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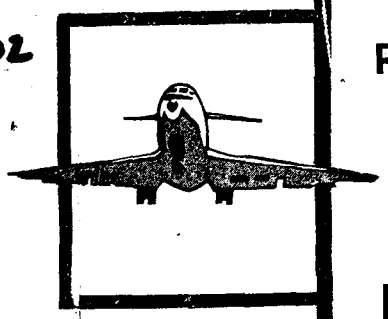

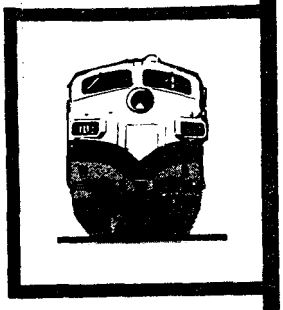

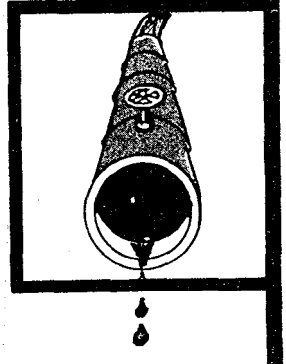

PB87-910402

NATIONAL TRANSPORTATION SAFETY BOARD

NATIONAL **TRANSPORTATION** SAFETY BOARD

WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT REPORT

SIMMONS AIRLINES, FLIGHT 1746
EMBRAER BANDEIRANTE
EMB-110P1, N1356P
NEAR ALPENA, MICHIGAN
MARCH 13, 1986

NTSB/AAR-87/02

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15. Supplementary Notes		

16. Abstract About 2050 on March 13, 1986, Simmons Airlines flight 1746, an Embraer Bandeirante, EMB-110P1, operating as a regularly scheduled flight, departed the Detroit Metropolitan Airport en route to Sault Ste. Marie, Michigan, with a stop in Alpena, Michigan. The en route portion of the flight to Alpena was uneventful. However, due to the prevailing instrument meteorological conditions, the crew was unable to complete the instrument landing system (ILS) approach and land and they declared a missed approach at 2142. At 2153, the flight was cleared for a second ILS approach to Alpena. At 2156, the crew acknowledged that radar services were being terminated. This was the last transmission from the airplane. About 2215, a motorist reported that the airplane had crashed. The airplane was found in a wooded area about 300 feet to the left of the extended centerline, and 1 1/2 miles short of the threshold of runway 1 at Alpena. The airplane was destroyed and two of the seven passengers and one of the two crewmembers onboard were killed.

The National Transportation Safety Board determines that the probable cause of this accident was the flightcrew's continued descent of the airplane below the glide slope and through the published decision height without obtaining visual reference Of the runway for undetermined reasons. Contributing to the accident was the inefficient system used to disseminate weather-related information to the crew.

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EXECUTIVE SUMMARY

About 2050 on March 13, 1986, Simmons Airlines flight 1746, an Embraer Bandeirante, EMB-110P1, operating as a regularly scheduled flight, departed the Detroit Metropolitan Airport en route to Sault Ste. Marie, Michigan, with a stop in Alpena, Michigan. The en route portion of the flight to Alpena was uneventful. However, due to the prevailing instrument meteorological conditions, the crew was unable to complete the instrument landing system (ILS) approach and land and they declared a missed approach at 2142. At 2153, the flight was cleared for a second ILS approach to Alpena. At 2156, the crew acknowledged that radar services were being terminated. This was the last transmission from the airplane. About 2215, a motorist reported that the airplane had crashed. The airplane was found in a wooded area about 300 feet to the left of the extended centerline, and 1 1/2 miles short of the threshold of runway 1 at Alpena. The airplane was destroyed and two of the seven passengers and one of the two crewmembers onboard were killed.

The safety issues in this accident concern primarily the reasons why the airplane continued the descent through decision height until it crashed. Although several possible reasons and scenarios are developed, without flight recorders and recorded radar data about the conduct of the flight and the nature of the flightpath, no single reason could be supported, to the exclusion of others. --

Other safety issues identified have been previously addressed in the Bar Harbor and Henson airlines accidents. In addition, in this accident, the dissemination of weather information was not carried out in a timely manner and as a result, the accident occurred when the conditions at Alpena were below minimum conditions for instrument approaches.

The National Transportation Safety Board determines that the probable cause of this accident was the flightcrew's continued descent of the airplane below the glideslope and through the published decision height without obtaining visual reference of the runway for undetermined reasons. Contributing to the accident was the inefficient system used to disseminate weather-related information to the crew.

As a result of its investigation, the Safety Board issued recommendations to the FAA to: improve the method of disseminating weather from weather reporting stations to military air traffic control facilities providing services to satellite airports, encourage operators under 14 CFR 135 to establish rehabilitation programs for pilots identified with alcohol abuse problems, conduct research to determine the minimum amount of time following alcohol consumption in which pilots can perform their duties without impairment, and improve the screening of passengers on aircraft without flight attendants onboard. Recommendations on cockpit voice recorders, flight data recorders, and ground proximity warning devices were reiterated from previous investigations.

NATIONALTRANSPORTATIONSAFETYBOARD
WASHINGTON, D.C. 20594

AIRCRAPTACCIDENTREPORT

Adopted: February 18, 1987

SIMMONS AIRLINES, FLIGHT 1746
AN EMBRAER BANDEIRANTE, EMB-110P1, N1356P
NEARALPENA,MICHIGAN
MARCH 13, 1986

l.PACTUALINFORMATION

1.1 History of the Flight

On March 13, 1986, Simmons Airlines flight 1746, an Embraer Bandeirante, EMB-110P1 (N1356P), was operating as a regularly scheduled flight under 14 CFR 135 from Detroit Metropolitan Airport, Detroit, Michigan, to Sault Ste. Marie, Michigan, with an en route stop at Alpena, Michigan. The flight was operated by Simmons as a Republic Express flight under terms of a marketing agreement between Simmons and Republic Airlines.

The crew of flight 1746 began their duty day at 1505 1/ when the captain and first officer reported to the Simmons Airlines operations office in Detroit. At that time, weather conditions were poor throughout much of Michigan and many Simmons flights were delayed or canceled as a result. Due to the weather, the crew that had been originally scheduled to fly N1356P was unable to land in Detroit as scheduled. As a result, the captain and first officer of flight 1746 were reassigned to fly N1356P from Detroit to Toledo, Ohio, and back to Detroit. The airplane departed Detroit over 2 hours behind schedule at 1800, arrived at Toledo at 1823, and returned to Detroit at 1900. After landing in Detroit, the airplane was loaded with 122 gallons of Jet A fuel. The only maintenance difficulty was the distance measuring equipment (DME) receiver, which was inoperative.

The captain and first officer of flight 1746, who had met each other socially the night before the accident but had never flown together, were scheduled to fly from Detroit to Muskegon and back to Detroit. However, weather conditions at Muskegon were below minimums for landing and the flights were canceled at 2015. The flightcrew was then reassigned to flight 1746, which was scheduled to depart Detroit at 2025 for the trip to Alpena and Sault Ste. Marie.

Shortly thereafter, the captain went to the Simmons operations office in Detroit, where he was given the weather information for the flight. He reviewed the weather and at 2020 told the dispatcher that he was ready to depart. He was given the flight manifest and the release for the flight. The route of flight 1746 was to be from Detroit direct to Flint, Michigan, Victor 133 to Saginaw, Michigan, and Victor 45 to Alpena, at a cruising altitude of 8,000 feet. The alternate airport designated for this flight was Cleveland Hopkins International Airport, Cleveland, Ohio.

1/ All times herein are eastern standard time based on the 24-hour clock, unless otherwise specified.

Flight 1746 departed the gate at Detroit at 2037 and was airborne at 2050. In addition to the captain and the first officer, there were seven passengers onboard. At 2124, Simmons flight 1746 was handed off from Saginaw terminal radar approach control to Wurtsmith Air Force Base approach control (Wurtsmith), the facility responsible for air traffic control (ATC) in the Alpena area. 2/ At 2125, following communication via the direct telephone link between Wurtsmith and the Pellston, Michigan, Flight Service Station (FSS) of the Federal Aviation Administration (FAA), flight 1746 was given the Alpena weather, with the exception of the temperature and dew point, that had been obtained in the most recent weather observation. The observation had been made at 2050 by a National Weather Service (NWS) specialist who was on duty at Alpena. Flight 1746 acknowledged receiving the information. At 2119, a special weather observation made by the NWS specialist indicated that visibility had deteriorated from the 1/2 mile observed at 2050 to 3/8 mile, which was below minimums for an approach. 3/ The 2119 Alpena special observation was transmitted by the NWS specialist through the weather dissemination system and became available to the Pellston FSS at 2127. Special observations are taken, as needed, when the ceiling or visibility is at or near minimum conditions or when they are changing significantly. They are also taken when airport conditions warrant.

At 2133, Simmons 1746 was cleared by Wurtsmith for the ILS approach to runway 1 of Alpena's Phelps-Collins Airport. Following the accident, the Simmons Airlines station manager at Alpena estimated that he received an in-range call from the crew of flight 1746 between 2140 and 2145. The pilot informed him that they would be landing in 5 minutes and that they would need fuel. Several minutes later, the station manager heard the sound of an airplane directly over the airport. He assumed, because of "the way it sounded," that it was flight 1746. He went outside but, due to the poor visibility, could not see the airplane. At 2142, the flightcrew of Simmons 1746 informed Wurtsmith that they had executed a missed approach. When asked by Wurtsmith for their intentions, the crew requested clearance for a second ILS approach to Alpena.

The station manager stated that about 30 seconds after he heard the airplane pass over the airport, the crew of flight 1746 requested over the radio that he "verify if the runway lights were on their highest level." The station manager then walked to the office of the NWS specialist to ask him if there was a way to make that verification. The specialist, who was outside at the time, informed him that one could only verify whether the lights were on, but one could not verify their intensity. The manager radioed the crew and informed them that as far as he knew the lights were on their fullest intensity. The crew acknowledged the call. At 2150:10, in response to a request from Wurtsmith, the crew was asked to describe the flight conditions in Alpena during their first approach. They responded: ". . . we picked up the lights but . . . but Pm not really sure uh what the visibility was and uh there's just fog it it was really hard to tell." (See appendix D.)

2/ In the continental United States, 2 Army facilities provide ATC services to 4 satellite airports, 12 Naval facilities provide the services to 37 satellite public use and 3 satellite private airports, and 27 Air Force facilities provide the service to 92 satellite airports in the United States and 1 in Canada.

3/ 14 CFR 135.225(b) states:

> No pilot may begin the final approach segment of an instrument approach procedure unless the latest weather reported by the facility described in paragraph (a)(2) of this Section indicates that weather conditions are at or above the authorized IFR [instrument flight rules] landing minimums for that flight.

At 2146, because of the marginal meteorological conditions, the Alpena NWS specialist made an additional special weathe observation, which indicated that visibility had deteriorated from 3/8 mile to 1/4 mile. About this time, the NWS specialist, who was aware of the minimum conditions required for an instrument approach, informed the Simmons station manager that Alpena was below minimums for the ILS approach. Following the accident, the station manager stated to the Safety Board that, "although I am not required to give current weather without being asked, I figured I had better get 1746 on the radio and tell them Alpena was below minimums." He tried several times to contact flight 1746 over the company frequency, 131.6 MHz, but there was no response from the crew. The Safety Board was unable to determine the precise time the attempts to contact the crew took place.

About 2210, a motorist driving through a wooded area south of the airport encountered two persons who appeared from behind trees. They informed him that they had been passengers in a Simmons airplane that had just crashed and that there were other persons who were still alive but trapped in the wreckage. They asked him to drive them to the airport. The motorist complied and they arrived at the airport about 2215. The motorist informed the Simmons station manager of the crash and of the survivors who were still in the wreckage. The station manager immediately notified the Alpena County Sheriff's Department of the accident and its location.

The surviving passengers generally described the flight as uneventful until the impact. Several said that the weather was clear until the aircraft began the approach to Alpena. One passenger remembered seeing lights on the ground during the first approach; during the second approach, after they broke out of the clouds, he saw trees and then heard a loud bang. Another passenger, who on the first approach saw lights that he believed were from the terminal, described the initial impact as feeling as if it were a hard landing. Another. passenger, who described feeling occasional gentle "wallowing" of the airplane en route, said that there was no turbulence during the approaches and no difference in the engine sounds during the approaches. He felt one "bump" after the second approach and then he apparently lost consciousness.

The captain recalled little of the flight, of the approaches, or of his activities on the day of the accident. The captain stated that he was the pilot flying the Detroit to Alpena leg. He remembered that the flight was a "rough ride" and that "it seemed like the whole thing was turbulent all the way . . ." He could not account for the discrepancy between the turbulence he recalled and the known meteorological conditions at the time, which did not indicate turbulence. He recalled receiving the weather information on initial contact with Wurtsmith and that there was a 100-foot overcast ceiling with visibility of 1/2 mile. He stated that there were no flight control or engine problems with N1356P and that the Alpena ILS system functioned properly. The captain was unable to recall specific information about coordination with the first officer during the flight, the approach briefings, flight parameters during the approaches, approach light activation, or radio communications with the Alpena station agent. In addition, the captain did not remember his reasons for deciding to attempt to execute the second ILS approach into Alpena. However, when asked to describe the rationale that he might have used in deciding to attempt the second ILS approach, the captain responded:

> Because we may have seen the lights on the first one, and we were still given half a mile as to current weather, because we were going to go-around and try it again.

He added that he had never felt pressured by the company to act contrary to his own best judgment on matters affecting flight safety. The Safety Board found no evidence that Simmons exerted pressure on their pilots to violate safety standards or Federal Aviation Regulations in the operation of their flights.

The captain said that although both he and the first officer possessed current instrument approach charts for the approach to Alpena, only one was readily available during the approaches to Alpena. The captain stated that once he determined that both crewmembers' charts were current, he, as the pilot flying the approach, would review the chart, and ". . . the FO [first officer] would give you an approach. briefing, and the captain would take the plate, look it over and hand it back. Any questions would be asked and the FO would give you that information." Although this was not standard company policy, the captain stated that it did not matter if only one chart was used since "It is crew coordination. As long as the approach plate is current. . ." He stated that he would determine the currency of the approach charts en route, once the destination was confirmed.

The accident occurred in a wooded area approximately 1.5 miles south of the threshold and about 300 feet to the left of the extended centerline of runway 1 at Alpena. There were 2 to 3 feet of snow on the ground in the principal impact area. The emergency locator transmitter (ELT) was activated upon impact and continued to transmit until deactivated the following day.

The accident occurred during darkness, at 45° 4' north latitude and 83° 33' west longitude.

1 . 2 Injuries to Persons

Injuries	Crew	Passengers	Others	Total
Fatal	1	2	0	3
Serious	1	4	0	5
Minor	0	1	0	1
None	0	0	0	0
Total	2	7	0	9

1.3 Damage to Aircraft

The airplane was destroyed by impact. The value of the airplane was estimated at $800,000 at the time of the accident.

1.4 Other Damage

Trees were damaged along the 500-foot swath from the first contact with trees to the principal impact area.

1.5 Personnel Information

The flightcrew consisted of a captain and first officer, both of whom were qualified in accordance with existing Federal Aviation Regulations. Both had received the required training. (See appendix B.)

On January 22, 1982, the captain attempted unsuccessfully to complete an instrument rating flight check. The examiner remarked, "The entire instrument flight test, ILS and VOR approaches were unsatisfactory." The captain successfully completed the flight cheek in his second attempt on March 10, 1982.

The captain was a flight instructor in Arizona from January 1983 through June 1984. He then flew for Air Nevada from June through November 1984. He was asked to leave Air Nevada after failing to report to work on at least three occasions. He was then employed as a pilot by Capitol Airlines of Manhattan, Kansas, from December 1984 through February 1985. He left Capitol Airlines after the airline encountered financial difficulties. He flew as a pilot-in-command for both airlines, mostly in the Cessna 402 and occasionally in the Piper Cheyenne (PA31T), in single pilot operations. He accrued about 1,000 hours of flight time with these operators, including about 7.5 hours with Capitol Airlines, as second-in-command of the DHC-6, Twin Otter. He joined Simmons Airlines on March 4, 1985, and was assigned to the position of first officer on the EMB-110P1.

Upon his employment at Simmons, the captain received both ground and flight instruction from company instructors. The ground training was carried out in classrooms and the flight training in aircraft. Aircraft simulators or cockpit procedures trainers were not used. The captain completed his initial training on March 21, 1985. He completed ground school to upgrade from the first officer position on November 13, 1985. The training, which addressed the EMB-110P1 systems and operating procedures, contained two hours on cockpit resource management, including a film on the subject. The flight phase of the captain's upgrade training was conducted by company instructor pilots.

The captain accumulated 14.5 hours of flight time in the EMB-110P1 in preparation for the airman competency check ride in the airplane. This flight time was in addition to the 401.8 hours he had flown as first officer in the EMB-110P1. On December 5, 1985, the captain performed unsatisfactorily on VOR approach procedures on the flight check. When asked by Safety Board investigators to describe the flight check that he administered to the captain on December 5, the FAA Air Safety Inspector stated that the captain directly departed a holding pattern that was part of the VOR approach to the Grand Rapids, Michigan airport, without commencing a procedure turn first. Because this action was not "technically correct," the captain did not pass the check ride. A reexamination was administered and successfully accomplished on January 7. The same FAA check airman administered both flight checks and said that the captain "did fine" on the second check. He believed that the captain was a "good pilot" who definitely "knew the airplane." On January 8, 1986, the captain began flying as a captain in the EMB-110P1 for Simmons. He completed his initial operating experience on January 13, 1986, accumulating a total of 10.8 hours of flight time and performing 12 landings, in accordance with the requirements of 14 CFR 135.244.

The captain met the requirements of 14 CFR 135.225(d) 4/ on February 24, 1986. At the time of the accident, he had accrued 171.8 hours as pilot-%-command in the airplane, 573.6 total hours in the airplane, 203 hours in instrument conditions, and 3,383.6 total hours of flight time.

