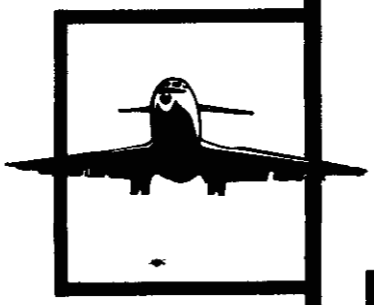

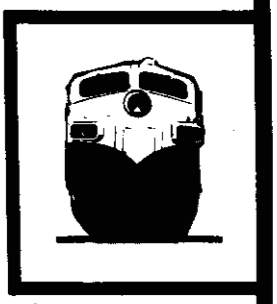

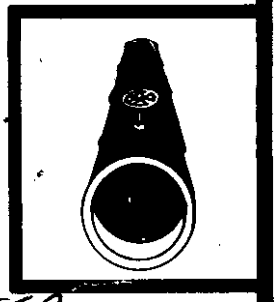

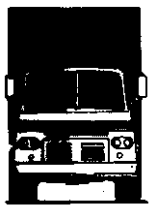

NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT REPORT

GEORGIA-PACIFIC CORPORATION
CESSNA 500 CITATION, N501GP
MERCER COUNTY AIRPORT
BLUEFIELD, WEST VIRGINIA
JANUARY 21, 1981

NTSB-AAR-81-9

UNITED STATES GOVERNMENT

TECHNICAL REPORT DOCUMENTATION PAGE

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The subject report was distributed to NTSB mailing lists: 1A, 8A and 8B.

16. Abstract

On January 21, 1981, at 0844 e.s.t., a Georgia-Pacific Corp. Cessna Citation, N501GP, with the pilot, the copilot, and three passengers aboard, overran the end of runway 23, following an instrument landing system (ILS) approach, crashed, and burned at the Mercer County Airport, Bluefield, West Virginia. The aircraft touched down between 500 and 2,000 feet on the runway which was covered with wet snow, and it did not decelerate normally. About 1,200 feet from the departure end of the runway, the pilot added engine thrust and rotated the aircraft for liftoff; however, it did not get airborne because of insufficient flying speed. The aircraft overran the end of the runway and struck three localizer antennas and a 10-foot embankment before it plunged down a steep, densely wooded hillside. The five occupants were killed, and the aircraft was destroyed by impact forces and postcrash fire.

The National Transportation Safety Board determines that the probable cause of the accident was the pilot's attempt to land on a slush covered runway with insufficient stopping distance available, and his delayed initiation of a go-around which resulted in there being insufficient runway available to complete the maneuver successfully. Contributing to the accident was the lack of adequate emphasis in the manufacturer's aircraft flight manual regarding the required aircraft landing/stop distances under wet and icy runway conditions.

17. Key Words	18. Distribution Statement
IFR, ILS Approach, slush covered runway, tailwind, insufficient stopping distance, hydroplaning, landing performance limitations, overshoot, severe postcrash fire, survivable impact forces.	This document is available to the public through the National Technical Information Service. Springfield, Virginia 22161 (Always refer to number listed in item 2)

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CONTENTS

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WASHINGTON, D.C. 20594
AVIATION ACCIDENT REPORT

Adopted: June 10, 1981

GEORGIA-PACIFIC CORPORATION
CESSNA 500 CITATION, N501GP
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BLUEFIELD, WEST VIRGINIA
JANUARY 21,1981

SYNOPSIS

On January 21, 1981, at 0844 e.s.t., a Georgia-Pacific Corporation Cessna Citation, N501GP, with the pilot, the copilot, and three passengers aboard, overran the end of runway 23 following an instrument landing system (ILS) approach, crashed, and burned at the Mercer County Airport, Bluefield, West Virginia. The aircraft touched down between 500 and 2,000 feet on the runway, which was covered with wet snow, and it did not decelerate normally. About 1,200 feet from the departure end of the runway, the pilot added engine thrust and rotated the aircraft for liftoff; however, it did not get airborne because of insufficient flying speed. The aircraft overran the end of the runway and struck three localizer antennas and a 10-foot embankment before it plunged down a steep, densely wooded hillside. All five occupants were killed, and the aircraft was destroyed by impact forces and postcrash fire.

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1. FACTUAL INFORMATION

1.1 History of the Flight

On January 21, 1981, the Georgia-Pacific Corporation had scheduled a business flight for company personnel from its Southern Division headquarters in Augusta, Georgia, to Frederick, Maryland, with an en route stop in Bluefield, West Virginia, where a public relations employee was to deplane at Bluefield, and the aircraft was to proceed with two engineering employees to Frederick. At the completion of their business, all three employees had planned to return to Augusta later that afternoon.

