken for other illnesses due to the delayed onset of symptoms and the ambiguity of the symptoms when they do appear.

Rocky Mountain spotted fever affects about 800 people in the U.S. each year. The disease usually occurs in the East from New York to Florida, and from Alabama to Texas in the South. It is most commonly seen from April through September but can occur anytime during the year when it is warm. Signs of the disease usually begin 3 to 12 days after a tick bite. The most common symptoms are fever, headache, rash, and nausea or vomiting. Left untreated, the disease can cause death.

If you get a fever, headaches, body aches, rash, or nausea soon after a possible tick bite or exposure, see your doctor immediately. Since there is presently no vaccine available for Lyme disease and Rocky Mountain spotted fever, however, prevention is important. The following advice is offered when working in areas that may be infested with ticks:

- Wear long pants and sleeves. Tuck pants legs into long socks or seal pants legs with masking tape or rubber bands.
- Spray a permethrin-type tick repellent on clothes, if available.

- Use a repellent containing the compound DEET on skin areas that are exposed except for the face area. Follow label directions carefully.
- Check your entire body carefully for ticks twice a day, including inspection of the neck and scalp. If you are alone, the use of a fine-tooth comb will help locate adult ticks in your hair.
- Remove attached ticks from your skin immediately with tweezers by grasping the tick's head parts as close to your skin as possible and applying slow steady traction. Do not attempt to get ticks out of your skin by burning them or coating them with anything such as nail polish remover or petroleum jelly.

## 4.2 Helicopter Operations

Helicopter operations are generally associated with rugged terrain and remote areas. The most common situations for using helicopters include:

- travelling to and from the site
- searching for and removing wreckage and/or bodies
- flying the flight path of the accident aircraft
- aerial photography.

Each of these situations is potentially dangerous. All persons associated with helicopter operations should be briefed by the IIC or a group chairman daily on the proper working procedures and the inherent hazards. The hazard briefing should particularly address, but not be limited to, main and tail rotor hazards, FOD, and rotor wash. Earplugs should be recommended, as should protection for eyes (from downwash) and head (from debris). Individuals should also be directed to only approach the helicopter from the designated direction and, if at all possible, to avoid walking under a hovering helicopter. It is the IIC's responsibility to make sure that the helicopter operator briefs all persons on the operation of exits in normal and emergency situations, use of headsets and restraint systems, and, if involved in over-water operations, describes all additional precautions that must be exercised (including the use of flotation gear). Use caution when operating in hostile environments or over water--especially in single-engine helicopters. Many helicopter pilots are anxious to assist the NTSB and may overlook some safety aspects of the mission.

The IIC, in coordination with the helicopter operator, should maintain strict control over the use of the helicopter. Both must be aware of the effects of ambient temperature, wind, and altitude on helicopter operational capabilities. When circumstances permit, helicopter operations should be controlled from a centrally located base, which will serve as an operational headquarters and communications center for the IIC or his designee and the helicopter operations manager. One of the key tasks of the operations center should be to maintain a log of the

persons and equipment carried on each helicopter trip. Limit helicopter transportation to those individuals who are absolutely necessary to conduct the investigation.

Communication between the helicopter and the base, the base and the wreckage site, and the wreckage site and the helicopter will be necessary. Operations at the accident site should be under the control of a qualified loadmaster. The loadmaster would maintain radio contact with base operations as well as with all incoming aircraft. Only qualified persons should be allowed to rig and attach loads to helicopters.

The landing site should be established so that disablement of one helicopter will not prevent the landing of a relief aircraft. In addition, fire extinguishes should be available at the landing site. Investigators should take the necessary survival precautions in the event that weather or mechanical problems prevent their timely return to the main base.

### **4.3 Water Operations**

The actual operation of water recovery equipment and the supervision of respective personnel should be left to the equipment operator. Only properly trained and fully qualified personnel will be assigned special missions such as underwater recovery and photography.

Salvage barges can be dangerous places. The hazards, to name a few, include large machinery, hoists, cables, nets, and rigging equipment. If necessary, advise on how to attach cables, hooks, etc. to the wreckage and ensure that the wreckage is not unnecessarily damaged during the recovery. Factory representatives should be able to provide guidance on lift points.

Some precautions include the following:

- Know the locations of exits, life rafts, and life preservers (if not already required to wear them).
- Insist on a safety briefing for everyone from the vessel captain on evacuation stations, safety precautions, and other critical information.
- Stay clear of sling loads. Take photos from a distance. (A telephoto lens is handy in this situation.)
- Even if the wreckage is secured on the deck, it can shift due to motion of the vessel.

### **4.4 Urban and Airport Accident Sites**

Maintain tight security at urban and airport accident sites. Keep the fire department on hand during the investigation and during the wreckage removal. As with any wreckage removal, keep people away and do not permit anyone under sling loads.

The hazards of urban crash sites include downed power lines; leaking natural gas, propane, heating oil or other flammable liquids or gases; and buildings that have become structurally unsound from fire or impact damage. (The latter source could also present a problem since some older buildings might still contain asbestos.) Before entering a building involved in an aviation accident, get a building inspector to approve entry. Minimize the number of individuals who must enter. Wear a hard hat; eye and respiratory protection may also be necessary.

Accident sites on airport premises will require escorts who are familiar with the taxiways, ramps, and runways. Caution people to stay inside the boundary of the site and maintain distance from runways or taxiways. Arrange for food, water, portable toilets, and other necessities at the site so members of the team won't need to return to the terminal.

## Attachment 1

### Survival Kit

Combination match holder, compass, and whistle  
2 disposable ponchos  
Emergency thermal sleeping bag  
Canteen, 1-quart size  
Collapsible drinking cup  
Stainless steel pocket knife  
Silva compass  
25-ft. 300-lb-test braided paraline  
2 yellow light sticks, 12 hours duration each  
2 boxes waterproof matches  
1 insect repellent  
Halazone (water purification), 50 tablets  
First aid kit  
Snake bite kit

### First Aid Kit

Antiseptic wipes (70% alcohol), 20 packs  
Wash and Dry wipes, 20 packs  
Eyedrops, 1 oz. bottle  
Dramamine (for motion sickness)  
Tylenol, purse pack of 16 tablets  
Kleenex, purse pack  
Hydrocortisone cream (1%)  
Mycitracin cream (antibiotic cream)  
Imonium AD (antidiarrhea), 6 caplets  
Chlor-Allergy (antihistamine), 20 capsules  
Allergy Formula, 20 capsules  
Chapstick  
Afterbite stick (treats insect bites)  
Silica gel (protects kit from moisture), 1 pack  
Tweezers  
Magnifying glass  
Benadryl, 20 tablets  
Antacid  
Scissors  
Moist burn pads, 5

**APPENDIX F**  
**GROUP CHAIRMEN CHECKLISTS**

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## AIR TRAFFIC CONTROL GROUP

The following material is intended to assist the investigator in determining what Air Traffic Control (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/her representative and arrange for a complete briefing of all facts surrounding the accident and 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. Through the briefing, the ATC investigator must quickly become knowledgeable of the situation so that the course of the investigation can be planned.

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 for the investigation. This request should be in writing in order to prevent any misunderstandings. However, if practicable, a thorough review should be conducted of each involved controller's training records before initiating controller interviews, 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.

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)<sup>1</sup>
- (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.  
(AT)
- (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.  
(AT)
- (13) Transcript of ATIS information current at time of accident.  
(AT)
- (14) ARTCC Copies of Radar Data. (AT)
  - a. NTAP (list 3 is complete)
  - b. Track Sort
  - c. Log Sort

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<sup>1</sup>AT-Air Traffic

- (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 layout. (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 Read and Initial, Area Binder, Position Binder, Reading Binder, FAB 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 FAA Form 406C, Facility Maint. Log. There should be one log for each piece of equipment checked. (AF)<sup>2</sup>

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<sup>2</sup>AF-Airways Facilities

- (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)<sup>3</sup>
- (32) Copy of Instrument Approach Procedure. (AT)
- (33) Original flight check certification of NAVAID. (AT)
- (34) LLWAS data. (AT)
- (35) HIWAS data. (AT)
- (36) Waivers. (AT)
- (37) Ops Error package. (AT)
- (38) Training report. (AT)
- (39) Light settings and runway light information.

The Airways Facilities Sector should be contacted to review and obtain copies of the facility maintenance logs and ground recertification checks (FAA Form 6030.1) 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.

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.

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<sup>3</sup>AFS-Airways Facilities Sector

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.

There are two FAA Handbooks that the investigator should study to acquire a better understanding of facility procedures and responsibilities: (1) Handbook 8020.11 - "Aircraft Accident Notification Procedures and Responsibilities"; and (2) Handbook 7210.3 - "Facility Operation and Administration". Other important FAA references are: (1) Air Traffic Control Handbook, 7110.65; (2) Data Communications Handbook, 7110.80; and (3) Flight Services Handbook, 7110.10. 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.

## FLIGHT RECORDERS

This section discusses the methods for handling Cockpit Voice Recorders (CVR)s and Flight Data Recorders (FDR)s and related matters. This section is prepared for the information of and to assist NTSB employees. This section is not regulatory in nature, is not a statement of policy, and this information is not all-inclusive. This section should not be used as a definitive interpretation of any law or rule, and it can be changed at any time.

### A. GENERAL

FDRs and CVRs are required on board certain aircraft by regulations set forth in Parts 121, 125, 135 and 91 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. Flight recorders found optionally installed on aircraft not requiring them are also required to be preserved for NTSB use.

#### 1. Background and Regulations

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 135 and 91 aircraft are also required to be equipped with FDRs. The FDR requirements differ depending on the number and type of engines, number of passengers and date of manufacture.

- a. 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.

Recorders on aircraft certificated 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.

Recorders on aircraft certificated after September 1969 and manufactured before October 11, 1991, must record 17 parameters.

Recorders on aircraft manufactured on or after October 11, 1991, must record 28 parameters.

- b. All existing 14 CFR 135 multi-engine, turbine-powered aircraft that are capable of carrying 20 or more passengers must, as of October 11, 1991, be retrofitted with FDRs that record:
  - 11 parameters, if type-certificated before October 1, 1969

- 17 parameters if type-certificated on or after October 1, 1969
  - 28 parameters if manufactured on or after October 11, 1991.
- c. All 14 CFR 135 multi-engine, 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 8 hours.
  - d. All 14 CFR 91 multi-engine, 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 8 hours.

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 135 and 91 aircraft are also required to be equipped with CVRs. The CVR requirements are different for different aircraft and are as follows:

- a. All 14 CFR 121 and 125 aircraft are required to be equipped with a CVR that records 30 minutes of audio information on 4 channels.
- b. All 14 CFR 135 multi-engine, 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 CVRs that record a minimum of 30 minutes of audio information on 4 channels.
- c. All 14 CFR 135 and 91 multi-engine, turbine-powered aircraft capable of carrying 6 or more passengers and requiring two pilots are required, as of October 11, 1991, to be retrofitted with CVRs that record a minimum of 15 minutes of audio information on 4 channels.

## 2. Public Disclosure of the CVR Transcript

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 contents of the CVR tape from a major accident when released to the public, 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 the full text of conversations. With

respect to when the transcript is to be made public, the transcript is released at the public hearing, but if no hearing is held, it is released at the time when a majority of the other factual reports are made public.

49 U.S.C. section 1905(c) provides 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

(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.

Within the Office of Research and Engineering (RE), the Engineering and Computer Services Division (RE-20) is responsible for recovering data from CVRs and the Vehicle Performance Division (RE-60) is responsible for recovering data from FDRs. It is very important

to secure these recorders as soon as possible after an accident or incident and deliver them intact to the appropriate laboratory at Headquarters so that the laboratory may obtain the best possible recovery of the relevant data in a controlled atmosphere using an experienced staff.

## B. FIELD PROCEDURES

### 1. Exterior Appearance

FDRs and CVRs 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 a 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.

### 2. Handling of Digital FDRs (DFDRs) and CVRs

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

- a. Do not attempt to remove or play a tape from an FDR or CVR in the field. The tape could be damaged or erased.
- b. 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."
- c. NEVER open the recorder. Do not allow anyone to remove the tapes or solid state memory unit under any circumstances.
- d. 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.
- e. If the case is broken, DO NOT remove the tape or solid state memory unit from the device. Wrap the 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 RE-20 (CVR) or RE-60 (FDR).

- f. 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.
- g. 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. 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.
- h. If the recording is a tape and is found broken and separated from the recorder, follow instructions as in (g) above and enclose all fragments of tape, no matter how small.
- i. If the recorder is from a major accident, get it to the appropriate Headquarters lab by the fastest, most secure means possible. If the 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 senior NTSB management. Circumstances may require 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 destination 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.
- j. If the recorder is found in water, DO NOT attempt to dry it. Observe the following instructions.

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 a tape, it MUST NOT BE ALLOWED TO DRY OUT UNDER ANY CIRCUMSTANCES.

Note: Ship by fastest means available.

### 3. Underwater Recovery Techniques

FDRs and CVRs from aircraft operating under Parts 121 and 125 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. However, some foil recorders have them mounted internally.

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.

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-82-1, April 20, 1982, for details). Because ULB 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.

#### C. OBTAINING READOUTS

All requests for CVR and FDR readouts must be made to the Chiefs of the Engineering and Computer Services Division and the Vehicle Performance Division, respectively. The Chiefs, or the Acting Chiefs, are almost always available by phone or by beeper. The following information will be needed:

- Type and condition of recorders
- Circumstances of the accident or incident
- Arrangements for method of shipping.

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

- Local altimeter setting at time of occurrence
- Elevation at accident/incident site
- Accident runway (if applicable)
- Location of previous takeoff, runway used, and field elevation
- Local altimeter setting at time of takeoff
- Flight number
- Coordinated Universal Time of departure
- Coordinated Universal Time of accident
- 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 6120.15, Receipt of Wreckage, enclosing one copy in the shipping container. This should provide the Board 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 or RE-60)  
490 L'Enfant Plaza  
Washington, DC 20594

## D. FLIGHT DATA RECORDERS

### 1. General Information

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

There are two distinct types of FDRs 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, 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 some investigations of incidents, the NTSB must take timely possession of the FDR, or pertinent flight information may be lost. Likewise, if FDRs from aircraft not involved in the accident or incident need to be examined, and if the appropriate FDRs 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.

### 2. Foreign Operators in the United States

While all FDRs in use in the United States are required to record data in a digital format, there are obsolete types of oscillographic (foil) FDRs 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 FDRs.

However, one model, the Lockheed model 109C, looks like a big bright yellow or international orange metal ball. If older foil type FDRs are encountered during an investigation, please call RE-60 for special instructions.

### 3. The Flight Recorder Readout

The Vehicle Performance 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 generally precedes the arrival of the FDR, 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 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.

### 4. FDR Group

Not every investigation will require the formation of an FDR group. Obviously, a major "Go-Team" type accident will usually involve an FDR group; however, non-major 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 an FDR group for non-major investigations is occurring more often. The 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 a 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 representatives 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 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 or 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.

#### 5. 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 and/or plots. 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.

#### 6. FDR Related Studies

Reconstruction of an aircraft flight path or 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 of RE-60. 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.

### E. COCKPIT VOICE RECORDERS

#### 1. Procedures to Initiate a CVR Readout - 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.

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 be composed of 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:

- are qualified and current in the type of aircraft involved in the accident,
- personally know the flight crew members' voices,
- have detailed knowledge of the accident flight's planned operation, and
- have 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. Procedures to Initiate a CVR Readout - 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 needed. 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 desire for that participation.

## 3. 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 Offices of RE and AS (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 perform whatever actions are necessary 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, is demonstrated.

#### 4. CVR Data to the IIC

Upon hearing the tape, the Director of the Office of AS (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.

#### 5. 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 to not discuss the group's work with the press or with anyone except their respective coordinators. Copies of 49 CFR 831, (NTSB) "Accident/Incident Investigation Procedures," will be distributed; group members will be told to note especially paragraphs 831.11(b) and 831.13(b), which, respectively, 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 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 unauthorized persons 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."

#### 6. 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 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. Special notation will be used to reflect ambiguity in inflection, for any particular word or phrase, which results in failure of the group to determine the correct punctuation. Every statement or abbreviated statement segment must end with punctuation. 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.

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

#### 7. 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 and Computer 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 Offices of AS and RE must approve any activity that requires work on the CVR recording at any outside facility.

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

#### 8. Surviving Crewmembers

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 that 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.