4/ 14 CFR 135.225(d) states: The MDA or DH and visibility landing niinimums prescribed in Part 97 of this chapter or in the operator's operations specifications are increased by 100 feet and 1/2 mile respectively, but not to exceed the ceiling and visibility minimums for that airport when used as an alternate airport, for each pilot in command of a turbine-powered airplane who has not served at least 100 hours as pilot in command in that type of airplane.

On February. 25, 1986, the captain was pilot-in-command of an EMB-110P1 that was about to turn onto the final approach course to Jackson, Michigan when the airplane was reported to have flown contrary to the directives of the air traffic controllers. Both crewmembers filed an operational irregularity report about the incident with Simmons. The Safety Board spoke to the first officer on the flight and she explained that the incident took place as she, and the captain had described it in the report. That is, while in the pattern the captain deviated to avoid another aircraft, and so informed the tower. The FAA investigated the incident and took no action against the crewmembers.

The Safety Board interviewed or received statements about the captain's piloting abilities from four Simmons pilots who had flown with him in his role as pilot-in-command. The pilots consistently described him as a 'professional" pilot who had handled the airplane well and in accordance with required procedures. Those who had flown with him in instrument conditions described his instrument flying skills as good and his practices as safe. There were no negative reports received about his piloting abilities.

The first officer began flying in 1973. He applied for his private pilot certificate in October 1973 but was unsuccessful in passing the oral phase of the examination. He reapplied but failed to successfully complete the flight check for the private pilot certificate in November 1973. On November 16, 1973, following additional flight instruction, he successfully completed the requirements and was granted the license. He applied for a flight instructor certificate in March 1979. At that time, he failed to complete the flight check successfully. He re-applied in April 1979 and again was unsuccessful. He was granted the flight instructor certificate on May 17, 1979.

The first officer flew primarily Cessna 207 and Cessna 402 airplanes for Aurora Air Services of Fairbanks, Alaska from July 1981 through July 1985. He then flew the PA-31-350, Piper Cheyenne, as pilot-in-command, with Air Logistics, also of Fairbanks, Alaska, from July through October 1985. He was furloughed following the end of the business season. He joined Simmons on January 1, 1986, and was assigned to the position of first officer on the EMB-110P1. He completed ground school on January 20, 1986, and initial flight training on February 11, 1986, having accrued 4.9 hours in the aircraft. He successfully completed his airman competency check on February 15, 1986.

At the time of the accident, he had accrued 21.3 hours in the EMB-110P1, 552.7 hours in instrument conditions, and 6,271.3 hours total time. Of his total aircraft time, 5,950 were as pilot-in-command and 271 were as second-in-command. In addition, 1,521.3 hours were in multi-engine land airplanes, and 71.3 of those hours were accrued in turbine-engine airplanes.

1.6 Aircraft Information

The airplane, Serial Number 110370, an Embraer Bandeirante EMB-110P1, was manufactured on November 8, 1981, by Embraer Aircraft Corporation of Brazil. (See figure 1.) It was owned by Titan Partners of Chicago, Illinois, operated by Simmons Airlines, and placed into revenue service on December 1, 1981. The airplane was powered by two Pratt & Whitney of Canada PT6A-34 engines. (See appendix C.) It was certificated for a crew of 2 and for 19 passengers; however, Simmons reconfigured its EMB-110P1 airplanes for 15 passengers.

At takeoff, the estimated gross weight of the airplane was 11,535 pounds and its center of gravity was 16.7 percent mean aerodynamic chord (MAC). At the time of

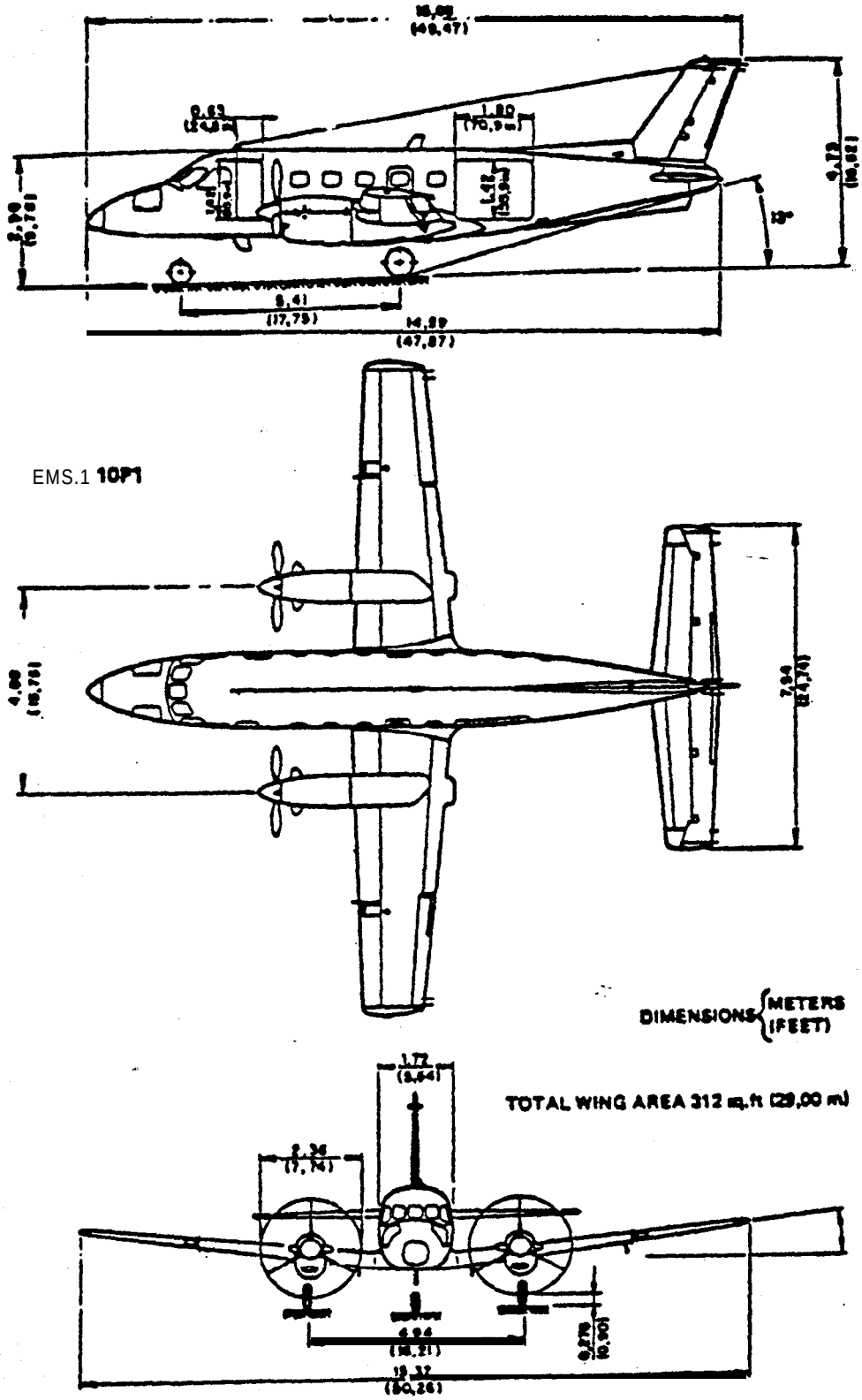


Figure 1.—The EMB-110P1.

the accident, the airplane weighed 10,935 pounds and its center of gravity was 15.1 percent MAC. Both the weight and center of gravity were within acceptable limits throughout the flight.

The airplane was equipped with the following radio navigation and communication equipment, all manufactured by the King Radio Corporation:

2	KY 196 Communication Transceivers
2	KN 53 Navigation Receivers
1	KR 87 ADF (Automatic Direction Finder)
1	KNI 582 RMI (Radio Magnetic Indicator)
1	KI 525 HSI (Horizontal Situation Indicator)

In addition, there was a Bendix RDR 130 weather radar unit onboard.

The airplane was not equipped, nor was it required to be equipped, with an autopilot or a radio altimeter.

1.7 Meteorological Information

1.7.1 Meteorological Observations and Forecasts

The NWS maintained an office in the passenger terminal of Alpena's Phelps-Collins airport, where NWS personnel made weather observations. On March 13, the following surface weather observations were recorded:

> 2050 - Record - Sky partly obscured, measured ceiling 100 feet overcast, visibility 1/2 mile, light drizzle, fog, temperature 33° F, dew point 33° F, wind 110° at 07 knots, altimeter setting 29.82 inches of Hg., fog obscuring 9/10ths of sky.
>
> 2119 - Special - Sky partly obscured, measured ceiling 100 feet overcast, visibility 3/8 mile, light drizzle, fog, wind 090° at 06 knots, altimeter setting 29.82 inches of Hg., fog obscuring 9/10ths of sky.
>
> 2146 - Special - Indefinite ceiling 100 feet, sky obscured, visibility 1/4 mile, light drizzle, fog, wind 100° at 03 knots, altimeter setting 29.82 inches of Hg.
>
> 2154 - Record - Indefinite ceiling 100 feet, sky obscured, visibility 1/4 mile, light drizzle, fog, temperature 33° F, dew point 33° F, wind 060° at 04 knots, altimeter setting 29.82 inches of Hg.

Weather radar data for 2222 from the NWS weather radar located at Alpena showed an area of weak echoes containing light rain showers and drizzle surrounding the area. The maximum cloud top was 10,000 feet msl.

There were pilot reports in the Alpena vicinity around the time of the accident. At 1850, a Short Brothers SD3-60 at 8,500 feet over Pellston, 70 miles from Alpena, reported skies 1,200 feet overcast with tops at 6,000 feet, and 7,000 feet overcast with tops at 8,500 feet. The flight reported moderate freezing rain at 2,500 feet with an inversion at 3,500 feet, where there was light rain. At 2050, a Cessna 404 reported over Pellston at 4,000 feet that skies were 1,000 feet overcast, with light to moderate icing from the surface to 3,500 feet.

No NWS Significant Meteorological Information (SIGMETS) or Center Weather Advisories were in effect at the time in the vicinity of the accident. The National Weather Service Area Forecast, issued on March 14 at 0140 Coordinated Universal Time and valid until 1400 Coordinated Universal Time, indicated:

> Flight precautions: IFR. Ceilings below 1,000 feet overcast, visibility below 3 miles in fog and precipitation. Cloud tops around 10,000 feet. Chance of light freezing rain.

The 1952 observation at Sault Ste. Marie, Michigan, the destination of flight 1746 following the enroute stop in Alpena, was:

> Ceiling estimated 1,000 feet overcast, visibility 1 1/2 miles, rain, snow and fog, temperature 33° F, dew point 32° F, wind 080 at 6 knots, altimeter 29.85, rain began 40 minutes past the hour.

The 2052 observation at Sault Ste. Marie indicated the following:

> Ceiling estimated 1,000 feet overcast, visibility 3 miles, fog, temperature 33° F, dew point 32° F, wind 090 at 6 knots.

1.7.2 Dissemination of Meteorological Information

After the Alpena NWS weather specialist completed the weather observation at the airport, the information was entered into the NWS-operated Automation of Field Operations and Services (AFOS) system. Surface observations were routed to the Systems Monitoring and Coordination Computer in Maryland and from there to another computer system in Maryland.. The information was then routed to the FAA's Weather Message Switching Center in Kansas City, Missouri, and then to the Saginaw (Michigan) FSS. From there the information was accessible to the Pellston FSS, which was linked by direct telephone line to Wurtsmith. Wurtsmith personnel obtained current Alpena weather via a "217 shout line" or direct telephone type landline, and then spoke directly to Pellston FSS personnel. Wurtsmith had no other method of obtaining weather information at Alpena. Of the 92 satellite airports that are provided air traffic control services by Air Force facilities, 8 have weather observers on the field but no automatic method of communicating weather from the observer to the air traffic controllers. Instead, as in Alpena, the controllers must call to obtain the weather.

The 2050 Alpena surface observation was entered into the AFOS system at 2051, the 2119 observation at 2121, the 2146 observation at 2147, and the 2154 observation at 2157. The 2119 observation was available to the Pellston FSS at 2127. The 2146 observation was not received at the Saginaw FSS and therefore was not available to Wurtsmith controllers. The Safety Board could not determine why the Saginaw FSS did not receive this observation. However, the Safety Board was told that occasional transmission difficulties occur to all receivers of weather information. This is considered a serious problem if a pattern of transmission difficulties emerges, or if the difficulties occur continuously.

The NWS observer would typically communicate observations directly via electrowriter to the Alpena tower, when the tower was in operation. The Simmons office at Alpena did not have an electrowriter; however, the computer terminal used for Simmons-related business, such as passenger check-in, could have also been used to access the weather information.

Both the Simmons station manager and the NWS specialist who were on duty at Alpena at the time of the accident indicated that they routinely contacted each other to help relay weather information to Simmons pilots. The NWS specialist stated that ordinarily Simmons personnel visited him in his office, located about 50 feet from the Simmons office, "every few minutes" if the weather was poor. However, no such communication occurred on the night of the accident until Simmons flight 1746 had executed the missed approach. There was no explanation as to why this communication did not take place at that time. The NWS specialist then mentioned to the Simmons station manager that Alpena was below minimums.

The Simmons station manager stated that he had provided weather information upon request to the Simmons crews who were inbound to Alpena. However, he was neither trained for nor required to provide this information. Following the accident, Simmons provided training to their Alpena station personnel to enable them to interpret weather information from their computerized format and required them to provide Simmons' flightcrews who were approaching Alpena with weather information, upon request from the flightcrew.

After the accident, several Simmons crewmembers stated that, as a matter of course, they had been provided with Alpena weather from controllers at Wurtsmith and from station personnel at Alpena without their asking for the weather first. For example, one pilot stated:

> . . .we were normally advised by Wurtsmith approach control as to the weather conditions in Alpena, when the current Alpena weather was unavailable to Wurtsmith approach control it was provided to us by company personnel in Alpena.

Similarly, the captain of flight 1746 stated that as far as receiving updated weather information, "the normal procedure would be that Wurtsmith would have given us the weather update . . . without us saying anything."

Wurtsmith personnel would obtain updated weather information from Pellston FSS following a pilot request for this information. This followed procedures contained in a letter of agreement between Wurtsmith and the Pellston FSS, dated July 8, 1981. The letter called for Pellston to:

> Provide to Wurtsmith Approach Control, upon request, all hourly, special, or other weather observations relating to the Phelps-Collins Airport, until advised that they are no longer needed.

The FAA's Air Traffic Control Handbook, 7110.65D, dated October 25, 1984, Paragraph 4-72, directs controllers to:

> Provide current approach information to arriving aircraft on first radio contact or as soon as possible thereafter.

Approach information was to include the following weather-related items of information: surface wind, ceiling and visibility if the ceiling at the airport of intended landing was reported below 1,000 feet or the visibility was less than 3 miles, and the altimeter setting. In addition, controllers were advised to: "issue any known changes

classified as special weather observations as soon as possible." Military air traffic controllers adhered to the same regulations and procedures as FAA controllers regardless of whether the air traffic was civilian or military.

Following the accident, representatives of the Safety Board, FAA, and Simmons Airlines interviewed the supervisor of the controllers on duty at Wurtsmith at the time of the accident after reviewing the transcript and listening to the recording of communications between Wurtsmith and Simmons 1746. The supervisor was asked about the background communication occurring just after 2131, in which a controller stated, "(unintelligible) sky and weather's below minimums for approach (unintelligible)." The controller who made that background comment later told Board investigators through his supervisor that he was referring'to Air Force landing minimums, which require that both the ceiling and visibility be at or above minimum conditions. In this case, the 1/2-mile visibility was at minimum conditions, but the ceiling was 100 feet below the minimum ceiling needed for a military aircraft to conduct the ILS runway 1 approach to Alpena. However, these conditions did not preclude the pilot of a civilian aircraft from commencing the approach; FAA regulations permit an approach to be made regardless of the ceiling if the visibility is at or above minimum conditions.

1.8 Aids to Navigation

Alpena's Phelps-Collins Airport is served by an ILS system for an approach to runway 1. (See appendix E.) On the morning of March 14, FAA Airways Facility (AF) technicians found the FELPS outer compass locator (LOM), the initial approach fix of the ILS runway 1 approach, out of service, which they believed may have been due to snow accumulation near the LOM. In any event, the LOM was reset to normal operation and no further adjustment was necessary. The LOM was not monitored by an ATC facility. Alpena tower personnel stated that they relied on pilot notification to determine if the LOM had gone out of service. A review of LOM maintenance records revealed no recurring maintenance difficulties. The outer marker beacon was found operational. According to paragraph 911 of the FAA's Terminal Instrument Procedures (TERPS) manual, the LOM is not considered a 'basic component" of the ILS.

Following the accident, several Simmons crewmembers informed Safety Board investigators that on occasion they had received fluctuations in glideslope and/or localizer indications while executing the ILS runway 1 approach into Alpena. For example, one captain stated that he had noticed fluctuations on a flight on January 30, 1986. Another captain said that he had encountered such fluctuations on December 1, 1985, and that he executed a missed approach as a result. According to Alpena tower personnel, the FAA would check the ILS system after pilots from at least two aircraft, who had been flying the approach within a short time period, reported fluctuations in the Alpena ILS system. There was neither a predetermined interval in which the reports were required to be made, nor a required format for submitting such reports. Pilots could report fluctuations via radio to the tower, by telephone, in writing, or by other means. According to FAA records, in the 6 months preceding the accident, no pilot reports that met the two aircraft reporting minimums had been filed and no FAA checks of the glideslope had been performed. In that interval, the glideslope had been out of service three times for an average of 2 hours each time. Two of those outages resulted from routine maintenance procedures, and one resulted from snow accumulation near the antenna.

On 0815 on March 14, 1986, FAA airways facility personnel began an operational check of the runway 1 ILS component. However, they found a snow drift approximately 3 feet high and 25 feet wide in front of the glideslope antennae array. A

complete ground check of the glideslope could not be performed because the snow drift interfered with the positioning of test equipment. The snow drift was left untouched until the airborne flight check of the ILS component could be completed.

