

SA-430

File No. 3-0380

AIRCRAFT ACCIDENT REPORT

**CHICAGO & SOUTHERN AIRLINES, INC.
Beech E18S (ATECO WESTWIND II) N51CS**

**Peoria, Illinois
October 21, 1971**

Adopted: April 19, 1972

**NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D. C. 20591
REPORT NUMBER: NTSB-AAR-72-15**

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No. NTSB-AAR-72-15	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Aircraft Accident Report Chicago & Southern Airlines, Inc., Beech E18S (ATECO Westwin II) N51CS, Peoria, Illinois, October 21, 1971		5. Report Date April 19, 1972	
		6. Performing Organization Code	
7. Author(s)		8. Performing Organization Report No.	
9. Performing Organization Name and Address Bureau of Aviation Safety National Transportation Safety Board Washington, D. C. 20591		10. Work Unit No.	
		11. Contract or Grant No.	
12. Sponsoring Agency Name and Address NATIONAL TRANSPORTATION SAFETY BOARD Washington, D. C. 20591		13. Type of Report and Period Covered Aircraft Accident Report October 21, 1971.	
		14. Sponsoring Agency Code	
15. Supplementary Notes			
16. Abstract Chicago & Southern Airlines, Inc., Flight 804 of October 21, 1971, crashed at approximately 1220 central daylight time while executing an instrument approach to the Greater Peoria Airport, Peoria, Illinois. All of the 16 persons on board received fatal injuries. The aircraft made initial contact with powerlines which cross the midpoint of the instrument final approach course, approximately 2 miles west of Runway 12 of the Greater Peoria Airport. The aircraft thereafter contacted the ground, bounced and slid into the base of a large hedgewood tree 152 feet from the point of initial wire contact along a wreckage path of 050° magnetic. An intense fire ensued which almost completely destroyed the cockpit and cabin area of the fuselage. The National Transportation Safety Board determines that the probable cause of this accident was that the pilot knowingly descended below the Minimum Descent Altitude in an attempt to complete the approach by means of visual reference to ground objects. Because of minimal visibility and low clouds in the approach zone, the aircraft was operated at an altitude too low to provide clearance over the powerlines.			
17. Key Words Airlines, scheduled air taxi, VORTAC, non-precision instrument approach, minimum descent altitude, clouds, low visibility, powerlines, tree, collision with ground objects, fire, fatal		18. Distribution Statement Released to Public. Unlimited Distribution.	
19. Security Classification (of this report) UNCLASSIFIED	20. Security Classification (of this page) UNCLASSIFIED	21. No. of Pages 28	22. Price 3.00

TABLE OF CONTENTS

	<i>Page</i>
Synopsis	1
1. Investigation	1
1.1 History of the Flight	1
1.2 Injuries to Persons	4
1.3 Damage to Aircraft	4
1.4 Other Damage	4
1.5 Crew Information	4
1.6 Aircraft Information	4
1.7 Meteorological Information	4
1.8 Aids to Navigation	5
1.9 Communications	5
1.10 Aerodrome and Ground Facilities	5
1.11 Flight Recorder	5
1.12 Aircraft Wreckage	5
1.13 Fire	8
1.14 Survival Aspects	8
1.15 Other Information	8
2. Analysis and Conclusions	9
2.1 Analysis	9
2.2 Conclusions	13
(a) Findings	13
(b) Probable Cause	14
3. Recommendations	14
Appendices	15
Appendix A	15
Investigation and Hearing	15
Appendix B	16
Crew Information	16
Appendix C	18
Aircraft Information	18
Appendix D	19
Jeppesen Approach Chart	19
Appendix E	21
Aircraft Wreckage Distribution Chart	21
Appendix F	23
Calculated Descent Profile	23
Appendix G	25
Safety Recommendations A-72-51 thru 55	25

NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D. C. 20591
AIRCRAFT ACCIDENT REPORT

Adopted: April 19, 1972

CHICAGO & SOUTHERN AIRLINES, INC.
BEECH E18S (ATECO WESTWIND II) N51CS
PEORIA, ILLINOIS
OCTOBER 21, 1971

SYNOPSIS

Chicago & Southern Airlines, Inc., Flight 804 of October 21, 1971, crashed at approximately 1220 central daylight time while it was executing an instrument approach to the Greater Peoria Airport, Peoria, Illinois. The 16 persons on board received fatal injuries.

The aircraft made initial contact with powerlines which cross the VOR Runway 12 final approach course, approximately 2 miles west of Runway 12 of the Greater Peoria Airport. Near the point of contact there are two towers, each of which supports four sets of cables. The elevation of the ground at the base of the most easterly tower is 681 feet mean sea level. The contact was made with the lower cables which were 65 feet above ground level. The aircraft thereafter contacted the ground, bounced and slid into the base of a large hedgewood tree 152 feet from the point of initial wire contact, along a wreckage path of 050° magnetic.

The major portion of the aircraft structure remained at the base of the tree. An intense fire ensued which almost completely destroyed the cockpit and cabin area of the fuselage.

The National Transportation Safety Board determines that the probable cause of this accident was that the pilot knowingly descended below the Minimum Descent Altitude in an attempt to complete the approach by means of visual reference to ground objects. Because of minimal visibility and low clouds in the ap-

proach zone, the aircraft was operated at an altitude too low to provide clearance over the powerlines.

I. INVESTIGATION

1.1 History of the Flight

Chicago & Southern Airlines, Inc., Flight 804 of October 21, 1971, was a regularly scheduled flight originating at Meigs Field, Chicago, Illinois, and terminating at Springfield, Illinois, with an en route stop at Peoria, Illinois.

The aircraft, N51CS, was an ATECO Westwind II.¹

The following is a chronology of events prior to the accident:

On October 21, 1971, prior to becoming Flight 804, the aircraft departed from Peoria, Illinois, at 0630² and was ferried to Springfield, Illinois, for the purpose of picking up the Springfield based copilot and initiation of the daily scheduled flights.

¹ An American Turbine Engineering Company (ATECO) Westwind II is a modification of the Beech E18S with turboprop powerplants and tricycle landing gear installed. The fuselage was extended 7 feet.

² All times herein are central daylight, based on the 24-hour clock.

At 0706, N51CS departed Springfield en route to Meigs Field, Chicago, as Flight 601. It was then used as Flight 802, which departed from Meigs Field at 0838 for the return flight to Springfield. N51CS returned to Meigs Field as Flight 603, arriving there at 1045. It was then scheduled as Flight 804.

At 1120, CSO³ Flight 804 (CSO 804), on an instrument flight rules (IFR) flightplan, departed Meigs Field with three passengers for Peoria and 11 passengers for Springfield. The assigned routing was via radar vectors to the Naperville VOR⁴, airway Victor 10 to Bradford VOR, and airway Victor 262 to the Peoria VORTAC.⁵ The flight was assigned an initial altitude of 5,000 feet mean sea level (m.s.l.).

At 1123, radar contact was established with the flight and it was cleared to climb to 4,000 feet m.s.l. At this time, Chicago Departure Control Radar informed the flight that the transponder of the aircraft was inoperative but that radar contact was being maintained.

At 1128:15, CSO 804 requested and received clearance to proceed direct to the Joliet VOR and thereafter via airway Victor 116 to the Washburn Intersection.

At 1134, CSO 804 arrived over the Joliet VOR and radio and radar contact was established with the Chicago Air Route Traffic Control Center (ARTCC). Radar service was terminated by Chicago ARTCC at 1142:15 and the flight was released to Peoria Approach Control.

At 1147, CSO 804 established radio contact with Peoria Approach Control. At

1154:06, upon reporting over Washburn Intersection, the flight was cleared to Mossville Intersection via Victor 116, and was instructed to maintain an altitude of 4,000 feet.

At 1156:34, Peoria Approach Control instructed CSO 804 to hold northeast of the Mossville Intersection, on airway Victor 116, to maintain 4,000 feet, and to expect further clearance at 1202. The Peoria altimeter setting of 30.23 inches of mercury was given to, and acknowledged by, CSO 804.

At 1201:22, the flight received clearance to the Peoria VORTAC via airway Victor 116, to maintain 4,000 feet, and to hold west on the 275° radial. The flight did not report departing the Mossville holding pattern but it did report that holding was established at the Peoria VORTAC at 1206:50. The holding at Mossville and the Peoria VORTAC was to allow two Ozark Air Line flights preceding CSO 804 to execute instrument approaches to the Greater Peoria Airport.

At 1210:22, Peoria Approach Control advised CSO 804 "... weather three hundred scattered, measured ceiling four hundred broken, two thousand five hundred overcast, visibility one, light rain shower and fog. The, ah, first Ozark Fairchild tried it about, ah, fifteen-twenty minutes ago, said it was better for Runway 4; however, ah, he tried to get established on final out there and he'd lose the airport, whereas at around 2,000 feet, you can fly right around the airport and keep it in sight, so that stuff is down low and the wind is 130 degrees at 6." CSO 804 replied, "We'll try it for four and thank you." The two Ozark flights, both using Fairchild FH-227 aircraft, made a total of five missed approaches before they proceeded to their alternate airports.

At 1212:05, CSO 804 was cleared for a VOR Runway 12 approach⁶ and to circle to

³CSO - Designation of Chicago and Southern Airlines, Inc., flights for air traffic control purposes.

⁴VOR - Very high frequency omnirange station.

⁵VORTAC - A collocated VOR and Tactical Air Navigation aid. These facilities are capable of providing distance information as well as azimuth to aircraft having distance measuring equipment (DME) on board.

⁶See Appendix D - Jeppesen Approach Chart used by Chicago & Southern Airlines, Inc., for this approach.

Runway 4. The flight acknowledged the clearance stating, "Okay, we're at the VOR outbound." At this time, Peoria Approach Control again gave the flight an altimeter setting of 30.23.

At 1214:05, CSO 804 reported descending through 3,000 feet m.s.l. and, at 1218:48, reported over the Peoria VORTAC inbound. Peoria Approach Control then cleared the flight to land on Runway 4 and gave the wind as 150° at 5 knots. The flight acknowledged the clearance. This was the last known communication from CSO 804.⁷

At 1224:07, Peoria Approach Control began a series of unsuccessful calls to establish radio contact with the flight. Then, suspecting that an accident had occurred, they alerted the Air National Guard Crash Rescue Unit which was located on the airport.