#### 9. Disposition of the CVR Group Chairman's Factual Report (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. Meanwhile, they 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 the following 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 Offices of RE and AS at this time. The Directors will take into consideration the recommendations of the IIC, the CVR Group Chairman, and the Chief of the Major Investigations Division or Field Operations and General Aviation Division in determining what portions, if any, of the transcript are deemed non-pertinent and are 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 of the Office of AS. 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 prior to the pre-hearing conference.

A copy of the transcript will be made available to each of the party coordinators at the opening of the public hearing, or one hour before, at the discretion of the Chairman of the Board of Inquiry. The transcript will be made available to the public at the time of the hearing.

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.

#### 10. Disposition of CVRs 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 Offices of AS and RE. If the Board decides to keep the original, the owner and the other parties will be advised of the reasons for such determinations.

#### 11. 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 Offices of AS and RE 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 RE-20 Chief, who will then arrange for the tape or transcript to be reviewed in the lab. Board Members and the IIC may audition the CVR tape at any time, review the preliminary transcript, and otherwise have unrestricted access to the CVR laboratory.

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 Director of RE, 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.

## F. READOUTS FOR FOREIGN INVESTIGATIONS

The FDR and CVR labs 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 effected by the U.S. Accredited Representative of the NTSB in consultation with the Chief of RE-20 and/or RE-60.

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 AS in consultation with the State Department Aviation Liaison and the Office of RE. 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.

## G. FAA AND MILITARY REQUESTS

### 1. 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 1700.2, but the three most important points are:

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

## 2. Military Requests

The NTSB may be 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 AS in consultation with the Office of RE.

## H. ACCREDITED REPRESENTATIVES

Accredited representatives and designated advisors from other countries sometimes participate in our CVR and FDR readouts. Under the provisions of ICAO Annex 13, they are to 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 Offices of AS and RE.

## I. OTHER RECORDINGS

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

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 has no capability of reading these recorders, but the operators can 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 such things as autopilot systems, flight management systems, electronic engine controllers, and navigation systems. Although the NTSB can't extract data from these either, the manufacturers probably have the capability.

As a general rule, you should ask the appropriate party if there is a quick access or maintenance recorder on board the aircraft. Determining the existence of non-volatile memory may be more difficult, however, since a representative of the supplier of the specific subsystem will not typically be on scene.

## **HUMAN PERFORMANCE GROUP**

### Human Performance

A human performance investigator will typically launch on a 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.

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

### Activities/Procedures of the Human Performance Investigator

Human performance investigation centers on the six areas charted in the following figure. In some cases, the work of the human performance specialist may parallel that of an operations or air traffic control specialist, except 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.





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 suitable 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 ensure 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 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 is collected in timely fashion and without error.
- (2) Requesting air traffic voice tapes. All 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, in coordination with the ATC investigator (if assigned), 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 tracing 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 significant 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 principal 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 should include a review of background records including records of previous accidents/incidents, airman records, and personnel, training, and medical records. These help 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 and National Driver Register records. In the case of medical records and NCIC records, there may be confidential material which is not appropriate for public reports but is valuable at suggesting areas for further investigation.
- (7) Corporate culture. In some accident and incidents, the stage is set for accidents by corporate events far removed in time and place from the accident. Companies vary in the degree that they emphasize safety in their operations, and individuals involved in accidents may be affected by the actions and decisions of even well-intentioned company officers and managers.

To investigate corporate culture issues, an investigator should talk to individuals knowledgeable about the company (including local NTSB and FAA employees and others who may have first-hand knowledge). The investigator should interview other employees, supervisors, and managers, up to the Chief Executive Officer, as appropriate. Focus on company history and policy in areas such as pay, morale, flight and duty time schedules, workload, sick leave, size of workforce, turnover rate of workers and managers, training, equipment, maintenance, promotion progress, financial condition of the company, and safety office/programs.

Examine the adequacy of operating procedures, as well as the extent to which these procedures are adhered to. Does the company say one thing and do something else?

By talking to people, observing employees in action, and examining records, obtain a view of the employee's commitment to performing a job well, and the company's commitment to assuring that employees perform all tasks at the highest level of safety possible. One of the most important "trouble signs" to alert an investigator that corporate culture issues may be involved is probably: multiple mistakes by different employees in different circumstances.

### Checklists 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 questions are often suggested by the details of the specific accident and may include training and management issues. 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, 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.

Following this standard human performance checklist is a special checklist for interviews on corporate culture issues, to provide guidance in this new and often subtle area of investigation.

## HUMAN PERFORMANCE STANDARD CHECKLIST

### A. Activities in Last 72 Hours

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

### B. Accident History

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

### C. Life Changes

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

### D. Medical/Drugs

1. How is your health?

2. What is the name/address of your personal doctor?
3. How is your vision? Do you wear corrective lenses? Name of eye doctor? Prescription?
4. How is your hearing? Do you wear a hearing aid? Name of doctor?
5. Do you take prescription medicine? What, how often? When was the last time you took it before the accident?
6. Do you drink alcohol? When/what was your last drink before the accident?
7. Do you smoke tobacco? Last use before the accident?
8. Do you use illicit drugs?
9. In the 72 hours before the accident, did you take any drugs, prescription or non-prescription that might have affected your performance?

E. Workload

1. How was workload on the day of the accident?
2. How was workload affected by the weather?

F. Environmental

1. Any problems with the aircraft?
2. Any problem with noise, vibration, temperature?
3. Any problems with visibility (instruments, signals, etc.)?

G. Mood

1. What was the mood of the other crew members before the accident? During the accident? After the accident?
2. Had the crew members flown together before?
3. Did the crew members get along personally? Did they see each other socially?
4. What did they talk about?

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

## H. Background

1. What was the pilot like personally?
2. Was he married? Any children? What were his living arrangements?
3. What level of education did he complete?
4. How did the pilot get interested in aviation? Where did the pilot get training? What were previous jobs?
5. What did the pilot like about flying? About this job? About the aircraft?
6. How familiar was the pilot with the accident route? With the accident airport?
7. What was the deadline for completing the trip?
8. What were the pilot's greatest strengths as a pilot? Were there areas in which the pilot could have improved?
9. Did anyone ever complain about flying with this pilot?
10. Did the pilot ever complain about the company or equipment?
11. Did the pilot experience any emergency/incident/problem during a previous flight? What happened?
12. Did the pilot receive training in cockpit resource management?

## CORPORATE CULTURE CHECKLIST

Compared to industry standards, how is:

pay  
morale  
flight and duty time schedules  
overtime  
sick leave  
employee assistance program  
size of workforce/workload to perform required tasks  
turnover rate of workers  
turnover rate of managers  
reasons for turnover  
quality of new hires  
training  
equipment  
maintenance  
promotion opportunities  
financial condition of the company  
relationship between company and company labor unions  
number of disciplinary actions/number of grievances

In the past several years, has the company undergone a significant expansion or scaling back of its operations?

How much overtime is there? Mandatory or volunteer? Is the employee paid extra for overtime work?

What pre-employment background screening is done for new hire candidates?

What complaints do you hear from employees? What complaints do you hear from managers?

How would you describe labor-management relations? What is the relationship with the union's Safety Committee?

Has the company entered bankruptcy protection? Has it entered a recent merger? What happened?

Has this company experienced previous accidents or incidents? Violations? Commendations? What was the company response in terms of changes in policy/procedure/personnel following any accident/incident?

What are the greatest strengths (as a manager) of the chief pilot? Vice-President of Operations/Maintenance? Chief Executive Officer (CEO)?

Has the chief pilot, Vice-President of Operations/Maintenance, or CEO been involved in previous accidents or violations either personally or through a previous company at which he/she served as a manager? (best obtained from the FAA)

What contact is there between the CEO and other employees including the line employees?

Do you have a corporate safety office? What are its activities? Does it report to the CEO? Executive Vice President of Operations? Vice President of Flight? Does it meet with the Board of Directors? How often?

How does the company communicate safety info to its employees (e.g., newsletters, videos)?

Is there a way for employees to bring up safety-related issues without fear of retribution (e.g., safety hotline)?

If there is no safety office, to whom do employees report safety recommendations/problems? What recent safety-related issues have employees raised, and what was done in response?

Is there incident reporting and incident investigation? How and to whom are incidents reported? Give a recent example of changes resulting from internal investigation of an incident.

How does the company learn of and share industry safety-related information? Does the company participate in industry safety meetings and organizations, such as Flight Safety Foundation, IATA, and ATA?

How does the company examine trends (good and bad) in operations and maintenance?

Does the company keep a safety data base or employ risk assessment? Does it employ safety audits, internal or external?

Does the company provide training in crew resource management (CRM)? What does it consist of? How many hours are devoted to it?

How are relations with the Federal Aviation Administration (FAA)? What are areas of differences?

How often do you see inspectors from the FAA?

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## MAINTENANCE RECORDS GROUP

The maintenance records group is responsible for reviewing all maintenance records to ascertain the service and maintenance history of an aircraft involved in an incident or accident. The data will address the approved maintenance program, indicators of the adequacy of inspection, airworthiness directives, and service bulletin compliance that might be related to the occurrence, time, and cycles on the aircraft engines and applicable components, and time or cycles since overhaul or major inspections of the airframe or critical system components. The function of this group will require coordination with the operator and is frequently performed at the maintenance headquarters of the operator. The investigation may extend into design, certification, manufacturing, and/or maintenance management. The areas could include standards and procedures, quality assurance, equipment and facilities, and maintenance personnel selection and training issues.

The collected data from all these areas of interest will be studied to determine the effectiveness of the maintenance system and its potential relevance to the issues associated with the accident. The investigator must consider operator differences and the regulations that govern them. Large air carriers are regulated by Federal Air Regulations Part 121, which is rigid and thorough. Commuter air carriers, on-demand air taxi, and general aviation operators are less rigorously regulated by Parts 135 and 91. It is therefore important to review the approved maintenance program with respect to the applicable operating specifications and rules.

The significance of improper or inadequate maintenance, servicing, or inspection of an aircraft becomes most evident after a thorough review of the relevant records. These data may indicate a need to explore further any records relative to the aircraft type under investigation. The adequacy of a maintenance program should never be assumed based upon the size or apparent sophistication of its operation or records system.

In a team-investigated accident or incident, an airworthiness specialist will be assigned as Maintenance Records Group Chairman to manage a group that includes representatives from certain parties to the investigation. This group is responsible for determining applicable background data relative to design, manufacture, certification, maintenance practices, inspection procedures, FAA oversight, and servicing of the involved aircraft.

The Maintenance Records Group Chairman will alert the investigative team to any system or component that becomes suspect through the records review. In this manner, the Maintenance Records Group will reduce the potential for overlooking possible system or "hardware" related accident causes. In some general aviation accidents, where extensive modifications to the aircraft have been accomplished, the investigative process is expanded. This expansion will include modification and engineering data relative to Supplemental Type Certificates (STC) and Major Repairs and Modifications (Form 337).

When the need arises for record search or review, the following steps are usually followed:

1. Immediate notification to responsible party of aircraft owner/operator to impound all maintenance records. This will normally be done by the IIC or the Maintenance Records Group Chairman depending upon circumstances at the time of the accident.
2. The assigned FAA principal maintenance inspector, an inspector from the operator's staff, a pilot, or a maintenance supervisor would all be able to make appropriate contributions to the efforts of this group. However, the group is usually kept small.
  - a. An opportunity to join is offered, but participation by all parties is not required.
  - b. On certain accident investigations, an NTSB investigator and a representative from the operator's organization may be the only members available to perform the records search.

The scope of the maintenance record search or review may cover all records from date of manufacture to present. The owner will be responsible for safekeeping of the records of the aircraft until the investigator or his designated representative arrives to take possession. CFR Part 831 states that NTSB investigators shall be provided any pertinent records for inspection, photographing, or copying. It will not be necessary for NTSB to retain original documents as long as suitable copies of necessary records are obtained for the public docket of the accident.

During the preliminary discussion with the owner/operator, stress the importance of collecting all records. The increasing use of data processing will require some background knowledge of computerized recordkeeping to fully explore this information. Also, a knowledge and familiarity with maintenance philosophy is necessary.

After the preliminary steps have been taken to impound the records, and the group has been formed, proceed to the maintenance facility or other location of the impounded records. The investigator will usually find the operator and his employees ready to cooperate in any way. At this point, the investigator should suggest that one of the company's technical personnel be placed on a standby basis to assist in deciphering any unclear or confusing write-ups in the maintenance log. Additionally, the following procedures should be established:

1. Have a complete set of an up-to-date operational and maintenance handbooks regarding the subject aircraft.
2. Make provisions for communicating with the IIC, and keep him advised of status.
3. In coordination with the IIC, decide the extent and priorities of the records review.
4. Have copies of ATA Code 100 available.
5. Use the ATA codes as a reference; choose the system chapters applicable to the subject accident.
6. Divide working group by assigning each person certain relevant ATA codes.
7. Supervise the group activities and make the group cognizant of the entire effort by

- holding progress meetings or discussions periodically. Full agreement might not be possible, but awareness of the pertinent facts by group members is necessary.
8. Make provisions for secretarial help and reproductions of data.
  9. Decide on documents to be copied, or data to be extracted for the report.
  10. The maintenance records group report should cover as a minimum:
    - Type of maintenance program
    - List of documents reviewed
    - Historical data on aircraft and engines
      - Serial numbers
      - Times
      - Times since last major inspections
      - Times since last line checks
    - Selected maintenance actions and/or discrepancies which may be relevant to findings or issues developed by other groups.
  11. If the field notes are compiled at a site remote from the IIC and command post, the draft report should be FAXed to the IIC for his concurrence before the maintenance records group or key records are released.

The following is a working list of records to review. Others can be added as experience and needs dictate. This list is not complete or in order of importance.

1. Company flight manual for aircraft involved
2. Operational weight and balance regulations
3. Aircraft flight logs and records
4. Applicable manufacturer's flight manual and maintenance manual
5. Mechanical irregularity reports (for any period preceding the accident that is deemed relevant)
6. Complete overhaul and inspection reports of engines, propellers, systems, and equipment
7. Preflight inspection records
8. Maintenance and repair records
9. Flight release and historical records related to the itinerary of the applicable flight or trip
10. Flight log prepared by crew
11. Flight operations bulletins and newsletters
12. Applicable AD's and compliance therewith
13. Service Bulletins
14. Engine/maintenance monitoring records
15. Aviation Safety Reporting System (ASRS) records (i.e., Service Difficulty Reports, pilot reports)
16. Engineering changes and modifications

Other records such as weight and balance, company load sheets and dispatch messages, flight

plan, and other pertinent data normally reviewed by other groups, may be requested for review. If other groups need this information and feel that the maintenance record group can help they usually request assistance during the group organizational or progress meetings. Coordination and communication between investigative groups works both ways and is essential to the resolution of all relevant safety issues.

## OPERATIONS GROUP

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.

Coordinate with the appropriate group (usually, the Structures Group) in documenting the identification, location, and weight of the cargo and passenger baggage on board the aircraft. To the extent possible, return the material to its pre-accident condition before weighing.

Coordinate with the appropriate group (usually, Systems) in documenting the cockpit environment. Confirm that the cockpit area will not be moved or violated pending its full documentation. If documenting the cockpit area, enlist the assistance of representatives from the airline, the aircraft manufacturer, and the FAA who are qualified and proficient in the design and operation of the aircraft. In documenting the cockpit, the group should:

- (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.

### 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 (i.e., 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 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 mean aerodynamic chord (MAC) or center of gravity (CG) computation. Verify by manual and automated method, if applicable.
- (7) Weight and balance manual used by airline. Compare with manufacturer and FAA approved data.
- (8) Aircraft limitations. Compare airline, manufacturer, and FAA approved data.

#### Aircraft Performance

Per evidence and company Standard Operating Procedures (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.

#### 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, Standard Terminal Area Arrival Route (STAR), Standard Instrument Departure (SID), terminal, and approach charts used by flightcrew. Determine if each crew member was provided with his/her 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.
- (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 FARs. Background and qualifications of dispatch/flight following personnel. Compare with the FARs. 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 to be relevant to the investigation.
    - 3. Information that 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.