Airways facility personnel estimated that from the time the snow drift was discovered until the completion of the flight check, the height of the snow drift decreased by no more than 1 inch. The flight'check disclosed that all components of the ILS system were operating within their prescribed tolerances. The glideslope angle was found to be 3.12'. The high angle tolerance for the glideslope was 3.2'. (See figure 2.) A review of outage reports for the Alpena runway 1 ILS system disclosed no outstanding maintenance discrepancies of system components at the time of the accident. In addition, there were no deficiencies of the ILS reported to the Alpena tower or to Wurtsmith on March 13, 1986. Six Simmons flights made approaches into Alpena that day. One resulted in a missed approach to another airport, four successfully landed, and one was flight 1746.

1.9 Communications

There were no known communications difficulties.

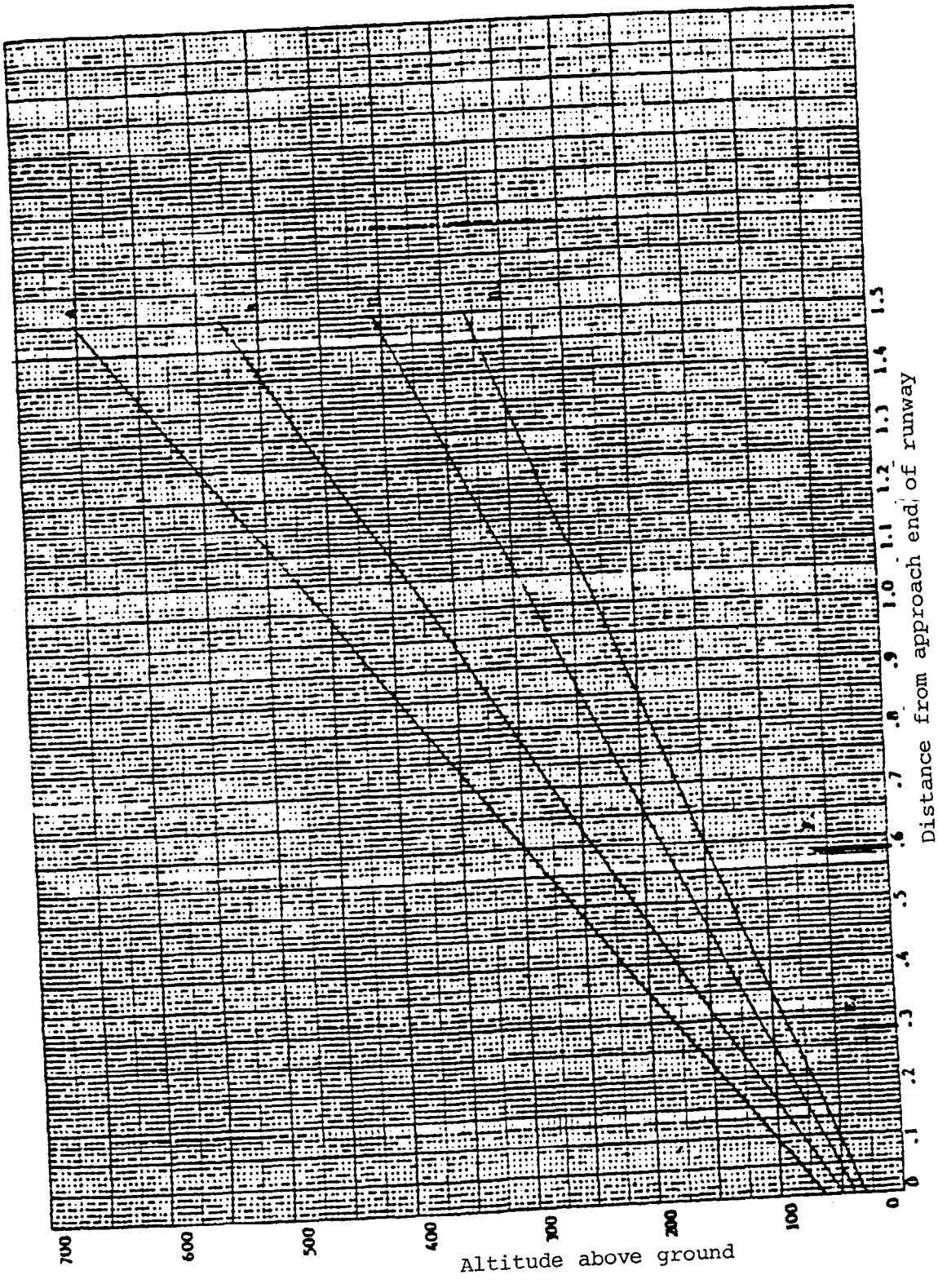
1.10 Aerodrome Information

Phelps-Collins Field, elevation 689 feet above sea level, is 6 miles northwest of Alpena. The Michigan Air National Guard was co-located at the airport and, during daylight hours, provided crash, fire, and rescue (CFR) service under an agreement with the airport. At the time of the accident, the airport held an Index A certificate for CFR Service although no certification was required because of the type of scheduled air carrier service at the airport. 5/ There were six runways at the airport; however, during the winter months, only four were in operation. Runway 1, with a length of 9,001 feet and a width of 150 feet, was the longest of the runways. It was served by the only ILS system at the airport. Runway 1 had high-intensity runway edge lights (HIRL) along the edge of the runway, a medium-intensity approach light system with sequenced flashing lights (MALSR), and a visual approach slope indicator (VASI).

The accident occurred at a time when the tower was not in operation. Before the tower was to be closed, ATC personnel were to perform the following procedures: set the HIRL to medium intensity and set the MALSR to be activated by pilots keying their microphones on 120.9 megaHerz, the same frequency used for communicating with the control tower. Keying the microphone seven times in 5 seconds would illuminate the MALSR to its highest intensity while keying it five times or three times each in the same interval would illuminate the lights to their medium and lowest intensities, respectively. The lights would remain illuminated for 15 minutes, after which they would automatically turn off.

On March 13, 1986, the Phelps-Collins control tower, operated by the Michigan Air National Guard, which was located at the field, was scheduled to remain in operation until 2400. However, due to the early completion of scheduled military maneuvers, the tower was closed at 1910. Air National Guard personnel stated that upon closing the

5/ 14 CFR 139.49 requires, for scheduled air carrier service with airplanes no longer than 90 feet, that at a minimum, the following equipment be maintained at an airport: one lightweight vehicle providing at least 500 pounds of dry chemical extinguishing agents or 450 pounds of dry chemical and 50 gallons of water for aqueous film-forming foam (AFFF) production.



A. 3.70 degrees. Equivalent to 150 microamp flydown on a 3.0 degree glideslope

B. 3.00 degrees. Normal glideslope

B. 3.00 degrees.

C. 2.30 degrees. Equivalent to 150 microamps flyup on a 3.00 eg. glideslope.

D. 1.88 degrees. Worst case scenario. Glide-path at maximum tolerance width .9 and lowest intolerance angle (2.78) and A/C at 150 microamp flyup (Note: after accident check of3/14/86 found 190 microamp flyup pt. at 2.12 degrees.

E. obstacle 32' above RPI and 32' left ofC/L

F. obstacle 69' above RPI and 100' right of C/L

NOTES: Elevations include earth's curvature

Figure 2.—Height above ground, at various altitudes on glideslope of ILS to Alpena.

tower, they placed the HIRL on medium intensity, tested the low-, medium- and high-intensity illumination levels of the MALSR, and confirmed that the ILS was operating. They stated that these systems were operating satisfactorily at that time.

Simmons had six daily scheduled flights into Alpena in the morning, afternoon, and evening. These were the only commercial flights into the airport.

1.11 Flight Recorders

N1356P was not equipped, nor was it required to be equipped, with either a cockpit voice recorder or a flight data recorder.

1.12 Wreckage and Impact Information

The airplane came to rest in a wooded area 1 1/2 miles south of the runway 1 threshold. The wreckage path was confined to an area about 500 feet long, and about 80 to 90 feet to the east of Indian Reserve Road, which was parallel to the extended centerline of the runway. (See figure 3.) The initial flightpath of the airplane through the trees was 3.2° down, an angle which then steepened to 10.4' at the principal impact point. The first tree struck was located on the east side of the road, about 500 feet south of where the airplane came to rest. Damage was found at the treetop level, about 35 feet above ground level (AGL). A second tree, about 35 feet north of the initially damaged tree, also was damaged at 35 feet AGL. An S-inch tip section from a right propeller blade was embedded in another tree located 84 feet north of the first damaged tree at about 17 feet AGL. The elevation of the tree tops at the initial impact point was about 40 feet (AGL), and the elevation of the terrain at the main wreckage was about 680 feet.

The right wing structure from the area outboard of the engine nacelle was fragmented and found distributed along the wreckage path. The remainder of the wing was attached to the fuselage. The left wing was found separated about 2 feet outboard of the engine nacelle and 18 inches outboard of the main wing spar attachment.

The ventral fin was bent by impact 90° to the right, and the left horizontal stabilizer by about 50° upward. The right stabilizer was found intact but had been crushed about mid-span.

The continuity of the aileron, rudder, and elevator cable systems was established despite some impact damage in each system. In addition, the left rudder cable was found frayed at the forward pulley assembly, and both of the 'first officer's aileron cables were found frayed in several locations in the area that passed through the forward pulley assembly. The first officer's elevator cables were also found frayed, up to five strands, in several areas along the forward pulley assembly.

The right main landing gear was folded aft, while the left main landing gear was extended. The nose gear was rotated forward and displaced aft. The landing gear handle was down. Although the flap selecter was broken, the left and right main flap actuator measured 26 and 25 percent extended, respectively. This corresponds to a 25 percent flap extension setting, the configuration used in an EMB-110P1 that is on an ILS approach.

The left engine was found separated from its mounts. The fuel filter bowl contained fuel. Internal examination showed that all compressor blades were present in the compressor drive turbine. There was no evidence that any of the blades had penetrated the case or had exited the engine. The interior of the turbine case adjacent to the blades was deeply gouged circumferentially through 360°.

WRECKAGE DISRIBUTION
SIMMONS AIRLINES FLT 1746
ALPENA, MICHIGAN
MARCH 13, 1986

LEGEND

Components

1. Right wing outboard section
2. Right aileron
3. Right wing de-leer boot line
4. Prop blade tip in tree
5. Skin section
6. Right wing tip in road
7. Top engine cowl
8. Windshield wiper blade
9. Three ft. section. leading edge skin
10. Fiberglass panel
11. Leading edge skin
12. Leading edge skin
13. ICC shield sections
14. Main landing gear door
15. Radar antenna end radome sections
16. Right propeller
17. Lower engine cowl
18. Hydraulic accumulator
19. Nose gear door
20. Radio compartment door
21. Nose wheel well section
22. Right landing light assembly
23. Left wing outboard panel
24. Engine mount and cowl
25. Passenger seat
26. Cockpit bulkhead. left side
27. Right inboard flap section
28. Hydraulic accumulator fn ground scar
29. Left elevator
30. Left outboard flap section
31. Rudder balance night
32. Left engine
33. Left propeller
34. Engine cowl
I. Right engine

Terrain

A. Pine tree topped 35' ø ½ø
B. pine tree topped 35' agl
C. Oak tree on roadbank - prop blade tip17'● gl
D. Pine tree topped 37' agl
E. Group of three pine trees topped 24'agl
F. Pair of pine trees broken 23' agl
6. Line of broken pine trees,20' agl
H. Pine trees topped 20' agl
I. Several trees in line broken 20' agl
J. Two foot dia. pine trees topped 20' agl
K. Two inch dia. tree broken 10' agl
L. Pine tree broken 20' agl
Ll. Pfne tree broken 20' agl
M. Pine tree splintered 12' agl
N. Small pine tree broken 12' agl
0. Ten inch din. pine tree broken 16' ● gl
P. Tree broken 29' agl
Q. Pine trees broken 23' rgl
R. Four inch dia. pine broken 10' agl
Rl. Ten inch dia. pine tree broken 26' agl
S. Six inch dia. tree broken 15' agl
T. Large pines scuffed on south side,26'● gl
U. Six inch dia. pine tree broken 7' ● gl
Ul. Eight inch dia. tree scuffed 12' agl
V. Eight inch dfa. tree broken 10' rgl
W. Four inch dfa. tree broken 8' a91
X. Ten inch dia. tree broken 15' agl
Y. Fight inch dia. tree on ground
2. Right inch dia. pine uprooted on ground
Zl. Eighteen inch dia. oak tree penetrating right side of cabin
Al. Tree base

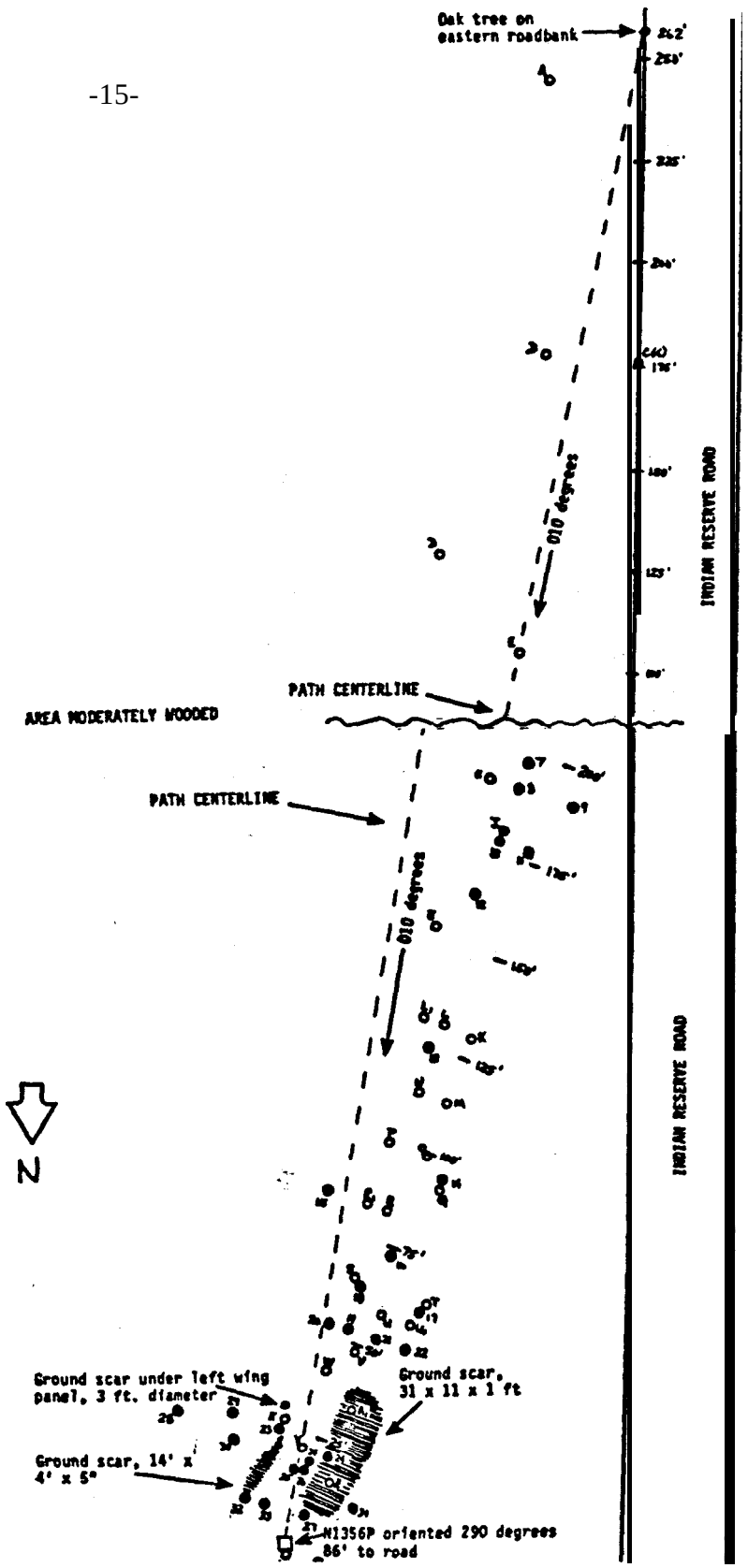


Figure 3.-Wreckage distribution of Simmons 1746.

The right engine, which was separated from its mounts, was found about 10 feet from the main wreckage. The propeller flange and a portion of the drive shaft had separated from the drive shaft. Wood splinters and cellulose fibers were found embedded in the drive shaft. The main oil filter, fuel filter, and oil scavenge pump were clean and unobstructed. All blades were present on the compressor drive turbine shaft assembly, which was heavily rubbed internally through 360°.

All blade clamps and blade counterweights of both propeller assemblies were attached to their respective blades. Internal examination of the propeller assemblies revealed no evidence of unusual mechanical phenomena with the operating mechanisms of either assembly. There was no evidence to indicate the blade pitch angle at initial impact.

The anti-ice system of the EMB-110P1 was controlled by toggle switches located just above the windscreen, in the center of the overhead panel. The system was composed of electrical components for the propellers, windshield, and the engine air inlets and pneumatic components for the leading edges of the wings and empennage. Following the accident, the engine air inlet de-ice switch was found in the up or "on" position, the propeller de-ice switch was found in the down or "off" position, the left windshield de-ice switch was broken, and the right windshield was found in the up or "on" position. One toggle switch that controlled the pneumatic anti-ice system was found in the up or "slow" position. The other two positions for this switch were middle or "fast" and down or "off."

1.13 Medicaland Pathological Information

The results of the autopsy and the toxicological examination of the first officer disclosed no evidence of a preexisting physiological condition or any substance present that could have adversely affected his performance. No samples were taken from the captain, nor were such samples required to be taken, for toxicological examination.

1.14 Fire

A small fire erupted in a portion of the left engine structure located to the left of the fuselage. The fire was quickly extinguished by a passenger who threw snow onto the flames. There was a considerable amount of fuel in the wreckage area, as well as on the passengers, but no other fire ignited.

