

INVESTIGATION INTO APOLLO 204 ACCIDENT

MONDAY, APRIL 10, 1967

MORNING SESSION

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
SUBCOMMITTEE ON NASA OVERSIGHT,
Washington, D.C.

The subcommittee met at 10:15 a.m., in room 2318, Rayburn Building, Washington, D.C., Hon. Olin E. Teague (chairman of the subcommittee) presiding.

Mr. TEAGUE. The committee will come to order.

The chairman has a very short opening statement.

Today the Subcommittee on NASA Oversight begins a series of hearings on the Apollo 204 accident which resulted in the death of Astronauts Virgil I. Grissom, Edward H. White, and Roger B. Chaffee on January 27, 1967, at Cape Kennedy.

It is our intention to conduct a full and complete review of the Apollo accident, its causes and effects. We cannot bring back these brave men who gave their lives in this program. However, we believe our review will be helpful to all future manned space flight endeavors, and will materially assist in insuring the safety of future astronauts.

The Monday after the accident when Chairman George P. Miller requested that the oversight subcommittee conduct this investigation, he stressed that he wanted a comprehensive and impartial investigation. We have waited until this time because we believe our inquiry would be most constructive if accomplished after the Apollo Review Board had completed its findings. Yesterday, each member of the committee received a copy of that report.

Our first witnesses this morning are James E. Webb, Administrator of NASA, and Dr. Robert C. Seamans, Jr., Deputy Administrator. They will discuss the appointment of the Apollo 204 Review Board and the charter of the Board. The members are requested to restrict their questions at this time to only these matters. After we have heard the testimony of all the other witnesses, Mr. Webb, Dr. Seamans, together with Dr. Mueller and other NASA witnesses, will be back to discuss the accident in terms of cost, schedule, objectives, and procedures, and to answer any other questions you may have.

During these hearings we have decided that it would be in the best interest of all concerned to swear the witnesses. We have made this decision for two reasons: First, it is our understanding that unlike the military and certain other Government organizations, NASA does not have the statutory authority to administer oaths and, consequently,

APPENDIX C

NATIONAL TRANSPORTATION SAFETY BOARD

STATEMENT OF BOBBIE R. ALLEN, DIRECTOR, BUREAU OF AVIATION SAFETY, ON AIRCRAFT ACCIDENT INVESTIGATION, ORGANIZATION, AND PROCEDURES

I. INTRODUCTION

The National Transportation Safety Board is charged with the responsibility of determining probable cause of all aircraft accidents in the United States involving civil aircraft, a duty it may not delegate. It may delegate the investigation function, and does, in certain categories of lightplane accidents; however, neither the NTSB nor its aviation safety predecessor, the Civil Aeronautics Board, has ever considered it prudent for anyone other than its own staff to conduct the investigation of catastrophic air carrier accidents.

The organization in NTSB which investigates accidents of civil aircraft is the Bureau of Aviation Safety. The Bureau maintains eleven field offices, strategically located throughout the country, staffed by from three to ten investigators. The field offices investigate general aviation accidents and the lesser accidents to air carrier aircraft and give valuable administrative assistance to the investigations of major air carrier accidents. In its Washington offices the Bureau has a staff of investigators ranging through such specialties as meteorology, metallurgy, structures, aircraft systems, electronics, aircraft maintenance, piloting, powerplants, flight and voice recorders. The Bureau has a total complement of 184 employees comprised of 52 field investigators, 55 investigators in Washington plus administrative and clerical personnel.

This paper presents a general discussion of the Bureau's procedures for the investigation of catastrophic or major air carrier accidents and includes information on one such actual investigation. It should be noted that the National Transportation Safety Board came into being on April 1, 1967, and that its functions and responsibilities in the field of aviation safety formerly rested with the Civil Aeronautics Board. All references in this paper to the Board and the Bureau refer to the CAB and its Bureau of Safety prior to April 1, 1967, and the NTSB and its Bureau of Aviation Safety on April 1 and subsequent thereto (the Bureau of Safety and the Bureau of Aviation Safety are one and the same organization simply transferred in total from CAB to NTSB).

The investigative procedure employed by the Board has, with minor variations, been used since the CAB assumed this function in 1939. There has been growth and improvement over the years. Methods have been improved, specialties expanded to keep pace with the increasing complexity which comes with technological progress; but the basic concepts of the "specialty group system" have proven as successful today as yesterday.

In the years following World War II, when the airline industry began expanding at an unprecedented rate, it became necessary for many small countries that had never before been exposed to large aircraft operation to investigate accidents. Many of these investigations were conducted by or under the tutelage of Board investigators or their British or French counterparts. Most of the governments of the world now have established accident investigation staffs, policies and procedures, and the vast majority of these follow the basic Investigator-in-charge, specialty group approach. There are modifications to adapt the local laws and customs. For example, some admit to the investigation personnel of organizations having a responsible safety interest as the Board does. Others do not; while still others permit such participation on a restrictive basis. In some countries the investigations proceed through a court of law, while others, such as in the United States, the investigations and determinations rest with an administrative agency.