A helicopter pilot employed by a Peoria construction company had been flying in an area 5 miles north of the airport and, upon receiving special VFR clearance from the tower, proceeded to the airport and landed to have his aircraft serviced. When he noted activity by the airport emergency equipment, he called the Greater Peoria Airport Tower and offered his assistance. He was advised that there was an aircraft probably down somewhere west of the airport, and was issued a special clearance to operate within the control zone during the search. He and an observer took off and flew toward the west. He stated, "As I proceeded westbound, the weather was considerably less than the 300 scattered and 400 broken and the visibility was considerably less than a mile which I estimate to be a quarter (1/4) to one-half (1/2) mile at the most. The height of the clouds in the area west of the field was not more than a hundred (100) feet." After he found the aircraft wreckage, he advised that there did not appear to be any survivors, and directed the emergency vehicles to the crash site.

⁷ According to two company employees who listened to the communications recordings, all transmissions were made by the copilot.

The wreckage was approximately 2.0 nautical miles west of the airport on the 095° radial of the Peoria VORTAC.

The aircraft had struck electrical transmission lines⁸ which cross the Peoria VOR Runway 12 instrument approach path 2.0 nautical miles from the approach end of Runway 12. These powerlines are supported at regular intervals by pairs of steel towers. Each tower supports eight cables in four sets of two lines. The two towers immediately to the left of the aircraft's flight-path were oriented northeast-southwest. The lowest cables on the westerly tower were severed, and one line of the next higher pair was damaged. The elevations of the wires on this tower were:

- Lowest pair - 65 feet above ground level
- Second pair - 80 feet above ground level
- Third pair - 95 feet above ground level
- Highest pair - 102 feet above ground level

One of the cables was embedded in the aircraft structure and remained entangled in the wreckage as the airframe came to rest against a large hedgewood tree, 152 feet from the point of initial wire contact.

The left wing tip, an 8-foot section of the left wing leading edge, and other structural parts were found adjacent to the base of the easterly tower. Marks were found on one leg of this tower which match impressions on the separated wing leading-edge section. The elevation at the base of the easterly tower is 681 feet m.s.l. (See Appendix E for additional details.)

One witness believes that he saw N51CS. Four other witnesses, within one-half mile of the accident, did not see the aircraft, but believe

⁸ These lines are fabricated from steel reinforced aluminum, 0.883 inches in diameter. The tensile strength of each cable is 22,500 p.s.i. Splicing of the two severed cables was accomplished prior to the arrival of the investigation team. The cable that was struck initially was spliced approximately 175 feet from the tower and the second cable, approximately 29 feet from the tower. A damaged cable in the second pair above the ground was spliced at a distance of 70 feet from the tower.

that they heard it prior to and at the time of the crash. A summary of their observations follows:

- a. All five witnesses indicated that the weather at the time of the accident and at the crash site was very poor, with rain, fog, and haze.
- b. Three of these witnesses heard a loud roar which sounded like a surge of engine power prior to impact.
- c. The witness who believes that he saw the aircraft was squirrel hunting a few miles northeast of the Peoria VORTAC when he sighted an aircraft flying at a very low altitude (low enough to frighten the squirrel that he was hunting). He estimates that he sighted the aircraft shortly after 1200.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Other
Fatal	2	14	0
Nonfatal	0	0	0
None	0	0	

Post-mortem examination of the captain of CSO 804 showed that he sustained fatal injuries upon impact. His medical records reflected no illness nor physical defects that would have affected adversely the performance of his flight duties. A comprehensive toxicological examination was conducted with negative findings.

The copilot sustained fatal impact injuries. As the result of the fire, he was not identified until 3 days after the accident; therefore, an autopsy or toxicological examination was not conducted. His medical records reflected no prior illness or physical defects that would have adversely affected the performance of his flight duties.

All 14 passengers sustained fatal injuries as the result of impact and fire.

1.3 Damage to Aircraft

The aircraft was destroyed by contact with the powerlines, the subsequent ground impact, and postimpact fire.

1.4 Other Damage

Two power transmission lines were severed and fell to the ground, and another was damaged.

1.5 Crew Information

The pilot and copilot were certificated for the operation involved. (See Appendix B for detailed information.)

1.6 Aircraft Information

N51CS, a Beech E18S, manufacturer's serial No. BA-211, was manufactured in 1956. It was modified on June 23, 1968, to a configuration identified as an ATECO Westwind II. The testimony of the company pilot who had flown N51CS on the previous day revealed that "there were no squawks on the aircraft." (See Appendix C for detailed information.)

1.7 Meteorological Information

The Greater Peoria Airport surface weather observations taken at 1226 was as follows:

Scattered clouds at 200 feet; measured ceiling 300 feet, variable to 500 feet overcast; visibility 1 mile; moderate rain showers; and fog.

Ozark Air Lines, Inc., Flight 866 and Flight 1866, in that order, executed instrument approaches to the Greater Peoria Airport ahead of CSO 804.

The captain of Flight 866 testified that when the aircraft was just over the west end of the airport, "I had the entire airport in sight. We broke out of a wall, and the entire airport was visible." Thereafter, during the one attempt to land on Runway 22, and three subsequent attempts to land on Runway 4, the entire airport remained visible during the initial part of each approach. However, visual contact with the approach end of the runway was lost in each instance as the aircraft was turned onto the base leg.

Ozark Flight 1866 made one approach before proceeding to an alternate airport. The crew stated that straight-down, intermittent visual contact with the ground occurred after the flight passed the VOR and had descended to the Minimum Descent Altitude (MDA). They did not see the airport until the aircraft was at the missed approach point. Accordingly, no further attempt to land was made.

Other witness testimony revealed that the ceiling and visibility deteriorated rapidly to the west of the airport, including the crash site area. A ground witness, located six-tenths of a mile from the impact point, stated that only a few moments after she heard the impact and explosion she could see the top of the 102-foot high powerline tower adjacent to the accident site. However, approximately 20 minutes later a helicopter pilot could not fly over this same tower without entering instrument meteorological conditions, even though he could see the top of the tower.

1.8 Aids to Navigation

The Greater Peoria Airport instrument landing system serving Runway 12/30 was shut down because of construction work on the runway.

Circling instrument approaches to Runway 4/22 from the Peoria VORTAC were permitted on October 21, 1971. Following the accident, the Peoria VORTAC was ground checked and flight checked by the Federal Aviation Administration (FAA) and was found to be operating within specified tolerances.

1.9 Communications

There was no radio communication difficulty between CSO 804 and the various FAA facilities.

Greater Peoria Airport has a designated control area up to 6,000 feet m.s.l. Radar service is available in the Peoria area only from the

Chicago ARTCC and at altitudes above 5,000 feet m.s.l.

1.10 Aerodrome and Ground Facilities

Runway 4 is 5,702 feet long and 150 feet wide. It is equipped with runway end identifier lights which illuminate when the medium-intensity lights for the runway are increased in intensity to steps 4 or 5. These lights were operating satisfactorily on step 5 at the time of the accident. The published airport elevation is 660 feet m.s.l.

1.11 Flight Recorder

No flight or voice recorders were installed or required on N51CS.

1.12 Aircraft Wreckage

While on an inbound flightpath from the Peoria VORTAC to the airport, the aircraft contacted powerlines. Wire contact diverted the direction of travel, resulting in a wreckage path heading of 050°. (See Appendix E for detailed information.)

There was no evidence of any in-flight separation of the aircraft structure or components prior to impact. The aircraft was destroyed by impact and the ensuing ground fire.

The major portion of the aircraft structure came to rest in an upright position. This portion contained sections of the following structural components:

a. Fuselage

The fuselage failed in a bending mode to the right, just forward of the empennage. It sustained extensive ground fire damage from the empennage forward to the electronics compartment. The seats received extensive impact damage and the seat positions could not be identified.

The forward fuselage section, which contained the electronic components, did not burn. This section was damaged on the lower left side at impact. The nose gear was in the retracted position.

The fuselage aft of the rear bulkhead was severely damaged by ground impact but it did not burn.

The right main landing gear upper cylinder was intact and in the retracted position. The left and right main landing gear screwjacks were in the retracted position.

The flight control system showed no evidence of any failure or malfunction prior to impact.

b. Empennage

The left vertical stabilizer and rudder were detached from the horizontal stabilizer. They had incurred severe ground fire damage. The left horizontal stabilizer was still attached to the fuselage but was bent upward approximately 90°.

The right horizontal stabilizer displayed only slight bending and was attached to the fuselage. The right vertical stabilizer was attached to the horizontal stabilizer and the spar was broken just above the attach point. There was impact damage and mud in the top forward portion of the right vertical stabilizer. The trailing edge of the rudder received impact damage and the rudder tab was rotated forward against the right side of the rudder.

The left rudder trim actuator rod was bent and fractured in the thread area. When the fractured rod ends were placed together, the trim tab was found to be in the trail position.

The left half of the elevator had separated from the empennage. It exhibited bending corresponding to that of the left horizontal stabilizer. The right half of the elevator remained in position on the horizontal stabilizer and could be rotated freely about the hinge line. The right elevator trim tab was

in a noseup trim position. There was three-eighths of an inch gap between the trailing edges of the tab and the stabilizer.

The ventral fin was attached to the fuselage and bent to the right.

c. Wings

The left wingtip made contact with the transmission line tower subsequent to ground contact. The left wing exhibited extreme upward bending at midspan. The forward half of the outboard wing panel separated from the wing. The outer wing panel separated from the center section in an upward bending mode. The inner portion of the outer wing panel had been subjected to severe ground fire.

The landing flap had separated at impact and showed severe compression damage. The aileron was intact with the exception of the outboard rib. The aileron was subjected to severe ground fire.

The center wing section was damaged by intense ground fire.

The right wing outboard panel was in two pieces. The plane of separation began at the leading edge at a point 7 feet 2 inches inboard of the tip rib. The separation proceeded aft and outboard at an angle of approximately 50°. The edges of the upper and lower wing skin were bent down on both sides of the separation, and there were cable marks in the area of separation.

A portion of the right aileron remained attached to the outer wing panel. One of the right aileron ribs was recovered directly beneath the first wire struck by the aircraft.

The wingtip had separated but remained attached by a fuel vent line.

The right wing flap was in the "up" position; however, the flap actuator screwjack measured 1 3/8-inch from the flange to the end of the dust cover tube (partially extended flaps).

d. Left Engine

The accessory section including the accessory gearbox was destroyed by ground fire. The accessory drive quill shaft was intact and was installed properly.

The left exhaust stack was completely closed and the right stack partially closed due to impact damage. The exhaust housing was contorted 45° due to rotation of the gearbox in a direction opposite to that of the propeller.

