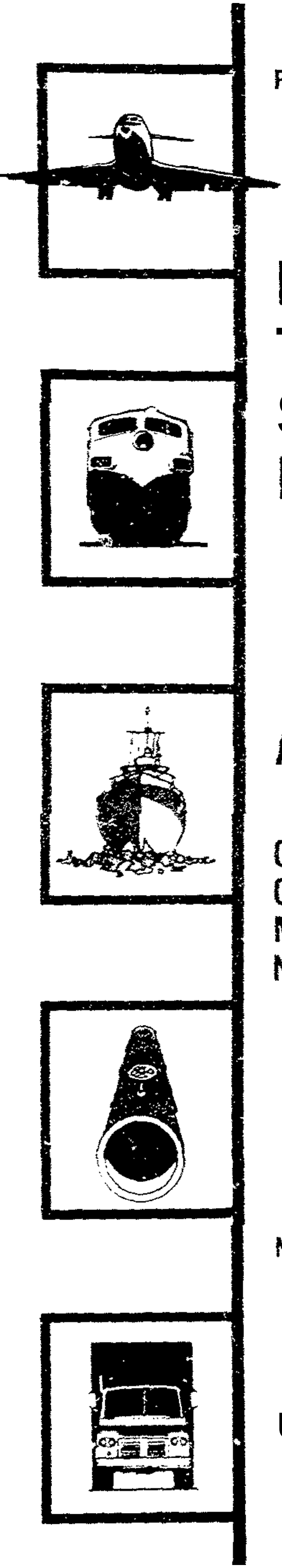

PB83-910404

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT REPORT

COIN ACCEPTORS, INC.
CESSNA MODEL 551, CITATION II, N2CA
MOUNTAIN VIEW, MISSOURI
NOVEMBER 18, 1982

NTSB/AAR-83/04

UNITED STATES GOVERNMENT

TECHNICAL REPORT DOCUMENTATION PAGE

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16. Abstract

At 0930, on November 18, 1982, a Cessna Model 551, Citation II, N2CA, with a pilot and two passengers on board, crashed immediately after takeoff from runway 28 at Mountain View Airport, Mountain View, Missouri. The pilot and both passengers were killed. The airplane was destroyed by the crash and the postcrash fire.

At the time of the accident, the weather at the Mountain View Airport was a ceiling of about 100 feet, with visibility about 1 mile in fog. The pilot had requested an IFR clearance, valid until 0930, from air traffic control. He arrived at the airport between 0920 and 0925. He boarded his passengers, loaded the baggage, and started both engines. According to witnesses, the takeoff was started about 2 minutes after the second engine was started. The takeoff appeared to be normal! however, the airplane crashed less than 3 minutes later, 1.75 miles due north of the airport. There were no witnesses to the accident.

The National Transportation Safety Board determines that the probable cause of the accident was the loss of control of the airplane following the takeoff in instrument meteorological conditions as a result of the pilot's use of attitude and heading instruments which had not become operationally usable and/or his partial reliance on the copilot's flight instruments which resulted in an abnormal instrument scan pattern leading to the pilot's disorientation. Contributing to the accident was the pilot's hurried and inadequate preflight procedures.

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Adopted: July 19,1983

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CESSNA MODEL 551, CITATION II, N2CA
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SYNOPSIS

At 0930, on November 18, 1982, a Cessna Model 551, Citation II, N2CA, with a pilot and two passengers on board, crashed immediately after takeoff from runway 28 at Mountain View Airport, Mountain View, Missouri The pilot and both passengers were killed. The airplane was destroyed by the crash and the postcrash fire.

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1. FACTUAL INFORMATION

1.1 History of the Flight

On November 17, 1982, the pilot of a Cessna CE-551, Citation II, N2CA, called Vichy Flight Service Station (FSS) and filed a request for an instrument flight rules (IFR) clearance for a flight from Mountain View Airport, Mountain View, Missouri, to Lambert - St. Louis international Airport, St. Louis, Missouri, for the following day. The piiot requested the IFR ciearance for a 0930 departure. The flight was to be operated under 14 CFR Part 91, and the purpose of the flight was to transport the pilot, who was the president of the company which owned N2CA, and two passengers to St. Louis. Neither passenger was a pilot.

Earlier on November 17, the pilot and the company's chief pilot had flown N2CA to Mountain View Airport from St. Louis. The chief pilot said that there were no mechanical deficiencies with the ai-plane, but that he believed that some of the avionics equipment was slow to warm up and become operationally usable. The Global Navigation System (GNS) 1/ required 4-5 minutes to become operationally usable from the time it was turned on According to the chief pilot, the attitude director indicator (ADI) on the pilot's side also required more time to become operationally usable than some of the other avionic equipment. He stated that there had been occasions when "we've had to sit for 1-1 1/2 minutes waiting for the artificial horizon to leave its caged position and go to the normal flight position." He also stated that in the last 10 flying hours, the pilot's heading indicator required more time "than normal to come on line." He said that the pilot had mentioned to him on the previous day that it was taking an increasingly longer time for the flag to disappear before the heading indicator was ready for use in flight. According to the chief pilot, the pilot stated that he (the pilot) occasionally would use the copilot's heading indicator during takecff until the heading information on the pilot's side was operationally usable.

After the flight to Mountain View Airport on November 17, the airplane was refueled with all tanks filked to capacity. A jet-A fuel supply recently had been installed at the airport; the airplane therefore could be "topped off" at Mountain View Airport instead of having to make an extra refueling stop. As a result, the airplane was about 3,400 lbs heavier for flight on the 18th than it had been in past takeoffs from Mountain View Airport.

About 0730 2/ c.s.t., November 18, the pilot called a fixed-base operator at Lambert - St. Louis International Airport and inquired about the weather. The operator was neither a pilot nor a weather observer. He told the pilot that the visibility was at least 1 1/2 miles, and the ceiling was "fairly low." The operator called the Lambert - St. Louis Air Traffic Control (ATC) Tower and inquired about ATC delays He then called the pilot back and relayed information about the ATC situation. There was no record of any other weather briefing.

At 0909, the pilot called the Vichy FSS for the IFR clearance. The pilot told the FSS specialist that he would need 15 minutes to get to the airport. He was given the clearance which was valid until 0930. The telephone conversation ended at 0914. The call was placed from the pilot's home.

Meanwhile, the chief pilot had conducted a preflight inspection of N2CA, and had taken the airplane out of the hangar. The pilot left his home shortly after 0915 end arrived at the airport between 0920 and 0925. The pilot then loaded the baggage and boarded the two passengers. The chief pilot said that both engines had been started by the time he had driven the tug back to the hangar and started to close the hangar door.

The airplane remained on the ramp for 15 to 30 seconds while a person handed some company materia! to the pilot through the cockpit window. The pilot was in the left cockpit seat, and a male passenger was in the right cockpit seat. The airplane was immediately taxied directly to runway 28, a distance of about 225 feet. The chief pilot said that the airplane was stopped on the runway for 30 to 60 seconds before the takeoff roll started. He said it was exactly 0930 by his watch when the takeoff roll started. He said that, assuming that the generators were turned on as soon as the second engine was started, about 2 minutes elapsed from the time they were turned on to the time the takeoff roll was started.

1/ GNS--A very low frequency radio navigation system which provides point to point navigation based on pilot-selected way points for programmed routes.
2/ All times herein are central standard time unless otherwise noted.

The chief pilot and another pilot at the airport described the takeoff as normal, although the airplane required about three-quarters of the runway before liftoff. The airplane disappeared from sight when it was 20 feet to 50 feet above the runway. The witnesses described the weather as low ceilings, reduced visibility because of fog, but no rain. The runway was damp from a previous rainfall. No significant winds were noted.

There were no witnesses to the accident. One person, located one-half mile northeast of the accident site, heard a "jet" fly over his house in a southwesterly direction and shortly afterward heard an explosion. A second person, located one-fifth mile north of the accident site, heard the airplane fly over his house on a southerly heading. He heard a loud explosion and immediately thereafter saw a fire in the woods. He and his sons ran toward the explosion. One son returned to call the sheriff; the call was placed through the operator and was logged at the sheriff's office at 0934. A call was received at a nearby State Police office at 0936.

The airplane crashed in a woods about 1.75 miles due north of Mountain View Airport on a heading of 120° in an attitude that was at least 30° nose down and a left bank of 90°. The airplane wreckage was spread over a 400-square-foot area. All three occupants died in the accident.

The accident occurred during the hours of daylight at 37° N latitude and 91° 41'30" W longitude.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Other	Total
Fatal	1	2	0	3
Serious	0	0	0	0
Minor/None	0	0	0	0
Total	1	2	0	3

1.3 Damage to Airplane

The airplane was destroyed by impact with trees and the ground.

1.4 Other Damage

There was some damage to the trees and a sizable crater in the ground in the area of the initial impact.

1.5 Personnel Information

The pilot was trained and certificated in accordance with current regulations. (See appendix B.)

The pilot was the president of Coin Acceptors, Inc., and several other companies. He was described by acquaintances and employees as a strong-willed, aggressive individual who had total confidence in himself as a pilot and as a businessman. He disliked wasting time, and he would schedule and conduct flights to minimize all delays. Pilots and individuals who had flown with him said he was a very skilled pilot, although he sometimes violated certain aviation safety practices. They also said that he was very comfortable with flying, and that he used his airplane as many people would use an automobile. Four persons said that they had been in the airplane with him when he had rolled the airplane; this [illegible] while in cruise flight above 18,000 feet.

Although Coin Acceptors employed a chief pilot, the president generally flew N2CA without a copilot. He routinely flew in instrument meteorological conditions, and be had logged about 815 hours of actual instrument flight time. He had flown about 3,350 total flight hours, of which 1,750 hours were in the Cessna Citation.

The chief pilot and a person who bad flown regularly with the pilot said that the pilot would use the autopilot and the GNS extensively. On flights to St. Louis, he would program the GNS for the flignt, and after takeoff, he would engage the autopilot and the GNS. According to the chief pilot, the pilot normally would allow the airspeed to increase to about 200 knots before starting a climbing turn on course.

The pilot had undergone an insurance medical examination on November 10, 1982. The physicians who conducted the examination said that the pilot was in excellent health. The company employee who spoke to and handed Some company material to the pilot shortly before takeoff could not recall if the pilot was wearing eyeglasses. However, he said the pilot kept sunglasses in the airplane and always wore them when he flew.

1.6 Aircraft Information

Tke airplane, a Cessna Model 551 Citation II, had been acquired new by Coin Acceptors. It was certified, maintained, and equipped in accordance with current regulations. (See appendix C.) The maintenance program for the airplane was conducted by a Federal Aviation Administration (FAA)-approved maintenance facility in Wichita, Kansas, and was approved under 14 CFR 91.169.