#### 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.

#### Federal Aviation Administration Information

- (1) 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.
- (2) Latest regional inspection performed. Obtain a certified copy.
- (3) Latest national inspection performed. Obtain a certified copy.
- (4) Frequency of surveillance. Compare the number and types of inspections performed with regional and national inspections guidelines.
- (5) Background, qualifications, and workload of Principal Operations Inspector (POI).
- (6) Authorized and current staffing level of district office.
- (7) Most recent pre-accident/incident flight inspection and post flight inspection results of pertinent en route and approach facilities/aids. Obtain certified copies.
- (8) Most recent pre-accident/incident airways facility inspection and post inspection or pertinent en route and approach facilities/aids. Obtain certified copies.

#### Interviews

Guidance on conducting interviews can be obtained in the section on Witness Group responsibilities. Generally, the NTSB Operations Group Chairman will conduct the interview and the Human Performance Specialist and Operations Group members will record notes of responses. An opportunity for members to ask a limited number of questions as follow-up should be provided.

#### Questions Relating to Flightcrew:

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

The interview should include questions of the following information or personnel:

- (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.

## AIRPLANE PERFORMANCE GROUP

The Airplane Performance Group will be responsible for developing factual information and conducting studies related to airplane performance issues. Normally, a Performance Group will be convened for any major aviation accident. A Performance Group should be convened for accidents involving transport and commuter category aircraft in the following situations:

- runway overruns,
- landing undershoots,
- windshear events, and
- any accident or incident for which a performance factor might be suspected.

The initial task of the Performance Group is to define the motion of the airplane. The group intends to use all available data, including: cockpit voice recordings (CVR), flight data recordings (FDR), recorded radar data, recorded air traffic conversations, photographs, video recordings, witness statements, ground scars, airplane damage, airplane configuration, weights and balance, airplane aerodynamic data, airplane performance data, engine data, and weather data. Normally, the next task is to determine the various events that could have produced the defined motion, events such as weather disturbances, engine anomalies, flight control deflections, and pilot actions.

The Performance Group will not meet until the FDR, CVR, and radar data are in a useable form and until sufficient information is available from the field (usually several days after the accident occurred). The group is normally formed in Washington, but may meet at the manufacturer's facility.

The Performance Group Chairman will normally go immediately to the accident scene on most major accidents. The purpose is to become familiar with all aspects of the accident before the start of the first Performance Group meeting. While on scene, the Performance Group Chairman will act as an advisor to the IIC on performance-related issues and may perform preliminary calculations related to subjects such as time/distance correlations, accelerate/stop distances, or trajectories of separated parts. The performance engineer may accompany other groups and assist in gathering performance-related material, such as ground-scar measurements, radar data, or maps. The Performance Group is particularly interested in ground-scar measurements from the first contact with objects to the point of principal impact. Members of the Performance Group may be identified and accompany the Performance Group Chairman on scene, although normally the group will not be convened to perform on-scene duties.

The Performance Group Chairman may leave the scene early to start the formal group functions. Any data collected by the Performance Group Chairman will be documented in field notes and provided to the IIC for review before he/she is released from the on-scene investigation. In many cases, the Performance Group Chairman's field notes will need to be coordinated with other group chairmen to ensure consistency and completeness. In general, all standard procedures and practices for group chairmen will be adhered to for this group.

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. The purpose of group participation is to elicit the necessary assistance to develop factual data and conduct studies. As the factual report is developed, parties are urged to comment; however, the decision as to the content of the report will remain that of the Group Chairman.

The Performance Group members need to be performance engineers or the equivalent. At times, airlines or pilots' unions have requested that a pilot be on the group to interface with their performance engineers. Since the Performance Group Chairman will insist on a direct working relationship with the performance engineers, these types of arrangements will not work. However, in cases where small airlines may not have a performance engineer, a person from the airline may be allowed to participate with the group.

#### A. Simulations and Flight Tests

If the Performance Group determines that simulations or flight tests are required to develop the necessary factual information, the IIC will be notified and shall coordinate the request for such activity. The actual tests or simulations shall be supervised by the Performance Group Chairman.

#### B. Visibility Studies

The IIC shall determine the need for visibility studies 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.

#### C. Video Animations

The Performance Group may be involved in developing data for video animations. There are two prime reasons to produce a video animation:

1. Large amounts of data can be presented on a video monitor so that more people can understand the available data.
2. Video animations also depict the element of time, something that is not readily apparent in other forms of data.

Simple animations are relatively easy to produce. Once the DFDR data are available, some of that data can be displayed immediately on the video monitor. That type of display may be useful to operationally-oriented investigators. However, once the engineers start adding ground tracks or airport scenes, the work load increases dramatically.

#### D. Global Positioning System (GPS)

The Board has numerous GPS receiving units which may be used in the field. In addition,

the lab has a more sophisticated GPS unit that may be used for sub-meter measurements.

## POWERPLANTS GROUP

The Powerplants Group is responsible for the documentation of the engines, propellers, engine related components, and auxiliary power units. Depending on the efforts or participation of Structures and Systems Groups, the Powerplants Group might also document the engine nacelles and/or thrust reversers.

Initial investigative efforts should be directed toward documenting evidence associated with the normal operation of the engine(s). A determination of normal engine operation at impact is most helpful for the investigation and can save needless documentation, tests, and analysis later on.

Operating engines, especially at high power, may leave evidence such as propeller blade cuts in the ground or trees, and efforts to document this evidence should be made prior to disturbing the accident site. If evidence suggests that the powerplant may be a causal factor, look for evidence of pre-impact fire, uncontained failures, or separation of engine or engine related components.

As the investigation progresses, the integrity of the engine, mounts, engine and propeller controls, and fuel and oil supply systems should be documented through visual examination or borescoping prior to disturbing the wreckage. Any potentially relevant and recoverable recorders/computers with non-volatile memory of engine/system parameters and inflight faults should be recovered for examination and potential data retrieval, regardless of their apparent condition. If conclusive evidence of normal engine operation prior to impact cannot be documented onsite, additional testing, disassembly, or laboratory examination may be required.

Document engine related components relative to aircraft structure and to initial point impact. Include final position of each engine relative to the normal position of the engine. If parts were liberated prior to ground impact, document engine part distribution and path. Identify and tag all engine and engine component model and serial numbers as shown on data plates or by other identifying marks. Also document inflight and ground fire damage.

The following is a working list of documentation items for the Powerplants Group.

- A. Turbine Engine (Inlet, compressor, combustor, turbine, systems, accessories and components).
  - 1. Inlet
    - a. Debris, mud distribution, foreign object damage, or ice ingestion damage; scrapes and scratches and their location inside the inlet. (Objects ejected from a rotating engine sometimes leave helical tracks as they fly forward.)
    - b. Bird or animal remains; if found, may be sent to an appropriate laboratory for further analysis.
  - 2. Compressor

- a. Degree, uniformity, and direction of rotor blade airfoil bending, leading/trailing edge blade breakage, and any rub marks on the leading and/or trailing edges of the blades; suspicious blade, disk, or shaft fractures.
  - b. Blade integrity or damage and, if visible, uniformity of mud coating on stators, blades, and cases (using borescope through bleed ports or inspection plates).
  - c. Inlet guide vane (IGV) damage. If engine utilizes variable IGV's, check inlet case and/or stator vane actuators for impact markings to determine stator position at impact.
  - d. Anti-ice valve positions and appropriate anti-ice plumbing.
  - e. Nose cone damage, displacement and condition of PT2 or TT2 probes. (PT2 and TT2 probes should be unobstructed and have anti or deice systems intact.)
  - f. Oil leakage in the vicinity of the front bearing.
  - g. Degree of compressor rotation or binding.
3. Combustor
- a. Integrity of combustor mounting structure.
  - b. Combustor burn-throughs, blow outs, and large cracks. Combustors can sustain many small cracks without performance degradation. Note if distress is immediately downstream of a fuel nozzle.
  - c. Condition of fuel nozzle. Note any obstructions on the nozzle that may distort or disrupt spray pattern. Even minute "streaking" of spray pattern can lead to severe burner and turbine distress downstream of the nozzle.
  - d. Condition of igniter.
4. Turbine
- a. Physical condition of all visible stages of blades and stators, including degree and direction of rotor blade bending, leading and trailing edge blade damage, rub or scrape marks, and any debris.
  - b. Evidence of overheat in first-stage nozzle guide vanes. Note any molten metal impinged on vanes.

- c. Damage to pressure and temperature exhaust probes, cones, and struts.
  - d. Evidence of leakage in area of rear turbine bearing.
  - e. Degree of turbine rotation.
  - f. Twisting or bending of shaft (if visible).
5. Systems, Accessories, and Components
- a. Oil
    - (1). Condition of engine/CSD oil, magnetic plugs in gearbox, and oil scavenge lines.
    - (2). Obtain oil sample from lubricating tank. Compare to previous oil samples from same engines.
  - b. Fuel
    - (1). Main fuel and fuel control filters.
    - (2). Fuel control linkage positions, integrity, and continuity and freedom of linkage movement. Presence of fuel in control.
  - c. Bleed and Breather Air
    - (1). Major damage or disruptions to bleed ducts and breather tubes.
    - (2). Aircraft/engine bleed systems for evidence of ingestion of dirt, vegetation, or debris (might provide indication of engine speed, EPR, and thrust by relating individual engine bleed operating schedules (i.e., starter, surge, air conditioning) to bleed locations where ingested material was found.
  - d. Accessories
    - (1). Accessory gear box and tower shaft integrity (attempt to rotate N<sub>2</sub> rotor by means of the starter drive pad or other accessory drive pad).
    - (2). Check starter for evidence of inflight engagement and possible disintegration.
    - (3). Check generator or alternator for evidence of high electrical loads.
  - e. Components
    - (1). Damage or displacement of various attached components and wiring.
    - (2). Surge bleed valve position.

B. Reciprocating Engines (Power section, Induction and Exhaust system, Accessory section)

1. Power Section

- a. Impact damage and evidence of pre-impact damage to each cylinder.
- b. Freedom of crankshaft rotation. If feasible, remove damaged cylinders or other obstructions to crankshaft rotation.
- c. Condition of valves and piston heads, especially for indications of detonation or pre-ignition (as necessary, by borescope)
- d. Remove rocker box and pushrod covers and, if possible, rotate engine to observe valve motion. Examine rocker arms, pushrods, springs, and valve keepers for breakage and wear.
- e. Check compression. If necessary, remove a representative number of cylinders to determine internal condition/power train continuity within the engine.
- f. Leak-check removed cylinders by placing upside down and filling with kerosene. (No leakage should be present.) Intake/exhaust valves should not be damaged.
- g. Uniformity of pistons; if necessary, clean and weigh pistons. Check piston rings for movement. (Rings should not be loose, rounded, or frozen.) Note condition of cylinder walls for piston ring marks, scrapes, etc.
- h. Amount of wear on crankshaft counter weight dampers, if abnormal.

2. Induction and Exhaust Systems

- a. Induction system blockage.
- b. Impellers/blowers (for turbo or supercharged engines). Evidence of internal blower fire, decoupling, and/or rotational scoring. Clutches and linkages of blower controls. Oil leakage at impeller seals and inside the intake pipes. (Oil deposits indicate seal leakage and may result in heavy gray or white smoke.)
- c. Carburetor, position of carburetor heat door (if installed). Examine carburetor for fuel in the bowl, float level, and general condition

of jets.

- d. Condition of inlet air scoops, carburetor air screens.
  - e. Security, rigging, and position of carburetor linkages (OFF, AUTO-LEAN, AUTO-RICH)
  - f. Bends and folds in exhaust pipes.
3. Accessory Section
- a. Fuel pump, freedom of rotation, and evidence of rotational scoring on gear housing pockets. Integrity of drive splines and coupling shafts.
  - b. For fuel injected engines, examine the master control, vapor vents, boost, and venturi suction.
  - c. For twin row fuel injection engines, examine condition of flow dividers and synchronization of injection pumps.
  - d. Evidence of fuel leaks, condition of injector lines, and condition of control diaphragms and diaphragm actuating devices.
  - e. Operation and security of fuel discharge valves.
  - f. Integrity and continuity of tank-to-engine fuel lines.
  - g. "As found" positions of the main engine, fuel, crossfeed, and firewall shutoff valves.
  - h. Obtain fuel samples from aircraft fuel tanks, pumps, and lines, and from fuel source tanks or trucks, as required. If necessary, obtain fuel samples from other aircraft which were refueled from the same sources.
  - i. Examine oil filters for contamination and proper installation.
  - j. Oil pressure relief valve position.
  - k. Oil type and quantity. Obtain oil sample if possible.
  - l. Integrity and condition of oil lines. (If collapsed or kinked, determine if this is pre-impact condition.)
  - m. Magnetic sump plugs.
  - n. Condition of oil pump, ability of gear drive to rotate, and evidence of

rotational scoring.

- o. Oil tank and cooler condition, proper installation, and condition of vents.
- p. Spark plugs, ignition harness/wires, magnetos, coils, rotor caps, distributor electrodes.

C. Propellers

- 1. Blade condition, blade angles.
- 2. Associated hydraulic/electrical/mechanical controls for each propeller.
- 3. Presence and spacing of any propeller slash marks.
- 4. Propeller governors

D. Auxiliary Power Unit (APU)

Documentation and investigation of APUs will follow the general guidance provided for turbine engines.

E. Nacelles (coordinate with Structures Group)

- 1. Inflight and ground fire damage, include sooting or scorching on adjacent surfaces.
- 2. Punctures or penetrations caused by liberated engine parts.
- 3. Integrity and security of cowl latches.
- 4. Mud and debris forced into inlet cowl, or between engine accessories, and cowl panels.
- 5. Position of flap and cooling door actuator shafts.
- 6. Major scrapes and penetrations by external foreign objects (e.g., trees).

F. Thrust Reverser (coordinate with Structures and Systems Groups)

- 1. Post-impact position (i.e., stowed, or amount deployed) as indicated by reverser lock latches and reverser actuator positions.
- 2. Operating mechanisms to determine if the final position of the reverser was due to crew actions or impact forces.

3. Impact and/or fire damage to the entire assembly including the linkages.

## STRUCTURES GROUP

The Structures Group Chairman will usually be the point-of-contact for on-site activities. As such, he will oversee and coordinate on-site activities and assure security of the wreckage during the on-site investigation. The initial onscene responsibilities of the Structures Group Chairman should include restricting access to the wreckage and ensuring that the accident site is well secured. Depending on the location of the wreckage, this may include roping or marking off the area and utilizing security guards as necessary. Arrangements should be made to restrict access to the wreckage to only those who have proper authorization. Access to the wreckage will be typically be controlled by the use of "Access to Wreckage" badges. The Structures Group might assist in locating and retrieving the cockpit voice and flight data recorders. Special care may be required to maintain the integrity of the recorders.

Basically, the Structures Group will be responsible for accounting for the total aircraft structure, documenting the aircraft damage/wreckage, and determining the pre-accident integrity of the aircraft.

The responsibilities of the Structures Group will often overlap those of other groups, especially the Systems, Performance, and Survival Factors groups. In absence of a specific agreement with another group, the Structures Group will be responsible for documenting the overall wreckage distribution and condition, relevant impact marks, and other evidence of the path of the aircraft immediately preceding impact. Coordination with other groups will be necessary during preparation of field notes and throughout the investigation.

The Structures Group Chairman will normally be in charge of the wreckage throughout the on-site investigation activities. He should be consulted before any wreckage is moved and should ensure that minimal damage occurs if and when it is to be moved. It may also be his/her responsibility to authorize the release of the wreckage at the end of the field phase of the investigation. Arrangements to revisit the wreckage should always be discussed in the event that additional, future documentation is necessary. Wreckage release will be to the owner or their authorized representative.

The Structures Group Chairman should emphasize the importance of taking proper safety precautions throughout the investigation. This will include the use of protective gear (gloves, masks, boots); the discharge of pressurized components (tires, struts, oxygen bottles); and the elimination or minimization of ignition sources (smoking, cutting equipment). Moreover, before any investigative effort is allowed to begin, the Structures Group Chairman should assist in identifying whether any hazardous materials are on board the aircraft or whether the area is unsafe for any reason. If so, the proper officials should be notified and the area decontaminated before any investigative work is conducted at the site.