The International Civil Aviation Organization with headquarters in Montreal and supported by over 100 contracting States, including the United States, has for many years now been the instrument through which accident notification, investigation and reporting has been standardized on a near world-wide basis. The "bible" for this is Annex 13 to the Convention on International Civil Aviation (Chicago 1944), entitled, "International Standards and Recommended Practices for Aircraft Accident Inquiry," and normally referred to as simply "Annex 13."

Annex 13 now contains an Attachment B which was added in the 1966 edition, largely through the efforts of the U.S. Delegation to the Third Session of the Accident Investigation Division in 1965. It will be found that the organization of an accident investigation spelled out in that document is completely consistent with the organization of a Board investigation as detailed in Section II, below.

The proceedings following an explosion and fire of an electron accelerator at Cambridge, Mass. on July 5, 1965, provide an illustration of the adaptability of the investigative procedure used by the Board. Immediately after this fatal accident the Atomic Energy Commission requested assistance from the Board in formulating an investigative organization and in methods of procedure. One of the Board's more experienced investigators was dispatched to the scene where he was briefed on the known circumstances of the accident. Following the suggestions of the Board investigator, an Investigator-in-Charge was appointed and several specialty groups were established, each with contractor participation, for fact-gathering and reporting. The Board investigator remained on scene in a consultative capacity and assisted by suggesting methods of search, mock-up, etc. This was a successful investigation in that it led to cause determination and corrective action. It also led to recommendations for safer practices in other than causal areas. This latter is often a very valuable by-product of a good, well-organized and functional investigation.

II. GENERAL DISCUSSION

A. Team concept

The Specialty Group System has been in use for many years, but until 1963 the Bureau's investigating party was made up of personnel from one or more field offices and from the Washington office. After the on-site portion of the investigation, during preparation for the public hearing and later, in the analysis and final report phases, there was a degree of continuity loss in some areas of endeavor and duplication of effort in others. While the then existing system worked fairly well, it was recognized that the job could be done much more efficiently.

In 1963 the so-called Team Concept came into being. Under this plan four Supervisory Air Safety Investigator positions were established in the Washington office to provide for Investigator-in-Charge on a rotating assignment basis. On Friday of each week a "Go-Team" is established, made up of one of the Investigators-in-Charge (IIC) and investigators in the several specialty areas, an Assistant IIC for Airworthiness and an Assistant IIC for operations. In addition, a duty officer (for off-duty hours) is assigned. The Go-Team is then on a standby status, ready to depart on short notice to the scene of a major air carrier accident. The team which proceeds to the accident site for conduct of the investigation remains a unit, operating as a team, insofar as possible, throughout the field investigation, public hearing, analysis and drafting of the Board's Aircraft Accident Report. The Bureau has sufficient personnel to staff four such teams in most of the specialty areas. In some areas, such as air traffic control, flight recorder and weather, it has been and still is necessary for these specialists to serve double and triple duty from team to team. Since accidents occur at random, there are times when there will be several accidents in a short span, such as the recent three major air carrier accidents in six days. On such occasions it is necessary to revert to the pre-1963 system of forming a team with a combination of field and Washington personnel.

B. Communications

The Bureau has established a communications system which is quite adequate for its purpose and at the same time employs no exotic, expensive or complex units or procedures. The only departures from standard, conventional telephones and the Federal Telecommunications System are the leased direct lines to FAA Communications Control Center, an automatic answering device, and the use of Bell Telephone Company's "Bellboy" service by the assigned duty officer.

C. Notification and travel

Notification of a major air carriers accident normally comes through the FAA Communications Control Center. Duplicate notification is often received through one of the Bureau's Field Offices or from other sources. Such duplications are not discouraged since, during those first minutes following an accident, additional helpful details are obtained from one source that may be unknown to another.

Upon receipt of an accident notification the Center relays all available information to the Bureau's Washington Offices during normal business hours or to the Duty Officer at other times. The assigned team members are immediately alerted and upon determination by the Investigation Division and the Director, they are dispatched to the accident site.

Immediately following the decision to use a Washington-based team, the Bureau field office nearest the accident is notified. Because of their proximity to the accident site, field personnel can usually reach the scene ahead of the Go-Team. These personnel arrange for security of the wreckage, establish liaison with police agencies, the airline, and others as may be necessary. Arrangements are made for government and/or rental cars, for office space, installation of temporary telephones, and living accommodations for the investigators. These field personnel act for and in the interest of the Investigator-in-Charge and his team until they arrive.

During this same period appropriate FAA personnel are being notified through FAA channels and the airlines involved notify the airframe, powerplant and equipment manufacturers. The pilots', flight engineers' and dispatchers' associations also notify certain key personnel according to their own established plans of operation.

During the few hours following an accident, the many people who are to participate in the investigation are converging on the site from widely dispersed areas of the country. So well established are the working procedures of the Bureau and the several interested parties that it is not uncommon for the investigation to be organized and in full operation within 8 to 10 hours after the accident.