The airplane was equipped with two Pratt and Whitney Aircraft of Canada JT15D-4 engines. The airplane's takeoff weight was 13,047 lbs. There were 5,000 lbs of jet-A fuel on board before takeoff. The maximum allowable gross takeoff weight for N2CA was 12,500 lbs based on the certification requirements of 14 CFR Part 23. The airplane could nave been certificated under 14 CFR Part 25, which would have increased the airplane's maximum allowable gross takeoff weight Eo 13,300 lbs. However, two pilots are required for an airplane certifiested under 14 CFR Part 25, and Coin Acceptor's Inc., therefore had requested a type certificate under 14 CFR Part 23 to allow for single-pilot IFR flights.

A review of the airplane's maintenance records disclosed no recent mechanical deficiencies. As a result of autopilot problems in March, 1981, three autopilot computers were removed and replaced. The copilot's directional gyro was repaired in September, 1982.

1.7 Meteorological Information

At the time of the accident, the general weather conditions for the area from southern Missouri to the Guif Coast were characterized by fog, drizzle, and low stratus clouds There was no convective activity, nor were there reports of turbulence or wind shear.

There was no official weather observer at Mountain View Airport. However, witnesses at the airport reported that the ceiling was between 20 feet and 100 feet, and that the visibility was reduced by fog.

The nearest weather observation stations were Vichy, Missouri, 57 miles north of Mountain View Airport, and Springfield, Missouri, 75 miles west-northwest of the airport. No special observations were taken after the accident. The following hourly observations were recorded:

Vichy

0950: ceiling indefinite 400 feet obscured; visibility--2 miles, light drizzle and fog; temperature--51° F; dewpoint--49° F; wind--140° at 7 knots; altimeter--30.08 inHg.

Springfield

0950: ceiling measured 500 feet overcast; visibility--? miles; temperature--52° F; dewpoint-46' F; wind--150° at 8 knots; altimeter--30.05 inHg.

1.8 Aids to Navigation

Aids to navigation were not a factor in the accident. The nearest VORTAC was Maples VORTAC, located 36 nautical miles north-northwest of the Mountain View Airport. There was a nondirectional beacon located at the airport.

1.9 Communications

There were no known communications difficulties.

1.10 Aerodrome and Ground Facilities

Mountain View Airport, elevation 1,169 feet, is an uncontrolled, noncertificated, general aviation airport. The one asphalt runway (runway 10-28) is 4,700 feet long and 60 feet wide. Air-ground communications at the airport are provided on a uniform communications frequency (UNICOM) located in the airport manager's office. There were no hills or other obstructions in the departure area of runway 28.

1.11 Flight Recorders

The airplane was not equipped with a flight data recorder, nor was it required to be by regulation.

1.12 Wreckage and Impact Information

The airplane crashed in a heavily-wooded area. The airplane struck the ground left wing down and nose down on a magnetic heading of about 120°. Major components of the airplane were scattered over a 400-square-foot area. (See appendix D.) Most of the components, however, were strewn along a line from the point of initial ground contact to 300 feet on a magnetic heading sf about 120°. Examination of the area near the point of impact indicates that the wings did not strike the trees along the flightpath.

The airplane's collision with the ground produced a crater 63 feet long and about 4 feet deep. Small sections of the red glass from the navigation light lens on 'he left wing tip were found in the crater. Small portions of cockpit components, the pilot's side window frame, two pitot masts, and the vertical gyro were found in the impact crater at a depth of 4 feet. Parts of both cockpit seats were also found in the crater.

All flight control surfaces, the wing flaps, and the landing gear were located in the main wreckage area. The landing gear and the wing flaps were fully retracted. The preimpact elevator, aileron, and rudder trim positions could not be determined. There was no evidence of corrosion or fatigue on any of the parts which were recovered. The flight control cables exhibited no preimpact damage.

The fuselage was completely destroyed by impact forces The entire fuselage had fragmented into small pieces from fuselage station (FS) 29 to FS 345. Sections of the fuselage aft of the wings from FS 345 to FS 533.25 exhibited severe fragmentation but were larger than the pieces from FS 29 to FS 345.

Examination of a battery, located 210 feet from the point of impact near the centerline of the wreckage path, disclosed no evidtnce of battery overheat. The hydraulic reservoir and the hydraulic valves and components exhibited no evidence of preimpact damage. The hydraulic filters were clean.

All major empennage components were located at the accident site. The vertical fin although twisted and compressed chordwise was intact and was attached to the aft fuselage. The rudder was attached to the vertical fin. The rudder trim tab was attached to the rudder, with both trim push-pull rods and jackscrews attached to the trim actuator. The hcrizontal stabilizer was separated from the empennage structural attachments. The horizontal stabilizer was compressed chordwise at the attachment point to a width of 7 1/2 inches; the normal width at that point is about 32 inches. Both left and right elevators had separated from the horizontal stabilizer. No components of the elevator control and trim systems exhibited preimpact damage.

Both wings were fragmented. The left wing tip was found near the impact crater and the right wing tip was found 169 feet from the left wing tip. There was no indication of preimpact damage or defects with any sections of the spars, spar caps, spar webs, or the wing spar joints. All spar webs were torn from the spars and spar caps. The webs were crushed and distorted. All wing ribs were crushed and compressed.

The two wing flaps and the flap drive were located. The flap drive was positioned for fully retracted flaps.

The ailerons were located in the main wreckage area, and there were no indications of preimpact damage.

The upper and lower speed brake panels had separated from the wing attachment points All the panels were located in the main wreckage area.

Both engines were separated from the airplane at the airframe engine mounts, and the low pressure compressor assemblies were located between 340 feet and 395 feet from the point of initial impact. Only the left engine was damaged by ground fire.

The fuel system received severe impact damage. All components including the two primary and boost fuel pumps were separated from their installed positions or fittings. Both manual shutoff valves were found; one valve was in the open position and the second valve was in the partially open position.

The cockpit instruments received severe impact damage. The encoding altimeter was damaged internally and the pointer was detached from the shaft. The barometric dial read 30.11 inHg and 1020 mb. The plastic sphere on the pilot's ADI was broken into many small sections, and the pieces were contained within the unit case. The horizon Line was in the vertical position from the zero bank indice on the roll scale to the bottom of the indicator. The blue portion of the attitude sphere was on the right side and the brown portion was on the left side. All pointers, warning flags, and command bars were missing. There were no marks which would indicate pitch or bank attitude at impact The copilot's ADI was not located.

Both the pilot's and the copilot's horizontal situation indicator (HSI) received extensive impact damage. The pilot's HSI indicated a heading of 20° on the compass card, and had a course pointer reading of 355'. Both NAV mode annunciator flags were in view. There were no pointers or flags remaining on the copilot's HSI. The compass card was in place and indicated a heading between 90 and 120°.

Both radio magnetic indicators (RMI) were damaged extensively by impact forces. The compass card on one RMI read 110°, the other read 020°.

1.13 Medical and Pathological Information

All occupants sustained fatal multiple injuries as a result of the accident. Post-mortem and toxicological examinations were conducted of the pilot and the two passengers. The examinations disclosed no evidence of preimpact incapacitation or preexisting physical or physiological problems which could have affected the pilot's judgment or performance or of any condition that would have incapacitated the passengers during the flight.

1.14 Fire

A ground fire developed after impact The left engine, parts of the fuselage, and all of the cabin seats were damaged by the fire.

1.15 Survival Aspects

The accident was nonsurvivable. The cockpit and cabin integrity was completely destroyed, and the restraint systems failed due to the very high impact forces. The piiot's lap belt was found in the latched position. There was no evidence to indicate whether the pilot had worn a shoulder harness. All cabin and cockpit seats were damaged severely.

1.16 Tests and Research

1.16.1 Powerplants

On December 7, 1982, Safety Board investigators examined both engines from N2CA at the Pratt and Whitney Aircraft of Canada facility. Both engines had been subjected to Severe impact damage. The engines were disassembled to the extent possible. Examination of the engines indicated that they were operating at impact and disclosed no evidence of preimpact malfunctions or damage.

The power stop lever for the fuel control unit pump module for the left engine was positioned at the "0" mark on the power lever position indicator. The power lever could be moved freely throughout its operating range, and no impact marks were noted on the indicator. The fuel control drive shaft rotated freely.

The fuel control unit body of the right engine had separated from the fuel pump. The control's power lever had broken off, and the power iever movemsnt could not be tested.

The main oil filter of the right engine was examined. There were no traces of metallic particles found on the filter cartridge.

The examination of the fuel controls did not indicate any preimpact damage or deficiencies

1.16.2 Fuel

A sample of the jet–A fuel from the Mountain View Airport fuei supply was analyzed in the Williams Pipe Line Company Central Laboratory, Kansas City, Kansas. The fuel sample met the requirements for aviation turbine fuels for jet–A or jet–A–1 except for the following: The minimum smoke point for jet–A and jet–A–1 is 25. The tested fuel was 24. The maximum freeze point for jet–A–1 is -52.6° F. The maximum freeze point of the tested fuel was -45° F.

1.17 Additional Information

1.17.1 Coin Acceptor's Inc., Operating Procedures

Coin Operator's, Inc., used the airplane checklist provided by the Cessna Aircraft Company. The BEFORE TAXIING and BEFORE TAKEOFF segments were as follows:

BEFORE TAXIING

1. Sights - AS REQUIRED.
2. Avionic Power Switches - INV 1 and ON.
3. DC Amperes and Volts - CHECK for normal reading.
4. Passenger Advisory Lights - PASS SAFETY.
5. Aft Facing Seat - CHECK FULL AFT ana UPRIGHT.
6. Avionics - AS REQUIRED.
7. Pressure - CHECK.
8. Temperature Select - AUTO.
9. Auto Temp Select - AS REQUIRED.
10. Cabin Fan - HI or LOW if the aft baggage compartment dividers are closed.
11. Pressurization - SET ALTITUDE & RATE.
12. AntiSkid - CFF.
13. Brakes - CHECK (During Taxi).
14. Anti–Ice System - CHECK: then AS KEQUIRED.

CAUTION

LIMIT GROUND OPERATION OF PITOT/STATIC HEAT TO TWO MINUTES TO PRECLUDE DAMAGE TO THE ANGLE-OF-ATTACK SYSTEM.

BEFORE TAKEOFF

1. Ignition - ON.
2. Engine Instruments - CHECK.
3. Fuel Quantity - CHECK.
4. Flight Instruments - CHECK.
5. Avionics - CHECK & SET.
6. Autopilot - ENGAGE; CHECX PITCH AND RGLL, HEADING MODE, ALT. MODE and TRIM. PUSH TO TEST MUST DISENGAGE AUTOPILOT.
7. Trim - SET.
8. Controls and Speedbrakes - FREE & CORRECT.
9. Flaps - SET.
10. Pressurization Source Selector - NORMAL.
11. V_1, V_R, V_2, Fan Speed Settings - CONFIRM.

12. Anticollision Lights - ON.
13. Pitot/Static Heat - ON.
14. AntiSkid - ON.
15. Annunciator Panel - CLEAR (Except ACM EJECTOR ON).