### A. Visual Survey of Crash Site and Surroundings

1. Conduct "walk-around" inspection (arrange for aerial view if necessary)
2. Note general wreckage distribution
3. Check for and document extremities of the aircraft, condition of leading edges, and evidence of pre-impact aircraft configuration
4. Determine pre-accident integrity of the aircraft
5. Document impact attitude (heading, flight path, etc.) and crushlines
6. Document pre-impact strikes on surrounding obstacles.
7. Document fire patterns and damage
8. Formulate general plan of investigation

#### B. Wreckage Distribution

1. Determine method of obtaining data
  - a. Global Positioning System (GPS) unit
  - b. Surveyor
  - c. Laser transit
  - d. Tape measure, compass, etc
2. Determine appropriate plotting method
  - a. Airport or local map
  - b. Centerline
  - c. Grid
  - d. Polar
3. Establish location
  - a. Latitude/longitude
  - b. Elevation
  - c. Terrain characteristics
4. Obtain maps, charts, and aerial photographs
5. Identify group member(s) to help in identification of parts
6. Information required
  - a. Note initial impact marks and heading
  - b. Note major ground scars (direction, length, depth, etc.) and obstacles struck
  - c. Location of significant pieces (control surfaces, cockpit, engines, "four corners of aircraft", etc.)
  - d. Limits of ground fire
  - e. Necessary terrain features and elevations
  - f. Photograph or videotape all pertinent items
7. Numbering of Pieces
  - a. Tag/identify/number parts -- include ground scars and obstacles struck
  - b. Number all main parts in succession from a reference point or number opposite sides of the centerline in succession (i.e., 1L, 2L; 1R, 2R)
  - c. While numbering important pieces, document the way their orientation and evidence of fire, impact angles, etc. (sketch as necessary)

#### C. Detailed Examination

1. Define piece/component and note its position and condition
2. Document evidence relevant to possible inflight failure (separate ground impact damage from inflight failure)
3. Document failure mode and sequence of failure
4. For structural failure, document fracture characteristics
5. Determine aircraft condition at impact
  - a. Control surfaces
    - (1) Ailerons
    - (2) Trailing edge flaps
    - (3) Leading edge devices (flaps or slats)
    - (4) Spoilers
    - (5) Elevator
    - (6) Rudder
    - (7) Trim tabs
    - (8) Other (canards, variable geometry, etc.)
  - b. Control systems (coordinate with Systems Group)
    - (1) Position of control surface at impact (jackscrews, actuating cylinders, etc.); look for witness marks
    - (2) Examine all movable mechanisms for integrity prior to impact
    - (3) Trace control systems from cockpit to control surface for integrity
    - (4) Measure travel of rudder, ailerons, and elevator
  - c. Fuselage - note telescoping, crushing, breaks
    - (1) Cockpit
    - (2) Entry/exit doors, emergency exits, and cargo doors (jammed, inoperable, etc.)
    - (3) Fuel tanks
    - (4) Windows (cracked/crazed, blown out, fracture patterns, etc.)
  - d. Wings
    - (1) Evidence of pre-impact marks or damage
    - (2) De-icer or anti-ice systems
    - (3) Fuel system (tanks, vents, dump) for integrity or evidence of leakage
  - e. Empennage
    - (1) Pre-impact strikes
    - (2) De-icer boots
  - f. Landing gear
    - (1) Position
    - (2) Direction of failure
    - (3) Condition of tires and brakes
    - (4) Wheel wells
6. Estimate impact attitude and velocity
  - a. Flight path (angles and heading)
  - b. Ground scars (preserve and measure)
  - c. Obstacles struck
  - d. Terrain at principal impact and nature of terrain
  - e. Terrain angle

- f. Crush line/angle
- 7. Analyze individual breaks and separations
  - a. Check for evidence of preexisting cracks/corrosion
  - b. Loading
    - (1) Type
      - (a) Tension
        - (b) Compression
        - (c) Bending
        - (d) Shear
        - (e) Torsion
      - (2) Direction
      - (3) Source
        - (a) Impact
        - (b) Aerodynamic
        - (c) In-service
        - (d) Explosion
        - (e) Firefighting/rescue
    - c. Determine need for laboratory study
    - d. Include sketches when necessary

#### E. Mock-ups

Two-dimensional mockups are generally used when a control system problem, a fire, or an inflight structural breakup are suspected. Three-dimensional mockups are usually limited to a critical section of the airplane, rather than the complete structure, and are used to determine the locus of failure and sequence of structural breakup. No mock-up should be started until the condition and location of all known parts have been documented.

- 1. Determine extent of mock-up required
  - a. Partial or Complete
  - b. 3-D or 2-D
- 2. Identify and label pieces/parts by looking for
  - a. Part numbers
  - b. Type of material
  - c. Shape
  - d. Dimension
  - e. Color
  - f. Marks
- 3. Supervise construction of support structure and reassembly of aircraft
- 4. Document damage and note any patterns on associated pieces

#### F. Fire Damage

- 1. Match up parts to determine what was burned
- 2. Be aware of parts that were not burned

3. Determine location and source of ignition
4. Determine when fire started (pre-impact, post-crash, etc.)
  - aa. Post-crash fire may obscure or destroy evidence of in-flight fire
  - b. Document soot, heat, and fire patterns
  - c. In-flight fire may show effects of fire (soot, molten droplets) downstream of origin due to airflow
  - d. Smoke and flames from post-crash fires will rise vertically or be blown in the direction of ground winds
  - e. Caution - mishandling wreckage will obscure or destroy evidence critical to a fire or explosion investigation
5. Determine laboratory study needs
6. Effects of fire
  - a. Flame temperatures of inflight fires (3000°F and above) will be greater than post-crash fires due to forced draft
  - b. Apply evidence against known melting temperatures for materials
  - c. Soot will not attach itself to surfaces which are over approximately 700°F.

## G. Composites

1. Found mostly on secondary structures
  - a. Control surfaces
  - b. Leading edges
    - c. Fairings
    - d. Interior structure (panels, seats, etc.)
2. Construction
  - a. Skin -- resists tension and shear loads
    - (1) Metal
    - (2) Fiber
  - b. Core -- holds skins in place; resists buckling load
    - (1) Metal
    - (2) Fiber
    - (3) Foam
3. For composite damage, document
  - interlaminar separation
  - direction of loose fibers
  - direction of adhesive flow lines
4. Bond failures
  - a. Void failure
    - (1) Indicates area that was never bonded
    - (2) Smooth, clean sides between core and skin are apparent (no pull-out damage)
  - b. Delamination
    - (1) Previously bonded
    - (2) Slightly rough sides
  - c. Adhesive failure

- d. Cohesive failure
- e. Resin failure
- 5. Impact damage
  - a. Localized breakage on leading edge
  - b. Small areas of skin/adhesive separation
  - c. Torn/crushed core
  - d. Use gloves to handle (small slivers may penetrate skin)
- 6. Fire damage
  - a. Amount of composite burned can indicate temperature
  - b. Resins may burn, leaving fiber/cloth (approximately 1200°F)
  - c. Dangerous residual particles could be inhaled (respirators may be necessary in closed areas)
- 7. Determine need for detailed laboratory analysis--field examination may be insufficient

## **SURVIVAL FACTORS GROUP**

The Survival Factors Group is responsible for among other things developing and documenting the following: impact and occupant dynamics including crash injury mechanisms; evacuation and post-evacuation survival; search and rescue; collecting and reviewing reports and written records; aircraft interior configuration and damage; cabin crew training; and post-mortem examinations and toxicological analyses of fatalities.

The Survival Factors Group Chairman should establish the following guidelines with group members 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. Work at times will involve 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) During Progress Meetings, the Group Chairman may call upon group members to present certain detailed findings which they were responsible for developing or documenting.

Survival Factors Group checklist items are included in the following recommended report outline.

NATIONAL TRANSPORTATION SAFETY BOARD  
Office of Aviation Safety  
Washington, D.C. 20594

(report date)

SURVIVAL FACTORS GROUP CHAIRMAN'S FACTUAL REPORT

(accident number)

A. ACCIDENT

Location:

Date:

Time<sup>4</sup>:

Aircraft:

B. SURVIVAL FACTORS GROUP

Chairman: (name)  
National Transportation Safety Board  
Washington, DC

Members: (name)  
(organization)  
(city, state)

C. SUMMARY

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

D. DETAILS OF THE INVESTIGATION

1. 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.

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<sup>4</sup>All times herein are local time and based on the 24-hour clock unless otherwise noted.

## 2. Crew Information

### 2.1 Cockpit Crew Interviews

Flightcrew interviews are conducted by the Operations Group. The Survival Factors Group Chairman will coordinate with the Operations Group Chairman to develop the following Survival Factors-related information, whether the group participates in these interviews or not:

- a. Seatbelt 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.

### 2.2 Cabin Crew

#### 2.2.3 Training

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.

#### 2.2.4 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 business 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. Were infant restraints used - seat location.
- d. Pre-impact precautions by flight attendants or passengers.
- 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 passengers.
- j. Description of F/A's pre and post accident activities.
- k. Difficulty opening door, assess conditions outside, 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. Were infant restraints used - seat location.
- p. Trouble with passengers during flight.
- q. How much liquor was served.
- r. Was any emergency equipment used, i.e., flashlights, megaphones, O<sub>2</sub>, PBE.
- s. Observations of floor path emergency lights, illumination inside\outside aircraft.

### 3. Passengers

List the number of adult males and females, children, infants and handicapped. List the age ranges for each. Determine the location of child safety seats, the occupant's age, injuries, etc.

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.

#### 3.1 General Instructions for Passenger Interviews

- a. Prior to interviewing hospitalized survivors permission will be obtained from the hospital administrator and the attending 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 and spontaneous.
- e. A technique which has been successful in interviewing survivors is to permit the interviewee to discuss his/her observations without interruption. The person 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.

### 3.2 Passenger Interviews

- 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. Noted the locations 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 sustained
- 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 who did not occupy

## child safety seats

### 4. Wreckage Site and Aircraft Damage

#### 4.1 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 will usually 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 ground 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)

#### 4.2 Aircraft Damage

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

##### 4.2.1 Exterior Damage

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

Direction, location, and dimensions of structural deformation

Location and damage to seats and cabin equipment outside the aircraft

Description of thermal and smoke damage

Blocked exits, deployed escape slides, and ropes

Evidence of fire fighting/rescue activity

##### 4.2.2 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.

#### 4.2.2.1 Cockpit

- a. Condition of instrument panel, pedestal, and overhead panels (crash impact and secondary impact evidence, direction and measurements of deformation, thermal damage, etc.).
- b. Condition of control yoke, rudder pedals, and floor (fractures, impact evidence, direction and measurements of deformation, etc.).
- c. Condition of windshields, windows, and escape hatches (impact evidence, direction and measurements of deformation, thermal damage, escape hatch locking mechanism, escape rope\slide device, etc).
- d. Crew life support equipment (evidence that smoke masks, goggles or O<sub>2</sub> mask\system were used, direction of damaged O<sub>2</sub> mountings, first aid kit, crash ax, PBE, medical kit, etc).
- e. Condition of crew seats (impact evidence, direction and measurements of deformation, thermal damage, integrity of tiedowns and rails, direction in which seat and tie-down components separated, etc.).
- f. Record manufacturer of seats, model numbers and rated loads.
- g. Condition and operability of crew's seatbelts, shoulder harnesses, release mechanisms, inertia reel.
- h. Record manufacturer of restraint systems model numbers, date of manufacture, and rated loads.
- i. Cockpit door (locked, direction of opening and measurements of deformation, thermal damage, operable\jammed escape panels, condition of locks, etc.).
- j. Miscellaneous (securing of luggage, flight bags, etc.).
- k. Examine and record location of personal effects found in cockpit.
- l. Perform tests as necessary on equipment.

#### 4.2.2.2 Cabin

- a. Description of overall cabin deformation, floor disruptions, location of upset\separated seats, location of thermal damage, location of separated ceiling panels, location of separated overhead storage bins\racks, location of separated galley\buffet equipment, etc.
- b. Condition of each of exit found in place, extent of damage operational check if possible, location in wreckage, operability of power assist system, etc.
- c. Compare safety card instructions against actual equipment and operation (doors, slides, rafts, life vest, O<sub>2</sub> systems, etc.).
- d. Conditions of flight attendant and passenger seats (impact evidence, direction and measurements of deformation, thermal damage, integrity of tie-downs and rails, direction in which seat and tie-down components defamed\separated.

- e. Record manufacturer of passenger and flight attendant seats, model numbers, date of manufacture, and rated loads.
- f. Condition and operability of safety belts, shoulder harnesses and inertia reels.
- g. Record seat belt\shoulder harness manufacturer(s) date of manufacture, model numbers, and rated loads. To facilitate on-scene tabulation of damage to seat(s), safety belts and cushions, the following (or similar) table can be used and made an attachment to the group report.

| <u>Row/Seat</u> | <u>Safety Belt</u> | <u>Seat Back</u> | <u>Seat Pan</u> | <u>Seat Legs</u> | <u>Floor Attach</u> |
|-----------------|--------------------|------------------|-----------------|------------------|---------------------|
|-----------------|--------------------|------------------|-----------------|------------------|---------------------|

|           |  |  |  |  |  |
|-----------|--|--|--|--|--|
| <u>1A</u> |  |  |  |  |  |
|-----------|--|--|--|--|--|

|           |  |  |  |  |  |
|-----------|--|--|--|--|--|
| <u>1B</u> |  |  |  |  |  |
|-----------|--|--|--|--|--|

- h. Security of carry-on luggage and the security of designated storage areas (under seats, hand-held).
- i. Security of cargo space in the cabin (combi aircraft).
- j. Security of each galley\buffet unit (damaged latches, inserts, etc.). Record galley manufacturer and model number.
- k. Record location of personal effects found in cabin.
- l. Perform tests on equipment as required to determine failure mode(s).
- m. Review cabin maintenance logs and obtain copies of pages as necessary. Determine what corrective actions were taken to clear the writeup(s).

#### 4.2.2.3 Emergency Systems

Document the condition of emergency systems and the results of any testing performed on equipment\systems.

- a. Condition of P.A. systems (component, system checks)
- b. Condition of emergency equipment (O<sub>2</sub>, flashlights, first-aid kits, megaphones, etc.).
- c. Condition of emergency lighting systems (components, system checks, position of emergency lighting control switch).
- d. Description and condition of evacuation alarm system (arming, location actuation).
- e. Condition of each emergency escape slide (stowed or deployed, inflated, damaged, etc.) and record manufacturer of slides model number, and date of last overhaul, date of manufacture, incorporation of service bulletins, etc.
- f. Condition of life rafts or slide/rafts.
- g. Record manufacturer of life rafts and life vests, model number, dates of manufacture, TSO, etc.

- h. Describe other emergency equipment on board, location and use.
- i. If the aircraft is in an unusual attitude, measure the height of the exit sills above the terrain.

5. Medical and Pathological

5.1 Injury Table

The following table summarizes the injuries sustained (Ref: 49 CFR Part 830.2, Definitions).

|                | Cockpit | Flight | Passengers | Others | Total |
|----------------|---------|--------|------------|--------|-------|
| <b>Fatal</b>   |         |        |            |        |       |
| <b>Serious</b> |         |        |            |        |       |
| <b>Minor</b>   |         |        |            |        |       |
| <b>None</b>    |         |        |            |        |       |
| <b>Total</b>   |         |        |            |        |       |

\*Use footnotes to indicate number of infants (up to 24 months), children 25 months to 16 years, and handicapped/mobility-impaired passengers.

5.2 Survivor Injuries

Describe in general the injuries sustained by survivors.

- a. Ask when and how their injuries were sustained.
- b. In some jurisdictions it may be necessary to obtain a release from injured passengers for medical records if they are necessary to the investigation. Issue a Subpoena Duces Tecum for hospital records which show injuries sustained (NTSB Form 6100.8).
- c. To facilitate on-scene tabulation of injury data, the following or a similar table can be used as Attachment 4 to the factual report.

**NTSB/ICAO  
CLASSIFICATION**

**SEAT    AGE    SEX    HT    WT    INJURIES    (E,S,M,N)    MAIS\***

\*The use of NTSB Maximum Aviation Injury Scale (MAIS, based on the American Association of Automotive Medicine 1980) can further categorize injuries.

**AIS (Severity)                      Crewmembers    Passengers    Total**

- 1. Minor \_\_\_\_\_
- 2. Moderate \_\_\_\_\_
- 3. Serious (life threatening) \_\_\_\_\_
- 4. Severe (not life threatening) \_\_\_\_\_
- 5. Critical (survival uncertain) \_\_\_\_\_
- 6. Fatal \_\_\_\_\_
- 7. Insufficient Information \_\_\_\_\_
- 8. Unknown \_\_\_\_\_
- 9. Total \_\_\_\_\_

5.3    Fatal Injuries

Describe fatal injuries sustained by occupants.