1.15 Survival Aspects

1.15.1 Survivability

Accurate documentation of the fuselage was complicated by the displacement of the airplane structure as a result of the rescue efforts. However, it was evident that the cockpit had been crushed inward during impact while the forward fuselage floor, to the airstair door, had been buckled aft and to the right. A large tree, which had penetrated the fuselage sidewall about 14 inches, displaced the right side of the cabin floor upward in the area of seat row 3, thereby reducing the cabin height from 5 feet 5 inches to 2 feet 8 inches. The floor was displaced upward about 12 inches just aft of seat row 4. The fuselage generally retained its original cabin dimensions aft of the overwing exits, at cabin row 5. Most of the passenger seats were found damaged and displaced from their cabin positions, However, it could not be determined if the displacements had occurred-as a result of the impact or the subsequent rescue efforts. The first officer's seat was found in the wreckage, wedged against a tree.

A postmortem examination of the first officer revealed major skeletal fractures and internal injuries. Two passengers, a 58-year-old man seated in seat 4A and a 75-year-old woman seated in either seat 1B or 2B, died from skull fractures and internal injuries. The Safety Board could not determine whether the female passenger had been wearing her seatbelt at the time of the accident. Although her seatbelt was found unfastened, it could have been opened by rescue personnel. Evidence indicates that the male passenger was wearing his seatbelt.

The captain was found unconscious on top of his seat with a large tree pinning his legs. Subsequent examination indicated that he had sustained a large scalp laceration, a concussion, and fractures of the feet.

Three passengers, who sustained relatively minor injuries were able to escape unassisted from the airplane. One of these passengers crawled through an opening in the forward fuselage, another escaped through the right overwing emergency exit, and the third escaped through the window at seat 6A. The two remaining surviving passengers, who were more seriously injured, were unable to escape because of their injuries and because they were trapped in the wreckage. They were extricated from the wreckage about 45 minutes after the arrival of fire and rescue units. All of, the surviving passengers stated that they were wearing their seatbelts at the time of the accident.

Toxicological analyses were performed on the fatally injured crewmember and passengers. All were negative except for the 75-year-old female passenger, who had a blood alcohol level of 0.165 percent and a urine alcohol level of 0.306 percent. Alcohol was not served onboard the flight and there were no reports that this passenger had brought or consumed alcohol onboard.

1.15.2 Crash/Fire Rescue Response

The airplane crashed in Alpena County. After being informed of the accident, the Simmons station manager immediately informed the Alpena County Sheriff's office of the accident and the airplane's location. An accident notification list displayed in the station manager's office showed the Air National Guard (ANG) fire department as the first party to be notified, followed by the sheriff's office. The airport operations manual noted that in an emergency, the sheriff's department was to be notified first. They would then coordinate the response to the emergency. At 2215, two deputies were dispatched to the accident site. When' they arrived on the scene, one deputy assisted the motorist, who had returned to the scene, in the rescue efforts, while the other deputy radioed for ambulances and fire equipment.

One ambulance was dispatched from the Alpena Fire Department (AFD) to the airport terminal at 2225, arriving there at 2235. It was used to transport the two survivors who had been brought there by the motorist to a hospital in Alpena. A second AFD ambulance arrived at the accident site at 2240, and a third at 2248.

Firefighting units from the closest local volunteer fire department with on-scene command responsibility began arriving at the accident site at 2220. Because of the strong odor of fuel at the site, firefighters requested the ANG crash, fire, and rescue equipment, which included a foam pumper. The chief of the ANG fire department, who was also a member of a local volunteer fire department, heard on the volunteer fire department's voice pager the request from the county sheriff's dispatcher for assistance at the site. He left his home shortly thereafter and arrived at the ANG station about 2230. Several pieces of equipment from the ANG fire department, including a foam

pumper, were dispatched or were already on the way, since several ANG firefighters, as members of civilian volunteer fire departments, had also heard the request from the sheriff's dispatcher on their pagers. A total of four volunteer fire departments responded as did two off-duty city police officers.

Upon arrival at the scene, rescuers directed their efforts at extricating the captain and the two surviving passengers who were still inside the cabin. Rescue personnel estimated that this effort required about 45 minutes to 1 hour. The bodies were removed after the medical examiner arrived, between 2345 and 2400. (See appendix F.)

1.16 Tests and Research

Following the accident, the airplane's two communication transceivers, two navigation radios, the No. 1 HSI and RMI, and the VOR/LOC converter were examined in the manufacturer's facility. The marker beacon receiver was not examined. When electrical power was applied, the navigation and communication radios selected the following frequencies:

Communication	Selected	Standby
No. 1	120.9	134.8
No. 2	131.6	120.65
Navigation		
No. 1	109.7	108.8
No. 2	110.0	110.0 6/

All radios operated satisfactorily except the numbers 1 and 2 navigation receivers. The localizer deflection on both receivers was slightly out of limits, by 0.9 mV and 1.0 mV (millivolts). The two VHF communication radios were found turned on, as was the number 1 navigation radio. The on/off switch of the number 2 navigation radio was broken. Consequently, it could not be determined whether it had been on at the time of the accident.

The altimeters, three-pointer types, were functionally tested to 4,000 feet mean sea level and found to function properly. The captain's altimeter had been found set to 29.82 inches of Hg and the first officer's, to 29.85. The transponder was on with the digit selection at 6046. The automatic direction finder (ADF) was on, but the frequency was not determined.

1.17 Additional Information

1.17.1 Simmons Airlines Growth and Personnel Turnover

Simmons Airlines is a publicly held corporation. The company conducts flights under 14 CFR 121 and 14 CFR 135, mostly in the Great Lakes areas of Michigan, Wisconsin, Illinois, and Ohio. Its flights through Detroit operate as Republic

6/ 120.9 was the frequency of the Alpena control tower, 134.8 was the frequency for communicating with Wurtsmith approach control, 131.6 was the Simmons communications frequency at Alpena, 109.7 was the frequency of the ILS Runway 1 approach at Alpena, 108.8 was the frequency of the VOR at Alpena, and 110.0 was the frequency selected automatically by default in that model radio. This probably resulted from impact damage. The identity of frequency 120.65 could not be determined.

Express flights, and its flights through Chicago operate, as American Eagle flights, in agreements with Republic Airlines and American Airlines, respectively. According to information provided by their Director of Operations, in the 2 years before the accident, the company experienced sustained growth. In January 1984, Simmons had 80 pilots and by January 1985, it had 182 pilots. At the time of the accident, Simmons employed 260 pilots.

According to information published in their Annual Report, on November 1, 1985, Simmons had 1,057 employees: 242 pilots, 104 flight attendants, 342 passenger service and reservation personnel, 209 maintenance workers, and 160 management and financial personnel. It operated 29 aircraft on that date: 6 Nihon YS-lls, 15 Short Brothers SD3-60s, and 8 EMB-110P1s. It had four Avions de Transport Regional ATR-42 airplanes on order, with delivery scheduled for 1986. It had options to purchase four more ATR-42 and six ATR-72 airplanes.

During the 15 months preceding the accident, 148 pilots left the airline. The Director of Operations at Simmons estimated that 85 percent of those were hired by other airlines, 10 percent failed to complete training successfully, and 5 percent left for disciplinary reasons. He attributed much of the pilot turnover to the desire of many pilots to fly with major, jet transport operators. He said that due to substantial pay increases after 2 years of service, few pilots who had been working at Simmons more than 2 years had left the company. He estimated that half of those who left had less than 1 year of service, 30 to 40 percent had 1 to 2 years of service, and about 10 percent had more than 2 years with Simmons. Most of the flight instructors were senior at Simmons and have remained with the company. One of the 11 instructor pilots employed by Simmons during the 15 months preceding the accident had left to accept a position with a major airline. During this period, Simmons had the same chief pilot and director of operations. As of March 1986, the average (mean) total pilot time of company pilots was 3,601.6 hours. For captains, the average total was 4,543 hours, and for first officers, 2,741 hours.

1.17.2 Simmons Airlines Procedures

The Simmons General Operations Manual specified that before performing an instrument approach, both pilots were to review the instrument approach chart. In addition, it stated that, "The approach chart shall be--available for ready reference throughout the approach and full advantage taken of all aircraft navigation equipment." The airline provided-approach charts and updates to the charts to all flightcrew members.

Once the approach was begun, the non-flying pilot was tasked- with calling out the following information:

> Localizer Alive/Glideslope Alive (as applicable),
> Airspeed in knots - below 500 feet AGL,
> Sink rate in feet per minute - below 500 feet AGL, and
> Sink rate in excess of 1,000 feet, any point.

In addition, on an instrument approach, just above Minimum Descent Altitude (MDA) or Decision Height (DH), the pilot not flying (the first officer on flight 1746) was required by the Simmons manual to make the following callouts above MDA or DH:

1,000 feet
500 feet
400 feet
300 feet
200 feet
100 feet

The manual stated that below 500 feet AGL, the first officer was to:

> . . . announce visual cues such as sequency (sic) flashers, the approach lights, and the runway lights or associated cues. Unless such visual cues are clearly visible upon reaching minimums, "minimums-no runway" shall be called-and a missed approach shall be executed.

The Simmons manual did not give specific guidance on executing a missed approach as a result of deviation in the approach path. However, the manual provided the following general information:

> The aircraft must not continue descent below 500 feet on any approach unless it is in the landing configuration stabilized on final approach airspeed and sink rate and in a position to touch down in the touchdown zone. Any time at or below 500 feet these conditions are not met, a go-around is mandatory.

In addition, the pilot not flying was required to call out "any deviations from planned approach speed, sink rate or instrument indications during the remainder of the approach." No further information was contained in the EMB-110P1 Operations Manual with regard to the extent of the deviations to be called out or the point at which deviations were sufficient to require that a missed approach be executed. Final approach speed of the EMB-110P1 was to be 120 knots.

Simmons provided its EMB-110P1 pilots with headsets and required that they be worn during flight operations. An interphone system between crewmembers was installed on the airplanes, which enabled the captain and first officer to communicate through their headsets.

Simmons required that EMB-110P1 pilots turn on the anti-ice system, with the exception of the pneumatic leading edge devices, when the airplane was in visible moisture and the temperature was 5° F above the freezing point or lower. Pilots were to turn on the pneumatic devices after an ice accumulation of at least 1/4 inch had developed. The devices were to be inflated, turned off, and turned on again when ice had reaccumulated.

1.17.3 FAA Surveillance

The primary FAA facility with surveillance responsibility for Simmons was Air Carrier District Office (ACDO) 31 in Chicago, Illinois. As of March 1985, ACDO 31 held the certificates of five carriers operating under 14 CFR Part 121 and one certificate of a carrier operating under 14 CFR Part 135. The ACDO also had surveillance responsibility for a flight engineer training program. ACDO 31 conducted numerous surveillance inspections of Simmons Airlines in 1985 and 1986. (See appendix G.)

Simmons operations were based in Marquette, Michigan, while maintenance bases were located in Marquette, Saginaw, and Detroit., FAA surveillance of Simmons maintenance and avionics programs was carried out from the FAA's Flight Standards District office in Grand Rapids, Michigan.

The Principal Operations Inspector (POI) of Simmons was assigned to that position in May 1985. She had been involved closely with the surveillance of Simmons as an air carrier inspector since the fall of 1983. Simmons was the only air carrier to which she had been assigned. She was rated in two of the three airplanes Simmons had operated at the time of the accident, the YS-11 and the SD3-60. She had performed no en route inspections since November 1985 due to her extensive involvement with preparing for Simmons' acquisition of the ATR-42. She estimated that from that time, through the time of the accident, she had spent between 90 and 95 percent of her time in preparing for that acquisition. The en route inspections were carried out by other FAA air carrier inspectors who were rated in the YS-11, the SD3-60, and the EMB-110P1.

The POI stated that a special operations inspection was performed in February 1986, at the request of the carrier's principal maintenance inspector (PMI), who noted that certain logbook entries were "hard to explain." Four inspectors carried out the inspection, which found minor flaws in operating procedures. The POI was satisfied with Simmons' compliance with the findings.

She expressed confidence in the ability of the carrier to maintain an adequate level of safety in its operations. She saw no instance of interference with the operations of the carrier by company management personnel. In addition, she believed that Simmons attempted to maintain a high level of pilot experience among its applicants for pilot positions, despite the demands placed on their operations by expansion and turnover.

1.17.4 Flightpath

Wurtsmith approach control did not have the capability to record an aircraft's flightpath from radar information. Consequently, a path of the flight of Simmons 1746 in the Alpena area could not be reconstructed with a high degree of precision. However, several points along the flightpath of Simmons 1746 could be established from the transcript of the flight's conversation with Wurtsmith ATC. At 2142:35, Simmons 1746 declared a missed approach. At 2145:39, the flightcrew" told Wurtsmith that they were outbound on the 150° radial, presumably of Alpena. Simmons 1746 established radar contact with Wurtsmith, following the missed approach, about 2147, when it was identified at 1 mile southeast of the Alpena VORTAC. At 2153:06, the controller identified Simmons 1746 and placed their location as 5 miles from the final approach fix. He directed the flightcrew to turn right to a heading of 350° in order to intercept the localizer and to remain at or above 2,800 feet until established on the localizer. During the following 2 minutes and 50 seconds, the controller provided the flightcrew with a vector of 340°. He also asked them repeatedly whether they were established on the localizer. At 2156:00 the flightcrew verified that they had intercepted the localizer. No gross deviations in operating procedures of flight 1746 could be discerned from the flightpath data obtained from the transcript of communications between Wurtsmith and Simmons 1746. The minimum altitude for providing radar vectors to aircraft during instrument approaches to the Alpena Airport was 3,500 feet msl.

The Wurtsmith approach controller on duty during the flight of Simmons 1746 into Alpena stated that the pattern of the flight on the second approach was a "vector to

final right downwind, right base." The supervisor on duty at Wurtsmith approach control stated that the pattern and flight of Simmons 1746 was "a normal radar pattern for an ILS approach."

1.17.5 Human Performance

Four weeks after the accident, Safety Board investigators asked the captain to describe his health prior to the accident. He indicated that he was healthy and that he had no medical difficulties at the time. He stated that he pursued his "standard" routine in the three days before the accident. He had no particular hobbies but was involved in exercise programs at a local YMCA. His diet, which was normal for that time, included three meals a day, supplemental over-the-counter vitamins, and oranges and tuna fish as between meal snacks. He stated that he had no financial or personal problems at the time. He recalled little of the first officer, except that he was "just a normal guy. I didn't see anything abnormal about him."

Following the accident, the Safety Board conducted a routine examination of the driving records of the flightcrew of flight 1746. This included a review of the National Driver Register (NDR). The NDR, which is operated by the National Highway Traffic Safety Administration, is a clearinghouse of data on drivers whose licenses have been suspended, revoked, or denied, or who have been convicted of certain serious offenses. The NDR is used by State driver licensing agencies to identify license applicants whose records include these adverse actions of a serious nature. The examination revealed nothing unusual about the driving history of the first officer, but the captain's record revealed that he had been arrested for driving while intoxicated: once in 1977, twice in 1978, and once in 1982. This information was not reflected, as required, in the captain's application for an FAA medical certificate. At least two of the charges from the arrests in 1977 and 1978, which occurred before the captain began flight training, were reduced. They resulted in convictions to lesser charges and a revocation of his driving license for one year. Following his conviction in 1982, for driving while intoxicated, the captain's driving license was suspended for 3 months and he was directed by the court to be evaluated by a counselor for alcohol-related problems. The counselor did not recommend treatment, but she did believe that the captain should attend a class on alcohol abuse. In addition, she commented that:

> The screen indicates some problems with alcohol, although he is controlling (it) at this time due to his job as a flying instructor. He has experience (sic) some of the classic symptoms of alcoholism.

The Safety Board was unable to determine whether the captain had sought treatment or participated in rehabilitation programs following his 1982 convictions for driving while intoxicated.

The Safety Board interviewed roommates and colleagues who were familiar with the captain, both during his duty and off-duty hours. The interviewees included those who had been roommates of the captain both at Simmons and at Air Nevada. They reported that the captain had been terminated in November 1984 after failing to report for work for the third time without informing the company in advance. A colleague who worked with the captain at that airline stated that at least one of the absences had been alcohol-related. Interviewees who knew the captain while he was associated with Simmons, prior to the accident, described him as a heavy drinker while he was off duty.

At the same time, those who had flown with the captain consistently described him as a "good pilot." No reports were received from Simmons colleagues or from those who had known him prior to his association with Simmons that the captain had ever flown while under the influence of alcohol. In addition, the captain's record at Simmons was good, without any reports of alcohol-related work problems.

Simmons personnel told the Safety Board that the night before the accident the captain attended a party attended mostly by Simmons employees, at which a keg of beer was available. The captain was seen to consume an estimated 8 to 10 beers at the party and at a club thereafter. The quantity of each beer was not established. The first officer also attended the party and did, according to witnesses, consume some alcoholic beverages. It was estimated, by his roommate, that the captain retired around 0200 on the morning of March 13 and arose about 1100 that morning. At the time, the captain's diet consisted almost exclusively of citrus fruits and tuna fish. He was exercising regularly at a health club in an effort to lose about 10 pounds, to attain a proper height-to-weight ratio in preparation for employment interviews with major airlines that were scheduled in April.

Safety Board investigators interviewed individuals who were-with the captain prior to his taking command of flight 1746. A pilot who talked to him in the crew lounge for about a half hour, prior to the flight, described his appearance and behavior as "normal." The dispatcher, who was responsible for dispatching flight 1746, also described his appearance as normal.

At the time of the captain's application for employment with Simmons, the airline had no program to check the employment history of pilot applicants for pilot positions, and as a result, the captain's previous employers were not contacted. This policy was changed as a result of new FAA security requirements for operators under 14 CFR 121, which became effective in the fall of 1985. As a result, Simmons did contact the first officer's previous employers.

In addition, Simmons had no rehabilitation for pilots with alcohol problems. Since they had not encountered a pilot with known alcohol -problems, they had no policy for dealing with such pilots. In recent years, major airlines have cooperated with the FAA and pilot unions to establish rehabilitation programs in which pilots with known alcohol-related problems are removed from flight status, with no penalty, and returned to active flying when they are certified to have successfully terminated alcohol consumption.

The captain was given the opportunity to comment on the information that the Safety Board obtained regarding his use of alcohol. However, he declined the opportunity and stated that he would use his constitutional protection against self-incrimination should the Safety Board attempt to require him to comment on this information.