D. Organization and conduct of field investigation

The first order of business upon arrival on scene is an organizational meeting of Bureau and interested party personnel. The Investigator-in-Charge at this time explains the NTSB's functions under the law and how the investigation is to be conducted. The following is part of the IIC's opening statement (from Air Safety Investigators' Manual, 2.21) :

"The purpose of permitting the participation of organizations is not to enhance the position of these parties, but to assist the Board in developing a more complete factual record. You will participate initially during the field phase of the investigation as parties of interest. Later you may be designated as a 'party to the investigation,' providing you meet the Board's requirement. All persons participating in this investigation must be in a position to contribute specific factual information or skill which would not otherwise be supplied. No participating organization will be permitted to be represented by a person whose interests lie beyond the legitimate scope of the accident investigation. Failure to comply with this provision shall result in a loss of status as a participating-interest party.

"The flow and dissemination of information will, in essence, follow this pattern: No one will withhold information. All information obtained by group members will be brought to the attention of their respective group chairman. All information and developments ascertained during investigation by the various groups will be passed to the Investigator-in-Charge by the group chairman. Each participating party will designate a coordinator (spokesman) for their organization. Group members may pass factual information to their respective coordinators after this information has been made known to their group chairman. All of the factual information and developments of the investigation that are made known to the Investigator-in-Charge will be passed on to each of the coordinators who may relay information to their respective organizations provided the information is factual and in its right perspective. This information should be transmitted on a 'need to know' basis for purposes of prevention, remedial action, or other similar reasons. The coordinators will keep the Investigator-in-Charge apprised of information so relayed. Common sense and good judgment should predominate in this matter. Do not discuss the investigation in public. At all

times you must exercise caution when you discuss aspects of the investigation, as there may be unauthorized persons about you who might misconstrue or misuse this information, thus, creating an adverse situation.

"I must again advise you that failure to comply with the investigating procedures of the National Transportation Safety Board may necessitate your removal from the team and adversely affect your organization's subsequent participation in this investigation. I request the confidence and loyalty of each of you so that we may proceed in an efficient and orderly manner on a fact-finding investigation that will assist in formulating appropriate corrective action.

"Investigation on aircraft accidents is a demanding and dedicated business, which requires, among other things, sincerity, honesty, cooperation, and above all, an open mind. It is our duty to investigate thoroughly and record all available factual information. Each of you is a member of this team and I want you to feel that you are a part of the team. You represent to me the most highly skilled, technically qualified, and dedicated group of people that can be assembled to investigate this particular accident. Some of the work will be hard and the hours long, but if aviation is made safer as a result of this work, then we will have done our job well.

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

The investigation must be well planned and conducted in a systematic manner. Depending upon the nature of the accident, this can best be accomplished by separating the investigatory activities into various phases and stages. In a major accident, each of the different phases will normally be handled by a separate investigatory group. In some cases the functions of one group might be merged with those of another group. In still other cases, it is possible that a more detailed division of functional responsibility might be made and a special group would be set up to handle this.

In addition to FAA, the participating parties normally include the following:

- Airframe Manufacturer,
- Powerplant Manufacturer,
- Equipment Manufacturers,
- The Airline Operator Involved,
- Air Line Pilots Association or Allied Pilots Association,
- Flight Engineers International Association or other Flight Engineer Union,
- Air Line Dispatchers Association.

Additionally, other organizations often participate (depending on the nature and circumstances of the accident or the equipment involved (actively as parties of interest or as observers. Examples are: (1) one or more of the military services in such cases as a midair collision with a military aircraft or if they operate similar equipment, (2) U.S. Weather Bureau, (3) Federal Bureau of Investigation, (4) Armed Forces Institute of Pathology, and (5) National Aeronautics and Space Administration.

Each of the interested parties has a coordinator assigned to the investigation. The Coordinator is the senior participant for his organization and acts as liaison between the investigation and his parent organization. Each Coordinator assigns personnel from his organization to each of the specialty groups, in which specialty his organization may have an interest and/or a high degree of expertise.

The Chairman of each group is an NTSB investigator who is a specialist in the particular field of investigation. It should be emphasized that this portion of the investigation is for the purpose of documenting observed facts—not to analyze or to then determine probable cause. The groups and their functions are as follows (See Appendix I):

Under Cognizance of the Assistant Investigator-in-Charge, Operations:

1. *Operations Group.*—The Operations Group is responsible for developing all facts concerning the history of the flight and flight crew activity in the final phases of the flight, during and after the accident. This includes flight planning, dispatching, weight and balance, radio communications, navigation facilities, en route stops, refueling, and aeronautical experience, flight checks and general information concerning the flight crew. The medical history of the crew, including any recent illnesses, psychological factors, crew rest periods and activities during the twenty-four hours prior to the accident should be determined. This latter aspect of the investigation should

be coordinated with the Human Factors Group to ensure that all information assembled is utilized to full advantage. The Operations Group should also develop information on the flightpath just prior to the accident. In this effort, coordination with the Air Traffic Control and Witness Groups is essential.

2. *Weather Group.*—This Group is responsible for the collection and compilation of all factual meteorological data pertinent to the accident, including both surface and upper air reports of actual conditions, pilot reports, recorded meteorological data, as well as forecasts of anticipated conditions prepared and issued by the appropriate agencies. Of necessity, close coordination must be maintained with other groups, particularly the Operations, Air Traffic Control and Witness Groups.