Before the flight, about 0620 e.s.t., 1/ the pilot conducted his own weather briefing at the National Weather Service (NWS) office located at the Bush Airport, Augusta, Georgia. The weather at the Mercer County Airport, Bluefield, West Virginia, at 0659 was:

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

> Record Special; clouds -- 600 ft scattered, ceiling measured -- 800 ft broken, 1,400 ft overcast; visibility -- 4 mi, fog; temperature -- 32°F; dewpoint -- 30°F; wind -- 070° at 13 kns; altimeter -- 29.86 in. Hg.

The pilot filed his Instrument Flight Rules (IFR) flight plan with the Savannah, Georgia, Flight Service Station (FSS) by telephone, and its records showed that he did not request Notice to Airmen (NOTAM) information. (A NOTAM in effect at this time for Bluefield reported that the braking action was nil.) He also did not request the available NOTAM information from the Augusta NWS office.

The flight departed the Bush Airport at Augusta at 0736 in Cessna Citation, N501GP and proceeded to Bluefield at Flight Level 290 under the control of the Atlanta Air Route Traffic Control Center and the Roanoke Approach Control. At 0817:13, the flightcrew reported to the Atlanta Center, ". . .with you descending to one niner zero." The Center acknowledged the check-in report, instructed them to descend to 7,000 feet and advised them that the Bluefield altimeter was 29.87. Thirteen seconds later, the Center reported to the crew, ". . .the Bluefield weather measured seven hundred overcast visibility 1 mile light snow and fog tops been reported in that area at seven thousand and they advised they had snow plows on runway and they need about 10 to 15 minute warning before you get there." The crew acknowledged the information, gave the Center an estimated time of arrival, and stated that they were presently calliqg the FSS.

The crew of N501GP contacted the FSS at Mercer County Airport, 35 miles from the airport, and requested the latest weather. An FSS attendent furnished the following weather report and stated that the crew acknowledged it:

> 700 ft overcast, visibility 1 mi, light snow and fog, temperature 32° F, wind 070° at 13 kns, braking action reported poor by a Beech 99.

At 0820:28, Atlanta Center advised Roanoke Approach Control that N501GP was 3 miles west of the SPEEL Intersection (25 nm south of the Bluefield VORTAC) descending to 7,000 feet mean sea level (msl). At 0822:11, the flight contacted Roanoke Approach, and 42 seconds later, they were cleared to the "one one DME arc and uh maintain seven thousand till joining the one one DME arc cleared for the ILS approach." The minimums for the instrument landing system (ILS) runway 23 approach are a decision height (DH) of 250 feet and 3/4 miles visibility for the straight in approach and a minimum descent altitude (MDA) of 543 feet and 1 miles visibility for the circling approach to runway 05.

At 0826:35, Roanoke Approach advised the flightcrew that "Bluefield weather measured ceiling seven hundred overcast, visibility one, light snow and fog, temperature 32°, wind 070 at 13, altimeter 29.87, ceiling is ragged, braking action reported poor by Beech 99, 3/4 in snow and ice on runway." The copilot acknowledged the information. At 0829:39, the copilot reported the localizer inbound. FSS personnel, who were located on the second floor of the terminal building, stated that N501GP was first sighted on what appeared to be a downwind leg for runway 05 and that it had entered some clouds. Shortly thereafter, the aircraft executed a missed approach and the crew requested a clearance for another ILS approach. At 0835:22, in coordination with the FSS, Roanoke Approach cleared N501GP for another ILS runway 23 approach.

FSS personnel stated that the second ILS approach looked normal and that the aircraft appeared to touch down about 500 to 1,000 feet from the approach end of the runway. The landing roll appeared normal until the aircraft passed the taxiway intersection in front of the terminal building, about 1,200 feet from the departure end of runway 23, at which time the FSS personnel heard a substantial increase in engine thrust from the aircraft. They also saw the aircraft rotate for liftoff before overrunning the runway. They stated that they did not see any spray coming from the aircraft during the landing roll.

N5016P crashed during daylight hours at an elevation of approximately 2,645 feet msl and at latitude 37°17'40"N and longitude 81°12'30"W.