2. ANALYSIS

2.1 General

The flightcrew was certificated and qualified in accordance with applicable regulations for the flight. The weather specialist, station manager, and air traffic controllers were also properly trained and qualified to perform their duties.

The evidence indicates that Simmons 1746 continued to descend below the glideslope and through decision height of the ILS approach into Alpena and crashed into the trees-l.5 miles short of runway 1. The Board believes that because the flightcrew had

not learned of changes in the weather conditions at Alpena since the 2050 observation, they believed that the airport was still at approach minimums. Two special weather observations that were made later indicated that visibility had deteriorated to below minimum conditions since the 2050 observation. However, the crew was not required to and did not ask for updates on the weather and was therefore unaware of the decreased visibility. Consequently, the investigation focused on the crew actions before and during the approaches and on other factors that may have affected their performance on the night of the accident. In addition, the Board examined the system used to disseminate weather information from the weather observer, through the communication channels to the flightcrew, to determine why they did not receive accurate information on the Alpena weather in a timely manner. The Board also looked at the operation of the airline itself to determine how, if at all, the quality of pilot training and performance was affected by both Simmons expansion and the concurrent high rate of pilot turnover. Finally, the Board examined the FAA surveillance on the airline to assess the degree to which the FAA monitored the operator's compliance with applicable Federal regulations.

2.2 Dissemination of Weather Information

2.2.1 Individual Actions

The Safety Board concludes that the communication of weather information to the flightcrew of flight 1746 was deficient. and that this factor contributed to the accident. Despite the fact that the crew would probably have obtained more current information from either the Simmons station manager or the approach controllers had they asked for such information, they were not required to and did not ask for it. As a result, they were unaware that conditions at Alpena had deteriorated to below minimums for the ILS approach. Had the crew been aware of this, they would have been prohibited by 14 CFR 135.225(b) from commencing the ILS approach to Alpena and the accident probably would have been avoided. The Board was pleased to learn that since the accident Simmons has trained station agents at Alpena and has modified its procedures to require them to provide Simmons pilots who are enroute to Alpena with the current airport surface conditions.

The Safety Board believes that the responsibilities of the Pellston Flight Service Station and Wurtsmith controllers to communicate updated weather-related information about Alpena were ambiguous. Wurtsmith was required to provide the flightcrew, on initial contact, with the current Alpena weather. However, the letter of agreement between Wurtsmith and Pellston could be interpreted to mean that Pellston should have continually provided updated information to Wurtsmith either as new observations were received, or only following a specific request' from Wurtsmith. Regardless, had Wurtsmith received updated Alpena weather information, they would have been required to inform the crew of the current conditions at Alpena. In that event, the crew would have been prohibited from initiating the approach.

Nevertheless, despite the ambiguities in the letter of agreement, the Safety Board believes that to maximize the safety of flight in Alpena, the pilots, the Wurtsmith controllers, and the Pellston FSS personnel all shared in the responsibility of providing and obtaining updated weather information about Alpena. For the system of weather dissemination to have worked effectively, the three participants in the system should have attempted to determine if the Alpena weather had changed. Since the flightcrew was in the Alpena area, they should have known, despite the absence of information on the lack of a temperature and dew point spread, that the weather was near minimum conditions and should have asked if there were updates, especially following the missed approach.

The Wurtsmith controllers were required to provide the pilots with updated weather information. They were also aware that Simmons 1746 was attempting to land at Alpena and that Alpena was below minimum conditions for military aircraft. As a result, they should have asked Pellston if special observations had been taken at Alpena since the 2050 hourly was made. This would not have been difficult since Wurtsmith was controlling only flight 1746 at the time of the accident, and as a result, their workload was light. Finally, the FSS personnel should have determined if the Alpena weather had changed and then provided Wurtsmith with the latest weather since they were aware that an airplane was in the Alpena vicinity, that conditions in the area were poor, and because they were required to provide Wurtsmith with updates to the Alpena weather.

2.2.2 The Dissemination System

Although the AFOS system for transmitting weather information appears to be unnecessarily complex, the transmissions from Alpena to Wurtsmith Air Force Base, by way of Maryland, Kansas City, Saginaw, and Pellston, were electronic and therefore very rapid, occurring within seconds. Transmission was not slow until information was sent from Pellston to Wurtsmith. Because the Air Force base was not able to access the FAA weather information system electronically, controllers had to talk to personnel at the Pellston FSS, via direct line, and ask them for the weather. Personnel at Pellston then had to access the information electronically, after completing the duties they were carrying out at the time, and then orally communicate that data to Wurtsmith. The Safety Board believes that this system is quite slow and unnecessarily cumbersome, and that these deficiencies could be rectified easily by providing Wurtsmith with the same capabilities to access the information as FAA facilities have. The Safety Board is aware that this slow process exists in other locations. Consequently, the Safety Board believes that the FAA should provide military ATC facilities that control civilian air traffic with the equipment necessary to allow them to access weather information as quickly as FAA facilities can.

2.3 Continued Descent Below the Glideslope and Through Decision Height

The evidence indicates that, in executing the first ILS approach, the flightcrew performed a missed approach as required when, presumably upon reaching decision height near the runway environment, they determined that they were not in a position to land. Having executed the first approach, the second ILS approach should have resulted in the same outcome, a missed approach at decision height. The Safety Board believes that the parameters that affected the first approach, such as the weather, the airplane, the ILS system, and the condition of the flightcrew themselves, did not change sufficiently in the short interval between the two approaches to have affected the outcome of the second approach. Although the visibility did deteriorate slightly in that time, the airport remained below minimum conditions throughout the time that both approaches were being conducted.

The Safety Board concludes that the continued descent of the airplane below the. glideslope and through the decision height was the major factor that led to this accident. Glideslope information allows pilots to fly precise vertical flightpaths that will lead aircraft to the decision height or, in some cases, runway threshold. Sufficient tolerance is allowed in the glideslope so that minor errors and deviations from the precise vertical flight path will not adversely affect the safety of the approach. Simmons procedures, in addition, require a missed approach in the event of significant deviations from the glideslope. At the point where the airplane impacted the ground, the glideslope deviation had to have been significant. 'In fact, the point of-impact was about 300 feet

below the bottom of the glidepath. Moreover, the airplane flew through the decision height, another important safeguard in a system designed to ensure the safety of flight during precision approaches in instrument meteorological conditions. Pilots are authorized to continue an approach below the decision height only if they can see specific visual indicators, such as runway lights, of the runway in use. These indicators could not have been seen 1.5 miles from the runway in the weather conditions that existed at the time of the accident. Therefore, the investigation concentrated on the potential factors affecting this segment of the approach to determine the cause of the accident. These include preexisting structural damage to the airplane or its components, airframe icing, failure of the ILS system or its components, intentional premature descent below decision height, pilot confusion of lights on the ground with airport lights, crew experience and/or training, and crew conduct of the flight.

2.3.1 Powerplant and Systems

The powerplants and propeller assemblies showed no evidence of a failure or malfunction before the accident. Similarly, there was no evidence of failure in the airplane's systems, including the anti-ice system, that could have contributed to the accident. Although some control cables were found frayed, there was no damage evident that could have led to a loss of control. Moreover, the descent angle of the airplane into the trees, the distribution of parts south of the airplane's resting place, and statements by the passengers all indicate that the airplane's descent was controlled. Therefore, the Safety Board concludes that there were no failures or malfunctions of the airplane's major structures, systems, or powerplants before the accident.

The Safety Board also examined the airplane% radios and altimeters because failures in these systems could have led the crew to continue the descent below decision height. However, the postaccident examination of the radios and altimeters also demonstrated that these had been operating effectively and therefore would not have contributed to the accident. The 0.9 and 1.0 milliVolt localizer deflection that had been found in the numbers 1 and 2 navigation receivers would not have resulted in a noticeable deviation of the localizers. In addition, both the communication and navigation radios were tuned to the correct frequencies for communicating with Wurtsmith ATC and to the Simmons ground station, activating the approach light system, and navigating during the ILS approach. Although the captain's and first officer's altimeters were found at different barometric settings, with the captain's at 29.82 and the first officer's at 29.85, the difference between the two would have only resulted in an approximate 30-foot discrepancy in their altitude indications. The difference in the barometric settings could have been due to postaccident rescue activities. Regardless, had the first officer% altimeters been set improperly, the Safety Board does not believe that this would have contributed to the accident since the captain was flying and his altimeter was set correctly.

2.3.2 Icing

The Safety Board examined the extent to which structural icing may have contributed to the descent of the airplane through decision height. Conditions at the time of the accident, with visible moisture from just above the surface to 8,000 feet and a temperature at ground level just above freezing, could have caused ice to accumulate on the airplane at a moderate rate. Had ice accumulated on the airplane during the time it was in the clouds, about 20 minutes, its ability to maintain airspeed and altitude could have been affected adversely.

However, the EMB-110P1 was certificated for continued operation into known icing conditions, and the flightcrew could have used the airplane's deicing system in the event that ice began to accumulate. It is unlikely that the crew could have continued to operate in icing conditions with a sustained buildup of ice on the airplane without their noticing a deterioration in the airplane's performance. They then could have readily activated the deicing system, which would have removed the ice. Although the position of the switches activating that system on N1356P suggests that the system was activated, the switches could have been moved by the impact sequence or in the subsequent rescue efforts. Therefore, the Safety Board was unable to determine whether the deicing system had been activated.

In addition, the captain stated that there were no difficulties operating or controlling the airplane and the passengers did not report aberrations in the airplane sounds or performance that might suggest an ice accumulation. The nature of the crash path through the trees suggests that indeed, the airplane descended in a controlled manner, unlike the type of descent typical of an airplane with deteriorated performance capabilities.

Moreover, in the event that the airplane had accumulated ice sufficient to compromise its performance capabilities, the accumulation would not have mitigated the ability and responsibility of the crew to prevent a continued descent through decision height. The Safety Board believes that regardless of a possible ice accumulation, an alert crew would have noticed the continued descent of an airplane and. would have taken the necessary steps to stop the descent. The Safety Board was unable to find evidence to suggest that the required actions could not have been taken. The powerplants were operating prior to impact and, if necessary, power could have been applied and the descent stopped. Therefore, the Safety Board concludes that an ice accumulation by itself, independent of crew actions, did not contribute to the accident.

2.3.3 ILS System Failure

Following the accident, investigators checked the components of the Alpena runway 1 ILS system. All components, with the exception of the FELPS outer compass locator, were found to have been working properly. However, the fact that the crew flew one ILS approach into Alpena about 15 minutes before the accident indicates that the ILS localizer and glideslope transmitters were, in all probability, functioning properly at that time. Therefore, since the ILS was operating effectively- both just before the accident and when checked the next day, it is unlikely that the system malfunctioned during the interval between the-first approach and the check performed the day after the accident.

However, in the unlikely event that a component of the ILS system had failed before or during the time of the accident, the nature of the accident indicates that the component most likely would have been the glideslope since the airplane crashed adjacent to where flight on the localizer course would have taken it. However, if the glideslope had failed or in the unlikely event that the information had been erroneous, the glideslope receiver should have shown warning flags to indicate that the information was unavailable or unreliable. Regardless, at decision height, the crew could not have seen the approach lights and consequently, was required by 14 CFR 91.116(c) and Simmons procedures to execute a missed approach since neither the approach lights nor the runway lights were visible from the location where they descended into the trees. Therefore, the evidence does not indicate that a failure or malfunction of the ILS system occurred.

2.3.4 Flightpath

Following the missed approach, the captain flew the airplane southeast of the Alpena VOR to attempt a second ILS approach to runway 1. However, since the DME was inoperative, the flightcrew had no means of determining their distance from the VOR except by complicated heading, time, and groundspeed computations or by radar information from Wurtsmith. Further, the LOM appears to have been inoperative and this may account for the request by Simmons 1746 for radar vectors "back out to the procedure turn." If the LOM had been inoperative, and the evidence suggests that it was, then it would have been a violation of Federal Aviation Regulations to execute the Alpena ILS runway 1 approach since the LOM was a critical element of the missed approach procedure. Nevertheless, Simmons 1746 could still have executed the approach, while being aware that the LOM was inoperative, had they requested alternate missed approach instructions from the air traffic control facility, Wurtsmith. That the flightcrew did not request such alternative procedures indicates that, in all likelihood, they were not aware that the LOM was probably out of service.

The subsequent request by Wurtsmith controllers for the flight to climb to 4,000 feet to facilitate radar identification was necessary because the minimum vectoring altitude was 3,500 feet. At 2153:06, the controller identified the flight's position as 5 miles from the final approach fix. He then directed the flight to turn right to a heading of 350° to intercept the localizer and to remain at or above 2,800 feet until established on the localizer. During the next 2 minutes 50 seconds, the controller provided the flightcrew a vector of 340° and asked them repeatedly whether they were on the localizer. Not until about 2156:00 did the flightcrew verify interception of the localizer.

Although the controller should have terminated radar service following the clearance for the ILS approach because he could not provide any radar services below the minimum vectoring altitude of 3,500 feet, his failure to terminate radar service until the flight verified interception of the localizer, presumably at 2,800 feet, probably was an oversight. In any event, following the initial radar vector to intercept the localizer, and the subsequent corrective vector, the flightcrew was responsible for navigating to intercept the localizer and to pass over the final approach fix (FAF) as identified by either the LOM or the marker beacon. Had the LOM been inoperative, the flightcrew would have had to rely on the marker beacon as positive identification of the FAF.

The Safety Board attempted to reconstruct the ground track of flight 1746 as it maneuvered on the final approach. Several possible ground tracks were calculated based on the ATC transmissions, the derived winds aloft, and assumptions about the indicated airspeeds flown by the flight while it was receiving radar vectors from Wurtsmith approach control. The possible ground tracks were not particularly definitive because of the many unknown variables involved and the assumptions that had to be made. For example, since the nearest point where winds aloft were measured was Pellston, about 70 miles from Alpena, the ground track calculations had to be made using derived winds.

The derived winds were calculated using the surface winds at Alpena and the winds aloft at Pellston. The derived winds were: 145° at 12 knots at 1,000 feet; 105° at 21 knots at 2,000 feet; 126° at 22 knots at 3,000 feet; and 147° at 18 knots at 4,000 feet.

Depending upon how the variables were examined, and what assumptions were made, the calculations could show that the airplane flew through the localizer (overshot) and corrected back to course, or that it converged with the localizer course relatively slowly from the south-southeast. Also, it could have intercepted the localizer normally

outside the LOM. In the first two cases, the airplane may have intercepted the localizer course inside the LOM. The time interval between when the controller identified the flight as 5 miles from the airport (2153:06) until the flightcrew acknowledged localizer interception (2156:00) supports that possibility.

If the flight did intercept the localizer inside the LOM, it may have been well above the glideslope, and a rapid descent would have been required to intercept the glideslope. Without knowledge of the distance from the LOM or to the VOR, the captain may have initiated a rapid descent to capture the glideslope, and as a result, allowed the approach to become unstabilized. For example, if the flight intercepted the glideslope about 1 mile inside the LOM at the prescribed 2,800 feet, a descent rate in excess of 1,000 feet per minute would have been required to intercept the glideslope. Such a rapid descent rate requires pilots to quickly increase their scan of all airplane instruments necessary for proper airplane control and flightpath guidance. Under such circumstances, an airplane can descend rapidly through the glideslope and continue below decision height before the flightcrew can interpret the airplane performance and control parameters and apply appropriate corrections to arrest the descent and return the airplane to the proper flightpath. Had this occurred, the flying pilot would have been responsible for arresting the descent, and according to Simmons procedures, the non-flying pilot, for calling the sink rate to the attention of the flying pilot. Therefore, it is possible that Simmons 1746 intercepted the localizer "late," and the captain initiated a high rate of descent which continued through the glideslope and decision height to an altitude that was too low to effect a complete recovery. However, because of the indefinite nature of the data necessary to reconstruct the flightpath, the Safety Board was unable to conclude with any certainty where, or under what conditions, the flight intercepted the localizer and/or the glideslope.

2.3.5 Intentional Descent Below Glideslope and Through Decision Height

The Safety Board considered the possibility that the crew intentionally continued the descent below the decision height in an effort to enhance their ability to locate the visual indicators of the runway. In previous accident investigations, 7/ the Safety Board learned of instances in which flightcrews had intentionally flown below minimum descent altitudes for that reason. However, in such instances, there had often been either subtle or overt pressure from the company or rewards given by them to crews to adhere to schedules. The captain of Simmons 1746 testified that he had never felt pressure by the company and that he could recall nothing out of the ordinary on the day of the accident with regard to the flight, himself, or the first officer. In addition, in a precision approach the glideslope provides the precise vertical guidance that is absent in a nonprecision approach. Flying an airplane on the glideslope and the localizer would lead it to the runway touchdown zone. Consequently, there was little incentive for the flightcrew of flight 1746 to descend below decision height intentionally, at least until they would have been considerably closer to the runway touchdown zone. Therefore, the Safety Board concludes that the descent of flight 1746 below decision height probably was not intentional.

2.3.6 Confusion with Ground Lights

Some survivors stated that they saw bright lights on the ground during the first approach. Consequently, the Safety Board assessed the likelihood that the crew may have seen ground lights while executing the second ILS approach, mistaken them for the runway

7/ Aircraft Accident Reports—"Downeast Airlines, Inc. DeHavilland DHC-6-200, N68DE, Rockland, Maine, May 30, 1979" (NTSB/AAR-80/5) and "Allegheny Air Lines, Inc. Allison Prop Jet Convair 340/440, N5832, New Haven, Connecticut, June 7, 1971" (NTSB/AAR-72/20).

or approach lights, and then continued descending until impact while looking outside the cockpit attempting to see the runway. However, the lights that the survivors described were characteristic of nonairport, residential lights. Certainly, they were substantially different from the approach light system or the runway edge lights that were present at the Phelps-Collins airport. Therefore, it is unlikely that the crew of flight 1746 mistook the ground lights that the survivors described for those at the airport. Moreover, had the approach been executed properly, the airplane would have been too high for the crew to have seen potentially confusing ground lights, in the visibility that existed at the time. Therefore, the Safety Board concludes that the flightcrew did not continue to descend below decision height because they confused ground-based lights. with the airport environment.