3. *Air Traffic Control Group.*—This Group is responsible for the review of the original records of the Air Traffic Service Units concerned including, when available, radar screen recordings, the monitoring of any original voice recordings and verification that written transcripts of voice communications are consistent with the re-recordings. This Group provides, when appropriate, a reconstruction of the history of the flight based on ATC information. In addition, this Group determines the operating status of pertinent navigation aids, communications equipment, radar, transponder equipment, computers, etc., and provides technical data on all such equipment and its operation, whenever it is deemed necessary. The Chairman of this Group is responsible for the cockpit voice recorder readout and coordinates this activity with the Operations Group Chairman.

4. *Witness Group.*—The Witness Group is responsible for contacting and interrogating all persons who may have seen or heard some portion of the flight or who may have knowledge concerning the flight or of the weather conditions at the time of the accident. They will obtain signed statements from witnesses, including survivors of the flight. The extent of the Group's activity can range from questioning a relatively few witnesses to a door-to-door activity covering great distances along the flightpath in which hundreds of possible witnesses are interviewed. Information concerning observed positions, altitudes, sounds, aircraft behavior and airborne disintegration can be developed in this manner. The location of witnesses at the time of the accident shall be plotted on a suitable map of the area. Close coordination must be maintained with the Operations Group in developing the probable flightpath from the witnesses' statements and with the Human Factors Group in the interrogation of witnesses. In many instances interpretation and translation facilities have to be provided for the interrogation of witnesses.

5. *Human Factors Group.*—This Group is responsible for the aeromedical and crash-injury aspects of the investigation. It is concerned with the possibility of crew incapacitation, the general physical and psychological conditions of the crew members and the environmental factors which might have affected the crew. It is also concerned with the possibility of psychological factors among passengers that might have been contributory to the accident. It will cover matters involving autopsies of crew and passengers as appropriate. It will also investigate the evacuation and survival aspects and design factors which may have contributed to the injury or death of aircraft occupants.

This Group is also responsible for investigating the circumstances of evacuation, search and rescue, and the performance of ground fire fighting services. The activities of this Group include an examination of the respective equipment and of the manner in which it was used. The function of this Group must be closely coordinated with the Operations, Witness and Structures Groups.

Under Cognizance of the Assistant Investigator-in-Charge, Airworthiness

6. *Structures Group.*—The Structures Group is responsible for investigating the airframe and flight controls. If the wreckage is scattered, the Group's first concern is to locate and identify as many sections, components and parts as possible and to plot their exact position on a wreckage distribution chart. They should give priority to location and recovery of recorders (flight and cockpit voice) installed on the aircraft.

A reconstruction of the structure may be desirable and this could vary from laying out various pieces of wreckage on a flat area to the more complicated reassembly of all available pieces in position on a framework.

This procedure is most often used in collision, structural failure, in-flight fire or explosion type accidents. Its purpose is to identify the point of original failure and to establish progression of the breakup pattern.

7. *Powerplants Group.*—The Powerplants Group is responsible for investigation of the engine or engines, including fuel and oil systems, propeller(s) and engine and powerplant controls. The initial work of this group may be carried out in conjunction with that of the Structures Group in the locating and plotting of wreckage. Powerplant fire is to be investigated as to the extent and time of occurrence. This Group is also responsible for investigating the type of fuel, the possibility of it being contaminated and the effectiveness of the powerplant fire extinguisher system. These functions must be coordinated with the Structures Group.

8. *Systems Group.*—The Systems Group is responsible for detailed examination of all systems and components such as hydraulics, electrical and electronics, radio communication and navigation equipment, air conditioning and pressurization, pneumatic, ice and rain protection, cabin fire extinguisher, oxygen, etc. The examinations will include determination of the condition and/or operational capabilities of components. It is important that all system components be accounted for within reason. The examination includes determination of the positions of associated controls and switches. The latter examination will be coordinated as appropriate, with the Operations Group.

9. *Flight Recorder Group.*—When a flight recorder is carried on the aircraft, this Group will arrange for a readout. The calibration of the recorder must be taken into consideration in the procurement of such a readout. The readout data when compiled must be coordinated with the Operations Group and such other Groups as the readout indicates.

Due to the importance of flight recorder data extreme care must be taken in handling the recorder and its recording to prevent damage. Only fully qualified personnel should be assigned to recover and handle the recorder.

10. *Maintenance Records Group.*—This Group is responsible for reviewing all maintenance records to ascertain the maintenance history of the aircraft in respect to adequacy of inspection, malfunctions that might be related to the occurrence, time on the aircraft engines and components and time since overhaul. The function of this Group involves coordination with the State of Registry and the operator involved and is normally performed at the maintenance base headquarters of the operator. This Group is also responsible for reviewing appropriate recovered flight documents.