1.17.2 Pilot Training

The pilot received Cessna Citation transition training from American Airlines between June 21, 1977, and July 23, 1377. The training included the following:

Ground School	-	38.30 hours
Simulator	-	36.30 hours
Actual Flight Time	-	5.00 hours

The oral examination and the airplane flight cheek were administered by an FAA inspector.

The pilot completed two 3-day recurrent training sessions at Flight Safety International in June 1979 and August 1581. Both training sessions were completed satisfactorily. The recurrent training covered normal and emergency procedures

1.17.3 Air Traffic Control

The Vichy FSS at Rolla, Missouri, is the controlling facility for the Mountain View Airport area. The Kansas City Air Route Traffic Control Center (ARTCC) is responsible for the airspace over Mountain View and had N2CA's IFR flight plan on file. The recorded radar data for the Mountain View area at the time of the accident did not reveal any primary OF secondary radar targets. The lowest altitude at which radar coverage is available in the Mountain View area is between 4,000 feet and 5,000 feet; coverage is intermittent at 4,000 feet and reliable at 5,000 feet.

1.17.4 Flight Director System

The airplane was equipped with a Sperry SPZ-500 autopilot/Flight Director Instrument System. The s tem included an automatic pilot, the pilot's ADI, the pilot's HSI, air data computer with associated outputs, autopilot controller, vertical navigation system which included altitude alerter, touch control steering, a rate gyro, and autopilot servos.

The piiot's ADI was an AD-600, single-cue 5-inch display. (See figure 1.) Pitch and roll attitude reference data are provided by a high inertia gyro located forward of the cockpit. The performance data for the gyro indicate the following:

GYRO ERECTION - Vertical within 3 minutes after power is applied.

Once the gyro is erect and the attitude warning flag disappears, the attitude indicator provides the pilot with reliable attitude information. Taxiing the airplane before the gyro is fully er-cred will affect the accuracy of the ADI display even though the attitude waxing flag may not be visible.

If no power is applied to the ADI or if power is interrupted during normal operation, the attitude sphere will indicate a left bank. The roll-attitude pointer will be in the horizontal position with the blue portion of the sphere to the right of the pointer.

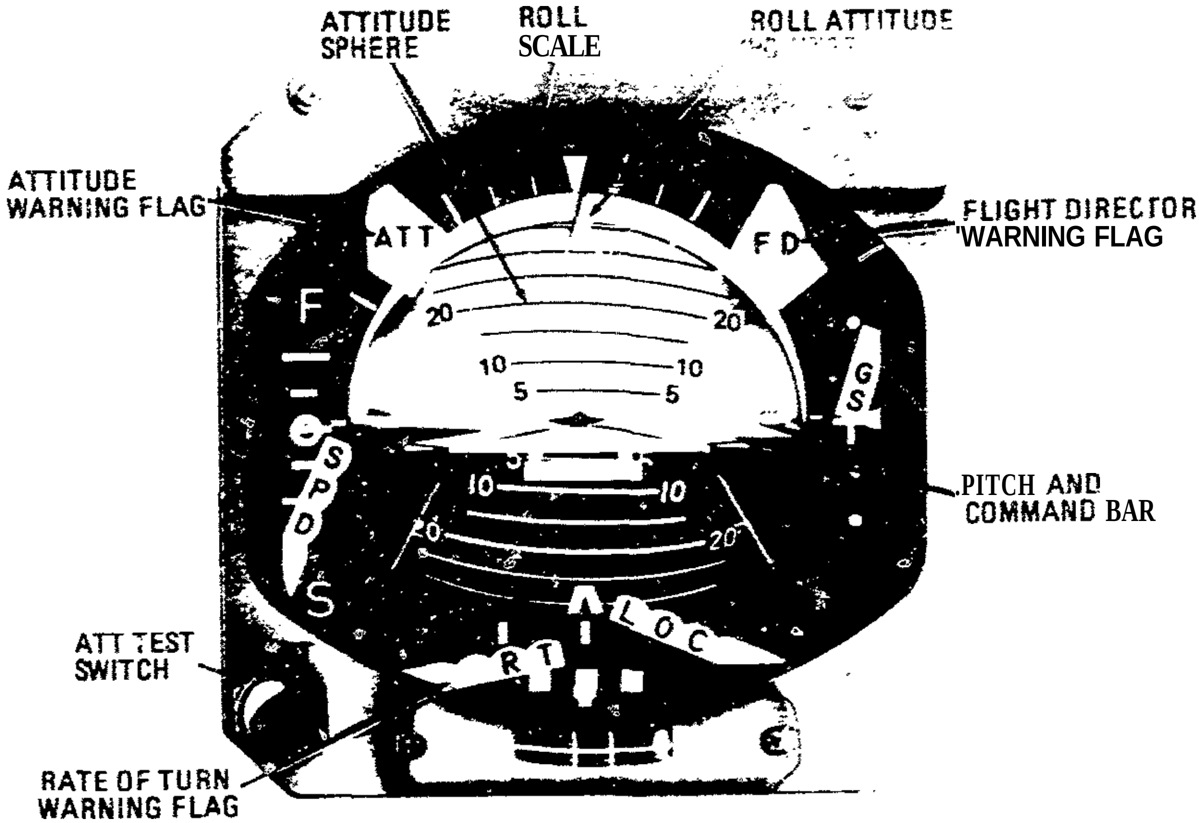


Figure 1.—Pilot's AD-600 Attitude Director Indicator.

The tolerance of the ADI in the unpowered state is 90° left bank ± 25°. Once power is applied to the system and the vertical gyro reaches operating speed to drive the ADI, the attitude sphere will move to a position where the roll attitude pointer aligns with the zero mark on the roll scale. At that time, the attitude warning flag disappears, and the pitch and roll command bar appears. The flight director warning flag disappears when power is applied to the flight director and will remain concealed unless the command bar information is unreliable. The attitude warning flag will also remain concealed unless the attitude information is unreliable. The autopilot can be engaged only when the gyros, which drive the ADI and the HSI, are operating properly.

The attitude sphere has the capability to provide attitude information up to ± 80° in pitch, and will rotate a full 360° when the airplane is rolled through 360°.

The copilot's ADI, a GH-14 Gyro Horizon, was a double cue, 4-inch instrument, with a self-contained vertical gyro. (See figure 2.) It required the same time to become operationally usable as the AD-600.

The pilot's HSI was a RD-600 5-inch display. (See figure 3.) The instrument is powered by a C-14 Gyrosyn Compass System (directional gyro), which provides primary

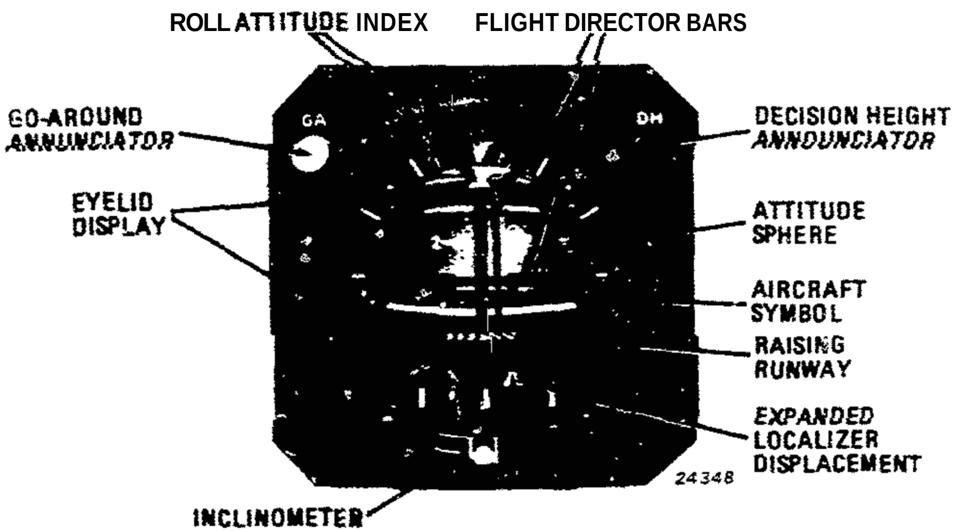


Figure 2.--Copilot's GH-14 Gyro Horizon Attitude Director Indicator.

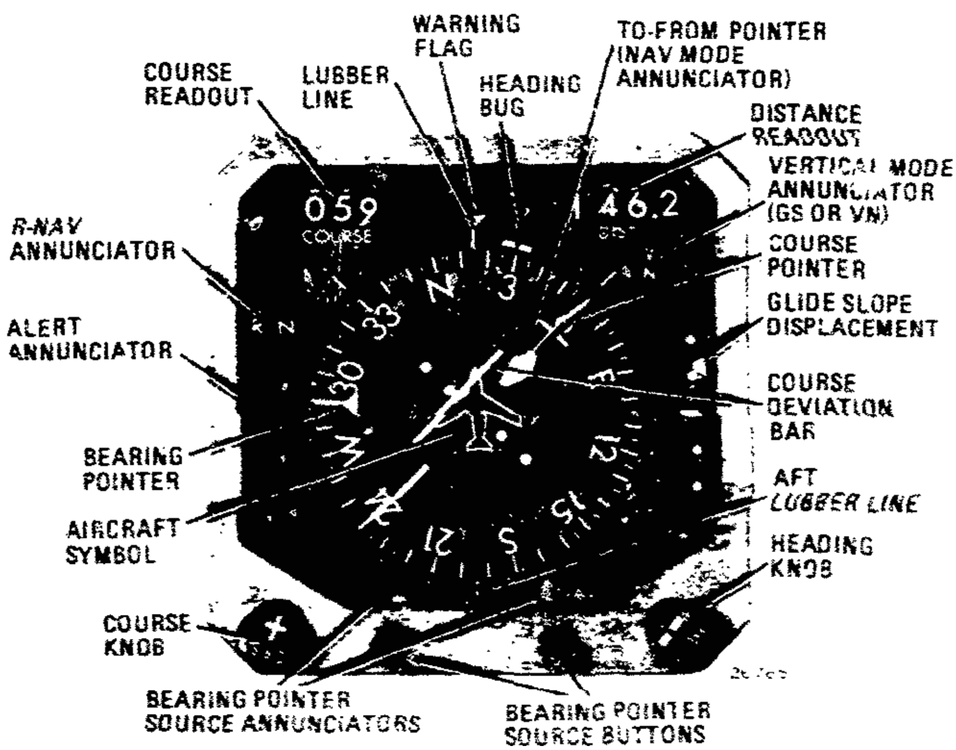


Figure 3.--Pilot's RD-600 Horizontal Situation Indicator.

heading data to the pilot's heading indicator and the automatic flight control including the yaw damper and flight director systems. The general specifications for the HSI and the C-14 system are as follows:

Start - Up Completely Automatic in Slaved Mode:

Time required for initial synchronization	-	45 seconds maximum
Time required for gyro wheel to reach full speed	-	3 minutes maximum

'he compass synchronization annunicator is located on the compass control panel.

Taxiing of the airplane before the directional gyro has synchronized or before the gyro wheel has reached full speed has a very small effect on the total start-up time.