2.3.7 Human Performance

The Safety Board could not determine if the captain was impaired by alcohol at the time of the accident. Although Simmons colleagues stated that he had consumed 8 to 10 beers the night before the accident, the precise quantity of alcohol consumed could not be established. The individuals who saw and talked to the captain prior to the departure of flight 1746 stated that he appeared normal at that time. In addition, he effectively served as pilot-in-command, in instrument meteorological conditions in several flights just before the accident. This included a missed approach that he executed in Alpena that, according to witnesses, was in a flightpath just above the runway. This indicates a level of precision flying uncharacteristic of a pilot who was impaired due to alcohol consumption. Further, the approximate 20-hour interval between the time the captain had reportedly last consumed alcohol and the time of the accident was sufficient for his body to metabolize the alcohol that witnesses described him consuming. Therefore, at the time of the accident, there should have been no alcohol present in his system.

Nevertheless, the captain could, without the presence of alcohol in his system, still have experienced 'hangover effects" from the alcohol consumed the night before the accident. Recent studies 8/ have suggested that even without measurable levels of alcohol in the body, pilots- still showed decrements in performance 14 hours after consuming alcohol. Other studies, 9/, 10/ conducted in laboratory and in simulated high altitude settings, indicated that pilot performance was not significantly impaired 8 hours after alcohol consumption. This apparent contradiction in results could be due to the differences in the methodology among the studies. That is, the studies employed different independent variables to quantify differences in alcohol consumption, and used different dependent variables to measure differences in pilot performance.

The Safety Board is troubled by the inconsistency in the research findings as they apply to alcohol consumption by pilots. Since a large body of literature indicates that alcohol can degrade performance even after the body has metabolized it, the Safety Board believes that the FAA should determine whether 14 CFR 91.11, which prohibits pilots from performing as crewmembers within 8 hours of consuming alcohol, is still

8/ Yesavage, J.A. and Leirer, V.O. Alcohol hangover in aircraft pilots: A preliminary report of effects 14 hours after ingestion. Unpublished Manuscript, 1985.
9/ Collins, W.E. and Chiles, W.D. Laboratory performance during acute intoxication and hangover. FAA Report (FAA-AM-'79-7). October, 1978.
10/ Collins, W.E. Performance effects of alcohol intoxication and hangover at ground level and at simulated altitude. FAA Report (FAA-AM-79-261, October 1979.

supported by current research. Therefore, the Safety Board believes that the FAA should reexamine this rule, in the light of the recent findings, and carry out the research needed to establish the minimum amount of time, following alcohol consumption, required by pilots to perform their duties without impairment.

The evidence does not indicate whether the pilot's performance was degraded as a result of alcohol. The combination of alcohol consumption and low food intake could, however, have led to a performance decrement due to low blood sugar or hypoglycemia. This could have caused a subtle deterioration in perceptual ability. Therefore, had toxicological analyses been performed on the captain following the accident, negative findings would still not have precluded determination of a hypoglycemic-related performance decrement. Without a cockpit voice recorder and more conclusive evidence, the Safety Board was unable to establish with certainty that the captain had suffered a performance decrement at the time of the accident.

At the same time, the Safety Board believes that the captain's behavior suggested an individual who, at best, exercised poor judgment about consuming alcohol in proximity to performing his duties as a pilot-in-command of scheduled revenue passenger flights and at worst, had not acknowledged an alcohol consumption problem, thereby jeopardizing the lives of those who flew with him. That a previous employer had terminated the captain's employment may have alerted the captain to-potential alcohol related problems and, according to records at Simmons, he did improve his performance. Nevertheless, Simmons did not check his previous work history and had no program to deal with pilots with alcohol-related problems. The Safety Board was pleased to learn that Simmons, following revisions to 14 CFR 121, has instituted a program to check the previous employment records of pilots upon their application for employment. However, individuals can conceal alcohol abuse and still perform as pilots. Therefore, the Safety Board believes that without a rehabilitation program for pilots with alcohol-related problems, pilots will not be encouraged to seek treatment, thereby increasing the risks to themselves and their passengers. The Safety Board believes that the FAA should encourage all carriers operating revenue passenger flights to institute rehabilitation programs for pilots with alcohol and substance abuse problems.

On May 4, 1984, the Safety Board issued its Safety Study, "Statistical Review of Alcohol-Involved Aviation Accidents, 1975-1981" (NTSB/SS/84-03). As a result of this study, the Safety Board issued the following recommendation (A-84-48) to the FAA:

> Provide to appropriate FAA personnel, particularly Aviation Medical Examiners and Flight Surgeons, and to others within the aviation community, materials to improve their ability to detect airmen with alcohol problems for use in determining fitness for medical certificating and in making referrals for counseling.

This recommendation has been classified "Open-Acceptable Action," pending the Safety Board's review of the material the FAA has been preparing for distribution to Aviation Medical Examiners (AMEs). The Board believes that this accident highlights the need for the FAA to comply with this recommendation as well as to encourage operators to institute rehabilitation programs to help in the treatment of pilots with alcohol abuse problems. Therefore, the Safety Board urges the FAA to provide Aviation Medical Examiners, at the earliest opportunity, with the necessary information to assist in the identification of pilots with alcohol abuse problems.

The Safety Board has also, as a result of the Safety Study, issued the following recommendation (A-84-49) to the FAA:

Seek legislative authority to use the NDR to identify airmen whose driving licenses have been suspended or revoked for alcohol-related offenses.

The FAA has responded that it could not use evidence from the NDR, by itself, to determine fitness for medical certification. As a result, the Safety Board has classified that recommendation 'Closed-Unacceptable Action." Since the Safety Board obtained information on the captain's use of alcohol following a search of his driving license history in the NDR, the Board believes that the NDR can be one source of information, to be used with others, to assist in the identification of pilots with alcohol-related problems. Therefore, the Board reissues this recommendation and urges the FAA to comply and seek the requisite legislative authority.

2.3.8 Experience and Training

The Safety Board considered the possibility that the crew may not have had sufficient piloting experience in the types of meteorological conditions that existed on March 13, or may not have been trained to proficiency by Simmons to execute properly the precision approach to Alpena. Since the first officer had only accrued about 20 hours as a Simmons first officer and the captain had met the 100-hour pilot-in-command requirements of 14 CFR 135.225 only 3 weeks before the accident, thereby allowing him to execute an approach to published minimums, the Safety Board examined closely the experience level of the crew and the training provided by Simmons to determine how either may have affected their performance on the night of the accident. This examination was performed in view of the high pilot turnover and rapid expansion of the airline that took place before the accident.

The Safety Board believes that the training provided by Simmons met all applicable FAA requirements. Although the company faced a high rate of pilot turnover in the months preceding the accident, with the extra burdens of rapid expansion and acquisition of a new aircraft type, there is no evidence that the quality of pilot training suffered as a result. Furthermore, Simmons' core of flight instructors remained intact during that interval. The flight hours provided to the pilots for training, the content of the training curriculum, and the methods of instruction complied with applicable FAA requirements. The film on cockpit resource management that Simmons presented to its pilots exceeded that required by regulations. In addition, the POI, who oversaw the training, stated that although the carrier had faced many pressures of expansion and turnover, in her opinion it had attempted and succeeded in maintaining high standards for pilot selection and training. Therefore, the Safety Board found no evidence that the training that Simmons provided the crew of flight 1746 was less than that required by FAA regulations.

The investigation revealed that both crewmembers had attempted unsuccessfully to complete flight checks several years before their employment with Simmons. These unsuccessful attempts suggest a deficiency in the piloting abilities of both crewmembers at those times. However, due to the interval between the time that the initial flight checks were attempted and the time of the accident, the Safety Board cannot attribute to the crew's performance on the day of the accident deficiencies that may have existed previously in their piloting abilities. The flight check failures occurred before they had accrued the substantial overall flight experience that both pilots possessed at the time of the accident.

However, the captain failed to pass his first captain upgrade flight check in the EMB-110P1 on December 5, 1985, because of what he described as a misunderstanding of an air traffic control clearance, and what the check airmen characterized as an

incorrect maneuver, not poor piloting ability. The Safety Board questioned other crewmembers who had flown with the captain about his piloting abilities and decisionmaking. The crewmembers consistently described him as a good pilot. Because the nature of the accident itself appears to have been quite different than the apparent reason for the captain's failure on the flight check, the Board concludes that the two events were unrelated.

Despite the evidence of their competence and their relatively high number of flight hours, the Safety Board believes that both crewmembers were relatively inexperienced in several important areas. The captain had met the pilot-in-command requirements to conduct low minimum approaches only 3 weeks before the accident. The first officer had only been flying with the company for several weeks and, due to his low seniority, had accrued only about 20 hours with Simmons. The captain's relative inexperience as pilot for Simmons, with its extensive route network in the Great Lakes area, may have made it difficult for him to anticipate the unique characteristics of winter operations there. Thus, he may not have realized, because of this inexperience, that the conditions measured in the 2050 weather observation at Alpena could quickly deteriorate and Alpena would then be below minimums. In addition, the captain may not have realized that the first officer's inexperience limited his ability to participate fully in the captain's decisionmaking process.

Unfortunately, the Safety Board cannot state with certainty the flightcrew actions that took place at the time of the accident. Without a cockpit voice recorder and a flight data recorder, the Board was unable to learn precisely what the flightcrew said, what callouts they made, what procedures they followed before the accident, and the precise flightpath of the airplane. Consequently, the Board can only assess the possible flightcrew actions that could have contributed to the continued descent below the decision height, based on the limited information available.

2.3.9 Flightcrew Conduct of the Flight

Several factors in the operation of flight 1746 indicate that the flightcrew's conduct of the flight was improper. For example, the captain's reliance on the first officer's approach chart during both approaches violated the intent of company procedures and showed a disregard for safe operating practices. His description of his reliance on the first officer's approach chart during the approach as manifesting "crew coordination" shows both a lack of appreciation of the importance of the ready availability of the chart to the proper execution of the approach as well as a fundamental misunderstanding of crew coordination and its application to flight operations.

The captain, as pilot-in-command, had the responsibility to bring about and maintain effective crew coordination throughout the flight. That the aircraft continued to descend below the glideslope and through decision height suggests, even without benefit of a cockpit voice recorder, that proper crew coordination was not followed. The Board has addressed the importance of crew coordination, defined as "the effective utilization of flightcrew members and other resources to enhance crew interaction, communication and decision-making in multi-crew aircraft operations" in other accidents involving carriers operating under 14 CFR 135 as well as under 14 CFR 121.

As a result of its investigation of an accident in Rockland, Maine, in 1979, 11/ the Safety Board on May 27, 1980, issued the following recommendation (A-80-42) to the FAA:

> Require that 14 CFR 135 operators emphasize crew coordination during recurrent training, especially when pilots are qualified for both single-pilot/autopilot and two-pilot operations. These requirements should be outlined in an operator's approved training curriculum.

On August 31, 1981, the FAA issued a change to handbook 8430.1B, Inspection and Surveillance Procedures-Air Taxi Operators/Commuter Air Carriers and Commercial Operators, that alerted operation inspectors to ensure that operator's training programs include, for operations with more than one pilot, provisions for emphasizing crew coordination procedures in all phases of flight. In addition, on January 12, 1982, the FAA issued a change to Advisory Circular 135-3B, Air Taxi Operations and Commercial Operators, about emphasizing new coordination procedures in training programs. As a result of these actions, the Board classified Safety Recommendation A-80-42 as "Closed—Acceptable Action."

As a result of its investigation of an accident in Reno, Nevada, in 1985, 12/ the Safety Board on March 4, 1986, issued the following recommendation (A-86-19) to the FAA:

> Provide, to all operators, guidance on topics and training in cockpit resource management so that operators can provide such training to their flightcrew members, until such time as the FAA's formal study of the topic is completed.

FAA has responded that it is studying several human factors issues in aviation, including cockpit resource management. The Safety Board has classified Safety Recommendation A-86-19 as "Open--Acceptable Action" until the results of the FAA study are obtained. The Safety Board reiterates Safety Recommendation A-86-19 and urges the FAA to expedite that study so that cockpit resource management can be integrated into the training curricula of all operators.

The Safety Board concludes, in addition, that the flightcrew should have asked for updates to Alpena weather conditions. Such a request would have been especially appropriate following the missed approach, when the crew was aware of the poor visibility at Alpena. In the 2151:10 transmission to Wurtsmith, when flight 1746 stated that they "picked up the lights" on the ground during the first approach, the first officer admitted, "I'm not really sure uh what the visibility was. . .." Although the captain could not recall many of his actions during the flight, he responded hypothetically to reasons for attempting a second approach to Alpena by saying that he may have made the decision "Because we may have seen the lights on the first one (approach), and we were still given a half mile visibility as to current weather, because we were going to go-around and try it again." The captain also stated that he always received additional weather information from the Alpena station agent. His statements suggest that because he did not receive updated or changed weather information, he believed that the weather had not changed. This suggests that he assumed, incorrectly, that the absence of information on a change in the weather indicated no change in weather. The Board further believes that the captain's inappropriate assumption about the weather conditions in Alpena, with the first officer's

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11/ Ibid.

12/ Aircraft Accident Report--"Galaxy Airlines, Inc., Lockheed Electra-L-188C, N5532, Reno, Nevada, January 21, 1985" (NTSB/AAR-86/01).

failure to ask for or obtain more weather information from ATC or the Simmons station manager, led the captain to decide to attempt a second approach into Alpena when the airport was below minimums for that approach.

The Safety Board believes that, regardless of the extent to which pilots had been given unsolicited updates to Alpena's weather, a prudent captain would not have assumed that the weather had not changed in an approximate 30-minute period, since the first report was received, or the approximate 60-minute period since the weather observation had been performed, particularly since the report available indicated that visibility was at minimum conditions. If the first officer had not obtained a weather update on his own initiative, then the captain should have asked him to do so. The request would not have been difficult to make since Simmons required its pilots to wear headsets and use associated interphones that facilitated communications between crewmembers. Further, the captain stated that there was no difficulty in communication within the cockpit.

The Safety Board concludes that the Simmons procedures for flying precision instrument approach procedures, although in compliance with applicable FAA regulations, should have been more specific with regard to defining stabilized and unstabilized approaches and providing guidance on when to execute a missed approach. Had the procedures been more specific, the flightcrew might have received the additional information needed to recognize that they were excessively below the glideslope and that a missed approach was required. Some carriers, for example, require a missed approach if the localizer or glideslope is deflected by more than 1 dot on the ILS display. With proper crew coordination, the nonflying pilot would call out specific deviations in the flightpath to alert the flying pilot to execute the missed approach.

The Safety Board believes that Simmons should provide such specific information in its operations manual so that pilots can execute missed approaches according to predefined localizer and glideslope deviations. Nevertheless, irrespective of specific missed approach criteria,. the fact remains that the glideslope indications available to flight 1746 would have shown that the airplane was well below glideslope. Therefore, specific missed approach criteria would not have been necessary to inform the flightcrew that they needed to execute a second missed approach. Consequently, the Safety Board concludes that the flightcrew did not perform a basic instrument flight procedure, that of an adequate instrument scan, to ensure that all flight performance parameters were within allowable tolerances.

The evidence suggests that because the flightcrew's instrument scan was improper, they were prone to continue an inadvertent descent below decision height. Because the crew had viewed aspects of the runway lights before executing a missed approach, they probably believed, and the captain's statements suggest that he assumed, that a second attempt at landing would prove successful. Thus, it is possible that both crewmembers, when approaching decision height, were preoccupied while attempting to see the runway lights and approach lights and thus failed to maintain a proper scan of the airplane instruments. Since the captain saw the runway lights on the first approach, he may have believed that if he increased his efforts to look for the lights, he could position the airplane to land successfully on the second attempt. If the first officer had been looking outside the cockpit in an effort to locate the runway, then he could not have made the required altitude callouts.

Although the evidence allowed the Board to rule out several possible causes of the accident and to suggest several reasons for the flightcrew's actions, the fact remains that the Board was unable, due to the absence of an FDR or a CVR, to determine why the

flightcrew did not execute a missed approach as required and instead continued the descent past the decision height. Consequently, the Board can only state that flight 1746 continued its descent beyond decision height and into the terrain for undetermined reasons.

2.4 FAA Surveillance

The Safety Board examined closely the nature of the FAA surveillance of Simmons to determine its effect on the airline's operations, and its possible effect on the accident. The principal operations inspector (POI) was located in Chicago and the principal maintenance (PMI) and avionics (PAI) inspectors in Grand Rapids. A large part of Simmons' maintenance was performed in Grand Rapids, the airline corporate headquarters were in Chicago, and its operations were based in Marquette.

The Safety Board believes that the FAA surveillance of Simmons was consistent during the period of Simmons' rapid expansion. The POI had been associated with Simmons since 1983 and had been POI since May 1985. She had witnessed the large growth of the company in that time and had observed the changes in quality of the operation that may have occurred. The Board believes, based on the record of surveillance and her statements, that the POI was aware of the changes in the Simmons operations during that time and attempted to monitor closely the possible adverse consequences of growth and pilot turnover on those operations. Further, that the coordination between the PMI and POI resulted in a special operations inspection of Simmons indicates that the geographic separation did not preclude effective surveillance of the operator, and that the inspectors cooperated with each other beyond the strict limits of their areas of surveillance. However, the Safety Board has reservations about the excessive percentage of time the POI spent preparing for the carrier's acquisition of the new aircraft type. Although the Board does not believe that FAA surveillance was a factor in the accident, the fact remains that only the POI can provide the continuity of oversight necessary to maintain effective ongoing surveillance. When the POI spends 90 to 95 percent of time on one project, then the ability to devote sufficient time to other, equally necessary activities becomes diminished.