These last two groups differ from the others in that they are formed and they function away from the accident scene. The Maintenance Records Group performs its functions at the maintenance base of the operator where the records are maintained. This Group may transfer its operation to the manufacturers' facilities if necessary to carry out a complete background investigation (applicable primarily to relatively new equipment). The Flight Recorder Group carries out its tasks at the Board's Washington offices where a Flight Data Laboratory is maintained.

As an investigation proceeds, it may develop that other groups need to be formed; these are handled on an ad hoc basis. These special groups have been instituted for such areas as manufacturing processes, overhaul facilities and aerodynamics. In one sabotage case it was advantageous to bring into being a Mock-up Group to carry on the "indoor" work normally done by the Structures Group while the Structures Group conducted its on-scene activities.

One very essential key element to accident investigation is *flexibility*. There can be no hard and fast rules governing how many groups, numbers of investigators, or the extent of investigation within the groups. Many varied factors influence the course of an investigation, e.g., terrain, weather, type of accident (in-flight failure, fire, explosion), type and complexity of the aircraft and its component parts.

E. Factual reports

Following the field phase of the investigation, the Group Chairmen return to the Washington office (or to the Field office) and each prepares a factual report of the findings of his group. It must be emphasized that these reports are the products of the Group Chairmen only and not, per se, group reports. This reporting method was adopted because seldom can there be an absolute "meeting of the minds" of group members where there are such varied interests, even in

the collection of that data which is considered to be factual evidence. The Bureau has a procedure of long standing which allows for a "one-man" report and still give recourse for diversity of view. The Group Chairman's report (either in draft or final form, depending on allowable time) is submitted to each group member for coordination and comment. The comments, if any, are reviewed by the Group Chairman and if he believes changes are in order he makes them in the final draft or by addendum or errata sheets. Should the Group Chairman decide not to alter the report, the group member is given the opportunity to submit an explanatory report.

The Factual Reports, together with photographs, charts, drawings, witness statements, laboratory reports and other documentary products of the investigation are introduced into evidence at the public hearing or deposition.

F. Hearings and depositions

Within ten working days after completion of the field phase of the investigation, or where circumstances warrant exceptions, at a mutually agreed time, each Group Chairman submits to his AIIC a final factual investigation report. The AIIC within the next three working days will prepare and submit to the IIC, with the Group Chairman's report, a summary of the investigation for which he is responsible, including (1) recommendations for remedial action, and (2) areas deemed appropriate for exploration at the Hearing/Depositions. Following receipt of the AIIC's report, the IIC will within two working days submit a recommendation to the Advisory Council relative to the convening of a Public Hearing or Deposition. Substantial departures from the above deadline dates are subject to the approval of the Director. When a public inquiry has been ordered, the IIC with the assistance of the AIIC's and in collaboration with the Hearing Officer will prepare within one working day an outline of the Hearing/Deposition objectives and a list of witnesses. After approval of the Hearing/Deposition objectives and witnesses by the Advisory Council, the Hearing Officer will within three working days prepare detailed outlines for the pre-hearing, hearing/deposition proceeding and upon approval of the Advisory Council will proceed with preparations for the public inquiry.

Public Hearings are usually held in a city near the accident site since most of the witnesses called to testify reside nearby and because wreckage is usually retained near the site of the accident. Depositions are sometimes held near the accident site or they may be convened in other parts of the country to ease the travel burden on the witnesses. In some cases depositions may be used in conjunction with the hearing for the purpose of questioning hospitalized crew members and passengers or when it is otherwise impossible for witnesses to attend the hearing. Depositions may also be used to admit information which has become available after the hearing.

Hearings and depositions are fact finding in nature and are not adversary proceedings. Hearings are conducted by a Board of Inquiry, composed normally of a Board Member, the Bureau Director or his Deputy, the Hearing Officer assigned to the investigation, and where appropriate, a legal advisor. A Technical Panel is also formed consisting of the Investigator-in-Charge and those of the Group Chairmen necessary to fulfill objectives of the hearing. Primary questioning of witnesses is by the Technical Panel and the Board of Inquiry. The parties to the investigation are permitted additional questioning of witnesses, but cross-examination in the legal sense is not allowed. Litigation attorneys, either those of the parties to the investigation or others, may attend these inquiries as members of the public but they may not participate in the proceedings in any way.

All questioning and testimony is recorded and becomes a part of the public record.

G. Analysis and final report

Following the hearing and/or depositions each of the Group Chairmen, the Assistant Investigators-in-Charge and the Investigator-in-Charge prepare analysis reports. These reports and the factual data gathered are used by the Hearing Officer to prepare a draft of the Board's Aircraft Accident Report. The draft is reviewed by Bureau supervisory personnel and the Group Chairman. Through written comments, meetings and consultations, the report reaches the stage where it is passed by the Advisory Council and is submitted by the Director, though General Counsel, to the Board for adoption.

Appendix II shows a table of events and action responsibility for an investigation from notification to adoption of the report by the Board.

III. A TYPICAL INVESTIGATION

The investigation of a Boeing 727 accident near the Greater Cincinnati Airport on November 8, 1965, has been selected to illustrate the Board's procedures. This investigation was neither an extremely complex investigation nor was it an easy task. It was not the longest or the shortest; the most expensive or the least expensive. It contained about the usual numbers of interested parties and the normal group formations. It also illustrates the creation of a special group and the use of both public hearing and deposition. Hence, this investigation may be considered as typical of those conducted in recent history.