Five witnesses located on the aircraft parking ramp in front of the terminal building also saw the landing of N501GP. One witness stated that the aircraft appeared "a little high and coming in faster than normal" during the approach. Two witnesses said the aircraft appeared to have touched down about halfway down the runway. Two other witnesses stated the aircraft appeared to be rolling faster than normal and another witness stated that the brakes seemed to be in use. One witness reported observing the flaps retracting before the aircraft reached the last taxiway intersection. All five witnesses confirmed that an increase in engine power occurred when the aircraft reached the last taxiway and that the aircraft rotated for liftoff before rolling off the runway.

12 **Injuries to Person**

Injuries	Crew	Passengers	Others	Total
Fatal	2	3	0	5
Serious	0	0	0	0
Minor/None	0	0	0	0
Total	2	3	0	5

13 **Damage to Aircraft**

The aircraft was destroyed.

14 **Other Damage**

Three localizer antennas were destroyed, and there was damage to trees on private property.

15 **Personnel Information**

The pilot and copilot both held airline transport pilot certificates, with ratings in the Cessna 500 Citation, and both were currently qualified for the flight. (See appendix B.) They reported for duty between 0600 and 0630 on January 21, 1981. Each pilot had been on duty for 7.5 hours the previous day and had been off duty for 14 hours before the flight on January 21. The last time the crew flew into the Mercer County Airport, previous to the accident flight, was in September 1980 at which time the pilot made six flights and the copilot made three flights.

The pilot held a current first class medical certificate with the limitation: "holder shall wear lenses that correct for distance vision and possess glasses that correct for near vision. .."

The copilot held a current first class medical certificate with the limitation: "holder shall wear correcting lenses. .." He also held a statement of demonstrated ability (waiver) for defective color vision.

16 Aircraft Information

N501GP, a Cessna CE-500 Citation, serial No. 500-0026, was manufactured and certificated for a minimum of two crewmembers in the transport category (14 CFR Part 25). (See appendix C.)

The aircraft was equipped with two Pratt & Whitney JT15D-1 turbofan engines, each rated at 2,200 pounds of static thrust. The engines were not equipped with thrust reversers. The aircraft was modified in accordance with the following manufacturer's service bulletins (SB):

- o SB 30-1 - Bleed Air Windshield
- o SB 32-1 - Increased Gross Weight (11,650 lbs taxi weight).
- o SB 32-23 - Increased Gross Weight (12,000 lbs taxi weight)
- o SB 21-9 - Increased Altitude and Range Modification

The aircraft's total fuel capacity was 556 gallons (3,753 pounds) of fuel, located in the wing tanks.

The aircraft had been owned and operated by Georgia-Pacific Corporation since June 23, 1972, and it had been maintained in accordance with 14 CFR Part 91, Subpart D, 91.217(b)(4) (Cessna Computerized Maintenance Program). Company records indicated that the aircraft had been currently inspected according to the maintenance program and there were no outstanding discrepancies recorded before January 21, 1981. A portion of the damaged flight log page for January 21, 1981, showed the following discrepancy: "Rt Eng Ice Fail Light Won't Go Out." The condition could have been caused by any one of the following conditions:

1. Either the cowl or stator valve fails to open;
2. Cowl leading edge temperature is below 170° F;
3. Inboard wing section is below 60° F;
4. Failure of one or more wing heating elements; or
5. Failure of the temperature controller.

Records also showed compliance with all airworthiness directives pertaining to the aircraft.

1.6.1 Weight and Balance

The aircraft was last weighed September 12, 1979. It was fueled to capacity with Jet A fuel before the flight. Computations disclosed that the gross takeoff weight

was 11,222 pounds with a center of gravity (c.g.) of 253.08 inches, and the landing weight was 9,900 pounds with a c.g. of 252.69 inches. The Cessna Citation's maximum certificated takeoff weight is 11,850 pounds, and the maximum certificated landing weight is 11,350 pounds. The certificated c.g. limits are 250.0 to 255.9 inches at 11,850 pounds and 248.4 to 255.9 inches at 9,900 pounds.

1.6.2 Aircraft Performance

A review of the Citation aircraft flight manual (AFM) and aircraft operating manual 2/ was made to determine the aircraft's landing and go-around performance under the environmental conditions that existed at the time of the accident. According to the standard procedure in both manuals, the aircraft would have been stabilized between a reference speed of Vref 3/ and Vref plus 10 knots. The flaps would have been lowered to 40°, and the landing gear would have been extended for landing on intercept with the glide slope at the outer marker, the final approach fix before the final descent for landing. The computed Vref speed for the approach would have been 107 KIAS. The rate of descent required to maintain the prescribed 3° glide slope at a groundspeed of 107 knots based on the approach chart would have been about 567 feet per minute. The remaining runway available beyond the glide slope touchdown point is 3,685 feet.