Coordination will be necessary with the Human Performance Group Chairman when contacting the medical examiners\coroner's office to assure that autopsies are performed on the flight and cabin crewmembers as a minimum and that specimens will be required for toxicological analyses. (Ref: NTSB Authority, Public Law 93-633 dated 1/3/75, Title III "Independent Safety Board Act of 1974, "Sec. 304(b) Powers of Board (5) Autopsy report & Title III FAA Act of 1985, Sec. 701(c).

Postmortem Examinations

1. Each crewmember must be positively identified.
2. Postmortem examinations should be made on each cockpit occupant.
3. Postmortem examination should be made on flight attendants, passengers, and persons on the ground as the circumstances of the accident indicate.
4. Gross injury descriptions should include all fractures, dislocations, lacerations, amputation, burns, and condition of clothing.
5. Toxicological and microscopic examinations as necessary, should be performed on all cockpit occupants, selected flight attendants and passengers, and other selected victims as the situation warrants.
6. All bodies photographs should show body number.
7. The following photographs should be taken by local authorities:
  - a. At the scene before body is moved.
  - b. At place of examination - anterior and posterior both clothed and unclothed.
  - c. At postmortem - close-up photographs of lesions, embedded foreign objects, fractures, internal injuries, etc.
8. If autopsies cannot be performed, X-rays should be made of cockpit occupants, cabin crewmembers, and selected passengers to identify fractures, imbedded foreign objects, etc., as well as gross descriptions of injuries.
9. Obtain body location charts\diagrams numbers, ID process, photos, and postmortem reports.

#### 5.4 Toxicologic Analyses

Summarize results of laboratory test.

Specimens will be taken for toxicological, biochemical and microscopic examination. Sufficient quantities must be taken to assure adequate specimens are available for use by CAMI and/or AFIP in addition to specimens for use by local officials.

#### 6. Emergency Response

In some instances a separate group may be formed to develop this information.

##### 6.1 Search and Rescue (SAR)

Describe search and rescue efforts particularly if the accident occurred in a remote area and identify any problems SAR encountered (communications, weather, etc.).

- a. Describe the notification, response and on scene activities.
- b. Interview involved personnel as required.

- c. Determine number and types of units involved and pertinent times as well as the number of responding personnel.
- d. Determine how many persons were rescued alive and how many non-survivors were removed from the accident site.
- e. Obtain reports on their air\ground search and rescue operations from participating organizations. Use maps and sketches to show search area. Obtain photos\video tapes.
- f. Problems encountered during the SAR operation (communication, command control coordination, etc.).

6.2 Aircraft Rescue and Fire Fighting (ARFF) Response

Describe the on and off airport firefighting operations from their notification to arrival on site and any problems responding.

- a. Determine when, by whom, and how the Fire Department(s) were notified of the emergency\accident.
- b. The time necessary to complete firefighting and\or rescue operations.
- c. Who was the on-scene commander and was a field command post used.
- d. Describe the communications network.
- e. Describe any difficulties encountered responding to the scene.
- f. Obtain or make map of site indication access routes, runways, location of vehicle, wind direction, etc. Obtain photos\video tapes.
- g. Quantity and type of fuel on board the aircraft.
- h. Describe the origin, and propagation of the fire.
- i. Describe fire and rescue conditions when ARFF units first arrived on scene.
- j. Interview firefighters as required. Describe tactics used, e.g., how.
- k. Obtain responding Fire Department accident\incident reports. Describe problems during fire attack.
- l. Airport CFR Index - was a NOTAM issued?
- m. Summarize the responding equipment as follows:

| <b>VEHICLES/<br/>UNIT NO.</b> | <b>PERSONNEL<br/>ABOARD</b> | <b>TRAVEL<br/>TIME/DIST</b> | <b>AGENT DISCHARGE<br/>CAPACITY RATE</b> | <b>QUANTITIES<br/>USED</b> |
|-------------------------------|-----------------------------|-----------------------------|--|----------------------------|
|-------------------------------|-----------------------------|-----------------------------|--|----------------------------|

Crash Trucks

- 1.
- 2.

Quick Reaction  
Vehicles

- 1.
- 2.

Engine

Companies

1.

2.

---

Ladder

Companies

1.

2.

---

Ambulances

1.

2.

---

Rescue

Squads

1.

2.

---

Helicopters

1.

2.

---

### 6.3 Law Enforcement Response

Describe involvement of local and airport law enforcement agency departments.

- a. Interview department personnel as required.
- b. Determine number of responding units, pertinent times, and number of personnel involved.
- c. Obtain police accident/incident reports, photos, and video tapes.
- d. Describe security perimeter and associated problems with traffic, site security, and crowd control.
- e. Describe staging areas and any traffic control problems.

### 6.4 Medical Response

Describe the efforts of local hospitals and medical personnel.

- a. Determine when and by whom hospitals were notified and the extent the hospitals implemented their disaster plans.
- b. Did medical personnel respond to the scene (i.e., was a triage area established) and, if so, at what time.
- c. What services did the hospital provide, i.e., ambulance, Life Flight Helicopter, equipment, etc.
- d. Clock times when first and last patients arrived at each hospital.
- e. Date and critique of most recent disaster drill.

## 6.5 Disaster Preparedness

Depending upon the circumstances, describe the community preplanning (or lack thereof) which enabled them to deal with the situation.

- a. Description of local community disaster plan(s).
- b. Dates of community disaster drills and, if so, were there any problems.
- c. Determine which disaster plans were implemented for this emergency and, if so, were there any problems.
- d. Interview appropriate personnel if necessary.
- e. Obtain copies of all pertinent disaster plans, response reports, and critiques by local disaster planning offices involved in this response.
- f. Describe command post(s), equipment, communications--note any command, communication, and coordination problems.

## 6.6 Airport Certification

- a. Review airport disaster plan (copies of portions of the plan may be required).  
Dates of table top and full scale disaster exercises.
- b. From the airport or the FAA, obtain copies of the FAA annual certification reports for past three years and related letters of correction.

## 7 Survival Aspects

Summarize based upon interviews and the condition of the wreckage, all aspects affecting occupant survival. Describe all aspects of the emergency evacuation process.

### 7.1 Cockpit Crew

Describe the crew's involvement in the post accident and evacuation processes.

- a. Outline flightcrew's duties and responsibilities during evacuation.
- b. Description of crew's efforts to assist passengers during evacuation.
- c. Flightcrew's account on how and when they egressed the aircraft.
- d. Flightcrew's observations of ARFF activity and passengers.

### 7.2 Cabin Crew

Describe the flight attendants' involvement in the emergency, the evacuation, and post evacuation.

- a. Flight attendants' duties and responsibilities during an emergency evacuation.
- b. Description of flight attendants' preparation of passengers for evacuation.

- c. Flight attendants' assistance of passengers during evacuation.
- d. Flight attendants' account of how and when they egressed the aircraft.
- e. Flight attendants' observations of ARFF and passengers' reaction to the emergency.

### 7.3 Passengers

Summarize from passenger interviews and statements their observations prior to, during, and after the emergency evacuation/accident.

- a. Description of how passengers exited or were rescued from the aircraft.
- b. Difficulties during egress.
- c. Observations of ARFF activities.
- d. Description of how passengers were injured, i.e., what they impacted or what struck them.
- e. An aircraft seating diagram of facsimile and symbols to denote injury, exit used, seat damage, etc.

## E. ATTACHMENTS

The following list of attachments is but a few of the possibilities.

Each attachment has its own cover sheet.

1. Passenger List
2. Crew Statements
3. ARFF and Police Reports
4. Disaster Plans
5. Test Reports
6. Toxicology Reports
7. Safety Card
8. Injury Chart
9. Passenger Interviews, Statements, and Questionnaire

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## SYSTEMS GROUP

The Systems Group will be responsible for:

### A. Cockpit Documentation

Documentation of post-impact control lever positions, switch positions, and instrument readings, and recovery of flight planning information and other documents related to flight operations which are found in and around the cockpit (coordinate with Operations Group).

1. No other groups or individuals will be allowed in cockpit area until system documentation is complete. Coordination is required with other groups.
2. Describe actual condition - do not state "destroyed by fire or impact." Specify fire damage and extent of mechanical deformation. Resolve what documentation of normal or abnormal system operation can be verified by the evidence, despite the fire damage.
3. Do not move levers or switches until written and photo documentation is complete and group concerns are resolved.
4. Use drawings from manuals to keep track of object identification.
5. The following information should be obtained where possible:
  - Positions of all switches
  - Positions of engine/propeller control levers
  - Positions of flap and gear levers
  - Readings from all instruments
  - Settings of all bugs (e.g. - heading, airspeed, altitude, EPR)
  - Frequencies and settings from all radio tuning panels including volume controls
  - All trim settings
  - Condition and documentation of electrical/circuit breaker panels.

NOTE: Key instrument and switch positions should be photographed before any effort is made to analyze those positions. Sooting or glass damage may temporarily obscure instrument readings but readings may be obtained by cleaning or removing the glass.

### B. Subsystem Documentation

Determination of system integrity, component condition, actuator and valve positions, etc. Priority and degree of concentration on a particular system will be dependent upon particular accident circumstances. Coordination with Structures Group is a must (to coordinate access to the

wreckage and to coordinate parallel group efforts). Documentation of the following subsystems and items is typically the responsibility of the Systems Group unless otherwise assigned by the IIC.

ATA Spec 100

Air Conditioning, Chapter 21 - air cycle equipment, valves, bearings, impellers, ducting connections, thermocouples, switches.

Auto Flight, Chapter 22 - cockpit control settings, servomotors.

Communications, Chapter 23 - operation and indications.

Electrical Power, Chapter 24 - wire integrity (continuity, shorts, arcing), switches, circuit breakers, electric generators.

Fire Protection, Chapter 26 - extinguisher bottles, discharge indications.

Flight Controls, Chapter 27 - pre-impact position and integrity, travel of control surface, control cable continuity.

Hydraulic Power, Chapter 29 - hydraulic fluid quantity and quality, valves, pumps, filters, tubing.

Ice and Rain Protection, Chapter 30 - anti-icing ducting, wiper controls.

Instruments, Chapter 31 - needle imprints, internal gears, non-volatile memory.

Landing Gear, Chapter 32 - actuators, up/down locks.

Lights, Chapter 33 - light bulb filaments, interior/exterior lights.

Navigation, Chapter 34 - frequencies, control knob positions.

Oxygen, Chapter 35 - crew/passenger oxygen bottles, lines, generators.

Pneumatics, Chapter 36 - ducting, joints.

Vacuum/Pressure, Chapter 37

1. Prior to documentation, ensure that immediate needs for preservation are being met (e.g., cover avionics if rain is forecast). Photograph the area and details first.

2. Use schematic diagrams from applicable manuals to document components and systems as they are identified.
3. Describe location and actual condition of each component as found. Do not move or change position of actuators, valves, switches, or controls until documented.
4. Measure actuator extended length. Be certain to be specific in describing points of measurement. Photograph actuators, valves, switches and controls that are potentially relevant to the accident. Don't assume "noninvolvement" of any components.
5. Record the following information from each component that is potentially involved, when possible:
  - Nomenclature
  - Manufacturer
  - Part Number
  - Serial Number
  - Position in aircraft
6. Determine whether electronics/avionics may have recoverable memory. Recover electronics/avionics with 12-18 inches of wire harness, rather than simply unracking the avionics box. Only disconnect at the plug connection if airplane is salvageable and memory retrieval is not possible or necessary.

#### C. Offsite Component Testing

If a particular subsystem component, or components, is critical to the resolution of the accident, a more detailed investigation may be required. This may include bench testing and disassembly. The group members will be expected to participate in such activity at the determined places and times. Component testing should not begin until an appropriate test plan has been developed and the group is briefed on its content. Test results will be documented in such a way that the test plan and results will be clearly understood by the reader.

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## WEATHER GROUP

The Weather Group will collect and review all available weather data pertinent to the accident. Depending on the circumstances of the accident, the group's activities may also 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.

Close coordination is maintained by the Weather Group with other investigative groups such as Operations, Aircraft Performance, 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.

The functions of the Weather Group 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.

## 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
- 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

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
- (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

## 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

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## WITNESS GROUP

### Witness Interviews

Witness interviews should be obtained as soon as feasible, since 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.

Under Part 831.7 of the Board's procedural regulations, "Any person interrogated by an authorized representative of the Board during the field investigation shall be accorded the right to be accompanied, represented, or advised by counsel or by 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. To expedite the investigation, the investigator should communicate these crew members' rights through their association or employer when the post-accident interviews of air traffic controllers, flight crew members, or flight attendants are scheduled. 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.

The following guidelines will help achieve a successful interview.

- Visit the accident site prior to interviewing witnesses. This will help develop a list of areas to be covered during the interview.

- Establish beforehand with the witness a time to conduct the interview, if possible.
- Prior to the interview, have a general idea of information desired from the interview.
- Attempt to develop a positive rapport with the witness. Always be polite and courteous to the witness.
- Qualify the witness regarding his/her knowledge and experience related to aviation.
- Obtain information on the location of the interviewee at the time the events being described in the interview were taking place.
- If witnesses are interviewed by a group, the group chairman 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. Only one person should ask questions at a time, with others to follow in order.
- Limit the number of persons participating in the interview.
- A model aircraft, compass, watch, maps, and charts are valuable tools that can be used during witness interviews.
- 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. Do not interrupt the interviewee.
- Ask specific questions after the witness has completed his/her narrative. Keep questions simple and brief. Avoid aviation/technical jargon with those not familiar with such terminology.
- Be cautious that the questions are not presented in a leading manner. Don't nod your head or communicate agreement or disagreement with something the interviewee has said.
- Note-taking during the interview is advisable; however, it should only be done with the consent of the witness and in such a manner as not to be distracting.
- A tape recorder can be a valuable tool but should only be used with the witness's

consent.

- 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 the size of the witness group.
- After all questions have been asked, provide the interviewee the opportunity to ask questions of the interviewers.
- 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. 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.
- Leave a telephone number and an address where you can be reached should the witness recall additional information.

When all information is obtained from the interviewee, review the notes of the interview with other group members who participated in the interview. The highlights of the interview should be noted in the group's report.

## APPENDIX G

### SAMPLE GROUP CHAIRMAN PROGRESS MEETING BRIEF

Each group chairman should briefly describe significant findings, state plans for the next day, and request any questions or suggestions from the investigative group on the information. The brief should be related to factual material only, as should questions or discussions from investigation members.

The following is an example of a Progress Meeting report the Structures Group Chairman might give.

"Today we documented the wreckage path and determined some aircraft configuration data. The airplane touched down about 1,000 feet from the runway end and slid about 800 feet to a stop. The crash path was oriented at 240 degrees. The first touchdown points are consistent with the right main landing gear and the right wing tip. Evidence of ground fire was noted about 100 feet after the right wing struck the ground. We have established that all three landing gear were down and locked. The left wing flaps were found in the "up" retracted position. The right wing flaps were virtually destroyed by impact and fire. The empennage is intact, and all control surfaces were found at the final resting point. One of our group members found what looks like a pilot's logbook that was partially burned. I have it here for the Operations Group Chairman. We will continue to examine flight control positions and continuity tomorrow. There is no evidence of in-flight fire at this point, but we would like to have input from the Witness Group and Survival Factors Group on eyewitness and passenger statements about fire. Tomorrow we will examine the flap jackscrews and actuators in coordination with the Systems Group. We will require another 2 days or more at the site before we can consider moving the wreckage to a hanger for closer examination. Are there any questions or suggestions for our group?"

## APPENDIX H

### MATERIALS LABORATORY EXAMINATIONS

#### 1. General

The NTSB Materials Laboratory should be the focal point for all material failures that may be a factor in an aircraft accident. Use of local outside laboratories (private, industry, or academia) should be limited to screening the component as to whether a problem exists with the part. For example, if a field investigator is unsure of the failure mode (fatigue or other preexisting cracks versus a complete overstress separation) then an outside laboratory might be used. If a preliminary examination by this outside laboratory discloses a preexisting condition, then the component should be immediately forwarded to the Materials Laboratory for detailed examination. Except for some instances of manufacture evaluations, use of outside laboratories to do a complete in-depth investigation has typically proven to be inappropriate, more time consuming, and sometimes inaccurate. The Materials Laboratory should be consulted before a manufacturer's laboratory is used.