The copilot's HSI was a RD-44, 4-inch display. (See figure 4.) The system has e compass synchronization annunicator. 'he display will oscillate between the two indicators when the system is in the slaved mode, indicating that the gyro stabilized rotating heading dial is synchronized with the airplane's magnetic heading.

Both HSI's have warning flags which appear if the heading information is not reliable, or if the gyro is not providing adequate power to the HSI.

In preparing the airplane for flight, the avionics power switch is turned on after both engines are started and after the generators are turned on. The time for the ADI's and HSI's to become operationally usable is determined from the time ?he avionics power switch is activated. Although a maximum of 3 minutes is required for She flight instruments to become operationally usable, the ADI and the HSI should have become operationally usable under the existing temperature conditions for the accident flight in about 2 minutes.

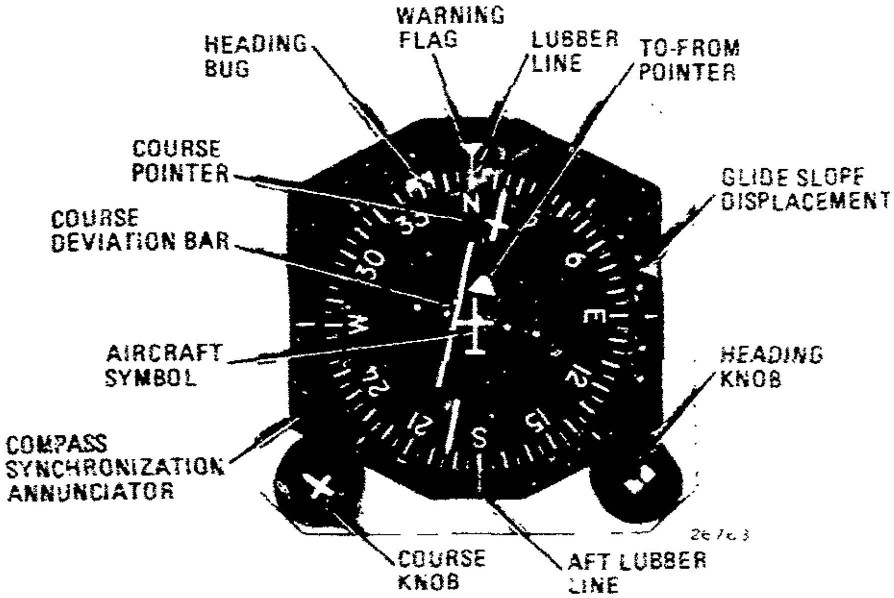


Figure 4.--Copilot's RD-44 Horizontal Situation Indicator.

1.18 New Investigative Techniques

None.

2. ANALYSIS

2.1 General

The airplane was certificated, equipped, and maintained in accordance with applicable regulations. The Safety Board's review of the airplane's maintenance records and the onsite examination of the wreckage disclosed no evidence of preimpact failure or malfunction of the airframe, powerplants, flight controls, or related components. Postaccident examination of the engines at the manufacturer's facility indicated that both engines were operating at the time of the initial impact. Each engine was producing a high level of thrust, although the exact thrust level could not be determined. The fuel control unit of each engine did not display any evidence of preimpact damage or malfunction.

The airplane exceeded the maximum allowable gross takeoff weight by about 500 lbs. However, the difference between the certificated maximum allowable takeoff weight of N2CA (12,500 lbs) and the allowable weight of a Cessna Model 551 (Citation II) certificated for a two-pilot operation (13,300 lbs) was not related to airplane structural limitations or performance. As a result, although the airplane exceeded its maximum allowable gross takeoff weight, the additional 500 lbs did not reduce the airplane's performance appreciably or alter the handling characteristics. Therefore, the additional weight was not considered a factor in this accident.

Aside from the low ceiling and limited visibility, there were no other meteorological conditions which might have contributed to the accident. The pilot had operated N2CA on many occasions in meteorological conditions similar to those which existed at takeoff from Mountain View Airport on the day of the accident. Therefore, the meteorological conditions should not have presented the pilot with any unusual flight problems.

2.2 The Accident

The Safety Board was not able to determine precisely the airplane's flightpath or its attitude along the flightpath, since there was no flight recorder information, recorded radar data, or eyewitnesses to the accident. However, analysis of the impact site and the airplane wreckage indicated that the pilot lost control of the airplane shortly after takeoff and that the airplane struck the ground in an uncontrolled attitude and at a high rate of speed.

The accident site was 1.75 miles north of the airport, and the duration of the flight, based on witness statements and police notification times, was less than 3 minutes and probably between 1 and 2 minutes. The airplane struck the ground while near a 120° heading in an attitude which was at least 30° nose down and a 90° banked attitude to the left. The lack of damage to the trees along the ground track to the impact site indicates that the airplane was in a steep bank just before it struck the ground. The pieces of the red lens from the left wing tip confirm that the left wing was down on impact. In addition, the position of the attitude sphere in the ADI after impact indicates that the airplane was in a 90° banked attitude to the left. The attitude sphere of the ADI will rotate to a 90° - 25° left bank if power to the instrument is interrupted. However, the extremely high-impact forces experienced by N2CA and the very small time period between initial impact and the crushing of the cockpit area would have locked the attitude sphere in the last attitude position before impact.

Given the location of the impact site, the approximate duration of the flight, and the attitude of the airplane at impact, the Safety Board considered two possible flight profiles. First, although the pilot would have started a right turn to a heading of 30° after takeoff from Mountain View Airport (a normal turn for the flight to St. Louis), it is possible, based on the very short distance of the impact site from the airport, that the pilot never rolled out on the 30° heading. Rather, for some reason, the airplane might have continued in a progressively steeper bank and tighter turn to the right which developed into a continuous roll to the right. The airplane could have rolled through 90° to the right to the inverted position and continued to a 270° right bank attitude or a left vertical bank of 90°, when the airplane struck the ground. During the continuous roll to the right, the airplane would have continued to turn sharply to the right, turning 200° from takeoff to ground impact on a 120° heading, 1.75 miles north of the airport.

A second possibility is that the airplane was stabilized on a 30° heading, was flown northeast for a very short time, and then was turned right to return to the airport for some reason. After the airplane was established on a southerly heading, a left turn would have been required to enter a right downwind for runway 28. If this flight profile had developed, the pilot could have lost control of the airplane in a steep, descending, high-speed left turn. However, this possibility must be discounted. The weather conditions precluded any visual flight with reference to the airport. In fact, the weather was below landing limits for an instrument approach procedure at Mountain View Airport. Additionally, if the pilot had made a decision to return to the airport, it is likely he would have contacted Kansas City ARTCC to advise the center of his intentions. Consequently, an in-flight situation similar to the first hypothesis is more likely to describe the flight profile of N2CA, since it accounts for a loss of control shortly after takeoff, the absence of radio communications, and the location of the crash site.

The absence of any recorded radar data indicates that the airplane did not climb to 4,000 feet mean sea level (or about 3,000 feet above ground level), and physical evidence indicates that the airplane struck the ground at a very high speed. The extensive fragmentation of the airplane and the injuries to the occupants indicate that very high decelerative forces were generated at impact. For example, compression of the horizontal stabilizer from a width of 32 inches to 7 1/2 inches, and the extensive crushing and compression to the wing spars, spar caps, and spar webs indicate extremely high impact forces. The depth and the length of the crater in very hard soil and rock at the initial point of impact further substantiates a high rate of speed at impact. The Cessna Aircraft Company estimated that if the airplane had reached 3,000 fee: above ground level in a continuous right roll and turn, and if a minimum 30° descent angle was maintained, the impact speed could have been near 500 knots

Based on the evidence, the Safety Boards investigation concentrated on three possible areas of causation: (1) pilot incapacitation or incapacitation of the passenger in the right cockpit seat, (2) malfunction or improper use of the flight and navigation instruments, and (3) pilot action.

23 Pilot Incapacitation

It is unlikely #at pilot incapacitation was a factor in the accident. The pilot had been examined by physicians 8 days before the accident and was found to be in excellent health. Furthermore, the toxicology results and the post-mortem examination revealed no medical problems. The pilot was observed by several close friends before the flight and up to the moment the airplane left the airport. All persons said that he appeared to be in good health. The very short duration of the flight would have required an immediate incapacitating condition after the airplane took off, which while possible, cannot be substantiated and is unlikely.

The Safety Board considered the possibility that the passenger in the right cockpit seat became incapacitated and disrupted the operation of the flight controls. However, this possibility is also unlikely since the toxicology results and the post-mortem examination of that passenger revealed no medical problems.

2.4 Malfunction of the Flight Instruments

The almost total disintegration of the engine and flight instruments and the avionics equipment made it impossible to examine most of the components, or to test the components. However, a review of the maintenance records disclosed no indication of previous incidents of unreiiable flight instruments or avionics equipment. The chief pilot did not recall any occasions where the flight instruments or the avionics equipment had been unreliable or faulty. Interviews with personnel at the facility which maintained N2CA and with those persons who knew the pilot indicated that if there were any known deficiencies with the airplane's flight instrumentation, the deficiencies would have been corrected before flight into instrument meteorological conditions.

The Safety Board believes that the position of the attitude sphere of the pilot's ADI indicated the actual attitude of the airplane at impact -- 90° banked attitude to the left. The Safety Board realizes that the attitude sphere woulo have gone to the left bank position if there had been a power failure. However, it is unlikely that the attitude sphere would have gone precisely to the 90° point, since the tolerance of the RD-600 was 50° ± 25°. Furthermore. the physical evidence near the impact site and the location of portions of the airplane wreckage in the impact site support the conclusion that the pilot's ADI essentially portrayed the *Sank* attitude of the airplane at impact This finding, and the absence of a history of ADI problems, leads the Safoty Board to conclude that the pilot's ADI was functioning properly at the time of the accident.

Although both HSI's were damaged severely, the copilot's compass card indicated a heading of 90° to 120°, which was generally coincident with the airplane's heading at impact. The pilot's HSI indicated 20°. If the gyro which drove the pilot's HSI was slow in bringing the HSI up to speed, as had occurred according to the chief pilot in previous flights, the difference between the two compass readings can be explained. It *was* concluded that the copilot's HSI was operating properly and providing accurate heading information to the pilot, while the pilot's HSI had not become completely operationally usable at impact A difference in the times required for the HSI's to come up to speed hed been noted by the chief pilot, who also said that the pilot had used the copilot's HSI for heading information on the previous **day** because the pilot's HSI was slow in becoming operationally usable. In summary, the evidence points to a conclusion that the two HSI's on the airplane were not completely functional. However, it appears that the copilot's HSI was providing accurate heading information and that the pilot's ADI probably was providing accurate attitude information at impact.

The Safety Board could make no evaluation of the autopilot system OF the GNS because of the almost complete destruction of the associated components.