A. Field phase

This accident occurred at 1901:30 E.S.T. on November 8, 1965, when the aircraft, with 56 passengers and a crew of 6, struck a wooded hillside approximately two miles from the Greater Cincinnati Airport. There were 58 fatalities, while 4 persons survived.

Notification of the accident was received by the Duty Officer at his home from FAA Communications Control Center at 1920 hours, E.S.T. The Go-Team was immediately alerted and directed to report to Washington National Airport for transportation to Cincinnati by FAA aircraft. The first aircraft, with IIC and most of the investigative party aboard, arrived at Cincinnati at approximately 2300; the second aircraft arrived at midnight. During this same period, personnel from the Bureau's field office at Chicago were also en route to Cincinnati. The field personnel normally arrive on scene first and take control until arrival of the team. In this case, however, prevailing weather conditions, airline schedules and the geography of the situation led to the team arriving on scene first. The field personnel were, nevertheless, extremely helpful in the early hours in assisting the team. One of the Chicago investigators remained throughout the field phase, per established procedure, to serve as an administrative assistant to the IIC.

By 2345 on the night of the accident a command post had been established in a conference room at a nearby motel and shortly thereafter a sub command post had been set up at the wreckage site. The area had been secured by the Kentucky State Police. Coordination with the police assured continuity of security and established for the police the credentials necessary for anyone to gain entry.

The organizational meeting was held at 0830 the morning of November 9, following a daylight survey of the accident scene. Coordinators and groups were established at this time. The investigative organization included:

Investigator in Charge.

Field Liaison (administrative assistant).

Hearing Officer.

Public Information Officer.

Assistant Investigator in Charge, Operations.

Assistant Investigator in Charge, Airworthiness.

(All of the above were Board employees.)

FAA Coordinator.

American Airlines Coordinator.

Boeing Company Coordinator.

Pratt & Whitney Coordinator.

Kentucky State Highway Patrol Coordinator.

Federal Bureau of Investigation Coordinator.

Allied Pilots Association Coordinator.

Witness Group (5 persons; 4 organizations, other than Board).

Systems Group (5 persons; 4 organizations, other than Board).

Structures Group (7 persons; 5 organizations, other than Board).

Air Traffic Control Group (5 persons; 4 organizations, other than Board).

Flight Recorder Group (4 persons; 3 organizations, other than Board).

Human Factors Group (6 persons; 5 organizations, other than Board. This group included representatives from Armed Forces Institute of Pathology which does work for the Board under contract, and from the Boone County Corner's office).

Powerplants Group (5 persons; 4 organizations, other than Board).

Operations Group (5 persons; 4 organizations, other than Board).

Weather Group (4 persons; 3 organizations, other than Board).

Maintenance Records Group (3 persons; 2 organizations, other than Board).

On November 11 a meeting of the IIC and the participating party coordinators was held to discuss the advisability of establishing a new, special group to examine the performance characteristics of the airplane. There was unanimous agreement that such a group should be formed. This was referred to the Advisory Council in Washington which also agreed; consequently, the following was added to the investigation on November 14:

Flight Characteristics and Performance Group (13 persons; 6 organizations, including personnel of the aeronautics branch of National Aeronautics and Space Administration who joined in a consulting capacity to the Bureau).

The on-site investigation was concluded on November 19, but this was by no means the completion of the field phase. Powerplant teardown and examination was conducted by the Powerplant Group at an airline maintenance facility, this work being completed about the end of November. Similarly, many systems components were removed to appropriate facilities for functional testing and detailed examination. The work of the Flight Characteristics and Performance Group continued into February 1966, and during this time its scope was expanded to include aspects of crew training in other related areas and the group expanded accordingly to 17 persons including the Operations Group chairman who served as Co-Chairman on this group to provide continuity of data flow.

Recapitulation of personnel by participating organization reveals the following breakdown:

Civil Aeronautics Board.....	17
Federal Aviation Agency.....	13
National Aeronautics and Space Administration.....	2
Armed Forces Institute of Pathology.....	1
Boone County coroner.....	1
Boeing Co.....	8
Pratt & Whitney.....	1
Allied Pilots Association.....	12
Air Line Pilots Association.....	2
Flight Engineers International Association.....	3
American Airlines.....	12
United Air Lines.....	2
Total	74

It is interesting to note that only 23 percent of the total were Bureau personnel and that over half were non-government. As this case illustrates, the NTSB investigative effort is supported in a large way by technicians and professional personnel from industry. It has been estimated that salary and living expenses (excluding transportation) for these 74 people during the field phase of the investigation amounted to about \$175,000. Cost to the Bureau for salary and expenses was approximately \$35,000.

B. The hearing and depositions

The public hearing in connection with this investigation was convened in Cincinnati on March 15, 1966, and was recessed indefinitely on March 17, following the testimony of 22 witnesses. Depositions had previously been taken in December of a hospitalized stewardess and her physician.