#### 2. Preservation of Parts

Moisture and mechanical damage are the two main causes of additional damage to components that are to receive laboratory examination. Moisture can be very harmful to fracture surfaces of ferrous alloys (steels) that rust easily, but has little effect on aluminum alloys that are more oxidation resistant. Mechanical damage to the fractures can occur when the components are mated together along the fracture planes. A slight movement while mated together will obliterate the fine fracture detail and disturb deposits often needed to establish the cause for the failure. For this reason the fracture surfaces should be kept apart from each other.

To best protect fractured components and specimens it is advisable to first air or blow dry the components (if wet) and then wrap the area of interest in clean rags or cloth to prevent any inadvertent contact with other hard surfaces. If the components will be in an outside environment for a considerable time, they should also contain an outer wrap of plastic or other water resistant material to keep the cloth dry and uncontaminated.

Because surface chemistries may be important to establish the cause of fracture initiation or establish inspection debris (e.g., dye penetrant), nobody should touch the fracture surface with their fingers (which leaves salts) or anything else that is hard or sharp or that may be contaminated. The use of preservative oils (WD-40) should be avoided for this reason except as noted below for steels.

In cases where the fractures may be encased in dirt, there may be a need to initially clean the surface for a preliminary inspection. If so, first use a soft bristle brush such as a toothbrush (wire brushes are prohibited) and gently remove the dirt. If liquid is then needed, use clean water and a

soft brush. Finally, rinse with alcohol or acetone, if available, to accelerate the drying. For steels, however, cleaning the fracture surfaces with alcohol or acetone will remove any protective oils that may be present. It is therefore recommended that a light application of protective oil (preferably WD-40, hydraulic fluid) be applied after the alcohol or acetone.

### 3. Submittal of Parts

After adequately protecting the areas of interest against moisture and mechanical damage, ship or hand carry the parts to the Materials Laboratory Division, NTSB, Washington, DC, 20594. Use registered mail when possible for traceability. Enclose some correspondence that identifies the parts, the normal accident information (location and date of accident, NTSB accident number, and the aircraft's make, model, and registration number), a brief account of the circumstances of the accident, and an explanation of the work requested. The form on the following page can be used to record this information, although a copy of NTSB form 6120.19A (Preliminary Report) can also be used.

### 4. Development of Background Information

When a component is found to have separated and caused or contributed to the accident, much background information is needed to do a complete failure analysis. This includes part numbers and component names, maintenance history (last overhaul, inspection, rework, modification, etc.) and total (and since overhaul) time and cycles of service. The Materials Laboratory will normally contact the manufacturer about the specified material, hardness, and other material properties as well as locate any service bulletins and airworthiness directives applicable to the part. Should the investigator have such information, he/she should also submit this with the parts.

**REQUEST FOR MATERIALS LABORATORY EXAMINATION**

NATIONAL TRANSPORTATION SAFETY BOARD  
Office of Research and Engineering  
Materials Laboratory, RE-30  
Washington, D.C.

---

**A. ACCIDENT/INCIDENT INFORMATION**

Location : \_\_\_\_\_  
Date : \_\_\_\_\_  
Aircraft : \_\_\_\_\_  
NTSB No. :

**B. COMPONENTS SUBMITTED**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**C. SERVICE HISTORY OF COMPONENT(S): IF APPLICABLE**

\_\_\_\_\_  
\_\_\_\_\_

**D. EXPLANATION OF WORK REQUESTED**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**E. SUBMITTED BY**

Name/Office : \_\_\_\_\_  
Phone/Date :

**F. RETURN PARTS TO:**

Name/Title : \_\_\_\_\_  
Affiliation : \_\_\_\_\_  
Address : \_\_\_\_\_  
Address :

## **APPENDIX I**

### **GROUP CHAIRMAN FACTUAL/ANALYSIS REPORT OUTLINES**

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NATIONAL TRANSPORTATION SAFETY BOARD  
Office of Aviation Safety  
Washington, D.C. 20594

[date]

[group] GROUP CHAIRMAN'S FACTUAL REPORT

[accident number, e.g., DCA-94-MA-001]

A. ACCIDENT

Location:

Date:

Time:

Aircraft:

B. [group] GROUP

Chairman: [name]  
National Transportation Safety Board  
Washington, DC

Member: [name, organization, city, state]

Member: [name, organization, city, state]

C. SUMMARY

[This section might contain a short summary of the accident, as provided by the IIC, but shall include a summary of the specific group's activities.]

D. DETAILS OF THE INVESTIGATION

[Include factual documentation from on-scene phase of investigation, as well as any follow-up efforts, testing, etc.]

[name, title, and signature of Group Chairman]

**"FOR OFFICIAL USE ONLY"**

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety

Washington, D.C. 20594

[date]

[group] GROUP CHAIRMAN'S ANALYSIS REPORT

[accident number]

A. ACCIDENT

Location:

Date:

Time:

Aircraft:

B. DETAILS OF THE 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.
- 3.
- etc.

C. FINDINGS

1. [State the principal findings briefly and concisely.]
- 2.
- 3.
- etc.

D. PROBABLE CAUSE(S)

[Give opinion on the relevancy of the findings to a probable cause of the accident or as contributing factors in the accident.]

E. RECOMMENDATIONS

[Mention any proposed recommendations addressing safety deficiencies discovered during the group's investigation.]

[name, title, and signature of Group Chairman]

**"FOR OFFICIAL USE ONLY"**

## APPENDIX J

### PUBLIC HEARING PREPARATION CHECKLIST

1. Determine date of Public Hearing.
2. Notify Public Affairs and Governmental Affairs of selected date, and later, of selected hotel or other meeting place.
3. Arrange for Court Reporter.
  - a. AS-10 secretary will do this through the contract firm Executive Court Reporters at (301) 565-0064.
  - b. Insure that a letter of confirmation with a copy of the Notice of Hearing (Exhibit 1E) is sent to the court reporter.
  - c. Confirm the availability of the court reporter at about the time of the prehearing conference.
4. Obtain Docket (SA) Number from Public Inquiries.
5. Determine hotel or other meeting place for Public Hearing (Do this as soon as a date and hearing city have been established).

#### Arrange for:

- a. Ballroom at hotel or other large civic meeting place  
Note: Close coordination with Public Affairs is essential to insure good sight lines for TV cameras, ample riser size, adequacy of ballroom size, etc.
- b. P.A. system/microphone locations
- c. Table/seating arrangements (see attached diagram)
- d. American flag

- e. Another small rented meeting room in the hotel, with tables and chairs, to use as an NTSB office
- f. Rental of dedicated, non-switchboard telephone, fax, and copier
- g. Room reservations for NTSB participants
- h. Description of transportation methods to and from the hotel

Notes:

- If possible, travel to the city selected for the hearing to coordinate personally with hotel, convention or sales personnel.
- Do not finalize the location or date of the hearing until all NTSB/Hotel details (small office equipment rental, participant reservations, etc.) have been determined.

6. Obtain:

- a. NTSB banner, NTSB seal, gavel, and gavel striker.
- b. Name tents for Board of Inquiry, Parties, Tech. Panel, GAPA, Press.
- c. Visual aids you plan to use and the large, black artist's shipping folio for the visual aids.
- d. Copies of CFR 91, 135, and 121 as appropriate.
- e. Cardboard Xerox boxes to mail items to the hotel.
- f. About 30 multi-slot file folders to house exhibits.
- g. Office supplies such as these --
  - 3-hole punch, notepads, pens, pencils, telephone message pads, scissors, stapler/staples, paper clips, post-it pads, NTSB mailing labels w/return address for returning boxes, filled-out overnight mailing labels, a roll of reinforced masking tape, whiteout, etc.

7. Oversee preparation of visual aids (blown up photographs, charts, etc.), as

required.

8. Together with the IIC:
  - a. Prepare list of suggested Parties to the Hearing to be formally designated later by the Chairman of the Board of Inquiry.
  - b. In conjunction with AS-1 and RE-1, determine members of Board of Inquiry.
  - c. Determine Technical Panel members (usually the IIC and certain Group Chairmen).
  - d. Determine areas of testimony to be developed at the hearing.
  - e. Identify witnesses to be called.
  - f. Determine exhibits to be used.
  - g. Establish date for receipt of all exhibits from group chairmen.  
Note: Allow for 10 working days in advance of prehearing conference for mailing exhibits to parties.
  - h. Begin a preliminary Witness List (also known as the Hearing Outline) by determining categories first, job titles second, and exact names last, when you and the parties decide on individual witnesses.
  
9. Send a memo to all Group Chairmen and Heads of Offices specifying:
  - a. Docket No.
  - b. Exhibit Numbers
  - c. Date/Time/Place of hearing
  - d. Exhibit page numbering procedure
  
10. Hold a "Hearing Planning Meeting"
  - a. Attendees should include AS-1 or 2, AS-10, Tech Panel, and the IIC, at a minimum.
  - b. Topics should include the Witness List, hearing areas of questioning, etc.

11. Brief the Presiding Officer of the hearing (the Board Member) of the planned witnesses and questioning topics (the Witness List). Rebrief him/her when subsequent major changes or additions/deletions to the Witness List occur.

12. Prepare:

- a. Order of Hearing (Exhibit 1A)
- b. Notice of Designation of Chairman of Board of Inquiry (Ex. 1B)
- c. Designation of Hearing Officer (Ex. 1C)
- d. Designation of Parties to the Hearing (Ex. 1D)
- e. Notice of Hearing (Ex. 1E)

Note: Deliver copies of these items to MD-5 when completed.  
One or more of them are supposed to go into the Congressional Record.

13. Notify each party to the hearing, in writing, return receipt requested of:

- a. The Board's decision to hold a hearing, the Presiding Board Member, plans, procedures, potential issues, witnesses, etc.
- b. Time/date/place of hearing.
- c. A request for the name of the party spokesman.
- d. NTSB Part 845, a Notice of Hearing, and a notice of Designation of Parties.
- e. A request for NTSB-desired witnesses from the party.

14. Prepare:

- a. Board Member's canned prehearing speech.
- b. Prehearing Conference Outline.
- c. Board Members canned hearing opening and closing speeches.
- d. Later version of the Witness List.
- e. Exhibit List.

Note: Do not include the canned speeches for the Board Member in anything you mail out to the parties until the speeches are approved by the

Board member.

15. Issue subpoenas to non-government or non-party witnesses.
  - a. Send by registered mail with explanatory letter.

Note: A subpoena is necessary to allow the NTSB to pay travel expenses for non-party or non-government witnesses. Witnesses employed by one of the designated parties will normally be requested verbally or by letter through their organization, with no subpoena necessary.
  
16. Prepare a travel order for NTSB participants and, if required, for non-government or non-party witnesses.
  - a. Attach a state tax-exempt form to the NTSB travel orders, if available.
  
17. Assemble and tab Hearing Exhibit Packages that will contain:
  - a. Copies of all canned speeches of Presiding Officer.
  - b. Any hearing informational memos deemed appropriate.
  - c. Exhibit List.
  - d. Latest and probably last pre-hearing version of the Witness List.
  - e. Exhibits 1A through 1E.
  - f. All exhibits from Group Chairmen.

Note: Do not allow anyone to talk you into putting their exhibits in three-ring binders. Drilling the holes and assembling the binders takes too much time and energy.
  
18. Mail and distribute hearing exhibit packages to parties and NTSB participants.

Distribution List for exhibit packages:

Chairman of Board of Inquiry .....2 copies  
Remaining Board of Inquiry Members .....1 copy each  
IIC .....1 copy

Remaining Technical Panel Members .....1 copy each  
 FAA.....3 copies  
 Remaining Parties to the Hearing .....1 copy each, 10 working before  
 prehearing conference.  
 PA/Public .....1 copy  
 Docket .....1 copy  
 Spare Packages.....At least 7 copies, one of which is  
 unstapled, for later copier use.

Notes:

- As a very general rule, about 30 exhibit packages are required for every public hearing.
- One spare package should be unstapled to facilitate copying at the hearing site.
- The public docket copy should be unstapled also, and be accompanied by an NTSB form 6120.3, Table of Contents. Set this exhibit package up as you would for a docket with no hearing. Have it delivered to Public Inquiries at the time the hearing opens.
- Try to use inexpensive mailing services, if possible.

19. Mail the NTSB participant exhibit packages, supplies and miscellaneous items to the hotel.

Notes:

- If you have the time, use regular mail, if not, use overnight.
- If you mail the artist's folio with the visual aids in it, the folio may not arrive intact. If you put it in airline checked baggage, it may not arrive intact. If you attempt to treat it as airline carry-on baggage, the lead flight attendant will not allow you to do so. In other words, like the CVR transcripts (see item 21), there is no good way to get your visual aids to the hearing location.

20. Hold the Prehearing Conference about 1 week prior to the hearing.

- a. Distribute exhibits not previously forwarded, corrections or amendments to exhibits, etc.
- b. Review Witness List to make sure the parties understand what is expected of their witnesses.
- c. Ask the parties if they desire any additional witnesses, exhibits, etc.
- d. Describe any administrative procedures that need explanation.

21. Procedures for handling cockpit voice recorder related exhibits:

- Do not take possession of CVR related material until the last working day before departure for the hearing site. Suggested methods of getting the CVR material to the hearing site follow.

-----

Plan A:

- On that day have RE deliver about 80 copies (50 for PA and 30 for hearing participant use) of CVR related exhibits to you personally. Seal them in one unmarked box and lock it up in your office.
- Or alternately, receive one copy of each CVR related exhibit and make the 80 copies yourself or under your very close supervision. Seal them in the box and lock it up.
- Take the box home with you and lock it up again until you depart for the airport.
- Check the box as checked luggage at the ticket counter.
- Retrieve the box at the luggage carousel at your destination and lock it up in your hotel room.

-----

Plan B:

- Determine if there is a commercial quick copy facility close to the hearing site that will be open on the day prior to the opening of the public hearing. Remember that policy is to allow the parties six hours to assimilate the CVR data before the opening of the public hearing. For instance, this would preclude using a commercial facility on Monday morning, if the hearing was to open early Monday afternoon.
- If you find a commercial printer open at the appropriate time, receive single copies of CVR related exhibits from RE on the last working day prior to the hearing and guard them closely as you bring them with you to the hearing site.
- Make 80 copies of the material at the quick copy facility at the site of the hearing and lock them in your hotel room.

-----

Plan C:

- If neither of the above plans are practical, and with explicit permission from AS supervisors, obtain the 80 copies in sufficient time to overnight mail the unmarked box of the CVR exhibits to the hotel.
- Either tell the hotel how to identify the box via the shipping documents and have them secure it in a more secure area than the rest of the material you mail out, or.....
- Don't tell the hotel anything and have the box placed with the rest of the boxes, trusting that its security will lie in its anonymity.
- As is obvious, this is the least secure way to get the CVR exhibits into the hands of the parties and the public under current rules. Use this plan with great caution. When in doubt, ask you supervisor about how he wants to get the CVR exhibits to the hearing site.

-----

- Pass out copies of the CVR related exhibits six hours prior to the opening of the public hearing.

Note:

- Sit down with the Public Affairs representative at the hearing the evening before the hearing opens and let him read the CVR related exhibits. Answer any questions he has on the material so he will be prepared for press queries the next day. Retrieve the copies that he reviewed after the briefing.

**APPENDIX K**

**EXHIBIT COVER SHEET AND IDENTIFICATION NUMBERS**

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## HEARING EXHIBIT IDENTIFICATION ORDER

| <u>GROUP</u>           | <u>IDENTIFICATION NUMBER</u> |
|------------------------|------------------------------|
| Operations             | 2                            |
| ATC                    | 3                            |
| Witnesses              | 4                            |
| Meteorology            | 5                            |
| Survival Factors       | 6                            |
| Structures             | 7                            |
| Powerplants            | 8                            |
| Systems                | 9                            |
| Flight Data Recorder   | 10                           |
| Maintenance Records    | 11                           |
| Cockpit Voice Recorder | 12                           |
| Aircraft Performance   | 13                           |
| Human Performance      | 14                           |
| Materials              | 15                           |
| Airports/ARFF          | 16                           |
| Other                  | *                            |

\* Use higher exhibit numbers for other groups, as necessary.

UNITED STATES OF AMERICA  
NATIONAL TRANSPORTATION SAFETY BOARD  
WASHINGTON, D.C. 20594

\*\*\*\*\*

**In the Matter of the Investigation of** \*  
**the Accident Involving** \*  
**(aircraft)** \*  
**(location)** \*  
**(date)** \*

DOCKET NO. SA-

\*\*\*\*\*

**ORDER OF HEARING**

A public hearing is hereby ordered by the National Transportation Safety Board in connection with the above matter at a time and place to be determined by the Hearing Officer who will be hereafter designated.