2.5 Pilot Actions

In the absence of positive indications that the flight instruments **and** avionics equipment had malfunctioned, the Safety Board examined the **possibility** that the pilot did not use the equipment properly. The HSI and the ADI require a maximum of **3** minutes, depending on the temperature, for the appropriate gyros to be erecred ana to provide heading and attitude information to the flight instruments. These time limits are reasonable and are common to most similar flight instrument systems. The chief pilot stated that the pilot's HSI was slow to become operationally usable. There was, however, no indication that, once operationally usable, the HSI information was unreliable. The same comment was made concerning the pilot's ADI, although this instrument usually was operationally usable before the pilot's HSI. Consequently, the Board concludes that the performance of the flight instruments and avionics equipment on N2CA, as described by the chief pilot, did not represent a malfunction of the equipment. Rather, the Safety Board believes that the pilot's impatience made him unwilling to await the time required for his night instruments and avionics equipment to become operationally usable. This impatience was evident on the day of the accident when the pilot allowed only about 2 minutes from the start of the engines until the takeoff was started. Additionally, the chief pilot's ststement that the pilot would sometimes use the copilot's HSI rather than wait for the pilot's HSI to become operationally usable was indicative of the pilot's general impatience in waiting for the instruments to become operationally usable.

The Safety Board finds it difficult to accept that any airplane, but especially a complex multiengine, turbine-powered airplane, can be started with the appropriate checklists procedures observed, and the airplane taxied to the active runway in less than 5 minutes This apparently was done by the pilot of N2CA on this flight, with the result that most likely the GNS and the pilot's HSI had not achieved fully operational usefulness. The Board believes, however, that the pilot's ADI was properly erected, based on the examination of the instrument and the belief that no pilot would attempt instrument flight without reliable attitude information.

The investigation revealed that the pilot was conscientious about the maintenance and care of N2CA and that he had established a regular program of recurrent ground and flight training for himself and his chief pilot. His initial preflight preparations were thorough, as indicated by the preflight inspection of N2CA which the chief pilot conducted on November 17, and the pilot's call to the Vichy FSS on that same day to file his IFR clearance request. However, the manner in which he approached the operation of N2CA was often in direct contradiction to his responsible programs for maintenance and training. His most apparent shortcoming in the operation of N2CA was failing to allow time to properly perform the pretakeoff checklist and to prepare the airplane for flight in instrument conditions Moreover, interviews with persons who knew the *pilot* indicate that he normally operated the airplane in a hurried manner without the thorough use of appropriate checklists

On the morning of the accident, the pilot called the flight service station and requested an IFR clearance. He said he would be ready for takeoff in 15 minutes, and accepted a clearance with a void time of 0930. The pilot did not request a weather briefing for his flight, although he knew that instrument meteorological conditions existed at his destination. Within 15 minutes, the pilot had to drive to the airport, load his passengers and bags, and go through the following checklists: Before Starting Engines; Starting Engines; Before Taxiing; Before Takeoff; and Takeoff. The pilot did not arrive at the airport until sometime between 0920 and 0925, when he boarded his passengers and bags The pilot had less than 5 minutes to perform all the prestart. start taxi and takeoff checklists. According to the chief pilot, about 2 minutes elapsed from the first time the avionics equipment could have been turned on until the airplane started the takeoff roll. The Safety Board believes that ail the required preflight items including an avionics check and a cheek of the autopilot system could not have been accomplished within 2 minutes. The autopilot check itself, which could easily require at least 30 seconds, consisted of engaging the autopilot and observing correct responses in the pitch, roll, heading modes, the altitude mode and trim. Operation of the autopilot system also required proper operation of the flight director system.. Consequently, the Board concludes that the pilot did not perform some items on the before takeoff checklist.

Further, the Safety Board can only conclude, given the time schedule the pilot had established, that inadequate time was allowed before takeoff to prepare for the flight The inadequate preflight preparation time led to a hurried departure and probably a cursory execution of the required checklists The existing weather should have dictated that the pilot prepare thoroughly for the flight since he knew he would encounter instrument conditions immediately after takeoff. The Safety Board also is concerned that a pilot would consider flight before the flight instruments and avionics equipment were operating properly. If, as the chief pilot stated, the pilot used the copilot's HSI rather than wait the additional few minutes for his HSI to become operationally usable, the pilot's sense of urgency clearly created hazards to safe flight. Certain limitations and procedures are inherent in the operation of airplanes, and pilots must observe the limitations to insure safety. By his actions preceding this accident, the pilot could well have deprived himself of his primary heading information instrument, the GNS, and the autopilot, by starting the takeoff before his flight instruments and avionics equipment had become operationally usable.

Based on the times required for the flight instruments and avionics equipment to become operationally usable, the cockpit procedures the pilot often used, and the known times from engine start to the beginning of the takeoff, the Safety Board concludes that the pilot did not have all of the available flight guidance systems operationally sable when he began the takeoff The Safety Board believes that the pilot's ADI was functioning, since that instrument did not have a history of slowness in reaching an operational status and its postimpact condition approximated the airplane's impact attitude. Furthermore, attitude information was most critical to the flight, and the pilot had waited for the instrument to erect properly on the previous day. However, it is likely that the pilot's HSI was not operationally usable, based on the chief pilot's statement and the postimpact position of ihe compass card. Therefore, the Safety Board believes that the pilot began the takeoff using his ADI and the copilot's HSL This would heve caused a disruption of the normal instrument scan pattern. Since it appears that he had resorted to this technique only recently, the use of a nonstandard, unorthodox, instrument Scan and the failure to monitor all the flight instruments probably could have led to disorientation and the loss of control of the airplane. A further factor wouid have been the increased pilot workload in flying the airplane manually instead of relying on the autopilot.

As in other cases involving multiengine, turbine-powered general aviation airplanes, the Safety Board's investigation and analysis of the accident causation was hindered by the lack of a cockpit voice recorder (CVR) and a flight data recorder (FDR) on the airplane. On April 13, 1918, the Safety Board issued Safety Recommendations X-79-27 through -29, which urged the development and installation of CVR's and FDR's for complex general aviation airplanes. On August 21, 1982, the Safety Board issued Safety Recommendations A-82-106 through -111, which again urged the FAA to develop recorder standards and regulatory amendments to place modern flight recorders on multiengine, turbine-powered, fixed-wing airplanes and rotorcraft The value of flight recorders in identifying airplane design deficiencies operational problems, and other subtle human factors influences has been established in those accidents where recorders were present, and the need for these devices in complex general aviation airplanes in aiding in accident investigation and prevention has become increasingly apparent. The previous recommendations applied to multiengine, turbine-powered airplanes which require a two-pilot crew. However, tine Cessna Citation II is frequently certificated for two pilots. Additionally, the facts of this accident support the need for flight recorders in multiengine, turbine-powered airplanes. As a result of this accident, the Safety Board reiterates Recommendations A-82-106 through -111 to urge the FAA to expedite rulemaking to require recorders on multiengine turbine-powered airplanes and rotorcraft.

3. CONCLUSIONS

3.1 Findings

1. There was no evidence of physical impairment or incapacitation of the pilot.

2. The airplane was certificated, equipped, and maintained in accordance with regulations

3. There was no evidence that the airplane structure, systems, powerplants, avionics equipment, or flight instruments malfunctioned or failed.

4. The pilot allowed minimal time for the preflight and prestart procedures.

5. The pilot either did not use the airplane checklists or . performed the checklists in an incomplete and perfunctory manner.

6. About 2 minutes elapsed from the time the avionics master switch was turned on until the takeoff was started.

7. The pilot's horizontal situation indicator probably had not become operational at the time the takeoff was begun.

8. The takeoff was probably made with the pilot flying the airplane manually using attitude information provided by the pilot's attitude director indicator, but most likely using the copilot's horizontal situation indicator for heading information

9. The low ceilings deprived the pilot of outside visual references; however, there was no indication that the airplane encountered turbulence.

3.2 Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was the loss of control of the airplane following the takeoff in instrument meteorological conditions as a result of the pilot's use of attitude and heading instruments which had not become operationally usable and/or his partial reliance on the copilot's flight instruments which resulted in an abnormal instrument scan pattern leading to the pilot's disorientation. Contributing to the accident was the pilot's hurried and inadequate preflight procedures

4. RECOMMENDATIONS

As a result of this accident, the National Transportation Safety Board reiterates the following recommendations which were made to the Federal Aviation Administration on August 31, 1982:

> Encourage timely adoption of the Society of Automotive Engineers (SAE) standard for "general aviation" flight recorders (intended for installation in multiengine, turbine-powered fixed-wing aircraft and rotorcraft in *any* type of operation not currently required by 14 CFR 121.343, 121.359, 135.151, and 127.127 to have a cockpit voice recorder and/or a flight data recorder), and issue a Technical Standard Order (TSO) covering such recorders immediately after the SAE document is approved. Include in the TSO requirements that:

a) specify a cockpit voice recorder (CVR) of high enough audio quality to render intelligible recorded dats on each of two channels which reserves 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;

b) specify all flight data recorder (FDR) parameters, ranges, accuracies, and sampling intervals cited in Tables I and II (attached);

c) specify crash and fire survivability standards for CVRs and FDRs which are at least as stringent as those of TSO-C51a for Type I (nonejectable) and Type III (ejectable) recorders as appropriate.

(Class I, Urgent Action) (A-82-106)

Require that all rnultiengine, turbine—owered, 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, **121.359,** 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 "generai aviation" flight data recorder to record sufficient data parameters to determine the information in Table I (attached) as a function of time. (Class II, Priority Action) (A-82-107)

Require that all rnultiengine, turbine-powered 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 127.127 **to** nave a cockpit voice recorder and/or a **flight** data recorder, be prewired to accept a "general aviation" cockpit vcice 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 **11** (attached) **as** a function of tine. (Class II, Priority Action) (A-82-108)

Require that "gfneral aviation" cockpit voice recorders (on aircraft Certificated **for** two-pilot operation) and flight data recorders be installed when they bec .ne 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 127.127 to have a cockpit voice recorder and/or a flight data recorder. (Class III, Longer Term Action) **(A-82-109)**

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 reserve3 for voice communications transmitted from or received in the aircraft by radio, and one channel reserved for audio signals from a cockpit area microphone. (Class II, Priority Action) (A-82-110)

Require that "genera! 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 informaticn as a function of time (see Table I (attached) for ranges, accuracies, etc):

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

(Class 15, Longer Term Action) (A-82-111)

The FAA responded to Safety Recommendation A-82-106 through -111 on December 15, 1982. The Safety Board classified the FAA response to each of the six recommendations as "Open--Acceptable Action," since the FAA indicated that positive action was in process to resolve the issues of each safety recommendation. However, the FAA's response was not totelly acceptable, since it indiceted some confusion about the intent of the recommendation. The Safety Board's concern about the FAA's response was stated in a letter to the FAA which raid:

> In your response letter of December 15, 1982, you not only referred to Safety Recommendations A-82-106 through -111, but also to Safety Recommendations A-82-66 and -67 which were issued on July 13, 1982. These latter two recommendations specifically addressed the kinds of recorders required on large aircraft operating under 14 CFR 121 and 127. Since Safety Recommendations A-82-66 and -67 deal with a completely different application of flight recorders than Safety Recommendations A-82-106 through -111 ("general aviation" recorders), we perceive that some confusion may exist in the minds of the Federal Aviation Administration (FAA) evaluating staff as to the thrust of our recommendations. In any event, this linkage ot two different series of recommendations has made it difficult for the Safety Board to assess your response.