The engine was opened at the "C" flange for inspection of the hot section. The power turbine had rubbed the forward face of the second-stage stator assembly. The aft corners of the power turbine blade tips were slightly rubbed. Metal deposits had adhered to the surface of the second-stage stator blades. The entire turbine section was sooted severely. There was tip clearance around the entire power turbine and the circumference of the compressor turbine. The first-stage compressor exhibited minor foreign object damage. There was dirt throughout the engine. The igniter plugs and oil screen looked normal.

e. Right Engine

The engine was opened at the "C" flange for hot section inspection. With the exception of the sooting and collapsed exhaust stacks, this engine incurred damage similar to that of the left engine. There was no evidence of engine malfunction prior to impact. The forward sun gear, in the reduction gearbox, had indications of high torsional loading at break-out.

f. Left Propeller

The dome was impact marked by the ring on the forward end of the three followup linkages. When this mark on the dome was aligned with the ring, the propeller was in a positive pitch midrange position.

One blade was removed and the impact marks on the blade butt and housing showed that the blade was in a positive pitch midrange position when the impact occurred. The blade had not slipped in the clamp and the control link was still attached at both ends.

The blades were bent and twisted opposite to the direction of rotation.

g. Right Propeller

Marks on the spinner matched those on the blade counterweight when the blade was in a positive pitch midrange position.

One blade had rotated clockwise in the clamp approximately 50°. The blade was removed and the impact damage on the blade root and the hub showed that impact damage occurred after the blade was rotated. The impact marks were aligned and then the blade was rotated counterclockwise approximately 50°. When this was done, the blade was in a positive pitch midrange position.

The propeller piston was disassembled. The pilot tube guide housing was fractured from the dome housing. Marks on the pilot tube showed that this occurred when the piston was in a positive pitch midrange position.

A fractured blade had indications of cable damage on the leading and trailing edges. The blades were twisted and bent opposite to the direction of rotation.

h. Instruments

All instruments had sustained extensive fire damage and little useful information was obtained.

The altimeters were recovered minus cases, bezel assemblies, or dials. Examination at the Kollsman Instrument Company disclosed that the captain's altimeter was set at 30.05 and the copilot's at 30.31. This difference in settings would equal a difference in altitude of 248 feet, with the pilot's altimeter reading higher.

i. Systems

Both fuel valves were found in the open position and the fuel crossfeed valve was found in the closed position.

The Pitot-static system lines were destroyed completely by impact and fire; however, the drain valve was found in the closed position.

There was no evidence of an electrical system malfunction or failure prior to impact.

The portions of the flight control system remaining showed no evidence of failure or malfunction prior to impact.

1.13 Fire

The fuel tanks were ruptured and fuel ignited upon ground impact. There was evidence of an explosion which occurred at the time of impact and rapid flame propagation with extensive burning. There was no evidence of an in-flight fire.

The Greater Peoria Airport fire and rescue crew responded to the crash with equipment which was located on the airport.

The fire and rescue crew consisted of 30 men.

The equipment consisted of:

- 2 0-11 fire trucks
- 1 530 structural truck
- 1 tanker
- 1 R-2 Forceable Entry Vehicle
- 1 P-6 pickup truck

When alerted by the control tower at 1235, the fire and rescue crew manned the above equipment and proceeded to the scene of the accident. They received directions from the crew of the helicopter and arrived at the site approximately 20 minutes after initially being alerted. Additional crash and rescue assistance was provided by the Hanna City, Illinois, Volunteer Fire Department.

1.14 Survival Aspects

The Peoria County, Illinois, Coroner stated that all occupants perished as the result of

impact and fire. The National Transportation Safety Board considers this accident to be non-survivable.

1.15 Other Information

a. Chicago & Southern Airlines, Inc:

Chicago & Southern Airlines, Inc., was a scheduled air taxi operation providing commuter services under Part 298 of the Civil Aeronautics Board's Economic Regulation and under the authority of, and in accordance with, the Federal Aviation Administration ATCO⁹ certificate No. 19CE-3. The original certificate was issued on April 17, 1969, and recertification under the new Federal Aviation Regulation Part 135 was accomplished on October 19, 1970.

The airline was incorporated in the State of Illinois on March 26, 1969, and began scheduled operations on July 7, 1969. At the time of the accident, it was operating scheduled intrastate flights under the authority of a Certificate of Public Convenience and Necessity issued by the Illinois Commerce Commission.

b. Surveillance of Chicago & Southern Airlines, Inc., by the FAA:

FAA records reveal that from April 20, 1970, to October 7, 1971, a total of 120 flight checks were made and recorded. These checks were given by FAA Operations Inspectors and company-designated check pilots. The pilot of CSO 304 received three flight checks from FAA Operations Inspectors and one from a company check pilot.

Three violations of Federal Aviation Regulation Part 135, concerning crew flight and duty time limitations, noncompliance with an Aircraft Deficiency Report and

⁹ Air Taxi Operators and Commercial Operators of Small Aircraft.

failure of a mechanic to make a logbook entry, were filed against Chicago & Southern Airlines in June of 1970 and resulted in civil penalties.

Testimony at the Safety Board's public hearing disclosed that the company knowingly continued its practices of exceeding crew flight and duty time limitations, and falsified company records to conceal these violations from the FAA.

The pilot of CSO 804 had operated several aviation companies as owner or president prior to his becoming president of Chicago and Southern Airlines, Inc. He had served frequently as a pilot-in-command in the flight activities of these companies, and had made some flights in violation of the Federal Aviation Regulations. Penalties were assessed against him as pilot-in-command for operating aircraft at more than the maximum allowable gross weight; for operating an air taxi flight under instrument flight rules without having the required 6-month proficiency check; failure to have the required aircraft registration certificate, the approved flight manual, or a copy of the company's air taxi manual aboard the aircraft; and in another instance for serving as a pilot without having a valid medical certificate in his possession.

2. ANALYSIS AND CONCLUSIONS

2.1 Analysis

There was no evidence of structural or mechanical failure of the airframe, control systems or powerplants, nor was there any indication of an in-flight emergency 1 minute prior to impact when the crew was in radio contact with air traffic control.

That the powerplants were producing power at impact is evident from metal spatter on the turbine blades, the 45° torsional twisting of the exhaust casings, and propeller blade deformation. The midrange power setting of the engines,

disclosed by the propeller blade angles at impact, was sufficient to maintain the aircraft in level flight at speeds in excess of 140 m.p.h.,¹⁰ or 50 m.p.h. above stall speed. Substantial forward velocity at the time of initial contact with the powerlines is indicated by the following: (a) two steel reinforced cables 0.883-inch in diameter, each with a tensile strength of 22,500 pounds per square inch, were severed successively, and a third cable was damaged; (b) the cables destroyed the aircraft's windscreen and severed the right wing; (c) the left wingtip struck the ground 75 feet beyond the point of initial contact with the powerlines, which caused the wing to bend at midspan and separate from the fuselage at impact, yet the forward momentum was great enough to cause the airframe to strike the tree 152 feet beyond the point of initial contact with the powerlines, and (d) the velocity at impact with the tree was still great enough to cause the fuselage to split apart, and light debris and two bodies to be thrown approximately 75 feet beyond the tree along the wreckage path.

Accordingly, the Safety Board concludes that the aircraft was fully controllable prior to impact with the powerlines, and that descent below the prescribed minimum safe altitude was not due to mechanical problems with the aircraft or incapacitation of the crewmembers.

Reasons other than mechanical failures or operational emergencies which could result in flight below the MDA include: missetting or misreading of the altimeters; misreading the instrument approach chart; malfunction of the altimeters, or restriction in the Pitot static system; failure of the crew to monitor altitude during the descent; and, an intentional descent below the MDA in an attempt to establish and maintain visual reference to the ground. Each of these possibilities was considered in light of the information developed during the investigation

¹⁰m.p.h. - miles per hour. The airspeed indicators in NS1CS were calibrated in both knots and miles per hour. M.p.h. was used operationally.

and subsequent public hearing. All but the possibility of an intentional descent were rejected for the following reasons:

a. Missetting of the altimeters. This possibility arises from the incorrect setting of 30.05 found on the captain's altimeter, although CSO 804 had been given, and had acknowledged, a setting of 30.23 before initiating the approach at Peoria. However, if this was the setting on the captain's altimeter prior to impact with the powerlines, the error would have been on the safe side and the aircraft would have been 180 feet higher than shown by the altimeter. Thus, if the intention was to level the aircraft at the MDA of 1,140 feet m.s.l., using the captain's altimeter set on 30.05, the actual altitude of the aircraft would have been 1,320 feet m.s.l.

Conversely, if the aircraft had been leveled at an indicated altitude of 1,140 feet m.s.l. by reference to the copilot's altimeter, with a setting of 30.31, the actual altitude would have been 1,060 feet m.s.l. This would be 80 feet below the MDA, but well above all obstructions. It is unlikely, however, that the copilot was flying the aircraft, since he was communicating with air traffic control. Also, the pilot had a reputation of doing all the flying himself, when instrument meteorological conditions were involved.

Accordingly, the Board believes that the disparity in the settings found on the two altimeters and the setting given by Peoria Approach Control is mainly due to movement of the setting scale as the result of impact forces which caused breakup of the altimeters, and the subsequent separation of the setting knob shaft and gear from the barometric dial.

b. Misreading the altimeter. Several studies in past years have discussed the possibility of

misreading the three-pointer altimeter,¹¹ and actual instances of such errors have been recorded. However, the misreadings usually involved changes of altitude of more than 1,000 feet, and nearly all involved errors of exactly 1,000 feet or 10,000 feet. In this instance, the required descent was only 660 feet, (from 1,800 feet m.s.l. over the VOR to the 1,140 feet m.s.l. MDA) thus minimizing the potential for a misreading. Also, the pilot and the copilot would have had to make identical mistakes in reading their altimeters (or not be observing them) in order for the error to go unrecognized. This is considered unlikely since other copilots testified that this pilot required his copilot to call out 500 feet above the ground and 100 feet above the MDA. Thereafter, he expected the copilot to be looking outside the cockpit to establish visual contact with the ground. Further, while the ceiling and visibility west of the airport were substantially less than at the airport itself, it is likely that the crew of CSO 804 would have had the ground in sight before reaching an altitude only 65 feet above it. Based on the testimony of the airline crew who made the approach immediately ahead of CSO 804, and the helicopter pilot who participated in the search and rescue activities, the low clouds coverage was scattered to broken in the area between the VORTAC and the crash site and ranged from 100 feet to 200 feet above ground level (a.g.l.). The tops of the transmission line towers, 102 a.g.l., were visible to the helicopter pilot, and to a witness located 0.6 mile from the crash site. Accordingly, the Board believes the ground

¹¹ Psychological Aspects of Instrument Display: Analysis of 270 "Pilot Error" Experiences in Reading and Interpreting Aircraft Instruments, 1 October 1947. Howard Garfield Heininger, Jr. - A Systematic Method for Determining the Best Altimeter Display for High Performance Aircraft, February 22, 1966.

would have been visible to the crew prior to their reaching the power line elevation, particularly if the copilot was looking outside the cockpit after the MDA was reached. An altimeter misreading should have been apparent and a climb initiated unless it was the pilot's intention to remain at that altitude. However, the low-cruise power setting of both engines indicates neither a descent nor a climb, and that the aircraft was in level flight when contact with the wires occurred.