Landing field length 4/ data in the AFM assumes a threshold crossing speed of Vref at 50 feet above the runway with thrust reduced to idle at that point and with a touchdown of 580 feet beyond the threshold of the runway. The maximum landing tailwind component is 10 knots, and according to the operating manual, a 1 percent increase in speed, or 108 knots, would require 2 percent more rollout distance, about 100 feet-of additional runway stopping distance for each knot above recommended landing speed. A tailwind component of 9 knots existed at the time of the approach, which would have resulted in a groundspeed of 116 knots. Therefore, a rate of descent of about 624 feet per minute would have been necessary to maintain the proper glidepath.

The takeoff and landing performance data in the AFM are based on a paved dry runway. However, the AFM does not contain correction factors to use in computing landing field length requirements when landing on wet or icy runways. Based on the AFM, the dry runway field length requirement for landing the accident aircraft was 2,625 feet with a 10-knot tailwind. The maximum runway water/slush accumulation under which the aircraft was certificated was 0.75 inch. "According to the aircraft operating manual, a pilot can expect landing field length requirements to increase over the AFM values by 50 percent if the runway is wet, and 100 percent if it is icy. 5/ Therefore, the landing field length required to stop the aircraft on a wet runway would have been 3,937 feet, and 5,250 feet would have been required to stop on an icy runway. Considering the runway surface condition report, the icy runway factor would be used in computing the required landing field length. The resultant increase in this case exceeds the total length of runway 23 by 508 feet." Since witnesses placed the aircraft's touchdown area between 500 and 2,000 feet from the threshold, the aircraft could not have been stopped on the runway.

2/ Manufacturer supplied information not required by regulation.

3/ The airspeed equal to a speed of 13 Vso with full flaps and landing gear extended on landing from a point 50 feet above the runway.

4/ The distance from a point 50 feet above the runway surface to the point at which the aircraft would come to a full stop on the runway.

5/ The 50 percent and 100 percent correction factors are based on National Aeronautics and Space Administration (NASA) test data for landing with low braking coefficients and a computer model developed by Cessna Aircraft.

An excerpt from page IV-31, of the aircraft operating manual states the following:

> With 100 p.s.i. main tires, the CITATION's minimum dynamic hydroplaning initiating groundspeed is 90 kns. At typical landing weights, touchdown is normally accomplished below that speed. Since groundspeed is the critical factor, landing on slick runways with any tailwind component should be avoided.

In accordance with British Civil Airworthiness requirements, Citation aircraft manufactured for export to Great Britian have revisions to the AFM which, in part, increase the landing field lengths by **220** percent on wet and icy runways, and operators are limited to landings only into headwind and on a runway with an uphill gradient.

According to the Cessna Aircraft Company, the normal touchdown speed is 4.7 knots below Vref, and spoilers have a negligible effect on the length of the landing **roll.** Deceleration, particularly with antiskid operative, is almost linear. The aircraft's groundspeed at touchdown, therefore, based on a computed groundspeed of 116 knots, would have been about **111** knots; well above the minimum dynamic hydroplaning speed which would invalidate the correction factors for wet and icy runways. The minimum unstick speed (Vmu) for a Citation weighing 10,000 pounds is 94 ±3 KIAS. The minimum nosewheel liftoff speed is **8** to 10 knots below Vmu. The computed decision speed (V_1) for the aircraft at 9,900 pounds was 93 KIAS (Anti-ice OFF) and 96 KIAS (Anti-ice ON) with flaps at 15°. The computed rotation speed (VR) was 97.5 KIAS and the takeoff safety speed (V2) was 107.5 KIAS.

Witnesses placed the area in which they heard the increase in engine thrust at 1,000 to 1,200 feet from the departure end of the runway. The following chart shows the linear deceleration and the acceleration rates corresponding to various touchdown points based on witness observations of the aircraft's landing and go-around maneuvers, aircraft manufacturer information, and low runway coefficients of friction based on the 90-knot dynamic hydroplaning speed:

If Touchdown Occurred at 111 Kns G.S. at	A/C Speed With 1,200' of Runway Remaining Would Be	A/C Accelerate and Would Depart Runway at
500 ft-landing roll=3,000 ft	36.4 kns/61.40 ft/sec	73.93 KIAS
1,000 ft-landing roll=2,500 ft	47.3 kns/79.78 ft/sec	77.28 KIAS
1,500 ft-landing roll=2,000 ft	58.2 kns/98.17 ft/sec	81.94 KIAS
2,000 ft-landing roll=1,500 ft	69.1 kns/116.55 ft/sec	87.72 KIAS

17 Meteorological Information

At the time of the accident, southern West Virginia was affected by a low pressure area over eastern North Carolina. At **0700,** the skies throughout the middle eastern states were overcast. Fog was reported at extreme southern West Virginia, snow at extreme eastern West Virginia, and rain over the remainder of the state. Based upon surface reports, winds were northeasterly at 10 knots or less. The winds aloft at Huntington, West Virginia, were northeast at 5,000 feet, west at 10,000 feet, and northeast again at **20,000** feet.