The Safety Board will continue to monitor the FAA's progress with respect to these safety recommendations However, the recommendations are reiterated to urge the FAA to expedite action on the safety issues, and to underscore the intent of the safety recommendations to the FAA.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JIM BURNETT
Chairman

/s/ PATRICIA A. GOLDMAN
Vice Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ G. H. PATRICK BURSLEY
Member

/s/ DONALD D. ENGEN
Member

July 19, 1983

5. APPENDIXES

APPENDIX A

INVESTIGATION AND BEARING

1. Investigation

The Safety Board was notified of the accident about 1130 e.s.t., on November 18, 1982, and immediately dispatched an investigative team to the scene. Investigative groups were established for operations, witnesses, powerplants, structures/systems, human factors and maintenance records.

Parties to the investigation were the Federal Aviation Administration, Cessna Aircraft Company, Coin Acceptors, Inc., and Pratt and Whitney Aircraft Group.

2. Public Hearing/Depositions

No public hearing or depositiors were conducted.

APPENDIX B

PERSONNEL INFORMATION

R. Claude Trieman

Mr. Trieman, 64, was the president of Coin Acceptors Inc. He held a private pilot's certificate for airplane, multiengine with an airplane instrument rating. He received a type rating in the Cessna Model 551 Citation II on July 23, 1977. He completed e Biennial Flight Review August 26, 1981. Mr. Trieman had a total of 3,750 flight hours, of which 1,750 hours were in the Cessna Citation; about 1,675 hours were as pilot-in-command of the Cessna Citation.

He held a third class medical certificate issued June 18, 1981, which contained the limitation that the "Holder shall possess correcting glasses for near vision while exercising the privileges of his airman certificate."

Mr. Triernan ned flown .5 hours in the previous 24 hours. In the pest 30 and 90 days, he had flown 20 hours and 60 "tours, respectively.

APPENDIX C

AIRCRAFT INFORMATION

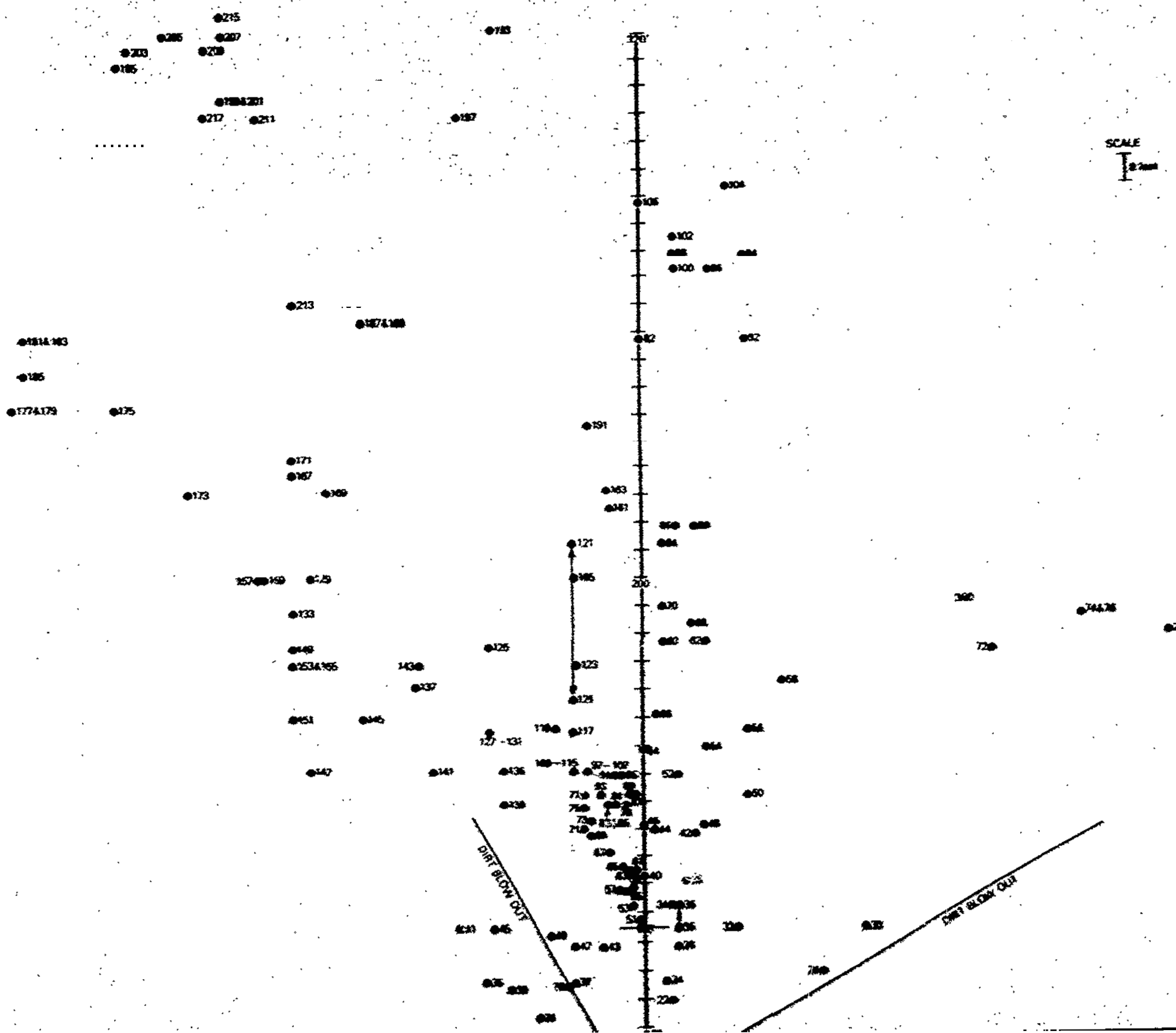
The airplane, a Cessna Model 551 Citation II, N2CA, serial number 551-0024, was purchased by Coin Acceptors, Inc., and been had flown about 1,155 hours since new. The airplane was equipped with two Pratt and Whitney of Canada engines, model JT15D-4. Each engine total time since new was about 1,155 hours

LEFT SIDE

ITEM	DOWN	OUT	DESCRIPTION
1	0	0	FUEL VENT TUBE
3	8	5	LEADING EDGE STRINGER
5	8	10	RED GLASS FROM NAV LIGHT LENS
7	13	0	FUEL PROBE
9	24	8	LEFT HAND WING TIP & DEICE BOOT 5523765-53
11	25	0	FORWARD TRUNION
13	29	5	COCKPIT SIDE WINDOW
15	20	6	RUDDER TIP
17	30	5	RUDDER NAV LIGHT GRIMES 40-0100-1
19	41.5	4	BALANCE WEIGHT & STRUCT. ELEV. 70R 5534150-3
21	46	8	POWER BRAKE VALVE
23	48	40	LH WING TIP-TRAILING EDGE FUEL BAY
25	51	10	STUB WING SPLICE PLATE
27	51	20	WEMAC
29	56	8	PULLEY BRACKET 6665396-10
31	75	30	RADOME SKIRT RH
33	64	22	MAIN SPAR ATTACH POINT TO STUB WING
35	85	45	ENGINE OIL FILLER DOOR
37	86	20	SONIC VENTURE
39	84	38	RUDDER RIB WC 236.95 5533110-48
41	100	53	CABIN DOOR & AFT CABIN SIDE STRUCT. BURNT
43	95	12	EMERGENCY PRESSURATION VALVE NO. 228456
45	100	43	RH NOSE BAGGAGE DOOR
[illegible]	[illegible]	[illegible]	[illegible]
49	98	27	RUDDER CHANNEL 5533000-3
51	102	1	SPERRY SERVO DRIVE 4006719-906
53	106	3	FUEL CONTROL PP & RH
55	110	5	LH REAR SPAR JOINT-STUB WING
57	110	7	SPEED BRAKE UPPER
59	111	3	ENGINE COWL
61	116	2	TR (THRUST REVERSER) STANG
63	116	4	ENGINE CARRY THRU BEAM & RH ENGINE MOUNT
65	117	6	SKIN LEADING EDGE VERTICAL FIN

ITEM	DOWN	OUT	DESCRIPTION
67	121	10	LH ELEVATOR COMPLETE BALANCE WEIGHT
69	126	15	FRAME TAILCONE 5512022-11
71	128	7	ENGINE COWL
73	130	15	PEDESTAL (COCKPIT)
75	134	17	WING TIP 5523000-5
77	138	17	VERTICAL FIN & TAILCONE SKIN
79	135	6	SADDLE SKIN 6512071
81	135	8	RH GEAR ACTIVATOR
83	135	10	ENGINE MOUNT BEAM LH
85	135	10	ENGINE PYLON
87	138	2	RH CORE ENGINE
89	138	4	ACCESSARY DRIVE RH PC E 70042
91	144	8	LH CORE ENGINE
93	138	12	FIRE BOTTLE
95	144	6	FIRE BOTTLE
97	145	16	RH ELEVATOR WITH TAB CONNECTED
99	145	16	ENTIRE HORIZ STAB. TIP TO TIP
101	145	16	VERTICAL FIN
103	145	16	RUDDER & TAB WITH TAB CONNECTED
105	145	16	AFT TAILCONE UNDER RUDDER
107	145	16	SPERRY DRIVE SERVO PN 4006719-904
109	145	20	AFT SPAR & LOWER SKIN
111	145	20	AFT PRESSURE BULKHEAD & AREA BELOW FLOORBOARD
GROUND FIRE			BETWEEN FS 309.0 & FS 346.0 & J BOX & BURNT
113 115	145 145	20 20	2 G.C.U BLEED AIR COOLER & CARRY THRU SPAR SPLICE PLATE
117	156	20	LH TR & BUCKET
119	157	25	BATTERY BOX LID
121	165 TO 210	20	BATTERY PIECES
123	195	20	ACM HEAT EXCHANGER
125	180	44	ENGINE OIL FILLER
127	156	44	UPPER SPEED BRAKE PANEL SMOKE DISCOLORED