The Safety Board is cognizant of the FAA's pressing need for additional surveillance resources. In its special operations inspection of Simmons in February 1986, the FAA recognized that additional resources were required to assist the POI to allow her more time for surveillance activities. These resources were not provided. The need for additional resources for surveillance was particularly important as a result of the possible effects of the high rate of pilot turnover and growth of Simmons. At the same time, the distance between Marquette and Chicago, although not particularly large, made it difficult to monitor the operator easily since commercial transportation between the two cities was time-consuming. Therefore, there was an even greater need for expending additional resources to allow the POI to spend more time performing surveillance. The Safety Board concludes that the FAA should provide the POI of Simmons, at the earliest opportunity, the necessary resources to maintain a continuing level of surveillance of the airline.

At the same time, the Safety Board appreciates the latest efforts of the FAA to alleviate the surveillance problems of the commuter airline industry. The hiring of additional well trained inspection personnel and the objectives of the FAA's Safety Activity Functional Evaluation (SAFE) program will assist in providing adequate surveillance. However, in many instances, these measures are still in their infancy and consequently will require a period of time before measurable benefits can be derived and validated. The continued dynamic growth of the commuter industry and these latest

accident findings warrant the development of more timely interim measures, procedures, and guidelines. A minimum level of direct surveillance should be established for periodic assistance visits, maintenance inspections, and airplane checkrides, to oversee commuter air carrier operations. The required level of personnel to execute such a program should be identified for each Air Carrier District Office having oversight responsibilities of Commuter Air Carriers. Additionally, guidelines should be developed and issued to provide for continued surveillance of commuter air carriers during periods when the POI is unable to fulfill these duties because of other work exigencies.

2.5 Survivability Factors

2.5.1 Survivability

The accident was partially survivable for passengers who occupied the seats in mid-cabin and in rear-cabin seats. In addition, the captain occupied a seat in a portion of the cockpit which was not crushed severely on impact, although it was deformed.

Several factors contributed to the survivability of the accident. The ability of two survivors to escape the wreckage and stop a passing motorist,-and that person's willingness to play an active part in the rescue efforts, contributed substantially to the survivability. In addition, the lack of a significant postcrash fire, the lack of significant damage to much of the cabin, and the quick response of crash, fire, and rescue personnel all enhanced the survivability of the accident.

2.5.2 Passenger Screening

One passenger was killed from impact forces when she was thrown from her seat. A toxicological analysis of this passenger revealed blood and urine alcohol levels indidating that she was intoxicated. Because the accident occurred almost 1 1/2 hours after the airplane left the gate in Detroit, which provided time to metabolize the alcohol, and because no alcohol was served onboard the airplane and there were no reports that she had consumed alcohol onboard, the Safety Board concludes that she was highly intoxicated at the time she boarded the airplane.

The Safety Board believes that intoxicated passengers can be hazardous to themselves and to other passengers as well. In an emergency where there is a need for passengers to exit the airplane quickly, such a passenger can hamper a rapid evacuation. They can also become unruly and interfere with the duties of flightcrew members, thereby creating an emergency situation. Moreover, when flight attendants are not on board to monitor such passengers inflight, there is a greater need to prevent intoxicated passengers from boarding the flight. It could not be determined whether this passenger had been wearing her seatbelt or, if worn, the extent to which it had been tightened. Since it could not be determined if she had her seatbelt fastened, it is not known whether she would have survived had she followed the instructions of the crew to fasten seatbelts. Without a flight attendant on board, crewmembers could not determine whether passengers had complied with the fasten seatbelt instructions.

Operators are prohibited by 14 CFR 135.121(c) from boarding intoxicated passengers, and the Board believes that carriers operating aircraft under 14 CFR Part 135, without flight attendants onboard, should enhance their passenger screening. The Board concludes that the FAA should issue an operations bulletin to POIs of carriers operating under 14 CFR Part 135 informing them of the need to improve passenger screening to prevent intoxicated passengers from boarding aircraft.

2.5.3 Emergency Response

Although the ELT did activate, no aircraft or other potential receivers were in a position to detect its activation to facilitate location of the accident. The emergency response was particularly critical in this accident for several reasons. The reduced visibility at the time would have precluded an aerial search until the next morning, at the earliest. Locating the aircraft would have been difficult because the fuselage color blended in with the snow covering much of the wreckage site, which was partially obscured by the dense tree cover there. Because several of the survivors were seriously injured, a timely response to rescue them was necessary to ensure 'their survival, both because of their injuries and because of the potentially injurious effects of the cold temperature at the time.

The Safety Board believes that following the fortuitous arrival of the motorist at the scene of the accident, the rescue efforts were well executed. Sheriff's deputies arrived 4 minutes after notification and the first firefighting units arrived 6 minutes after their notification since the sheriff's department coordinated the rescue efforts. Despite the reduced visibility, all necessary equipment was requested and arrived quickly after notification. Further, the coordination among the different agencies and their response to the accident was effective and contributed to the survivability of this accident.

2.6 Cockpit Voice Recorder and Flight Data Recorder

The Safety Board believes that the facts and circumstances of this accident further illustrate the need for a requirement that FDRs and CVRs be installed in multiengine, turbine-powered, fixed-winged airplanes. Recorded flight parameters and CVR conversation would have provided significant factual information regarding the cause of this accident. This information would have aided the Board in determining the proper remedial action needed to prevent recurrence of this type of accident.

As a result of its investigation of an accident at Felt, Oklahoma, on October 1, 1981, 13/ the Safety Board issued four recommendations to the FAA requiring the installation and use of cockpit voice recorders and flight data recorders, as soon as they are available, on all multiengine, turbine-powered, fixed-wing, or rotor type aircraft that are certificated to carry six or more passengers, and requiring that the flight data recorders store significant parameters of aircraft performance. Although the Safety Board is encouraged by the FAA's notice of proposed rule making (NPRM) issued on January 8, 1985, concerning CVRs on newly manufactured multi-engine, turbine-powered, fixed-wing aircraft operating under 14 CFR 135, it is concerned that a final rule has yet to be issued. Therefore, the Board urges the FAA to expedite implementation of the rule. Further, the Board believes that the issues of flight parameters and CVR retrofit have been neglected and need to be addressed, as stated in Safety Recommendation A-82-107. Therefore, the Board reiterates Safety Recommendations A-82-109 through -111 on recorders for all multiengine, turbine-powered aircraft. The recommendations remain in an "Open—Unacceptable Action" status.

The Safety Board believes that a CVR would not only have been a valuable tool in analyzing this accident, but would be a positive force in developing measures to prevent similar accidents. Until the FAA requires the installation of CVRs, or airlines voluntarily

13/ Aircraft Accident Report--"Sky Train Air, Inc., Gates Learjet 24, N44CJ, Felt, Oklahoma, October 1, 1981" (NTSB/AAR-82/4).

install CVRs, similar accidents may occur and important preventive measures will go undetected.

2.7 Ground Proximity Warning System

As a result of this and two other approach phase accidents involving scheduled domestic passenger commuter flights operating under 14 CFR 135, which occurred in August 1985 and September 1985, and in which 30 persons were fatally injured, 14/ the Safety Board concludes that the time has come for the FAA and the commuter airline industry to install ground proximity warning systems (GPWS) aboard those aircraft commonly used by the commuter airlines for the commercial transport of 30 or fewer passengers. An advisory type of system to monitor height above the ground may have been sufficient to direct the flightcrews' attention to the possibility of ground contact in time to avoid an accident.

As an example of the terrain protection afforded by the GPWS, the Safety Board examined the alerting features of a GPWS product and applied the specifications to the flightpaths of the two airplanes involved in the accident in Virginia and in Maine. In the Henson accident, the GPWS would have alerted approximately 29 seconds before impact. The same GPWS would have alerted at least 10 seconds-and possibly as much as 17 seconds-before impact in the Bar Harbor accident. In this accident, although the flightpath could not be reconstructed, it is clear that a GPWS would have provided an additional alert to the flightcrew of the continued descent below the glideslope and through decision height.

The Safety Board realizes that a full GPWS like those installed in large turbojet airplanes may be prohibitively expensive to retrofit into Part 135 type airplanes. However, other devices are available that could provide viable alternatives to a full GPWS. The Safety Board believes that the FAA and the commuter industry must address the installation of ground proximity warning devices in turbine-powered airplanes used by commuter air carriers for the commercial transport of 30 or fewer passengers.

3. CONCLUSIONS

3.1 Findings

1. The flightcrew was properly certificated and qualified.

2. The weather specialist, station manager, and air traffic controllers were properly trained and qualified to perform their duties.

3. Weather conditions at Alpena at the time of the accident were below minimums for an approach, but neither the crew nor the air traffic controllers knew this.

4. There was no preexisting damage, to the airplane, its systems, or powerplants that could have contributed to the accident.

14/ Aircraft Accident Reports--"Bar Harbor Airlines, Beech B99, N300WP, Auburn, Maine, August 25, 1985" (NTSB/AAR-86/06) and "Henson Airlines, Beech B99, Grottoes, Virginia, September 23, 1985 (NTSB/AR-86/07).

5. The airplane radios and altimeters were working properly and were probably set correctly at the time of the accident. The DME was inoperative at that time.

6. Ice accumulation on the airplane was not a factor in the accident although meteorological conditions were probably conducive to an ice accumulation.

7. Although the FELPS LOM was probably out of service at the time of the accident, this would not have led the flightcrew to continue to fly the airplane below the glideslope and through decision height and therefore would not have contributed to the accident.

8. The flightcrew probably did not intentionally descend below the glideslope.

9. The flightcrew did not confuse ground-based lights with the runway environment.

10. The training that Simmons administered to the flightcrew met and exceeded applicable regulations.

11. Both flightcrew members were relatively inexperienced in flying approaches in instrument meteorological conditions to minimums from their respective cockpit positions for Simmons.

12. Although each crewmember had an approach chart accessible, only the first officer's chart was used during the approaches into Alpena.

13. The captain incorrectly assumed that the weather in Alpena had not changed from the information contained in the report he last received because he had not been informed of any changes to that report.

14. The captain had been convicted for driving while intoxicated and other alcohol-related infractions, and had been seen consuming alcohol the night before the accident. However, the Safety Board could not determine if his performance on the night of the accident had been affected by alcohol consumption.

15. The flightcrew should have requested updated weather information from Wurtsmith controllers or from the Alpena station manager before commencing the second approach to Alpena.

16. The National Weather Service specialist, the Simmons station manager, and the Wurtsmith controllers followed the requirements of their assigned tasks in the dissemination of weather-related information.

17. The system of disseminating weather information from the Alpena National Weather Service observer to the Pellston FSS was quite automated and rapid but the transmission of information from the Pellston FSS to Wurtsmith, was not automated and was slow.

18. FAA surveillance of Simmons was adequate and did not contribute to the accident although the POI had been unable to provide a high level of continuous ongoing surveillance before the accident.

19. The accident was partially survivable due to the limited cabin structural damage and absence of fire following the accident.

20. The emergency response to the accident was well-coordinated, timely, and effective.

3.2 Probable Cause

The National Transportation Safety Board determines that the probable cause of this accident was the flightcrew's continued descent of the airplane below the glideslope and through the published decision height without obtaining visual reference of the runway for undetermined reasons. Contributing to the accident was the inefficient system used to disseminate weather-related information to the crew.

4. RECOMMENDATIONS

As a result of its investigation of this accident, the National Transportation Safety Board reiterates the following recommendations to the Federal Aviation Administration:

A-82-107

Require that all multiengine, turbine-powered, fixed-wing aircraft certificated to carry six or more passengers manufactured on or after a specified date, in any type of operation not currently required by 14 CFR 121.343, 122.359, and 135.151 to have a cockpit voice recorder and/or a flight data recorder, be prewired to accept a 'general aviation" cockpit voice recorder (if also certificated for two-pilot operation) with at least one channel for voice communications transmitted from or received in the aircraft by radio, and one channel for audio signals from a cockpit area microphone, and a "general aviation" flight data recorder to record sufficient data parameters to determine the information in Table I as a function of time.

A-82-109

Require that "general aviation" cockpit voice recorders (on aircraft certificated for two-pilot operation) and flight data recorders be installed when they become commercially available as standard equipment in all multiengine, turbine-powered fixed-wing aircraft and rotorcraft certificated to carry six or more passengers manufactured on or after a specified date, in any type of operation not currently required by 14 CFR 121.343, 121.359, 135.151, and 127.12'7 to have a cockpit voice recorder and/or a flight data recorder.

A-82-110

Require that "general aviation" cockpit voice recorders be installed as soon as they are commercially available in all multiengine, turbine-powered aircraft (both airplanes and rotorcraft), which are currently in service, which are certificated to carry six or more passengers and which are required by their certificate to have two pilots, in any type of operation not currently required by 14 CFR 121.359, 135.151, and 127.127 to have a cockpit voice recorder. The cockpit voice recorders should have at least one channel reserved for voice communications transmitted from or received in the aircraft by radio, and one channel reserved for audio signals from a cockpit area microphone.

A-82-111

Require that "general aviation" flight data recorders be installed as soon as they are commercially available in all multiengine, turbojet airplanes which are currently in service, which are certificated to carry six or more passengers in any type of operation not currently required by 14 CFR 121.343 to have a flight data recorder. Require recording of sufficient parameters to determine the following information as a function of time for ranges, accuracies, etc.):

altitude
indicated airspeed
magnetic heading
radio transmitter keying
pitch attitude
roll attitude
vertical acceleration
longitudinal acceleration
stabilizer trim position
pitch control position.

A-84-49

Seek legislative authority to use the NDR to identify airmen whose driving licenses have been suspended or revoked for alcohol-related offenses.

A-86-19

Provide, to all operators, guidance on topics and training in cockpit resource management so that operators can provide such training to their flightcrew members, until such time as the FAA's formal study of the topic is completed.

A-86-109

Amend 14 CFR 135.153 to require after a specified date the installation and use of ground proximity warning devices in all multiengine, turbinepowered fixed wing airplanes, certificated to carry 10 or more passengers.

The Safety Board also makes the following recommendations to the Federal Aviation Administration:

Provide to all military facilities that are the air traffic controlling units for civilian aircraft the equipment necessary to allow them to access weather information as quickly as Federal Aviation Administration facilities can. (Class II, Priority Action) (A-87-11)

Encourage all operators of revenue passenger flights to establish alcohol rehabilitation programs for pilots with alcohol abuse problems. (Class II, Priority Action) (A-87-12)

Reexamine 14 CFR 91.11(a)(1) in the light of recent findings on the effects of alcohol consumption on pilot performance, and carry out the research needed to establish the minimum amount of time, following alcohol consumption, required by pilots to perform their duties without impairment. (Class II, Priority Action) (A-87-13)

Issue an Operations Bulletin to Principal Operations Inspectors of carriers operating under 14 CFR Part 135 informing them of the need to improve passenger screening to prevent intoxicated passengers from boarding aircraft. (Class II, Priority Action) (A-87-14)

Seek legislative authority to use the National Driver Register (NDR) to identify airmen whose driving licenses have been suspended or revoked for alcohol-related-:-offenses. (Class II, Priority Action) (A-87-15)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JIM BURNETT
Chairman

/s/ PATRICIA A. GOLDMAN
Vice Chairman

/s/ JOHN K. LAUBER
Member

/s/ JOSEPH T. NALL
Member

February 18, 1987

5. APPENDIXES

APPENDIX A
INVESTIGATION AND HEARING

1. Investigation

The National Transportation Safety Board was notified of the accident about 2300 eastern standard time on March 13, 1986, and dispatched an investigative team from its Washington, D.C., headquarters the following morning. Investigative groups were formed for operations/air traffic control, meteorology, survival factors, structures, powerplants/systems, and maintenance records. A human performance group was established following the completion of the on-scene phase of the investigation.

Parties to the investigation were the Federal Aviation Administration, Embraer Aircraft Corporation, the United States Air Force, and Simmons Airlines.

2. Public Hearing

There was no public hearing. A deposition of the captain was-conducted at his home in Chandler, Arizona, on April 10, 1986.

APPENDIX B

PERSONNEL INFORMATION

Robert D. Wiggins - Captain

The captain was born on September 27, 1957. He was employed by Simmons Airlines, Inc., as a first officer on the EMB-110 on March 21, 1985. He was upgraded to captain on that airplane on January 7, 1986. Before his association with Simmons he was employed by Capitol Airlines of Manhattan, Kansas, where he flew Cessna 402 type aircraft. He held airline transport pilot certificate No. 527155346, dated January 7, 1986, for airplane multiengine land with ratings in the EMB-110.

His current first class medical certificate, dated November 23, 1985, contained no limitations.

At the time of the accident, the captain had accrued a total of 3,383.6 flight hours, 573.6 of which were in the EMB-110, with 171.8 of those as pilot-in-command.

In the previous 90 days, 30 days, and 24 hours, the captain had flown 171.8, 73.3, and 2.2 hours; respectively.

Steven A. Frank - First Officer

The first officer was born on August 7, 1950. He was employed by Simmons Airlines, Inc., as a first officer on the EMB-110 on January 1, 1986. He became qualified on the EMB-110 on February 15, 1986. Before his employment with Simmons, the first officer was employed by Air Logistics of Alaska, in Fairbanks, as a pilot-in-command of a PA-31-350. He held airline transport certificate No. 380540994, dated September 29, 1985, for airplane multiengine land type aircraft.

His first class medical certificate, dated November 29, 1985, contained no limitations. At the time of the accident, the first officer had accrued a total of 6,271.3 flight hours, 21.3 of which were in the MB-110P1, all as second-in-command.

In the previous 90 days, 30 days, and 24 hours, First Officer Frank had flown 21.3, 15.4, and 2.2 hours, respectively.

APPENDIX C

AIRCRAFT INFORMATION

The airplane was an Embraer Bandeirante EMB-110P1, United States Registry N1356P, Serial No. 110370, manufactured on November 8, 1981, and placed in revenue service by Simmons Airlines, Inc., on December 1, 1981. It was owned by Titan Partners of Chicago, Illinois. The airframe had accrued 9,698.4 hours total time, in 16,767 cycles, at the time of the accident.

The airplane was powered by two Pratt & Whitney of Canada PT6A-34 turboprop engines.