For the reasons just given, the likelihood that an improper approach chart was used; that the appropriate chart was used but misread; or that there was a failure to monitor altitude during the approach, also are dismissed.

c. Malfunction of the Altimeter or Restriction in the Pitot-static System. The badly damaged conditions of the altimeters precluded the possibility of determining any malfunction that would cause the altimeter indicators to stick, lag, or otherwise fail to record proper altitudes during descent. If such a malfunction had occurred, it would have been necessary for both instruments to have an identical failure, or for the copilot not to have been monitoring his own instrument in order for the error to go unrecognized. However, it is likely that ground visual reference had been established, and if the excessive descent had been due to an altimeter malfunction, the pilot would have been alerted by the copilot's callout. The pilot's own observation of the ground would have alerted him to the excessively low altitude. In this situation, corrective action could have been taken. In connection with possible altimeter malfunction it is pertinent to note that there had never been any altimetry problems with the aircraft. The company chief pilot, who had flown the previous day's terminating flight, testified that there were no writeups on the aircraft;

the altimeters had functioned normally; and the aircraft needed no maintenance on the night of October 20, 1971. Further, the pilot involved in the accident had flown the aircraft on several of the morning flights prior to the accident on October 21, 1971. He had been in contact with the company's Director of Operations during the day, and had reported no discrepancies.

Concerning the possibility of a restriction in the Pitot-static system, the Board noted that the aircraft had a single static line supplying information to both the pilot's and copilot's instruments. Accordingly, a restriction in the static line could cause identical misreadings on both altimeters.

If, in reality, a restriction in the static line had been causing the altimeter to register an altitude error of 400 feet as the apparent MDA was approached, there also would have been a 50 m.p.h. error in the indicated airspeed. The effect would have been that the airspeed would have shown the normal 140 m.p.h. indication, when, in fact, the correct indicated airspeed would have been 90 m.p.h., which is the stall speed of the aircraft. Thus, as the airspeed was reduced during the initiation of the instrument approach, the "stick shaker" would have been activated when the indicated airspeed reached 145 m.p.h. and would have alerted the crew to an unusual situation. Further, as the aircraft descended, there would have been an increase in indicated airspeed without any change in power settings, or without a change in the pitch attitude of the aircraft. The Board believes that all of these indicators would not have been missed or ignored by both the pilot and copilot, but particularly by the pilot, who had an unusually high degree of skill according to pilots who had flown with him. Accordingly, the possibility of an altimeter error as the result of static system restriction is rejected.

d. The remaining possibility is that the descent was intentional, that the pilot was proceeding by means of visual reference to ground objects, but, because of the restricted visibility and rain droplets on the windscreen, he did not see the powerlines in time to avoid collision.

Because of many variables such as actual descent rates, airspeeds, variance in ground speed due to wind, actual altitude and time at departure from the VORTAC, and possible maneuvers by the pilot in navigating the aircraft, the exact time and geographic point at which the aircraft arrived at the elevation of the powerlines could not be determined. Nor, because of the extensive damage to the aircraft during wire and ground contact, and the subsequent fire, was it possible to determine the exact attitude or heading of the aircraft immediately before collision. However, the witness who heard the aircraft over her house was located only 400 feet south of the centerline of the Peoria VORTAC 095° radial. Accordingly, it is believed that CSO 804 proceeded inbound along the VOR Runway 12 final approach course, with the possible exception of a last minute maneuver in an attempt to avoid the powerlines. It is believed that the aircraft was operated below the MDA intentionally, in order to make an approach to Runway 4 by means of ground visual reference, for the following reasons:

- (1) The pilot had been informed that it was possible to "fly right around the airport and keep it in sight" at 2,000 feet. Notwithstanding, the first Ozark Air Lines flight had been unsuccessful in its attempt to land because of the inability to keep the airport in sight while it attempted to line up with Runway 4.
- (2) The crew of the second Ozark flight testified that occasional visual reference to the ground was established as the aircraft proceeded inbound from the VORTAC to the airport.

- (3) The pilot of CSO 804 was exceptionally skillful and intimately familiar with the airport environment.

- (4) The reported ceiling at the airport was 80 feet below the MDA. A "duck under" maneuver to position the aircraft below the MDA would be necessary if ground reference was to be established at a distance that would permit aligning the aircraft with Runway 4 for landing. Conversely, if the approach was made in accordance with prescribed procedures, and the aircraft was kept at the MDA until the environment associated with the approach end of Runway 4 was sighted, the pilot could anticipate a missed approach for the same reasons the two Ozark Air Lines flights ahead of him had missed their approaches.

Under these circumstances, it is likely that the pilot would conclude that the essential problem of establishing and maintaining alignment with Runway 4 during the final approach to landing could be solved by an early descent below the cloud cover, and the attainment of visual ground reference.

It is apparent that a deviation from the standard approach procedure must have been initiated before the VOR was reached, or shortly thereafter, in order for the aircraft to have descended to the 746-foot altitude at which it struck the powerlines. Either the aircraft was not at the specified 1,800 feet m.s.l. over the VORTAC, or an average rate of descent in excess of 1,000 feet per minute was established after it passed the VORTAC and continued through the MDA until shortly before impact. (See Appendix F.)

The Safety Board believes that the greater probability is that the crew of CSO 804 established momentary ground contact, shortly after passing the VORTAC, in the same manner as did the crew of the Ozark Air Lines flight preceding them. A descent was initiated during encounter with one of these breaks in the cloud layer, and continued until the aircraft was below the lowest clouds. Because some of the scattered

clouds in the lowest layer had bases only 100 feet above the ground in the vicinity of the accident site, it would have been necessary for the pilot to descend to an altitude slightly lower in order to maintain visual reference to the ground. Visibility ranged only from 1/4 to 1/2 mile in the area. From the aircraft cockpit it was probably somewhat less because of moisture on the windscreen. Accordingly, the absence of a well-defined horizon and the scarcity of geometric shapes on the ground below the aircraft's flightpath would have caused the pilot to direct his attention downward, as well as forward, and would have made the detection of wires against a low contrast background extremely difficult, if not impossible. The factors which could explain why the pilot attempted this course of action were:

a. If the landing at Peoria were abandoned, the company would have had to pay the transportation costs of three passengers from an alternate airport back to Peoria.

b. A crew change was to take place at Peoria, and if the landing was not effected, the pilot, the president of the airline, would have had to continue to fly the schedule, and would have been unable to attend to his duties as president of the airline. Since he was known to run every facet of the company business himself, without delegating authority to others, it is likely that he considered his daily presence at the company headquarters vital to the success of the airline.

During testimony at the Safety Board's public hearing, a question arose as to the adequacy of FAA's surveillance and enforcement regarding compliance with Federal Aviation Regulations by Chicago and Southern Airlines, Inc. Three violations of these regulations occurred 16 months prior to the accident, for which civil penalties had been assessed. The company continued violations of the crew flight time limitations and evidence of this was hidden deliberately from the FAA Operational Inspector. The Safety Board believes that more aggressive followup should have been taken by the FAA General Aviation District Office having

jurisdiction over Chicago and Southern Airlines, to insure that company's continued compliance with all Federal Aviation Regulations.

Company adherence to all Federal Aviation Regulations and the FAA surveillance and enforcement thereof will be a special subject of the Safety Board's forthcoming in-depth study of the overall air taxi operations.

3.2 Conclusions

a. Findings

- (1) The crewmembers were certificated and qualified for the flight activity involved.
- (2) The aircraft was certificated and airworthy at the time of takeoff as Flight 804.
- (3) There was no in-flight failure or malfunction of the aircraft, powerplants or control systems.
- (4) The company was authorized and certificated to engage in scheduled air taxi operations under the provisions of Part 135 of the Federal Aviation Regulations.
- (5) No preimpact physical condition or abnormality of the crewmembers was detected that could be associated with the causal area of this accident.
- (6) There were no malfunctions or difficulties with the navigational aids or communications.
- (7) The aircraft had been cleared for a VOR approach to Peoria and had reported at the VORTAC inbound, west.
- (8) Weather conditions in the approach zone west of the airport were worse than those reported at the airport itself.
- (9) The pilot did not adhere to the prescribed procedure for the VOR Runway 12 instrument approach.

b. Probable Cause

The Board determines that the probable cause of this accident was that the pilot knowingly descended below the Minimum Descent Altitude in an attempt to complete the approach by means of visual reference to ground objects. Because of minimal visibility and low clouds in the approach zone, the aircraft was operated at an altitude too low to provide clearance over the powerlines.

**3. RECOMMENDATIONS AND
CORRECTIVE MEASURES**

On May 10, 1972, the Safety Board made specific recommendations to the Administrator

of the Federal Aviation Administration concerning (a) better methods of determining passenger weights, (b) investigation into the background of applicants for Air Taxi and Commercial Operator of Small Aircraft Certificates and check pilot authority, and (c) flight time limitations for pilots operating under the provisions of Part 135 of the Federal Aviation Regulations. Details of these recommendations are contained in Appendix G to this report.

Additionally, in December 1971, the Board initiated a special safety investigation and accident prevention study to determine the level of safety existing in air taxi operations, and to identify the safety factors involved. Upon completion of this study the Safety Board will publish a special report, including any further recommendations found necessary.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD:

/s/JOHN H. REED

Chairman

/s/OSCAR M. LAUREL

Member

/s/FRANCIS H. McADAMS

Member

/s/LOUIS M. THAYER

Member

/s/ISABEL A. BURGESS

Member

April 19, 1972

INVESTIGATION AND HEARING

1. Investigation

The Safety Board received notification of this accident about 1255 c.d.t., October 21, 1971, from the Federal Aviation Administration. Investigators from the Safety Board's Chicago, Miami, and Washington offices proceeded to the Greater Peoria Airport at Peoria, Illinois, where the investigation headquarters was established on October 22, 1971. Working groups were established for Operations, Air Traffic Control, Human Factors, Witnesses, Engines and Systems, Structures, and Maintenance Records. Parties to the field investigation included: Chicago and Southern Airlines, Inc., the Federal Aviation Administration, the Illinois Commerce Commission, Beech Aircraft Corporation, and the Pratt & Whitney Aircraft Division of United Aircraft Corporation. The on-scene investigation was completed about October 29, 1971.

2. Hearing

A public hearing was held at the Ramada Inn in Peoria, Illinois, December 15 to 17, 1971. Parties to the hearing included: Chicago & Southern Airlines, Inc., the Federal Aviation Administration, the Illinois Commerce Commission, Beech Aircraft Corporation, and the National Air Transportation Conferences, Inc.