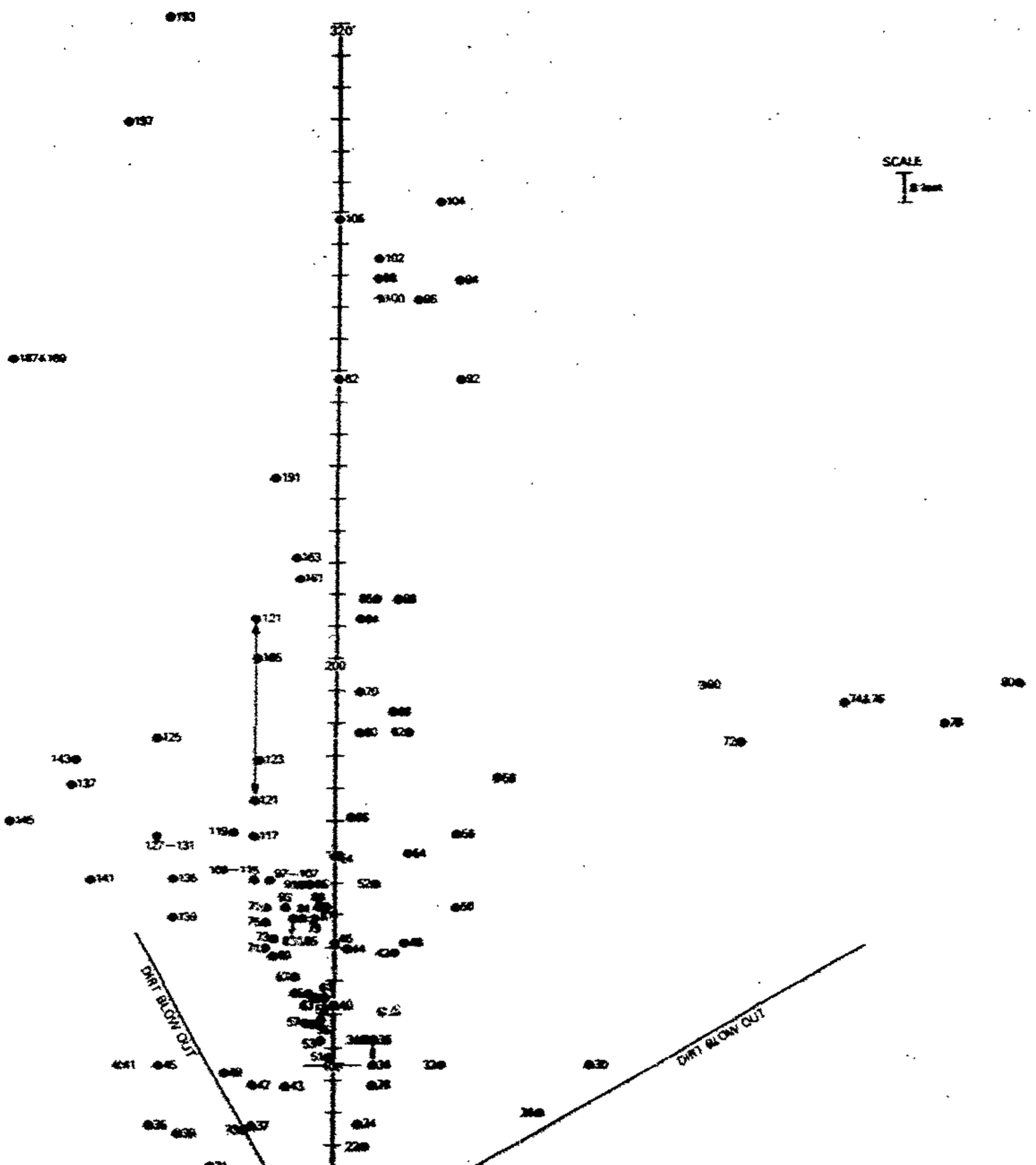
ITEM	DOWN	OUT	DESCRIPTION
129	200	95	LOWER WING FUEL ACCESS DOORS
131	156	44	FUEL LINE & FITTINGS
133	190	100	HYD RESERVOIR
135	145	40	COPILOT SIDE WINDOW FRAME & LOWER SKIN
137	169	65	RH WING TIP
139	136	40	SURGE TANK
141	145	60	ENGINE INLET
143	175	64	TOP 18" OF AFT PRESSURE BULKHEAD
145	169	80	TR LOCK OUTS & TOOLS ESCAPE HATCH STREAMER STOWED
147	145	95	THROTTLE QUADRANT
149	190	100	WEMAC & HYDROLOCK & MISC SHEET METAL PARTS
151	160	100	FUSELAGE SKIN PANEL (FS 287
153	175	100	1/2 SUN VISOR
155	175	100	FS 180 DOOR FRAME INCLUDING 2 TOP FITTINGS
157	200	108	CROWN WINDSHIELD TOP
159	200	110	WINDSHIELD & SIDE WINDOW FRAME
161	220	9	AILERON LEADING EDGE END RIB
163	225	10	COPILOT AFT WINDOW FRAME & SIDE WINDOW
165	200	20	WHITTAKER CONTROL 222878 K
167	230	100	LH UPPER WING SKIN 16" LONG
169	225	90	2 SMALL FRAG OF PILOT INSTRUMENT PANEL
171	234	100	LH ENGINE LOW PRESSURE COMPRESSOR



ITEM	DOWN	OUT	DESCRIPTION
67	127	10	LH ELEVATOR COMPLETE BALANCE WEIGHT
69	126	15	FRAME TAILCONE 5512022 11
71	128	7	ENGINE COWL
73	130	15	PEDESTAL (COCKPIT)
75	134	17	WING TIP 5523000-5
77	138	17	VERTICAL FIN & TAILCONE SKIN
79	135	6	SADDLE SKIN 6512027
81	135	8	RH GEAR ACTIVATOR
83	135	10	ENGINE MOUNT BEAM LH
85	135	10	ENGINE PYLON
87	138	2	RH CORE ENGINE
89	138	4	ACCESSARY DRIVE RH PC E-70342
91	144	8	LH CORE ENGINE
93	138	12	FIRE BOTTLE
95	144	6	FIRE BOTTLE
97	145	16	RH ELEVATOR WITH TAB CONNECTED
99	145	16	ENTIRE HORIZ STAB TIP TO TIP
101	145	16	VERTICAL FIN
103	145	16	RUDDER & TAB WITH TAB CONNECTED
105	145	16	AFT TAILCONE UNDER RUDDER
107	145	16	SPERRY DRIVE SERVO PN 4006719 964
109	145	10	AFT SPAR & LOWER SKIN
111	145	20	AFT PRESSURE BULKHEAD & AREA BELOW FLOORBOARD
GROUND FIRE			BETWEEN FS 309.0 & FS 345.0 & J BOX & BURNT
113	145	20	2 G C U
115	145	20	BLEED AIR COOLER & CARRY THRU SPAR SPLICE PLATE
117	156	20	LH TR & BUCKET
119	157	25	BATTERY BOX LID
121	165 TO 210	20	BATTERY PIECES
123	195	20	ACM HEAT EXCHANGER
125	180	44	ENGINE OIL FILLER
127	156	44	UPPER SPEED BRAKE PANEL SMOKE DISCOLORED

ITEM	DOWN	OUT	DESCRIPTION
129	200	95	LOWER WING FUEL ACCESS DOORS
131	156	44	FUEL LINE & FITTING
133	190	100	HYD RESERVOIR
135	145	46	COPILOT SIDE WINDOW FRAME & LOWER SKIN
137	169	65	RH WING TIP
139	136	99	SURGE TANK
141	145	60	ENGINE INLET
143	175	64	TOP 18 OF AFT PRESSURE BULKHEAD
145	160	80	TR LOCK OUTS & TOOLS ESCAPE HATCH STREAMER STOWED
147	145	95	THROTTLE QUADRANT
149	190	100	WEMAC & HYDROLOCK & MISS SHEET METAL PARTS
151	160	100	FUSELAGE SKIN PANEL FS 287
153	175	100	1 2 SUN VISOR
155	175	100	FS 180 DOOR FRAME INCLUDING 2 TOP FITTINGS
157	200	108	CROWN WINDSHIELD TOP
159	200	110	WINDSHIELD & SIDE WINDOW FRAME
161	220	9	AILERON LEADING EDGE END RIB
163	225	10	COPILOT AFT WINDOW FRAME & SIDE WINDOW
165	200	20	WHITTAKER CONTROL 222878 %
167	230	100	LH UPPER WING SKIN 16' LONG
169	225	90	2 SMALL FRAG OF PILOT INSTRUMENT PANEL
171	230	100	LH ENGINE LOW PRESSURE COMPRESSOR

ITEM	DOWN	OUT	DESCRIPTION
173	225	130	FAN BLADE
175	250	150	TOP AFT COPILOT SIDE WINDOW FRAME
177	250	180	FORWARD DOOR FRAME & CABIN DOOR
179	230	220	ESCAPE HATCH & SEAT BURNT IN GROUND FIRE
181	270	210	PILOT SEAT
183	270	200	RH CABIN SKIN & ESCAPE HATCH OPENING
185	290	200	CONTROL COLUMN
187	275	90	SPERRY BLACK BOX RT 220 SN 922264
189	280	80	CB PANEL & WING SKIN BURNT
191	245	15	ENGINE GENERATOR
193	385	50	EMERGENCY ATTITUDE INDICATOR FACE
195	350	150	AUTO SWITCH PANEL TRANSANT AND RECEIVE
197	235	40	BLACK BOXES (ELECTRONICS)
199	340	120	CONTROL COLUMN & CROSSOVER TUBE BURNT
201	340	120	FORWARD PRESSURE BULKHEAD & WIRE BUNDLE & NOSE GEAR
203	355	147	PILOT ADI SPERRY AD 500
205	365	137	ANNUNCIATOR PANEL (CRUSHED)
207	360	120	RH WINDSHIELD CENTER POST
209	356	125	RADAR INDICATOR PRIMUS 400 SN 1836
211	335	110	ADI 4020531 581 SN 78090617
213	280	120	2 PAX SEAT BASES & 1 SEAT BACK BURNT
215	425	120	OXYGEN BOTTLE & LEADING EDGE OF CONTROL SURFACE
217	335	125	COPILOT SEAT BASE