The Board of Inquiry for this hearing was composed of the Chairman of the Civil Aeronautics Board, the Director of the Bureau of Safety and the Chief of the Hearing and Reports Division. The Technical Panel consisted of the IIC and the Chairman of the witness, weather, operations and performance groups. Testimony was received from eye witnesses, control tower personnel, a survivor, an engineering test pilot, airline training and operations personnel, meteorologists, and FAA inspectors. The transcript of testimony totals 542 pages.

C. Analysis and reports

Immediately following the public hearing, the long, arduous, and complex task of analysis began. All of the Bureau's investigators of the accident had to research a vast collection of operational and engineering data, testimony, charts, graphs, maps and diagrams toward the end result of finding the pattern of omission and/or commission which led to the accident producing situation. Following

this intensive analytical effort, an initial draft of the final report was completed on May 24, 1966, and through the coordinated efforts of the team and the Advisory Council, was developed into the Aircraft Accident Report which was adopted by the Board on September 27 and released on October 7, 1966.

IV. CONCLUDING REMARKS

While the procedure used by the Board has proven satisfactory over the years, it has not been without criticism, specifically the practice of admitting organizations whose function, equipment, or service is involved, to participate actively in the fact-finding phase of the investigation. It has been argued that the admission of these participants could dilute the objectivity of the investigation. The Bureau has not found this to be true. Occasionally, a participating party (or some representative thereof) will attempt to divert attention away from or negate the importance of a particular finding, but such actions can be halted very quickly by one or more of the Bureau's investigators or, as in some cases, by the other participating parties. One of the prime attributes of a Bureau investigator is his ability to meld people of diverse interests into a smoothly functioning investigative organization. Problems of this type rarely occur; when they do, they are immediately resolved by the IIC.

The Bureau sees two outstanding advantages in admitting participating parties:

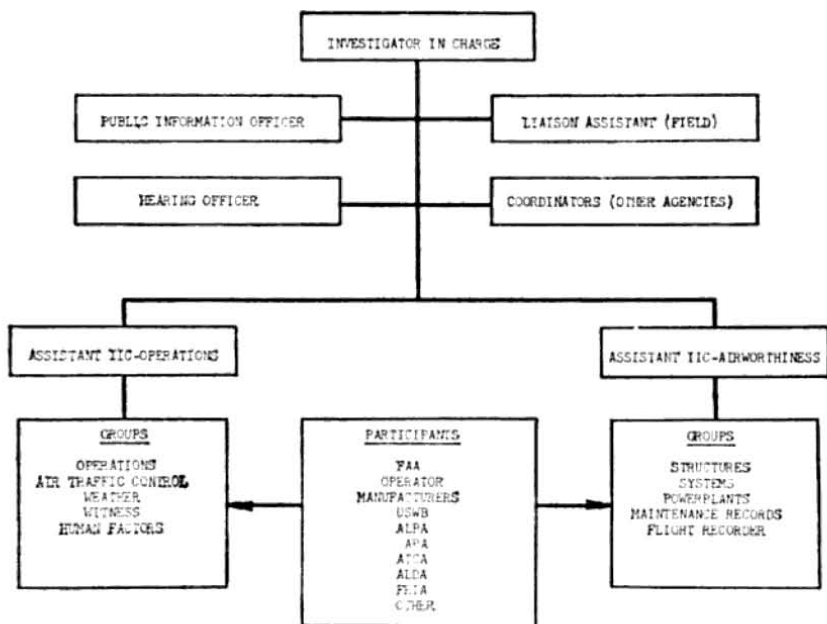
First, it permits rapid and natural flow of information to the participating organization's supervisory personnel. This can lead to early, coordinated corrective action in many areas of design, manufacture and operation of the aircraft and its many components. Many such actions are outside the sphere of causal factors, but nevertheless, enhance future safety of operation.

Second, the government realizes a reduction in the cost of each investigation.

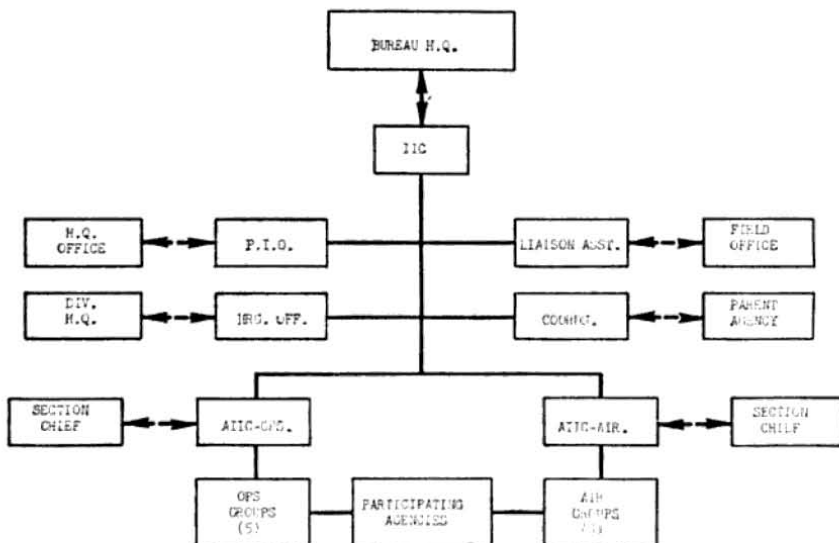
In connection with this latter point, it can be stated that it would be impossible for the Bureau to maintain a staff large enough to contain up-to-date knowledge on all the models of aircraft and their many systems. Even if such a staff were possible, an expert on one model of aircraft might not have an accident to investigate for several years and would, thus, through inactivity, lose his expertise as an investigator.