Dated this     day of     .

FOR THE BOARD

Chairman

UNITED STATES OF AMERICA  
NATIONAL TRANSPORTATION SAFETY BOARD  
WASHINGTON, D.C. 20594

\*\*\*\*\*

**In the Matter of the Investigation of** \*  
**the Accident Involving** \*  
**(aircraft)** \*  
**(location)** \*  
**(date)** \*

**DOCKET NO. SA-**

\*\*\*\*\*

**NOTICE OF  
DESIGNATION OF CHAIRMAN OF BOARD OF INQUIRY**

Pursuant to the authority conferred by the National Transportation Safety Board, Washington, D. C., Member \_\_\_\_\_ is hereby designated as Chairman, Board of Inquiry, to conduct a public hearing on behalf of the National Transportation Safety Board, in the above matter. The said Chairman of the Board of Inquiry is authorized to exercise such powers in connection with the conduct of said proceedings as authorized by the National Transportation Safety Board.

Dated this \_\_\_\_\_ day of \_\_\_\_\_ .

FOR THE BOARD

Chairman

UNITED STATES OF AMERICA  
NATIONAL TRANSPORTATION SAFETY BOARD  
WASHINGTON, D.C. 20594

\*\*\*\*\*  
**In the Matter of the Investigation of** \*  
**the Accident Involving** \*  
**(aircraft)** \* **DOCKET NO. SA-**  
**(location)** \*  
**(date)** \*  
\*\*\*\*\*

**DESIGNATION OF HEARING OFFICER**

Pursuant to the authority conferred by the National Transportation Safety Board, \_\_\_\_\_, Office of Aviation Safety, Washington, D. C., is hereby designated Hearing Officer to conduct a public hearing on behalf of the National Transportation Safety Board, to be held in the above matter. The said Hearing Officer is authorized to set the time and place of the hearing, to give notice thereof, and to exercise such other powers in connection with the conduct of said proceedings as authorized by the National Transportation Safety Board.

Dated this \_\_\_\_\_ day of \_\_\_\_\_ .

FOR THE BOARD

Chairman

UNITED STATES OF AMERICA  
NATIONAL TRANSPORTATION SAFETY BOARD  
WASHINGTON, D.C. 20594

\*\*\*\*\*

**In the Matter of the Investigation of** \*  
**the Accident Involving** \*  
**(aircraft)** \*  
**(location)** \*  
**(date)** \*

DOCKET NO. SA-

\*\*\*\*\*

**DESIGNATION OF PARTIES TO THE HEARING**

The following organizations are designated Parties to the hearing in accordance with Part 845.13 of the Board's Procedural Regulations:

Dated this     day of     .

Chairman, Board of Inquiry

UNITED STATES OF AMERICA  
NATIONAL TRANSPORTATION SAFETY BOARD  
WASHINGTON, D.C. 20594

\*\*\*\*\*  
**In the Matter of the Investigation of** \*  
**the Accident Involving** \*  
**(aircraft)** \* **DOCKET NO. SA-**  
**(location)** \*  
**(date)** \*  
 \*\*\*\*\*

**NOTICE OF HEARING**

Notice is hereby given that pursuant to the authority conferred by the National Transportation Safety Board, I hereby designate that a hearing on the above matter will commence at (time) on (date) in (location).

Dated this     day of     .

FOR THE BOARD

Hearing Officer

## **APPENDIX L**

### **PREHEARING CONFERENCE PROCEEDINGS**

- (1) Opening Statement by the Chairman of the Board of Inquiry
- (2) Introduction of Board of Inquiry and Technical Panel
- (3) Discussion of Prehearing Conference and Public Hearing
- (4) Introduction of the Parties to the Hearing
- (5) Discussion of Issues for Public Hearing
- (6) Review of Exhibits by Hearing Officer and Group Chairmen
- (7) Review of Witnesses by Hearing Officer and Technical Panel
- (8) Resolution of Any Procedural Issues
- (9) Closing Remarks by the Chairman of the Board of Inquiry

Ladies and Gentlemen, please come to order.

This prehearing conference is being held in accordance with Title 49 Code of Federal Regulations Part 845, which prescribes the National Transportation Safety Board's Rules of Practice in Transportation Accident/Incident Hearings and Reports.

I am [name], Member of the National Transportation Safety Board, and Chairman of the Board of Inquiry. On [date] we will commence a public hearing to investigate the accident involving [airline] flight [#], which occurred at [accident location] on [accident date]. The public hearing will be convened at the [hotel or other building] in [city, state] beginning at [time]. Before proceeding, I would like to introduce the other members on the Board of Inquiry and the Technical Panel, who are all employees of the National Transportation Safety Board.

Assisting me on the Board of Inquiry will be:

Mr./Ms./Mrs./Dr. [name], [title]

(other members of the Board of Inquiry to follow)

Members of the Technical Panel are safety investigators from the NTSB. They are:

Mr./Ms./Mrs./Dr. [name], Investigator-in-Charge of this investigation (if true) and Hearing Officer

[name], [Group] Investigator (or Group Chairman)

(other members of the Technical Panel to follow)

Mr./Ms./Mrs. [name], from the Safety Board's Office of General Counsel, is also with us to assist in resolution of any legal matters.

Mr./Ms./Mrs. [name], from the Safety Board's Office of Government and Public Affairs, is here to assist in matters dealing with the news media.

Mr./Ms./Mrs. [name], my Special Assistant, is also here to assist me.

(as appropriate, for the following:)

Mr./Ms./Mrs. [name] is here to handle all administrative matters dealing with the hearing. [He/she] will also be present at the hearing itself, to handle administrative duties in New York. Mr./Ms./Mrs. [name], my Confidential Assistant, will also assist me in the course of the hearing.

Before proceeding with the conference, I wish at this time to acknowledge and thank the

parties for the cooperative spirit which they have displayed as we have worked together to determine the facts, conditions, and circumstances regarding this accident.

This prehearing conference will be conducted on an informal basis. The purpose is to acquaint the parties with the Safety Board's rules and procedures for the conduct of the more formal public hearing, to identify the witnesses to be called at the hearing, to discuss the areas in which the witnesses will be examined, and to review the exhibits which will be offered in evidence and used during the testimony. The Board has designated as parties to the hearing those agencies, companies, and associations whose participation in the hearing is deemed necessary in the public interest and whose special knowledge or participation will contribute to the development of pertinent evidence applicable to this investigation. I assume that all parties have copies of applicable Board regulations, a set of exhibits, and a proposed witness list. If you have any questions with regard to the issues or the procedures, they should be raised at this meeting.

Any party desiring to submit additional exhibits or to call additional witnesses should raise the matter at the appropriate time later in this conference. Any party failing to do so will be precluded from introducing additional exhibits or calling additional witnesses during the hearing, unless good cause is shown why such evidence should be admitted.

We are anticipating a [#] day hearing. In order to conclude the hearing within the allotted time, it will be particularly important to confine the hearing to the issues defined at this prehearing conference. Therefore, during the hearing, the testimony and evidence must remain within the confines of the issues as they are defined today. I will make all the rulings on the pertinence of proffered testimony, and my rulings will be final.

In order to develop a complete factual record to assist the Board in meeting its public safety obligations in an efficient and equitable manner, I request the continued full cooperation of all the parties. I am confident, and I expect, that each of you has the same overall interest as that of the Board, namely to determine the facts, conditions, and circumstances of this accident, and to develop a record that will enable us collectively to prevent a similar accident in the future. This is the primary focus of the hearing, and I expect the parties, in their questions, to adhere strictly to that focus and to the issues agreed upon today.

I will not permit the hearing to become an adversarial forum in which parties or organizations that may have narrow or special interests attempt to advance those interests.

The Board has designated the organizations that you represent as parties to the public hearing in the interest of advancing the conduct and the comprehensiveness of the Board's investigation. No person or organization, except the Federal Aviation Administration, has the statutory right to be designated a party to the Board's investigation of this accident. I appreciate your participation as parties and urge you to take an active role in the hearing.

The public hearing is an administrative fact-finding portion of the investigation. There are no adverse parties or interests. There are no formal pleadings. The Board does not determine liability, nor does it attempt to do so, and for this reason, questions directed to issues of liability will not be permitted. I must emphasize the fact-finding nature of the hearing. Our sole purpose is

to determine how and why this accident occurred and what can be done to prevent similar occurrences in the future. The witnesses who are called will not be at the hearing to speculate as to cause or to furnish an analysis of the facts. Rather, they will be there to testify as to the facts or to give expert testimony on various subject areas germane to the investigation.

In accordance with the Board's regulations, following the hearing, the parties will have the opportunity to analyze the evidence and to make recommendations to the Board regarding what conclusions should be drawn from the evidence, and what preventative measures should be taken. Analysis of all the evidence will be accomplished by the Board following the hearing, and the Board will consider the views of the parties as submitted in their written comments. I strongly urge each party to submit such comments, since it is beneficial to the Board in its analysis, and offers the parties the opportunity to state their views to the Board for the record. If you decide to submit any proposed findings, conclusions, or recommendations, we ask that you submit 15 copies to us within 30 days after the receipt of the transcript of the hearing. Note: This date may be revised depending on the need for delayed followup investigation activities that may arise during the hearing. The rules (Title 49 CFR Part 845.27) provide that parties must also receive copies of their submissions to each of the other parties. That includes the parties to the field phase of the investigation and the public hearing. Any submission will be made a part of the public docket of the investigation.

Let me emphasize that the Board does not permit cross examination in the legal sense. Therefore, I request that all parties and the technical panel refrain from asking questions that (1) have no factual relationship to this accident or to the prevention of similar accidents, but are merely posed for their dramatic value, (2) are narrative type questions, more in the nature of testimony than a question, (3) are beyond the scope of the issues agreed upon, (4) are repetitive, or (5) are irrelevant, immaterial, or argumentative.

During the hearing, the witnesses will testify under oath. Each will be introduced by name and any special qualifications he or she may possess will be identified. Witnesses at the hearing will first be questioned by a designated member or members of the technical panel. Following this, each party in turn will have the opportunity to question the witness. I will permit a second round of questions only if the designated spokesperson makes the request and specifically states the reason it should be granted. There are only two reasons for a second round of questions: 1) if the record needs to be clarified or 2) if some new matter has been raised after the requesting party has taken its turn in the questioning rotation. If a party is granted the right to additional questioning, I would expect it to be very brief. There will be no repetition of previous questions. We may go off the record while the need for additional questions is explained.

Once a witness has completed his testimony, he/she should realize that he/she may be subject to recall should the need arise. Therefore, witnesses should not leave unless they or their party spokesman has checked with the National Transportation Safety Board.

The following organizations have been designated parties to the hearing. When I call the name of the party, the designated spokesperson will please respond with his/her title and affiliation. This designation will continue in force until the completion of the hearing, except in those circumstances in which the designated spokesperson is also a witness or for other good cause.

(as applicable:)

Federal Aviation Administration -

[airline] -

[airframe manufacturer] -

[engine manufacturer] -

[pilots association] -

[machinists association] -

[flight attendants association] -

[air traffic control association] -

[local authorities] -

I would now like to address the question of the issues that will be developed at the hearing. As the Board has posed them, the relevant issues are the following:

1. (typically) The facts and circumstances of the accident involving [airline] flight [#].
2. (other issues to follow)

If any party believes that these issues should be modified, clarified, or limited, the time to make that request is during this conference. The hearing will adhere to the issues identified and agreed upon here. Before I entertain questions about these issues, please be advised that these are the same issues that I will announce during the opening of the hearing. The issues are purposely broad in nature. The specific issues to be covered during the various witnesses' testimony are contained in the witness list which we will describe and agree upon very shortly.

Are there questions regarding these broad issues? If not, the Technical Panel members and the Hearing Officer will discuss the witness list for the purpose of explaining in detail the type of testimony that will be elicited from each witness.

**(After completion of review of witnesses and exhibits by Hearing Officer)**

Are there any additional comments on the exhibits, or any recommendations for additional exhibits?

Are there any additional comments on the witnesses, or any recommendations for additional witnesses?

I believe this brings us to the completion of our work for the day. I thank each of you for your comments and your participation and I look forward to working with you during the hearing. Should you have any questions concerning proceedings or other administrative matters between now and the hearing, Safety Board staff are available to assist you. Please direct your questions to [hearing officer] and [he/she] will ensure that your questions are answered. Again, I look forward to seeing you on [date] when we convene the hearing.

This prehearing conference is now completed.

## **APPENDIX M**

### **PUBLIC HEARING PROCEEDINGS**

- (1) Opening Statement by the Chairman of the Board of Inquiry
- (2) Introduction of Issues for Public Hearing
- (3) Introduction of Board of Inquiry and Technical Panel
- (4) Introduction of the Parties and Party Spokespersons
- (5) Swearing In of Hearing Officer
- (6) Swearing In and Testimony of Witnesses
- (7) Closing Remarks by the Chairman of the Board of Inquiry

## OPENING STATEMENT BY CHAIRMAN OF THE BOARD OF INQUIRY

Good morning and welcome.

I am [name], a Member of the National Transportation Safety Board, and Chairman of this Board of Inquiry.

At this hearing we are considering an accident which occurred [accident date] at [accident location] involving [airline] flight [#].

The hearing is being held for the purpose of supplementing the facts, conditions, and circumstances discovered during the on-scene investigation. This process will assist the Safety Board in determining the probable cause and in making any recommendations to best prevent similar accidents.

This inquiry is not being held to determine the rights or liability of private parties, and matters dealing with such rights or liability will be excluded from these proceedings.

Over the next several days of this hearing, we will collect information that will assist the Safety Board in determining how and why this accident occurred. Specifically, we will concentrate on the following issues:

1. (typically) The facts and circumstances of the accident involving [airline] flight [#].
2. (other issues to follow)

At this point, I would like to introduce the other members of the Board's staff for this hearing. Assisting me on the Board of Inquiry will be:

Mr./Ms./Mrs./Dr. [name], [title]

(other members of the Board of Inquiry to follow)

Mr./Ms./Mrs. [name], from the Safety Board's Office of General Counsel, is also with us to assist in resolution of any legal matters.

The Board of Inquiry will be assisted by a Technical Panel. These persons are:

Mr./Ms./Mrs./Dr. [name], Investigator-in-Charge of this investigation (if true) and Hearing Officer

[name], [Group] Investigator (or Group Chairman)

(other members of the Technical Panel to follow)

During this hearing, neither I nor any other Safety Board personnel will attempt to analyze the testimony received nor will any attempt be made at this time to determine the probable cause of the accident. Such analyses and cause determinations will be made by the full Safety Board after consideration of all of the evidence gathered during our investigation. The report on the subject accident, reflecting the Safety Board's analyses and probable cause determinations, will be considered for adoption by the full Board at a later public meeting which will be held at the Safety Board's headquarters in Washington, D.C.

The Safety Board's rules provide for the designation of parties to a public hearing. In accordance with these rules, those persons, governmental agencies, companies, and associations whose participation in the hearing is deemed necessary in the public interest and whose special knowledge will contribute to the development of pertinent evidence are designated as parties. The parties assisting the Safety Board in this hearing have been designated in accordance with these rules.

As I call the name of the party, will its designated spokesperson please give his or her name, title, and affiliation for the record:

(as applicable:)

Federal Aviation Administration -

[airline] -

[airframe manufacturer] -

[engine manufacturer] -

[pilots association] -

[machinists association] -

[flight attendants association] -

[air traffic control association] -

[local authorities] -

I want to publicly thank all of the parties for their assistance and cooperation they have displayed as we have worked together in the investigation of this accident.

On [date], the Board of Inquiry held a prehearing conference in Washington, D.C. It was attended by the Safety Board's Technical Panel and representatives of the parties to this hearing. During that conference, the areas of inquiry and the scope of the issues to be explored at this hearing were delineated and the selection of the witnesses to testify to these issues was finalized.

Copies of the witness list developed at the prehearing conference are available at the press table and a set of exhibits to be used in this proceeding is available for review there.

The witnesses testifying at this hearing have been selected because of their ability to provide the best available information on the issues. The first witness will be the Investigator-in-Charge of the accident investigation, who will summarize certain facts about the accident and the investigative activities that have taken place since then.