3. Preliminary Report

A preliminary aircraft accident report summarizing the facts disclosed by the investigation was released by the Safety Board on December 10, 1971.

CREW INFORMATION

The crew was certified properly and qualified for the flight.

Captain Frank Daniel Hansen, aged 39, was President of Chicago & Southern Airlines, Inc., which began scheduled operations in Illinois on July 7, 1969. He held Commercial Pilot Certificate No. 1260988 dated September 6, 1957, with instrument privileges and held ratings in single- and multiengine land aircraft. He satisfactorily passed his last examination for a Federal Aviation Administration first-class medical certificate on December 1, 1970, without limitations.

On May 13, 1970, Captain Hansen was approved by the Federal Aviation Administration General Aviation District Office (GADO) No. 3 to conduct 6-month instrument checks and flight checks for multiengine operations for pilots employed by Chicago & Southern Airlines, Inc. He was authorized also to issue Statement of Competency Letters to pilots who demonstrated satisfactory competency. This approval was renewed by the Springfield, Illinois, GADO No. 19 on January 22, 1971, and again on April 19, 1971.

Captain Hansen had accumulated a total of 16,119 flying hours according to Chicago & Southern Airlines, Inc., records. Pilot time in the "ATECO" Westwind II was approximately 133 hours, of which 41 hours were acquired during the last 90 days preceding the accident, and 4 hours were acquired during the last 24 hours. His total instrument flight time as of January 1, 1971, was 916 hours. Since that date, company records reflect 16:15 additional hours of instrument flight. There were no records of logbooks to document and separate multiengine from single-engine flight time.

Company records indicate that Captain Hansen completed his transitional ground training for Westwind II aircraft on November 27, 1970, with a total of 6 training hours. His transitional flight training was completed on November 29, 1970, with a total of 6:05 training hours.

Captain Hansen scheduled himself to fly either the morning or afternoon schedule and occupied himself with office administrative duties during his nonflying portion of the day. He visited the maintenance hangar two or three times a week during late evening hours.

On the day prior to the accident, Captain Hansen departed from his office at 2315 and was in his apartment by midnight. He was at the airport at or shortly before 0630 the next morning. On October 21, 1971, he had flown a total of 4 hours and had been on duty a total of 6 hours at the time of the accident.

Copilot Robert William Moller, aged 25, was employed by Chicago & Southern Airlines, Inc., on August 23, 1971. He held Commercial Pilot Certificate No. 1642594 with aircraft single- and multiengine land and instrument ratings. He also held Flight Instructor Certificate No. 1642594, Mechanic Certificate No. 1634433, and Ground Instructor Certificate No. 1944397. He satisfactorily passed an examination for a FAA second-class medical certificate on August 1, 1971, without limitations.

Mr. Moller satisfactorily completed competency checks for Chicago & Southern aircraft on the following dates:

- a. DHC-6, Twin Otter on August 28, 1971
- b. Westwind II on August 30, 1971
- c. Hamilton I Turboliner on September 11, 1971

According to Chicago & Southern Airlines, Inc., records, he had accumulated a total of 4,690 flying hours. Pilot time in the ATECO Westwind II was approximately 43 hours, all of which was acquired in the last 90 days. He had flown approximately 3:30 hours during the last 24 hours. He had a total of 3,400 single-engine hours and 1,290 multiengine hours. His total actual instrument hours was listed at 50. In addition, he had 65 hours of simulated instrument flight time.

Company records indicate that Mr. Moller completed his transitional ground training for Westwind II aircraft on August 22, 1971, with a total of 6 training hours. His transitional flight training was completed on August 30, 1971, with a total of 1 training hour. His proficiency check for the Westwind II was given by Mr. Frank Hansen with the remarks "OK for second-in-command."

He completed the Federal Aviation Regulation Part 61 test with a grade of 95 and the Westwind II test with a grade of 99.

AIRCRAFT INFORMATION

The modifications to the Beech E18S that converted the aircraft to the "ATECO" Westwind II are as follows:

- a. A 7-foot extension of the fuselage.
- b. Installation of Pratt & Whitney PT6A-27 turboprop engines.
- c. Installation of Mark IV tricycle landing gear.
- d. Installation of nose strut snubber.
- e. A spar reinforcement.

The modification incorporated Supplemental Certificates (STC's): SA1721WE, SA111WE, SA285WE, SA1533 WE, and SA1016WE. The SA1016WE Supplemental Type Certificate was not applicable to N51CS as it listed incorporation of PT6A-6 or PT6A-20 turboprop engines.

N51CS was a normal category aircraft and had a Standard Airworthiness Certificate reissued on April 9, 1970.

The aircraft entered line service with Chicago & Southern Airlines, Inc., on November 27, 1970, with a total time of 6,159:36 hours.

Maintenance records as of October 20, 1971, showed a total time in service as 7,751:44 hours. The time since conversion was 2,884:21 hours.

The aircraft was maintained under a FAA approved inspection system. The last 50-hour detailed inspection of record was completed on September 26, 1971, at airframe hours 7,734:35. Company records show that an annual inspection was conducted on January 31, 1971.

The left engine, serial No. PC-4007, manufactured in January 1968, had a total time in service since new of 2,357:23 hours as of October 20, 1971. The right engine, serial No. PC-E40006, had a total time of 2,313:26 hours and 83:40 hours since overhaul. The engine power required to maintain altitude at or near maximum gross weight and an airspeed of approximately 140 m.p.h. falls in the low-range category.

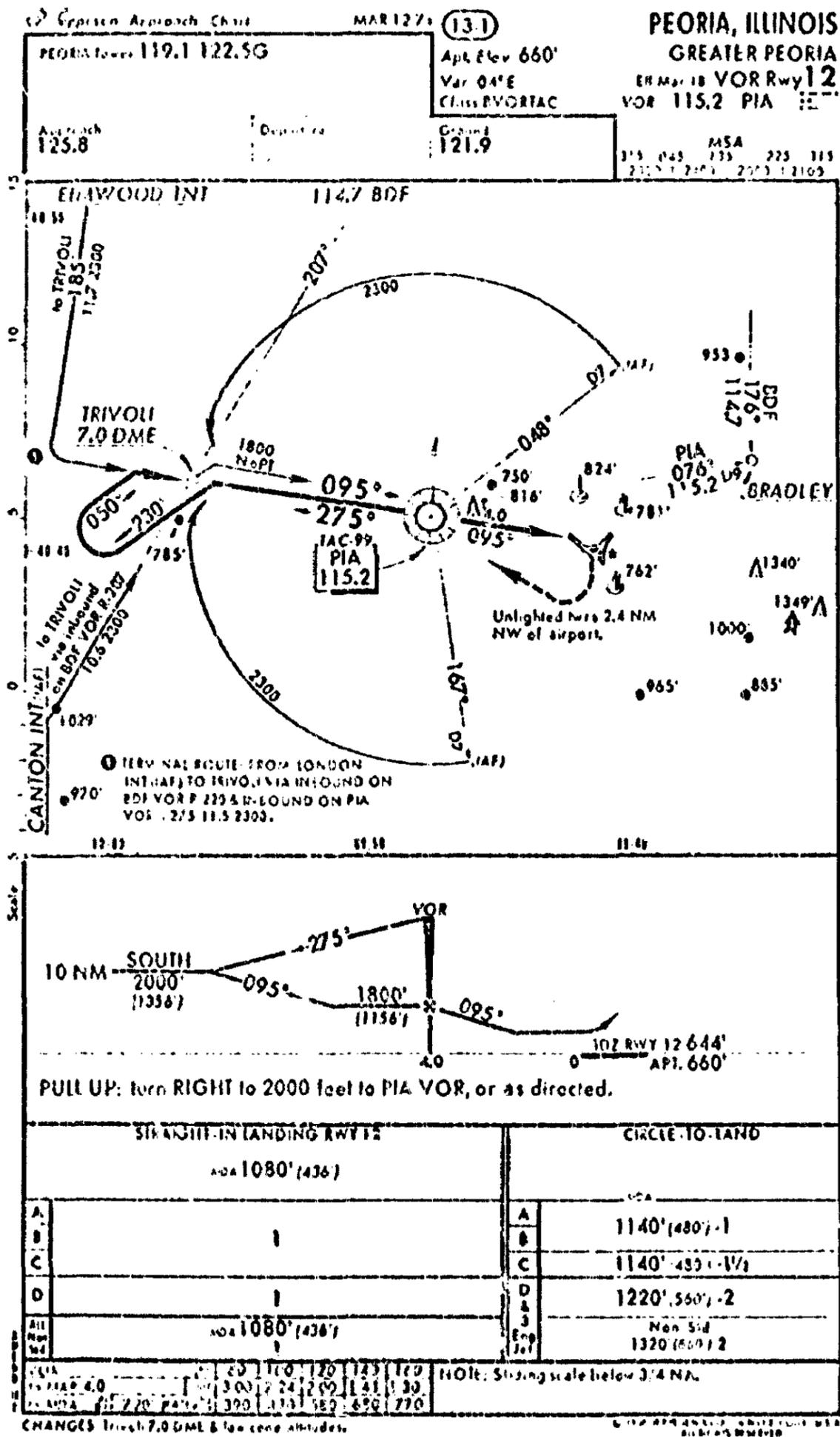
The left Hartzell propeller, serial No. BU13, had a total time in service of 2,885 hours and the right Hartzell propeller, serial No. 2738, had a total time in service of 2,885:40 hours.

The aircraft had been maintained in accordance with Chicago & Southern Airlines, Inc., and FAA procedures. Company records show that all required inspections and airworthiness directives had been accomplished. The aircraft's weight and balance were within prescribed limits at takeoff and at the time of the accident.

The aircraft was equipped with a stall warning device (stick shaker), which would be activated at not less than 5 m.p.h. above stall speed, and would continue to operate until a stall occurred, or until speed was increased.

The aircraft static system was a balanced type. Two static ports, one on each side of the aft fuselage, connect to a single line running forward to a tee fitting. Lines then run to both sets of instruments in the cockpit. A drain is located midway in the single line running the length of the fuselage. Federal Aviation Regulation 91.170, *Altimeter System Tests and Inspections*, was complied with on April 13, 1970.