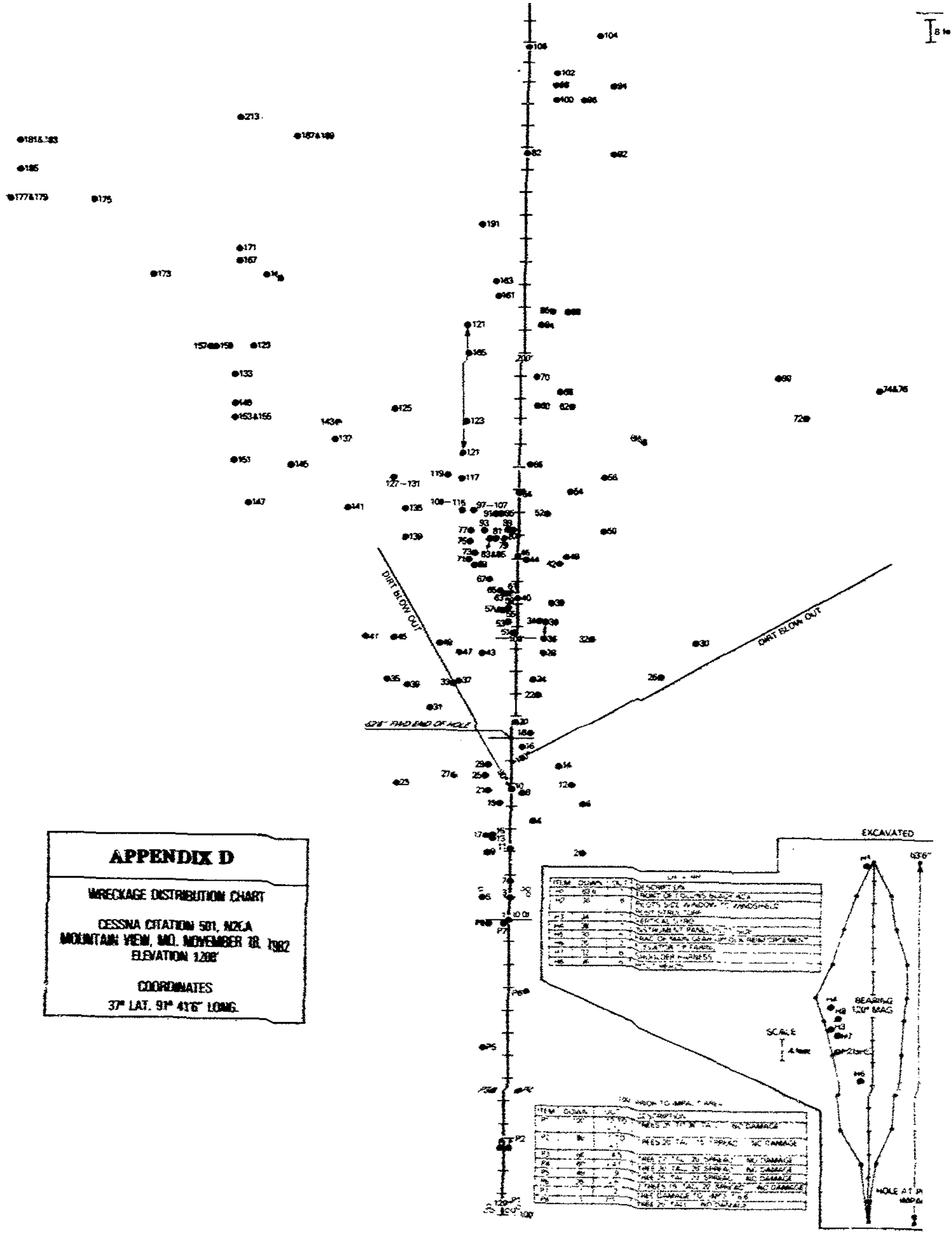


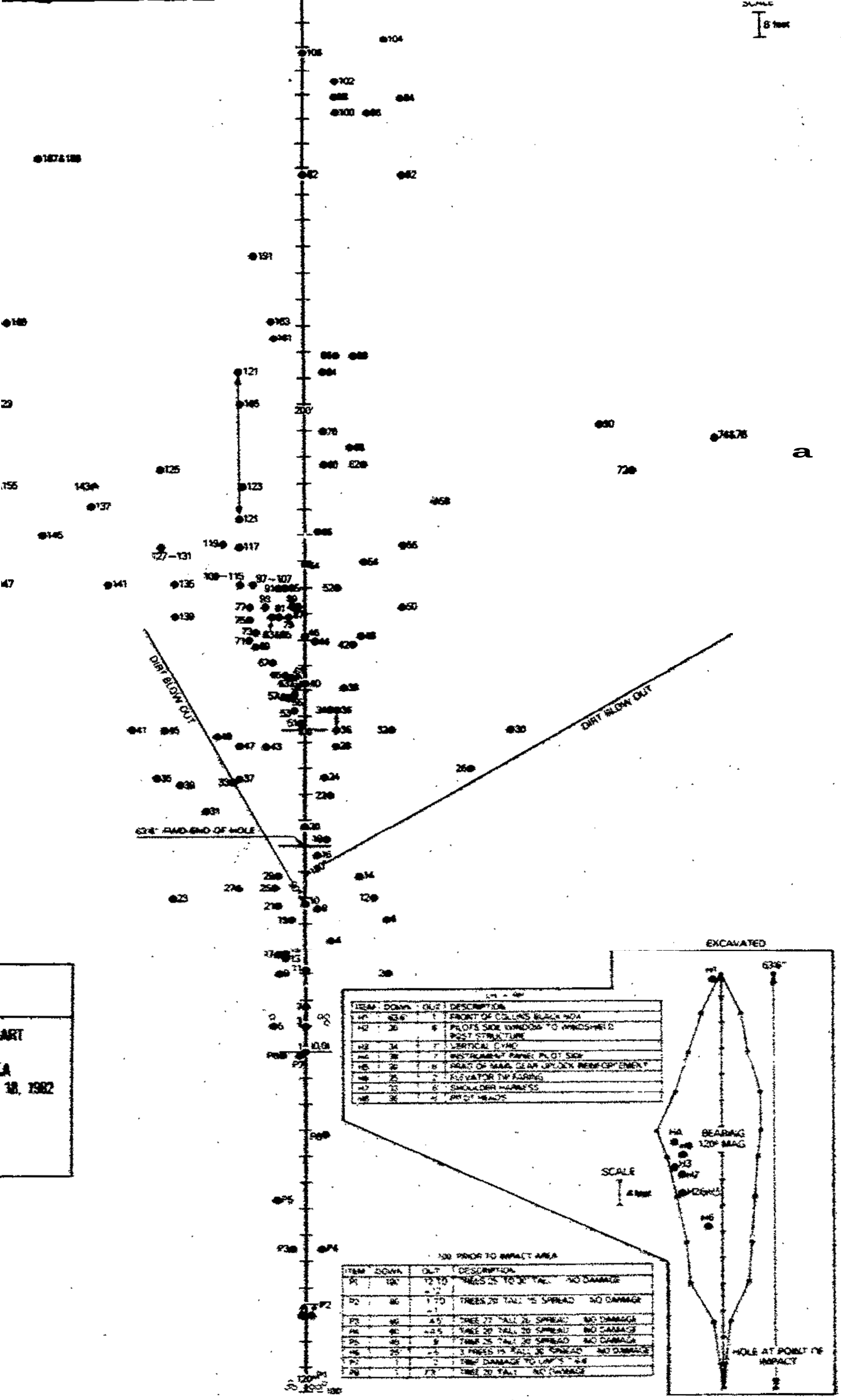
APPENDIX D

WRECKAGE DISTRIBUTION CHART

CESSNA CITATION 501, N2CA
MOUNTAIN VIEW, MO. NOVEMBER 18, 1982
ELEVATION 1208'

COORDINATES
37° LAT. 91° 41'6" LONG.





ART

A

18, 1982

ITEM	DOWN	OUT	DESCRIPTION
H1	63.6'	1	FRONT OF COLLINS BLACK BOX
H2	30	6	PILOTS SIDE WINDOW TO WINDSHIELD POST STRUCTURE
H3	34	7	VERTICAL GYRO
H4	38	7	INSTRUMENT PANEL PILOT SIDE
H5	30	8	FRAG OF MAIN GEAR UPLOCK REINFORCEMENT
H6	25	2	ELEVATOR TIP FAIRING
H7	33	6	SHOULDER HARNESS
H8	36	4	PITOT HEADS

100 PRIOR TO IMPACT AREA

ITEM	DOWN	OUT	DESCRIPTION
P1	120	12 TO +12	TREES 25' TO 30' TALL NO DAMAGE
P2	86	1 TO +1	TREES 20' TALL 15' SPREAD NO DAMAGE
P3	66	4.5	TREE 27' TALL 26' SPREAD NO DAMAGE
P4	60	+4.5	TREE 20' TALL 20' SPREAD NO DAMAGE
P5	45	9	TREE 25' TALL 20' SPREAD NO DAMAGE
P6	25	+5	3 TREES 15' TALL 30' SPREAD NO DAMAGE
P7	1	2	TREE DAMAGE TO LIMBS [illegible]
P8	1	7.3	TREE 20' TALL NO DAMAGE

RIGHT SIDE

ITEM	DOWN	OUT	DESCRIPTION
2	24	25	1/2 SPEED BRAKE PANEL LOWER
4	35	8	MOTIVE FLOW JET PUMP
6	40.5	25	1/2 SPEED BRAKE PANEL LOWER
8	46	4	TAILCONE ACCESS DOOR
10	46	0	FUEL BOOST PUMP 1E33
12	48	21	FLAP SEGMENT
14	56	17	LH MAIN GEAR
16	61	4	WING SPAR
18	66	7	TR ACTUATOR ARM
20	70	0	REAR SPAR & TRUNNION RH
22	80	8	LH AILERON & TAB & RH GEAR DOOR
24	95	6	FUEL QUANTITY PROBE
26	96	57	FLAP BELLCRANK 6525803G SN92
28	95	10	LANDING LIGHT HOUSING
30	100	43	NOSE GEAR DOOR
32	100	27	FLAP SECTION
34	104	8	TR BUCKET
36	106	70	REAR SPAR & FLAP COVER LH
38	113	12	FLAP
40	114	0	ENGINE COWLING
42	127	15	AILERON OUT BD HALF
44	128	3	FLAP FRAG & TRACK
46	129	0	AFT FUSELAGE STRUCTURE
48	129	25	OIL FILTER
50	138	30	FUEL SHUT OFF 9912894-2
52	144	10	RH MAIN GEAR
54	152	20	FUEL FILTER ELEMENT
56	157	30	LARGE AFT RH FUSELAGE SKIN 5612872-8
58	171	40	LOWER SPEED BRAKE
60	182	4	FUEL FILTER HOUSING 309572
62	182	18	AFT BAGGAGE COMPARTMENT PANEL 6512056-47
64	187	0	BRACKET ASSY 6565800-816
66	191	4	FUEL FLOW TRANSMITTER
68	187	14	RH REAR SPAR WEB & SPEED BRAKE DRIVE
70	192	6	MAIN SPAR STUB WING JOINT
72	189	100	STUB WING TRAILING EDGE 6511093-907
74	190	125	LOWER WING SKIN PANEL & FUEL ACCESS DOOR
76	190	125	SPLICE PLATE
78	195	150	12' OF SPAR CAP & LOWER WING SKIN
80	206	175	LOWER WING SKIN STRUCTURE
82	230	0	HEAT EXCHANGER [illegible]
84	270	6	ACM TURBINE
86	276	10	FUEL HEATER OIL COOLER
88	245	15	ENGINE CASE
90	198	90	LOWER WING SKIN LARGE PIECE
92	270	30	RH AILERON W TABE 90' UP
94	256	30	AILERON BALANCE WEIGHT
96	258	20	ENGINE INTAKE
98	290	20	MISC. ENGINE PARTS
100	294	10	TEMP CONTROL VALVE 172536 [illegible]
102	300	10	ANTI ICE VALVE 9912086-30
104	315	25	OIL DIPSTICK ASSY
106	316	0	COLLINS FCR-[illegible]