The witnesses will be questioned first by the Board's Technical Panel, then by the designated spokesperson for each party to the hearing, followed by the Board of Inquiry.

As Chairman of the Board of Inquiry, I will be responsible for the conduct of the hearing. I will make all rulings on the admissibility of evidence, and all such rulings will be final.

The record of the investigation, including the transcript of the hearing and all exhibits entered into the record, will become part of the Safety Board's public docket on this accident and will be available for inspection at the Board's Washington office. Anyone wanting to purchase the transcript should contact the court reporter directly. Note: The parties also have to order their own transcripts because the NTSB only orders copies for its own use.

(as appropriate:)

There are several other people I would like to recognize at this time. They are Mr./Ms./Mrs. [name], of the Safety Board's Office of Government and Public Affairs, who is at the press table, Mr./Ms./Mrs. [name], who will be handling the administrative matters regarding this hearing, and my Confidential Assistant, Mr./Ms./Mrs. [name], who will be furnishing the witnesses with exhibits. You may wish to contact these individuals for assistance pertaining to copies of exhibits and other items.

At this time I would like to acknowledge other officials who are observing this hearing.

[hearing officer], have all the exhibits been entered in the public docket? Thank you.

I will call the first witness. Mr./Ms./Mrs. [hearing officer], will you please come forward and take the witness stand?

## SWEARING IN AND QUALIFYING A WITNESS

To swear in the witness, the hearing officer shall ask him or her: "Do you swear to tell the truth, the whole truth, and nothing but the truth, so help you (God)"?

To qualify a witness, the Hearing Officer shall ask him or her:

1. Would you please state your full name and business address?
2. By whom are you presently employed?
3. What is your present position?
4. How long have you held that position?
5. Would you briefly describe your duties and responsibilities in your current position?
6. Would you briefly describe the education, training, and experience that you obtained to qualify you for your current position?
7. What, if any, FAA aviation certificates do you hold, and what, if any, flight experience do you have, including flying time and types of aircraft flown?

## EXHIBIT LIST

- 1A Order of Hearing
- 1B Designation of Parties to the Hearing
- 1C Notice of Hearing
- 1D Designation of Hearing Officer
- 1E Designation of Chairman of Board of Inquiry

(list of exhibits to follow)

## WITNESS/ISSUES LIST

1. Mr./Ms./Mrs. [name] Investigator-in-Charge  
Major Investigations Division  
National Transportation Safety Board  
Washington, D.C.

- a. Duties, responsibilities, and qualifications.
- b. Description of investigation.

2. Mr./Ms./Mrs. [name] [title]  
[affiliation]  
[location]

- a. Duties, responsibilities, and qualifications.
- b. [areas of which the witness has specific knowledge relating to the issues of the accident]

Exhibit: [#] Series

Questioned by: [Technical Panel questioner]

(similar format for subsequent witnesses)

## CLOSING STATEMENT BY CHAIRMAN OF THE BOARD OF INQUIRY

With the last witness having been heard, this concludes this phase of the Safety Board's investigation.

In closing, I want to emphasize that this investigation will remain open to receive, at any time, new and pertinent information concerning this accident. The Board may, at its discretion, reopen the hearing in order that such information be made a part of the public record.

The Board welcomes any information or recommendations from the parties or the public that may assist it in its efforts to ensure the safe operation of commercial aircraft. Any such recommendations should be sent to the National Transportation Safety Board, Washington, D.C. 20594, within 30 days after the receipt of the transcript of this hearing. Note: This deadline may be affected by unforeseen followup investigative activities that evolve during the hearing. All the evidence developed in this investigation and hearing and all recommendations received within the specified time will be presented and evaluated in the final report of the accident in which the National Transportation Safety Board's determination of the probable cause will be stated.

On behalf of the National Transportation Safety Board, I want to again thank the Parties for their cooperation, not only during this proceeding but also throughout the entire investigation of this accident. Also I want to express sincere appreciation to all those groups, persons, corporations, and agencies who have provided their talents so willingly throughout this hearing.

The record of the investigation, including the transcript of the hearing and all exhibits entered into the record, will become part of the Safety Board's public docket on this accident and will be available for inspection at the Board's Washington office. Anyone wanting to purchase the transcript may contact the court reporter.

I now declare this hearing to be in recess indefinitely.

## APPENDIX N

### IIC'S OPENING STATEMENT TO BOARD MEETING

(example)

Good Morning. On [date] at 0326 eastern standard time, [airline] flight [#], a [manufacturer & model] freighter crashed about 3 miles northwest of [accident location] after executing a second missed approach to runway 7. Night instrument flight conditions prevailed. The airplane was destroyed, and the flightcrew of three and an observer onboard received fatal injuries. The airplane was operating under 14 CFR Part 121 as a scheduled domestic cargo flight.

Flight [#] originated in [city, state] and flew the short leg to [city, state] uneventfully. The flight departed [city] at about 2330 EST. The flight into the [city, state] terminal area was without incident, and the first officer was the flying pilot. The flight was vectored for an instrument landing system (ILS) runway 7 approach.

About 0312, the [airport designation] tower cleared the flight to land. However, the first officer had trouble aligning the airplane with the ILS final approach course and a missed approach was then accomplished.

By 0320, the controller had vectored the airplane onto a base leg and then gave the flight a heading to intercept the final approach course again.

Flight [#] was again cleared to land around 0322, and about that time they inquired about the surface winds. The tower controller reported the surface winds as 100 degrees at 10 knots, and the flightcrew reported that their winds were 180 degrees about 35 knots at their altitude.

Between 0324:01 and 0324:15, and as the first officer was attempting to stabilize the approach, the CVR recorded three ground proximity warning system (GPWS) glideslope warnings, three GPWS sink rate warnings, and three power changes. Because the first officer was again having trouble flying the instrument approach, the captain took control of the airplane and performed another missed approach maneuver.

At 0324:46, the first officer advised the controller that the flight was performing the missed approach, and then the flight was directed to climb and maintain 3,000 feet. At 0325, the captain called for climb power, and a sound similar to that of a slight power reduction was recorded on the CVR. About 30 seconds later, the tower controller directed the flightcrew to turn left to a heading of 300 degrees.

At this juncture, the angle of bank to the left steepened dramatically, eventually reaching about 60 degrees. During this maneuver, the nose dropped to a maximum of 25 degrees nose low.

Although the exact sequence of events next is open to some interpretation, the staff believes that control of the airplane then passed to the first officer. The attitude of the aircraft then lessened in severity to about 17 degrees left bank and 17 degrees nose low, when impact with the ground occurred at a little over 300 knots airspeed.

The Safety Board was notified of the accident shortly thereafter and dispatched an investigative team to [city]. The team was accompanied by [Member], [his/her] staff and a representative of the Office of Public Affairs. Team specialists included:

Mr./Ms./Mrs. [name], [investigative group]

(others to follow)

Mr./Ms./Mrs. [name], Editor

No physical or empirical evidence of mechanical malfunctions could be positively identified. The weather at the time of the accident, the time of the accident itself, and the maneuvers of the aircraft just prior to the loss of control indicated a possibility of spatial disorientation of the captain for physiological reasons alone. However, the investigation uncovered some evidence, of a somewhat conflicting nature, that an attitude direction indicator on the instrument panel failed sometime during the accident sequence. If this attitude indicator was the captain's, and if it indeed failed, then its failure could have precipitated the loss of control by the captain. The staff believes these two scenarios encompass the most likely events on the early morning of [accident date].

Parties to this investigation included: [list of parties to the investigation]. We received formal party submissions from [list of parties or others providing submissions] and their views were considered during the report writing process.

Thank you. That concludes my opening statement.

## APPENDIX O

### PETITION FOR RECONSIDERATION PROCEDURES

The following steps are to be followed in the processing of reconsiderations of probable cause. The various steps and comments are based on Board Rules, policies, and established procedures.

1. All petitions for reconsideration of probable cause must follow the Notation process.
2. Upon receipt, ensure that the correspondence is mail-controlled for the Chairman's signature. Some letters come directly to the IIC or other persons. For example, if the petition comes directly to a Field Office, forward it to the Managing Director to be mail-controlled.
3. Verify that the probable cause has been approved by the Board. Some correspondence incorrectly references reconsideration of probable cause when in fact a probable cause has not yet been determined, or the letter is intended to influence the determination of probable cause of an "open" case. This type of correspondence should be handled as a "submission (reference 845.27) by a party--it should be placed in the public docket and copies provided to other parties. The reply to the petition should state that the Board will review the submission as part of its deliberations to determine probable cause. Give the petitioner an estimate of the time required for Board action, if possible.
4. If it is determined that a submission is a bona fide reconsideration (ref. 845.41(d)), send an acknowledgement letter that the petition has been received and is being evaluated by staff. Board policy dictates that the petition not be assigned to the original investigator-in-charge or original report writer. Also send a copy of Part 845, citing 845.41 and the provision that copies of the petition be forwarded to the parties, and that proof of service be provided. State that the case has been assigned to a specific person--give the name of the specialist assigned if desired and mention that that person may contact the individual directly.
5. Send a letter to all parties after they have received the petition, along with a copy of Part 845, stating that they have 90 days to comment on the petition to aid the Board in its evaluation of the petition. Mention that all correspondence will be placed in the public docket.
6. Request the factual and analysis reports and supporting documents from

## Public Inquiries.

7. If necessary, request from appropriate AS or RE personnel a written evaluation of the data in the petition and the data submitted by the parties (consequently, after the 90-day period). A great deal of the petitions refer to highly technical factors that have resulted from litigation or other non-NTSB investigators (e.g., ALPA). Although not a mandatory step, the original IIC/report writer should be consulted for his/her evaluation of the petition.
8. Review all data after it has been received, but also the original factual and analytical information. Consolidate all the information and make a determination as to whether the probable cause should be revised. It is possible to accept a petition totally, partially, or not at all.
9. Prepare a draft response for Board approval to include a summary of the petitioner's submission and the Board's decision and rationale. There is a standard format for the response letter; AD-23, AS-5, or AS-10 can provide examples of format. The standard review process applies--Initial Draft, Director's Draft, and Notation Draft. Most field reconsideration cases are voted upon by the Board in the "pink sheet" manner. If the report text and/or probable cause for major "blue covers" is to be revised, a draft revised report with specific changed text annotated in the margin should be forwarded to the Board as part of the Notation Memorandum package. For field cases, the original and the revised Accident Brief should be attached for Board approval.

The following attachments are included:

- (1) Reconsideration Checklist
- (2) Letter of Acknowledgement
- (3) Letter to Parties
- (4) Letter to AS or RE Requesting Technical Evaluation
- (5) Sample Notation Format
- (6) Sample Response Format
- (7) Sample Response Format (No New Evidence)

Attachment 1

RECONSIDERATION CHECKLIST

1. Petition for Reconsideration Received \_\_\_\_\_
2. Mail Control Assigned (by AD) \_\_\_\_\_
3. Acknowledgement (with Chairman's Signature)  
Sent to Petitioner \_\_\_\_\_
4. Letter to Parties Sent \_\_\_\_\_
- Response Due By \_\_\_\_\_
5. Request for AS or RE Assistance, if Necessary \_\_\_\_\_
6. Initial Draft Prepared and Circulated for Comments \_\_\_\_\_
7. Directors' Draft Prepared and Concurrence Received \_\_\_\_\_
8. On Notation \_\_\_\_\_
9. Final to Chairman for Signature \_\_\_\_\_

Attachment 2

LETTER OF ACKNOWLEDGEMENT

[name]  
[address]

Dear Mr/Ms./Mrs. [name]:

This will acknowledge receipt of your petition of [petition date] for reconsideration of our findings in the investigation of the accident involving [aircraft, location, and date of accident].

Our staff will review the evidence provided in your submission. A response to your petition will be forwarded to you shortly after our staff review has been completed.

Respect

[name]

Chairman

Attachment 3

LETTER TO PARTIES

[date]

[name]  
[title]  
[party]  
[address]

Dear Mr/Ms./Mrs. [name]:

Enclosed for your review is the petition for reconsideration of the probable cause of the [operator and aircraft type] accident at [location] on [date].

Please provide us with your comments as soon as possible.

Thank you for your cooperation in this matter.

Sincer  
ely,

[person  
evaluating petition]

Enclosure:

Attachment 4

LETTER TO AS OR RE REQUESTING TECHNICAL EVALUATION

Date:

To: (applicable AS or RE Division Chief or Director)

From: Director, Office of Aviation Safety

Subject: Reconsideration of Probable Cause of Aircraft Accident--[aircraft, location, date, and accident number]

We recently completed a review of the attached petition for reconsideration from [name of petitioner]. [State which investigator or office conducted the investigation.]

The Safety Board concluded that the accident occurred as a result of [cite probable cause, circumstances of failures, FAA or manufacturer corrective action, etc.]

The petitioner claims that [cite details of the petition for reconsideration].

Please have your specialists review the petitioner's evidence and provide us with your analysis and recommendations in order for us to prepare an appropriate response. Also, provide us with a schedule completion date as soon as practical.

Attachment:

Attachment 5

SAMPLE NOTATION FORMAT

**FOR OFFICIAL USE ONLY**

**NATIONAL TRANSPORTATION SAFETY BOARD**

**NOTATION**

**NOTATION MEMORANDUM**

**TO:** The Board

**Date:**

**THRU:** Managing Director

**FROM:** Director, Office of Aviation Safety

**SUBJECT:** Response to Petition for Reconsideration regarding an accident at [city, state] on [date], involving [aircraft, registration number]

**Action**

The staff recommends that the Safety Board [grant/deny] the Petition in [its entirety/part] by [action taken].

**Petitioners and Dates of Petition**

**Issues Presented by Petitioners**

**Evidence Presented by Petitioners**

**Pertinent Issues in Original Analysis**

**New Evidence/Conclusions**

**Staff**

**Distribution**

**Attachments**

Response to Petition for Reconsideration  
Petition for Reconsideration  
Original Brief or Report

[Director, Office of Aviation Safety]

**FOR OFFICIAL USE ONLY**

Attachment 6

SAMPLE RESPONSE FORMAT

[name of petitioner]  
Petition for Reconsideration  
[accident aircraft, location, and date]

Petition No. \_\_\_\_\_

RESPONSE TO PETITION FOR RECONSIDERATION

In accordance with its rules (Title 49, U.S. Code of Federal Regulations, Part 845), the National Transportation Safety Board has reviewed the [date] petition for reconsideration and modification of probable cause in the aviation accident involving a [make and model of aircraft], [registration #], in [location] on [date]. Based on its review of the petition and the factual derived during the course of the investigation, the National Transportation Safety Board [grants/denies] the Petition in [its entirety/part] by [action taken].

On [date of adoption of original report], the Safety Board determined that [synopsis of the accident and brief reiteration of the Board's analysis and conclusions relevant to the subject petition].

At that time, the Safety Board determined that the probable cause of the accident was [original probable cause as adopted].

The following discussion addresses the new evidence and/or errors in analysis as presented in the Petition with regard to [issue No. 1, issue No. 2, etc.] \_\_\_\_\_

With regard to [issue No. 1], the Safety Board's analysis, shows \_\_\_\_\_

As a result, the Safety Board concludes that \_\_\_\_\_

[use similar format for subsequent issues]

With regard to the probable cause, the Safety Board has \_\_\_\_\_

As a result, the Safety Board concludes that \_\_\_\_\_

ACCORDINGLY,

(1) Petitioner's petition for reconsideration of \_\_\_\_\_ and/or \_\_\_\_\_ is hereby [granted/denied].

(2) The Board's original report is revised and an Errata to the report issued as follows:

- (3) The probable cause is revised as follows: The National Transportation Safety Board, upon reconsideration, determined that the probable cause of the accident was

(If appropriate) ~~The Safety Board commends the \_\_\_\_\_ for its thorough Petition and~~  
for its interest in aviation safety.

[Members' concurrences to follow]

[writer] [routing] draft typed [initials and date]

File name

cc: C(2), V, ME's

Attachment 7

SAMPLE RESPONSE FORMAT (No New Evidence)

[name and address of petitioner]

Dear Mr./Ms./Mrs. [name]:

The National Transportation Safety Board has evaluated the information you provided in your letter requesting that the Safety Board reconsider its probable cause of the accident at [location and date of accident].

Your letter does not contain any new factual information, but only your interpretation of facts already in the factual report of the investigation.

Accordingly, the Safety Board hereby denies your request that the probable cause of this accident be changed.

Sincerely yours,

[name]  
Chairman