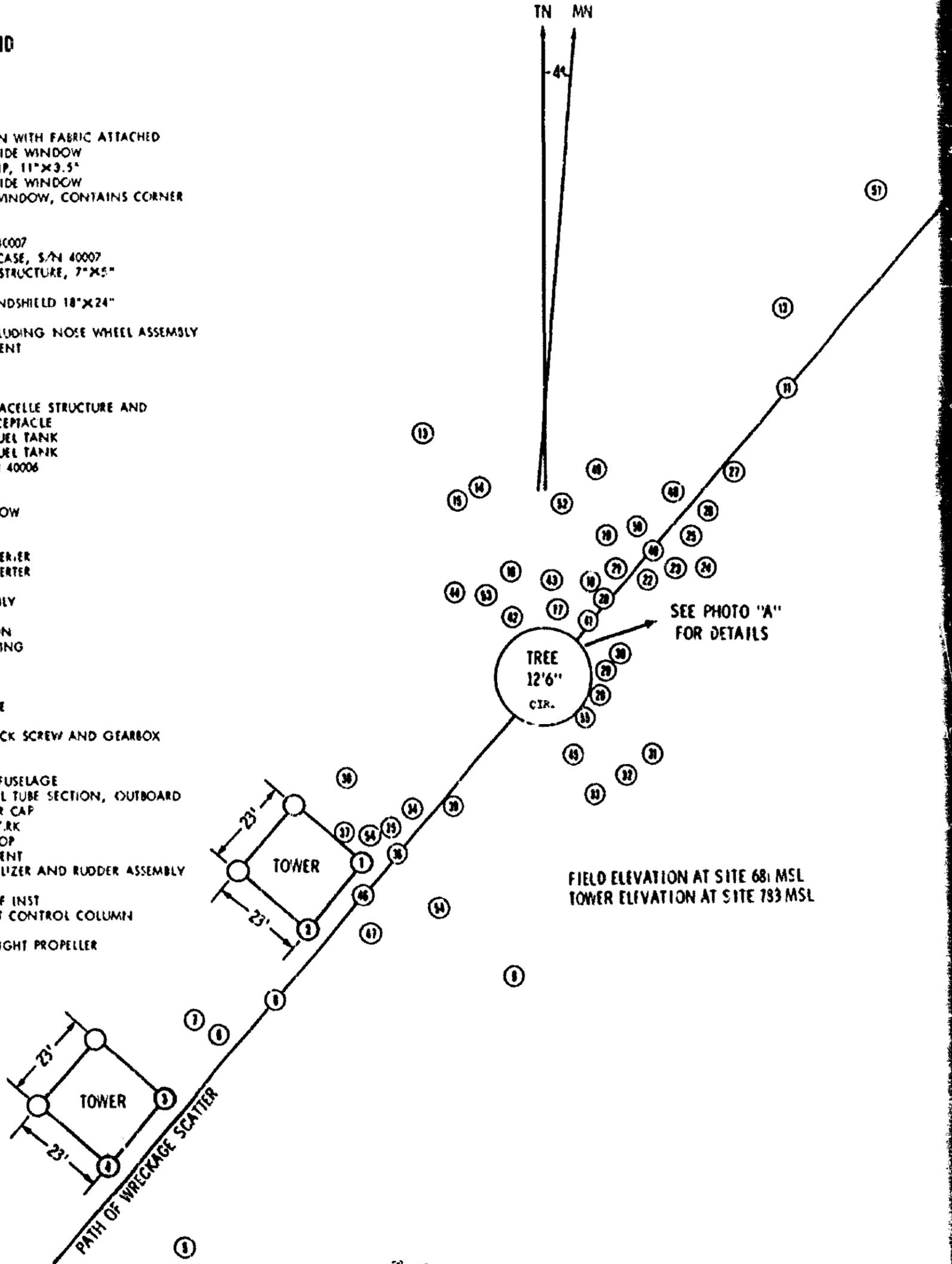
APPENDIX D



A

LEGEND

1. TOWER LEG
2. TOWER LEG
3. TOWER LEG
4. TOWER LEG
5. AILERON RIB SECTION WITH FABRIC ATTACHED
6. PIECE OF COCKPIT SIDE WINDOW
7. SKIN, SPAR CAP STRIP, 11"X3.5"
8. PIECE OF COCKPIT SIDE WINDOW
9. PIECE OF COCKPIT WINDOW, CONTAINS CORNER OF WINDOW
10. RIGHT PROPELLER
11. LEFT ENGINE, S/N 40007
12. SECTION OF NOSE CASE, S/N 40007
13. SECTION OF WING STRUCTURE, 7"X5"
14. LEFT PROPELLER
15. PIECE OF FRONT WINDSHIELD 18"X24"
16. CARGO DOOR
17. NOSE SECTION INCLUDING NOSE WHEEL ASSEMBLY AND RADIO EQUIPMENT
18. COCKPIT BULKHEAD
19. LEFT WING
20. CABIN SEAT FRAME
21. SECTION OF LEFT NACELLE STRUCTURE AND GROUND POWER RECEPTACLE
22. FLOAT AND ARM, FUEL TANK
23. FLOAT AND ARM, FUEL TANK
24. RIGHT ENGINE, S/N 40006
25. BODY FLAP
26. BODY FLAP
27. COCKPIT SIDE WINDOW
28. RIGHT WING
29. RIGHT WING
30. MOTOR DRIVEN INVERTER
31. MOTOR DRIVEN INVERTER
32. LEFT ELEVATOR
33. EMPENNAGE ASSEMBLY
34. RIGHT WING TIP
35. RIGHT WING SECTION
36. SECTION OF LEFT WING
37. LEFT WING TIP
38. LEFT WING FLAP
39. ANTENNA
40. FUEL SHUTOFF VALVE
41. AIR STAIR DOOR
42. LEFT MAIN GEAR JACK SCREW AND GEARBOX
43. LEFT MAIN GEAR
44. ALCOHOL PUMP
45. MAIN SECTION OF FUSELAGE
46. LEFT WING ELLIPTICAL TUBE SECTION, OUTBOARD END OF LOWER SPAR CAP
47. GROUND IMPACT MARK
48. ENGINE COWL SCOOP
49. COCKPIT CEILING VENT
50. LEFT VERTICAL STABILIZER AND RUDDER ASSEMBLY
51. TACH GENERATOR
52. BURNED PORTION OF INST
53. PILOT AND COPILOT CONTROL COLUMN
54. STROBE LIGHT
55. PROPELLER BLADE, RIGHT PROPELLER



SEE PHOTO "A" FOR DETAILS

FIELD ELEVATION AT SITE 68: MSL
TOWER ELEVATION AT SITE 73: MSL

B

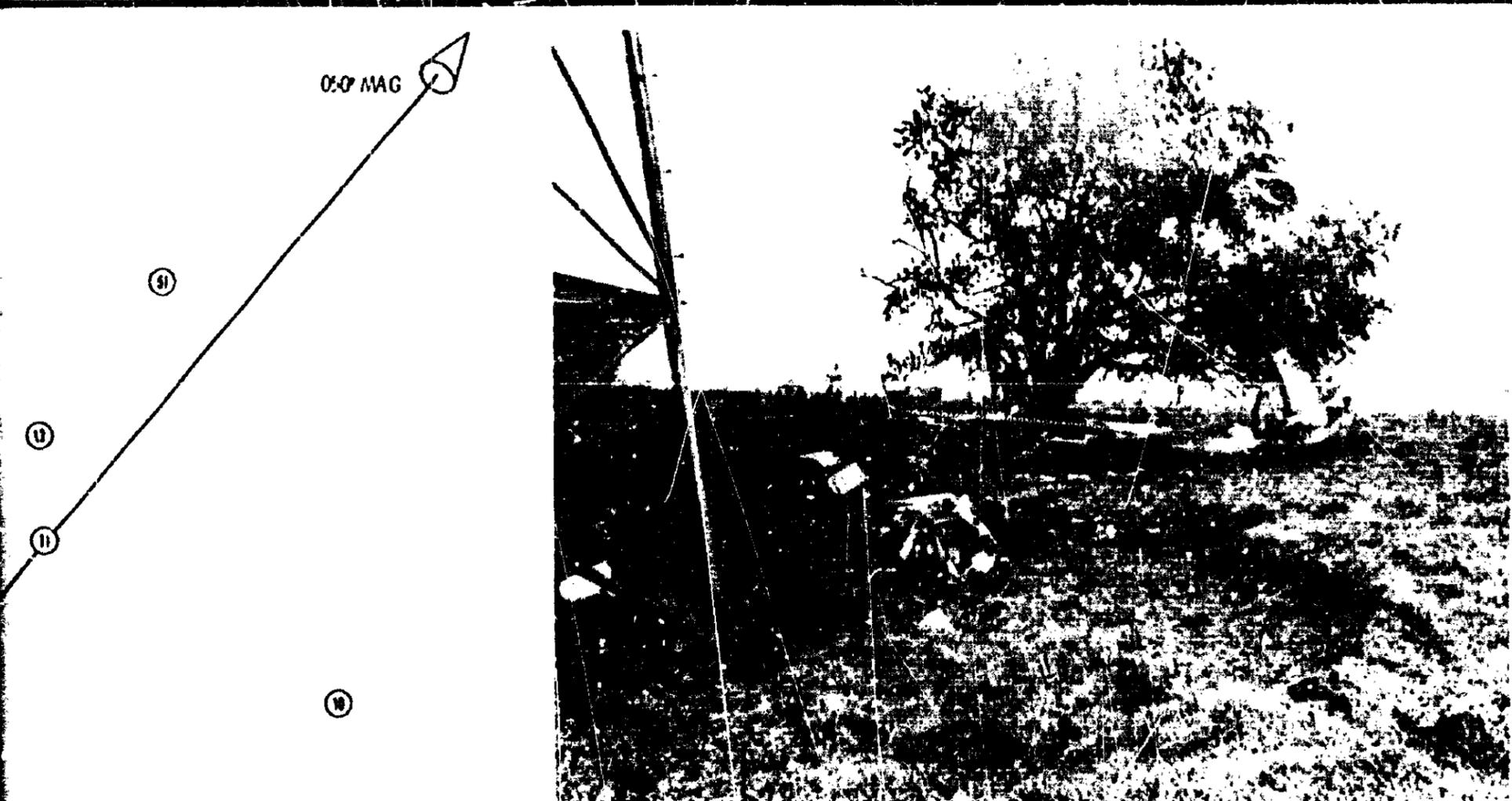


PHOTO "A"