Some participating parties have been critical of the Board's procedure by claiming that the parties should be allowed to participate in the analysis phase as well. Here the Board and the Bureau can see the possibility of losing objectivity. As mentioned earlier, it is seldom possible to get absolute agreement of all parties on the gathering of fact. Certainly any approach to agreement in analysis would be a very long and argumentative procedure. Additionally, the Board and the Bureau believe that analysis is, in fact, a process of cause determination, a function which the Board is not permitted under law to delegate. Admission of participating parties to this phase could be construed as at least a dilution of the Board's authority and responsibility for cause determination. Finally, and overriding all other considerations, the Board and the Bureau believe that their trained and experienced staff are the most eminently qualified to analyze accident data and should do so in a completely unobstructed atmosphere.

TEAM COMPOSITION



COMMUNICATIONS PLAN CHART



APPENDIX II

Responsibilities for activities involved in the investigation of the accidents covered by the directive

Event	Action responsibility	Time
A. Accident notification.....	Chief, Central Investigation Section, after consultation with Chief, Investigation Division, activates "Go-Team."	
B. Field phase.....	IIC IIC and AIIC.....	
1. Urgent action safety recommendations.	Deputy Director.....	Within 5 working days following accident.
2. Advisory Council meeting....		
C. Analytical research phase.....	IIC and AIIC.....	
1. Initiation of safety recommendations, safety studies, and special projects.....	IIC and AIIC through supervisory channels for approval of Director. Group Chairmen present factual reports to AIIC. AIIC presents summary to IIC. IIC prepares recommendation on hearing or deposition for Advisory Council.	Within 10 working days following end of field phase. Within 3 working days following receipt of group reports. Within 2 working days following receipt of AIIC reports.
2. Writing factual reports and summaries, and preparing hearing or deposition recommendation.	Deputy Director.....	Upon notification that IIC is prepared to discuss causation and make hearing/deposition recommendation.
3. Advisory Council meeting.....		
4. Presentations to Board.....	IIC with AIIC support.....	
D. Hearing/deposition phase:		
1. Determination for holding hearing.	Director with advice from Advisory Council.	
2. Hearing order.....	Director.....	
3. Hearing officer designation....	do.....	
4. Notice of hearing.....	Hearing officer.....	
5. Present outline of hearing objectives and witness list to Advisory Council.	IIC and AIIC in collaboration with hearing officer.	Within 1 working day following D-1 above.
6. Present outline for prehearing conference and hearing to Advisory Council.	Hearing officer in coordination with IIC.	Within 3 working days following Advisory Council approval of hearing objectives.
7. Advisory Council meeting....	Deputy Director.....	(a) Upon notification that IIC is prepared to present hearing objectives and witness list. (b) Upon notification that hearing officer is prepared to present hearing outlines.
8. Presentations to Board.....	IIC with AIIC and hearing officer support.	
9. Designation of technical panel.	Director with advice from Advisory Council.	
10. Prepare exhibits and arrange for hearing.	Hearing officer.....	
11. Detailed planning and preparation for hearing program roles of technical panel and hearing officer to facilitate an orderly and systematic development of public record at public inquiry.	do.....	
12. Conduct hearing.....	(a) Panel of inquiry..... (b) Technical panel.....	
E. Formal report writing phase:		
1. Writing analysis reports.....	Group chairmen to AIIC..... AIIC to IIC..... IIC.....	Within 10 working days following hearing or deposition. Within 3 working days following receipt of group chairmen reports. Within 3 working days following receipt of AIIC reports.
2. Prepare initial draft report and present to advisory Council.	Hearing officer in collaboration with IIC and AIIC.	Within 10 working days after receipt of IIC report.
3. Advisory Council meeting.....	Deputy Director.....	
4. Prepare 1st Bureau draft.....	Hearing officer.....	Within 5 working days after E-3.

Responsibilities for activities involved in the investigation of the accidents covered by the directive—Continued

Event	Action responsibility	Time
E. Formal report writing phase—Con. 5. Prepare final Bureau report...	Hearing officer.....	Within 5 working days after receipt of Division comments on 1st Bureau draft (E-4)
6. Forward copies of Bureau draft to panel of inquiry.	Director.....	
7. Presentations to Board.....	Hearing officer with IIC and AIIC support.	Following resolution of comments from panel of inquiry.
8. Forward Bureau draft through Office of the General Counsel to Board for action.	Director.....	
9. Board adopts report.....	Board.....	