Engines	Number 1	Number 2
Serial number	PC-E56905	PC-E56552
Date installed	12-29-84	01-13-86
Total time (in hours)	7,818.4	11,164.9
Time since overhaul	2,331.4	2,579.0
Total cycles	13,740	17,550
Propellers		
Manufacturer	Hartzell	Hartzell
Model	HC-B3TN-3C	HC-B3TN-3C
Serial number	BU 4391	BU 11840
Date installed	12-18-85	01-21-85
Total time (in hours)	6,470.4	9,259.5
Time since overhaul	3,262.4	2,275.4

APPENDIX D

TRANSCRIPT OF AIR TRAFFIC CONTROL CONVERSATION

TRANSCRIPT CERTIFICATION

SUBJECT: Transcript of Aircraft Accident, Simmons 1746, E-110
Alpena, MI 13 Mar 86

RECORDING FACILITY: Wurtsmith AFB Radar Approach Control
Wurtsmith AFB MI 48753

FACILITY/AIRCRAFT IDENTIFICATION:

a. Simmons 1746 - Simmons

b. osc - Wurtsmith Radar Approach Control

c. MBS - Saginaw TRACON

d. PLN FSS - Pellston Flight Service Station

e. Portions of the tape contain background noise and/or voices which come from the Wurtsmith RAPCON operations room. The controller was using a telephone handset to key the radio transmitter and the handset picked up surrounding noise in the room.

POSITIONS/FREQUENCIES RECORDED: ASR-2 Radar and ASR-2'Flight Data

DATE/TIME RECORDED: 13 Mar 86, from 2123:56 to 2201:00 EST

TIME ENTRY SOURCE: Michigan Bell Telephone Time Announcer NOTE: The time announcer gives times in relation to a twelve hour clock in local time. These times have been converted to twenty four hour references.

CERTIFICATION: As custodian of the original recording, I certify this to a true and exact transcript thereof.

DAVID L. SULSBERGER, Captain, USAF
Air Traffic Operations Officer
Wurtsmith AFB, MI 48753

Eastern Standard TIME	AGENCY	TRANSCRIPT
2123:56	osc	Wurtsmith
	MBS	Saginaw approach, handoff landing Alpena
	osc	Go ahead
	MBS	Simmons seventeen forty six E one ten slant alpha, squawking six zero four six, eight thousand, three southeast of snoww and he's direct.
	OSC	Radar contact
	MBS	RZ
2124:12	osc	PZ
2124:27	Simmons	Wurtsmith approach, Simmons seventeen forty *six* with you level eight thousand
	OSC	Simmons seventeen forty six Wurtsmith affirmative (unintelligible) eight thousand Phelps Collins tower is closed, Wurtsmith altimeter two niner eight one, stand by for the latest
2124:42		weather
2124:47	OSC	Pellston radio Wurtsmith
	PLN FSS	Pellston

	OSC	Yeah this is Wurtsmith request Phelps Collins latest weather
	PLN FSS	Standby * * * sky partially obscured measured one hundred overcast visibility one half light drizzle and fog temperture dewpoint thirty three the wind one one zero at seven an twenty nine eighty two, (unintelligible, can not make out persons initials.)
2125:22	OSC	PZ
2125:35	OSC	Pellston radio Wurtsmith
	PLN FSS	Pellston
	OSC	Yea Wha-What time was that, on that report
	PLN FSS	Zero one fifty two
2125:43	OSC	PZ
2125:45	OSC	Simmons seventeen forty six Phelps Collins lastest weather at zero one five two sky partially obscured measured ceiling one hundred overcast visibility one half with light drizzle fog wind one one zero at seven altimeter two niner eight two expect I-L-S
	Simmons	OK AH two niner eight two on the weather er the altimeter seventeen forty six

APPENDIXD

2126:13	osc	Simmons seventeen forty six desend at your discret ion maintain four thousand
	S immon s	OK we're out of eight for four Simmons seventeen forty six
	osc	Background voices (unintelligible, appears to be information picked up by the telephone handset used by the controller. Similar information occurs throughout the transcript and is ident if ied as "background voices".)
2126:25	Simmons	Ah Wurtsmith give me a D-M-E readout
2126:31	osc	Simmons seventeen forty six say again
	Simmons	Give me a D-M-E readout from Alpena V-O-R
2126:43	OSC	Simmons seventeen forty six, ah, approximately five zero miles south.
	Unknown	(Unintelligible)
2126:50	Simmons	And ah just for further reference we're negative D-M-E
	osc	Simmons seventeen eighty three roger
2127:00		No transmissions

	Simmons	Zero one five
2132:26	osc	Simmons seventeen forty six roger
	Background voices	(unintelligible)
2133: 21	osc	Simmons seventeen forty six, one five miles from the final approach fix turn right heading zero two five maintain at or above two thousand eight hundred till established on approach proce correction til established on the localizer cleared ILS.
	Simmons	Seventeen forty six cleared
2134: 09	OSC	Simmons seventeen forty six change to my frequency one three four point eight
	Simmons	One three four point eight ah seventeen forty six.
	Simmons	Were on.
	osc	Simmons seventeen forty six you' re loud and clear
2134: 28	osc	Simmons seventeen forty six ah fly heading zero three zero vectors I-L-S.
2134:31	Simmons	Zero three zero

2135:00		No transmissions
2136:00		No Transmission
2137:08	OSC	Simmons seventeen forty six ah Phelps Collins (unintelligible) runway was reported wet braking action is good by a B-E thirty six at one seven two seven.
	Simmons	Seventeen forty six
2137:22	OSC	Simmons seventeen forty six I show you ah approximately uh one three miles south of the field radar service terminated report your down time via this frequency change to advisory frequency approved.
	Simmons	(unintelligible) Seventeen forty six
2138:00		No Transmissions
2139:oo		No Transmissions
2140:00		No Transmissions
2141:00		No Transmissions
2142:35	Simmons	And Wurtsmith ah seventeen forty six is missed approach

	O S C	Simmons seventeen forty six roger say intentions
	Simmons	OK we'd like to go back and try it again
	osc	Seventeen forty six roger climb and maintain ah two thousand eight hundred proceed direct FELPS L-O-M
2142:52	Simmons	OK two thousand eight hundred and direct to uh the outer marker
	Background voices:	He went missed approach. He's gonna try it again
2143:13	Simmons	And uh verify that was to the V-O-R or the marker for seventeen forty six
	osc	Simmons seventeen forty six proceed direct ah FELPS L-O-M
	Simmons	The L-O-M
2143:54	osc	Simmons seventeen forty six cross Phelps the L-O-M at or above two thousand eight hundred cleared I-L-S
	Simmons	OK cross at or above two thousand eight hundred and we're cleared for the I-L-S uh seventeen forty six

	OSC	Seventeen forty six affirmative report uh commencing approach
2144: 13	Simmons	Seventeen forty six
2145:39	Simmons	And seventeen forty six can you give us uh some vectors uh back out to the uh (unintelgible)procedure turn
	OSC	Simmons seventeen forty six ah be advised you're too low for radar identification if you'd want it climb and maintain four thousand
	Simmons	OK we're goin up to four uh we're out of three for four seventeen forty six
	OSC	Simmons seventeen forty six roger say your position now
	Simmons	OK we're negative D-M-E ah we're goin outbound one five zero
2146: 05	OSC	Simmons seventeen forty six roger
2146: 33	osc	Simmons seventeen forty six report reaching four thousand
	S i m m o n s	Ok we're just leveling off at four now uh seventeen forty six

	Background voices :	(unintelligible) * * * at four thousand south of Alpena right there.. . (unintelligible)
2146:57	osc	Simmons seventeen forty six say your radial tracking outbound on was it the one five zero radial
	Simmons	uh hold it one
	Simmons	OK we're uh tracking outbound on the one five zero seventeen forty six
	OSC	Simmons seventeen forty six roger radar contact one mile south east of the Alpena VORTAC
2147:41	Simmons	Seventeen forty six
	osc	Seventeen forty six fly heading of ah one six zero vectors I-L-S
2147:47	Simmons	One six zero vectors I-L-S
	Background noise	Hand set being laid on console
	Background voices	(Discussion about not being able to pick up the aircrafts transponder.)
2148: 54	osc	Simmons seventeen forty six turn right heading one eight zero

	Simmons	One eight zero seventeen forty six
	Background voices/noise	Unintelligible
	OSC	(Transmissions are very weak approach controller is apparently telling the aircraft that he is not receiving his transponder)
2149:50		No transmissions
2149:58	Simmons	OK no transponder still
	Background voices:	What did he say (?)
2150:08	osc	Seventeen forty six I'm picking up now
	Simmons	OK real good thanks
2150:58	osc	Simmons seventeen forty six say flight conditions
	Simmons	OK go ahead
	OSC	Simmons seventeen forty six request ah your flight conditions on final
2151:10	Simmons	OK we ah we picked up the lights but we were uh we were in a

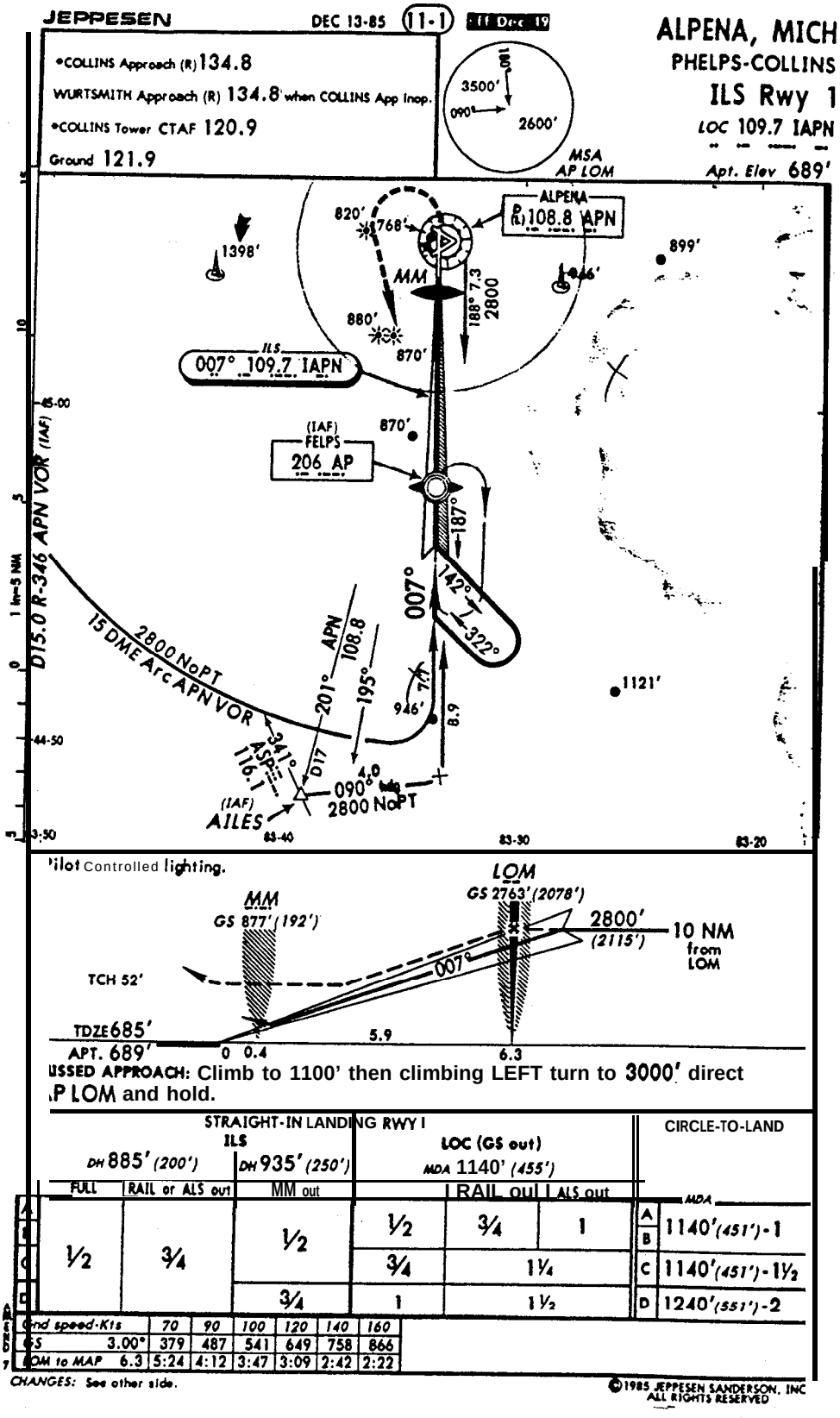
		little bit uh But I'm not really sure uh what the visibilty was and uh you know there's just. fog it it was really hard to tell
	OSC	Simmons seventeen forty six roger turn right heading two seven zero
2151:31	Simmons	Two seven zero seventeen thirty six
	Background voices:	Background (not over radio) I don't (unintelligible) I see a lot of primary targets (unintelligible) no way is it a V-F-R aircraft * * * (unintelligible) It's about five miles south,it fades in and out . (unintelligible).
2152:30		No transmissions
2153:06	OSC	Simmons seventeen forty six five miles from final approach fix turn right heading three five zero maintain at or above two thousand eight hundred till established on localizer cleared I-L-S runway one.
	Simmons	Three five zero on the heading and ah maintain twd'thousand eight hundred till established on the localizer
	Background voices	(unintelligible)
2153:43	osc	Simmons seventeen forty six fly heading of three four zero

	Simmons .	Three four zero (unintelligible) uh seventeen forty six
	Background voices	See that line right there that's eight miles. (unintelligible) The final approach fix the line with the dash across it oh yeah * * * (unintelligible) well I just gotta decenter it * * * (unintelligible)
2154:32	OSC	Simmons seventeen forty six are you established on approach (unintelligible)
	Simmons	Uh negative
2154: 38	osc	Simmons seventeen forty six roger
2155: 10	osc	Simmons seventeen forty six report established on localizer
	Simmons	Ok seventeen forty six will
2155:48	OSC	Simmons seventeen forty six verify you are on the localizer
	OSC	Simmons seventeen forty six verify you are on the localizer
	Simmons	That's affirm
2156:03	osc	Simmons seventeen forty six

		roger radar service terminated report your down time via this frequency change to advisory frequency approved
2156:09	Simmons	okay seventeen forty six
	Background voices	(unintelligible)
2157 :00		No transmissions
2158:00		No transmissions
	Background voices	No transmissions
2159: 00		No transmissions
2200 : 00	Background voices	(unintelligible)
2201:00	Background voices	(unintelligible)

APPENDIX E

ILS RUNWAY 1 APPROACH TO ALPENA, MICHIGAN



APPENDIX F

CHRONOLOGY OF CRASH, FIRE, RESCUE EFFORTS

Time (Approx.)	Events	Arrive On Scene
2200	Accident	
2210	Passing motorist is flagged down by two survivors and they are driven to airport and report the accident to the Simmons manager.	
2215	Simmons agent told of accident and he telephones Sheriff's Department. Two deputies dispatched.	2219
	Sheriff notifies Wilson VFD chief via voice pager of accident.	
	Wilson VFD responds from station 8 *milts* away.	2220+
	ANG Fire Department chief *heats* on his voice pager the sheriff notifying Wilson VFD.	
2216	ANG Chief *leaves* home for ANG fire station 17 miles from his home.	2230 at ANG Station
2220	City Police Department hears radio call including a request for ambulances at the *scent*.	
2225	City Fire Department notified (possibly by Simmons manager).	
	City FD ambulance #1 dispatched to the airport to pick up the *two* survivors.	2235 at airport
	City FD ambulance #2 dispatched to *scent* of accident.	2240
	Alpena Hospital notified by ambulance that it was en route to plane crash. Hospital began calling in extra personnel.	
2230	City Fire Department ambulance #3 dispatched to *scent*.	2248

Time (Approx.)	Events	Arrive On Scene
2233	ANG chief en route from station with C-2.	2238
Unkn.	ANG Unit C-5.	2255
2242	ANG Fire Department communications room operational.	
2245	Sheriff requested Hubbard Lake VFD to respond with a ● pumper" contrary to the Wilson VFD chief's request for ♋ ● tanker".	2305
2240 to about 2320	Extrication of occupants from the airplane.	
2300 to 2339	Survivors arrive at Alpena Hospital.	
	Medical Examiner on scene.	2342 to 2400

APPENDIX G

FAA SURVEILLANCE OF SIMMONS AIRLINES-SELECTED EVENTS

ACDO lo. 31 conducted numerous surveillance inspections on Simmons Airlines. The following information highlights the manner of this surveillance activity.

October 31, 1985/February 10, 1986
7 Ramp Inspections (Operations)
Aircraft Involved: YS-11, SD-360, EMB 110
Results : Satisfactory

September 13, 1985/March 11, 1986
7 Station Facility Inspections (Operations)
Aircraft Involved: YS-11
Results: 3 Unsatisfactory - Training Records, Manuals, Ramp Security

September 9, 1985/March 11, 1986
64 Air Carrier Enroute Inspection Reports (Operatins)
Aircraft Involved: YS-11, SD-360
Results: Satisfactory

September 10, 1985/February 12, 1986
28 enrout e Cabin Inspect ions (Oper at ions)
Aircraft Involved: YS-11, SD-360
Results: Satisfactory

August 22, 1985/March 6, 1986
14 Examiner and Check pilot Surveillance (Operations)
Results: Satisfactory

August 22, 1985/February 27, 1986
7 FAR 135 Enroutes (Operations)
Aircraft Involved: EMB 110
Results: Satisfactory

October 31, 1985/February 24, 1986
19 Mrworthiness Inspections
Aircraft Involved: YS-11 SD 360
Results: Satisfactory

October 17, 1983/February 28, 1986
7 Airworthiness Enroutes
Aircraft Involved: YS-11, SD 360
Results: 2 Unsatisfactory - Shoulder Harness, Cabin Material

July 24, 1985/February 24. 1986
15 Airworthiness Ramp
Aircraft Involved: YS-11. SD 360
Results: 4 Unsatisfactory - Engine Servicing, Cabin Material

From February 10, 1986, thru February 13, 1986, AGL ACDO-31 conducted a special operations inspection of Simmons Airlines. Following are highlights of the inspection findings.

Dispatch release not signed by the dispatcher as required by FAR 121.687 (b).
Training records - errors/omissions

YS-11 difference training

The principal operations inspector is in need of an resistant in surveilling of Simmons Airlines.

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