"A"
S

MSL
783 MSL

APPENDIX E

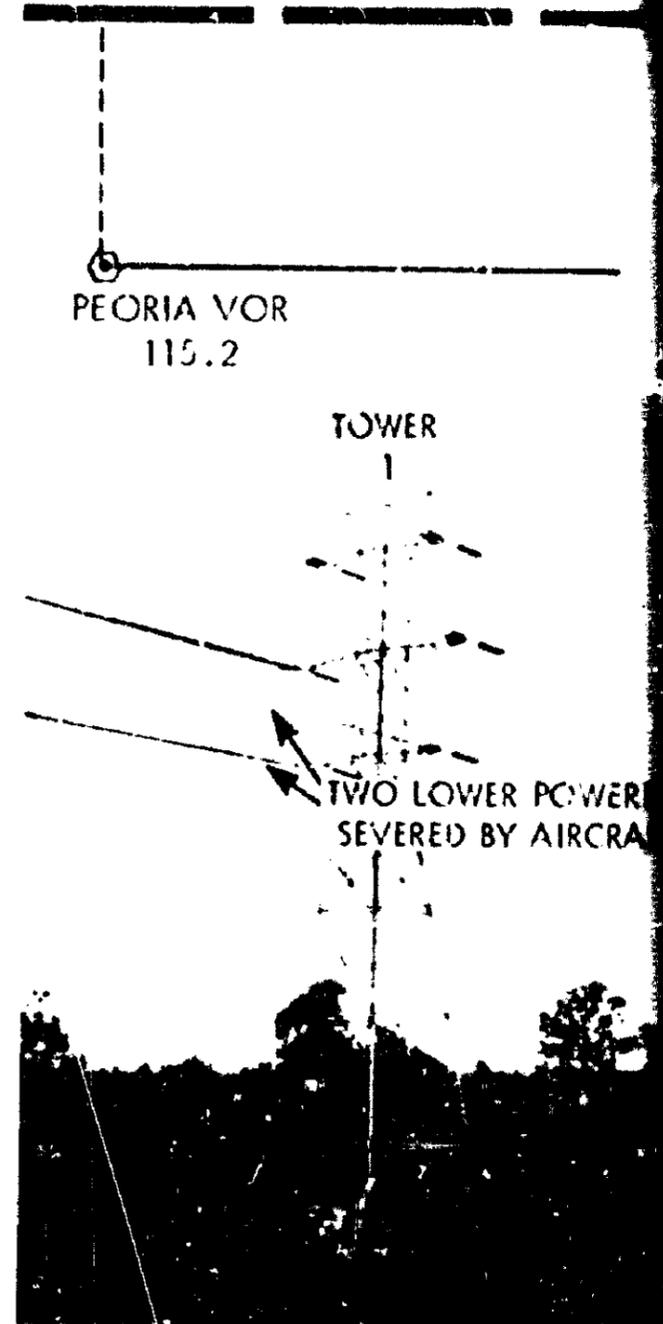
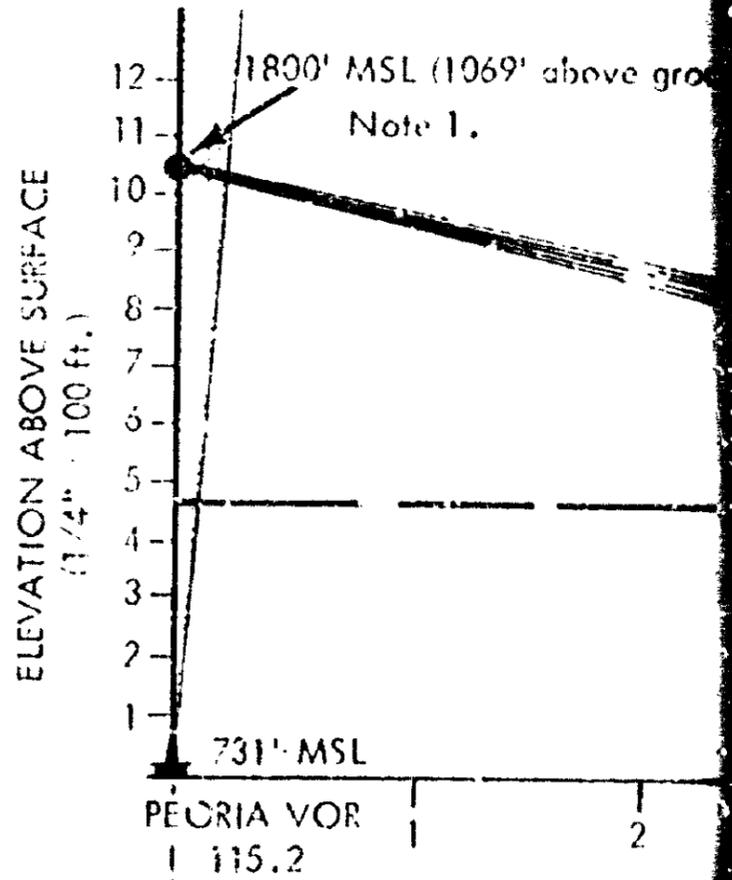
NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

WRECKAGE DISTRIBUTION CHART
CHICAGO AND SOUTHERN AIRLINES, INC.
AMERICAN TURBINE WESTWIND II N51CS
APPROX. 2 1/2 STATUTE MILES WEST OF
PEORIA MUNICIPAL AIRPORT,
PEORIA ILLINOIS, OCTOBER 21, 1971

21

NOTES

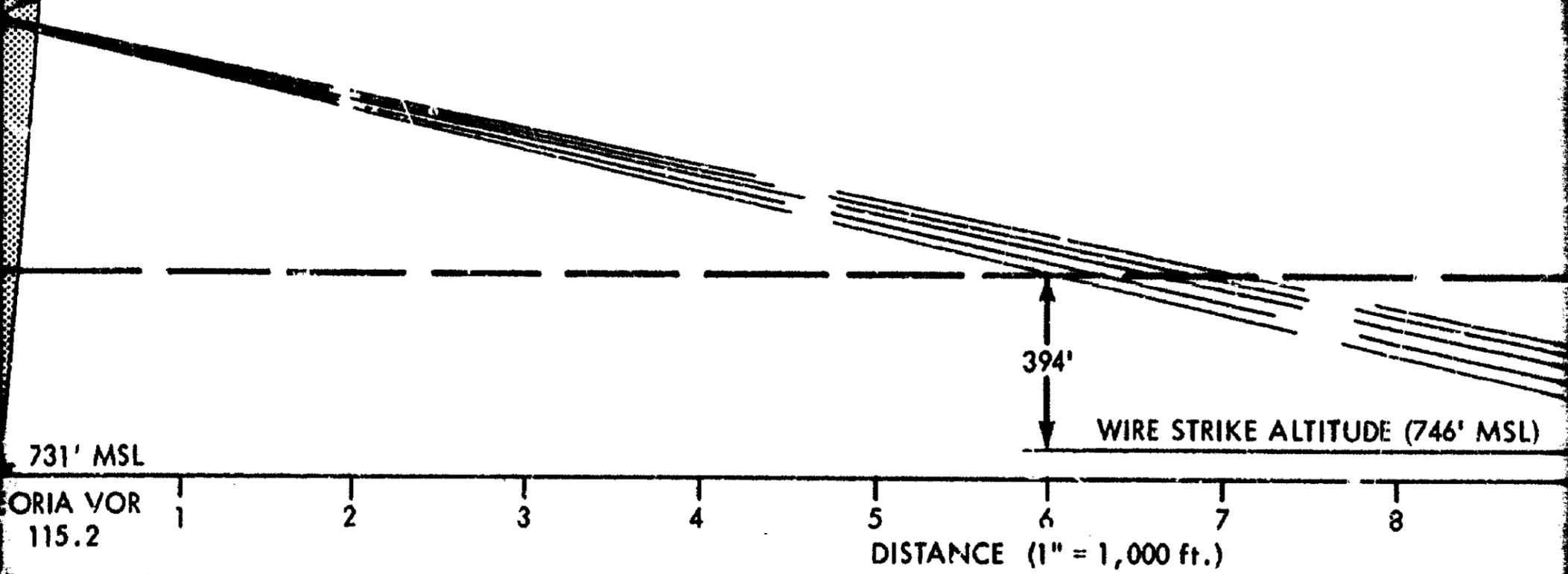
1. Descent profiles based on VOR departure at 1800' MSL, and a constant descent rate of approximately 1000 feet per minute. Variables of wind, speed fluctuations, or crew actions not considered.
 - A - at 140 mph. ground speed
 - B - at 135 mph. ground speed
 - C - at 130 mph. ground speed
 - D - at 125 mph. ground speed
 - E - at 120 mph. ground speed
2. Towers and photographs not to scale.
3. Power lines struck by aircraft accentuated for clarity.



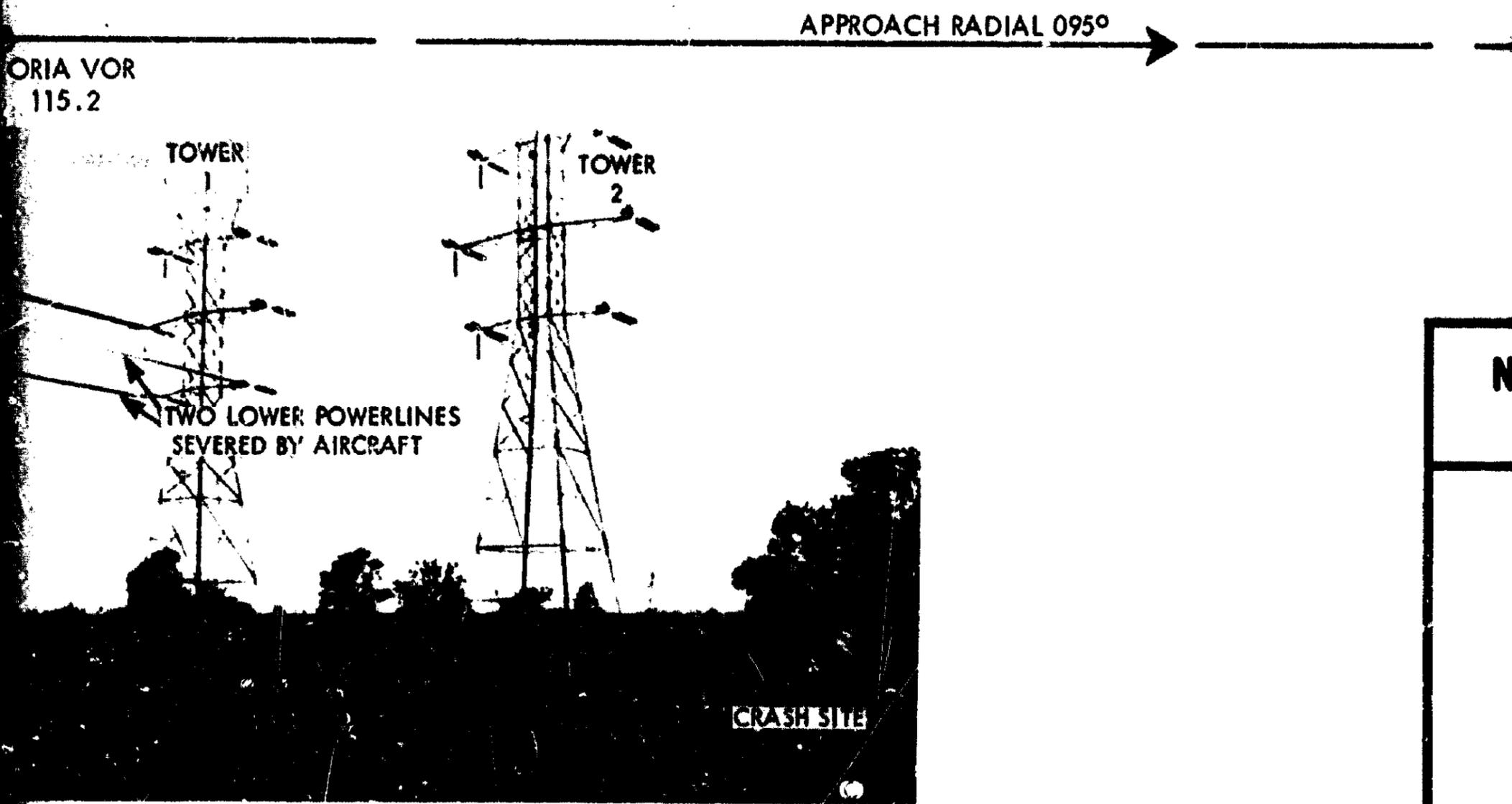
1800' MSL (1069' above ground level).

Note 1.

PROFILE VIEW



PLAN VIEW



DETAIL A

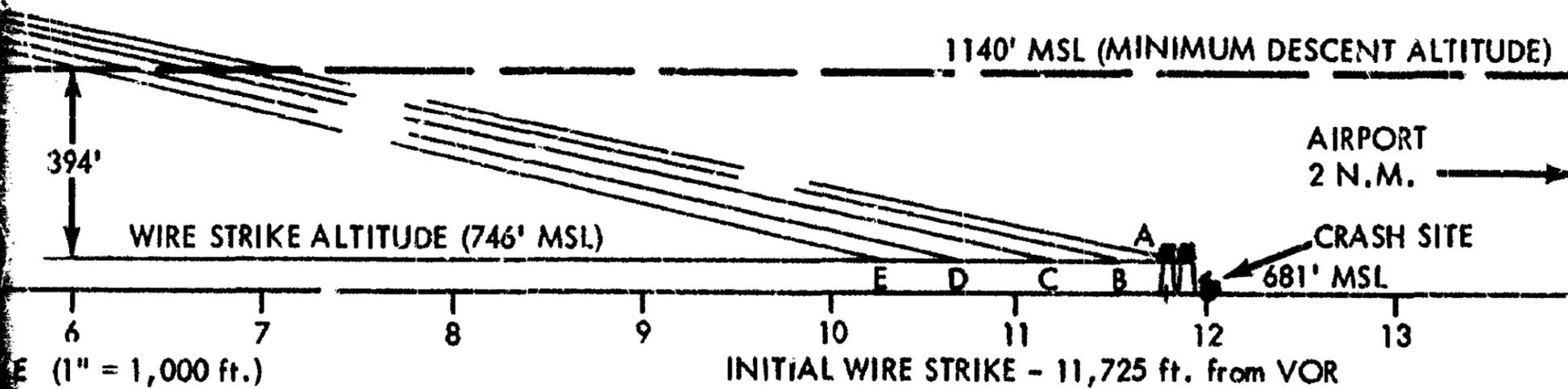
23

Note 3.

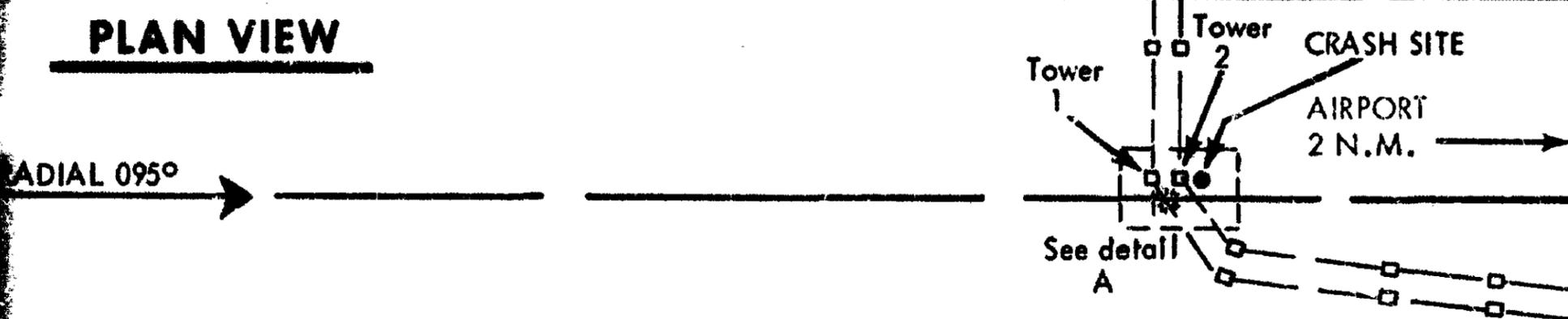
24

PROFILE VIEW

APPENDIX F



PLAN VIEW



NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D. C.

CALCULATED DESCENT PROFILES

CHICAGO AND SOUTHERN AIRLINES, INC.

AMERICAN TURBINE WESTWIND II N51CS

**APPROX. 2 NAUTICAL MILES WEST OF
GREATER PEORIA MUNICIPAL AIRPORT,
PEORIA, ILLINOIS, OCTOBER 21, 1971**

24

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

APPENDIX G

ISSUED: May 10, 1972

Adopted by the NATIONAL TRANSPORTATION SAFETY BOARD
at its office in Washington, D. C.
on the 19th day of April 1972

FORWARDED TO:
Honorable John H. Shaffer
Federal Aviation Administration
Department of Transportation
Washington, D. C. 20591

SAFETY RECOMMENDATION A-72-51 thru 55

Investigation of the air taxi accident of Chicago & Southern Airlines, Inc., on October 21, 1971, in the vicinity of Peoria, Illinois, disclosed regulatory areas that require consideration for corrective action.

The National Transportation Safety Board believes the following areas require review by the Federal Aviation Administration:

A. BACKGROUND INVESTIGATION OF APPLICANTS FOR ATCO CERTIFICATES AND CHECK PILOT AUTHORITY

With the expansion of scheduled air taxi operations, and with many of the air carriers having a form of interline agreement with scheduled air taxi operators, the Board believes that there is a need for increasing the requirements for a background investigation of Part 135 operators to improve the overall safety of their operations.

Review of the Federal Aviation Administration Commuter and V/STOL Air Carrier Handbook (8430.1A) did not disclose adequate guidelines for a background investigation of a check pilot applicant or a requirement to consider the background of an applicant for an ATCO certificate. Without specific requirements that such checks be accomplished, the possibility exists that an applicant who has a record of below standard safety performance and who has been cited with numerous FAR violations may be issued an ATCO certificate or be given a check pilot authority.

To augment a background query, a central clearinghouse within the FAA is needed where information would be maintained on a company/applicant name cross-reference

Honorable John H. Shaffer

APPENDIX G

basis for violations of the regulations and for involvement in accidents and incidents. At the present time, a General Aviation District Office (GADO) or an inspector has no expedient method to collect such data for consideration.

Review of Federal Aviation Regulation Part 135 disclosed that there is no provision giving a GADO authority to refuse to issue an ATCO certificate, on the same basis for which one could be suspended or revoked. The Board believes that such authority is paramount to facilitating adequate safety guidance and control.

The Safety Board recommends that:

1. Explicit requirements for background investigation of applicants for ATCO certificates and check pilot authorization be incorporated into the Commuter and V/STOL Air Carrier Handbook (8430.1A).
2. A central facility be provided within the FAA where information would be maintained on a company/applicant name cross-reference basis for violations of the regulations and for involvement in accident and incident data.
3. The FAA promulgate a provision in FAR Part 135 giving a GADO the authority to refuse an ATCO certificate on the same basis for which one could be suspended or revoked.

B. USE OF AVERAGE PASSENGER WEIGHTS VERSUS ACTUAL OR DECLARED WEIGHTS

In the course of the investigation it was noted that the operator was authorized in his Operations Specifications to use average, assumed or estimated passenger weights in computing the weight and balance of the aircraft. Review of past history reveals that small aircraft are extremely critical to weight-and-balance variances, and that the majority of accidents for which weight and balance was assessed to be in the causal area occur to small aircraft.

The operational difficulties in making advance reservations, or in maintaining an economically feasible schedule if actual scaled passenger weights are made a requirement is recognized. Therefore, the Board recommends that:

4. The Federal Aviation Administration require the use of either actual scaled or passenger declared weights for those aircraft under 12,500 pounds that are employed in commercial or air taxi operations. The use of declared weights should be restricted to those operators receiving specific authority from the FAA.

C. FLIGHT TIME LIMITATIONS

Investigative findings and hearing testimony pertaining to flight time and flight time violations disclosed that FAR Part 135 does not prescribe maximum yearly or monthly flightcrew flight time limitations, nor does it prescribe a 7-day duty time limitation.

Honorable John H. Shaffer

APPENDIX G

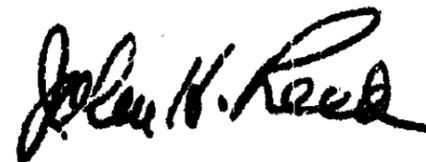
Although there is no definitive measure for pilot fatigue or positive method to determine that an accident was fatigue induced, the Board believes that pilot fatigue does cause accidents. Therefore, there is a need for practical flight time limitations, especially for commercial operations. Under the present provisions of FAR 135.136, a pilot can fly as much as 310 hours in a 31-day period. Reference to FAR 121.503 (Flight time limitations pilots airplanes) reflects that it limits pilots of supplemental air carrier and commercial operators that operate under the provisions of FAR 121, to 100 hours during any 30 consecutive days and 1,000 hours during any calendar year. These limitations were adopted for the primary purpose of preventing fatigue-induced errors by commercial flightcrews of large aircraft. The Board believes that similar limitations should also apply to Part 135 operators. Therefore, the Safety Board recommends that:

5. The Federal Aviation Administration revise FAR 135 to provide adequate flight and duty time limitations.

Our technical staff is available for any further information or clarification if required.

These recommendations will be released to the public on the issue date shown above. No public dissemination of the contents of this document should be made prior to that date.

Reed, Chairman; Laurel, McAdams, Thayer and Burgess, Members, concurred in the above recommendations.



By: John H. Reed
Chairman