The following area forecast was issued at 1940, January 20, 1981, and was valid from 2000 through 1400, January 21:

> Remainder of Ohio, West Virginia except eastern panhandle, and mountains of Maryland and Virginia: ceiling 2,000 to 4,000 feet overcast layered to above 20,000 feet, visibility occasionally 3 to 5 miles in light rain. Conditions lowering from the south to ceiling 1,000 to 2,000 feet overcast, visibility 2 to 4 miles in light rain and light snow reaching northern West Virginia and central Ohio by 0100.
>
> Occasional moderate to severe icing in clouds and in precipitation above the freezing level over central and southern West Virginia, Virginia, southern Maryland, North Carolina and South Carolina spreading to southern and central Ohio, remainders of West Virginia, Maryland, Delaware, and the District of Columbia by 0300. Freezing level at or near the surface in northern Ohio sloping to 4,000 to 5,000 feet in southern Ohio through Delaware to 8,000 feet in southern South Carolina.
>
> Occasional moderate turbulence below 10,000 feet developing over North Carolina, South Carolina, southern West Virginia, and southwest Virginia.

The following terminal forecast for Charleston, West Virginia, 75 miles northwest of the accident site, was issued at 0444, January 21, and was valid from 0500 through 0500 on January 22:

> Ceiling 500 feet obscured, visibility 1 mile reduced by light snow and fog, chance of ceiling 200 feet obscured, visibility 1/4 mile reduced by moderate snow and fog.

Two SIGMETS 6/ in effect at the time of the accident reported occasional moderate to severe rime or mixed icing in clouds and in precipitation above the freezing level. Icing conditions were expected to be most frequent above 15,000 feet. The freezing level was 2,000 feet over northern Maryland and northern West Virginia, sloping to 7,000 feet over South Carolina.

At 0809, a Beech 99 commuter pilot departed runway 05 at Bluefield. He stated that he did not encounter any ice or turbulence on climbout and that the tops of the clouds were at 7,000 feet msl. He also said that the visibility on the ground was 2 miles to the northeast.

A special surface weather observation taken at the Mercer County Airport at 0851 on the morning of the accident was as follows:

> Ceiling - measured 1,000 feet broken, 4,000 feet overcast; visibility -- 2 miles; weather - light snow and fog; temperature -- 32°F; dewpoint -- 30°F; wind - 070° 10 knots; altimeter -- 29.89 inches; remarks -- aircraft mishap.

6/ Significant Meteorological Information - A weather advisory issued concerning weather significant to the safety of all aircraft.

On January 20, the minimum temperature recorded at Bluefield at 0055 was 32° F. No other temperatures were recorded during the day at or below freezing. The maximum temperature was 42° F. On January 21, temperatures remained above 32° F until 0455 when 32° F was recorded. At the time of the accident, the temperature was 32° F.

Between 1859, January 20 and 0057, January 21, a trace of snow with 0.06-inch water equivalent was recorded. Between 0057 and 0657, 0.7 inch of snow with a 0.16-inch water equivalent was recorded. The actual period of snowfall was from 1847 on the 20th to 0422 on the 21st. Between 0657 and 1259, 0.2 inch of snow with a 0.01-inch water equivalent was recorded. The actual period of precipitation was from 0718 to 0946 and from 1030 to 1145.

The following is a list of pertinent NOTAM issued by the Bluefield FSS on January 21, 1981:

NOTAM	Time Issued	Description
01/026	0534	3/4 in. snow and ice on the runway
01/027	0612	Braking action nil (NOTAM cancelled at 0735)
01/29	0800	Thin wet snow on runway
1006	0809	Braking action poor by Beech 99

There was no NOTAM 01/028

1.8 Aids to Navigation

Mercer County Airport is served by the Bluefield Class B VORTAC which is located approximately 1/2 mile from the approach end of runway 23. It is also served by three instrument approach procedures: VOR Rwy 23, VOR DME Rwy 23, and the ILS Rwy 23. The ILS glide slope touchdown point is 1,057 feet beyond the approach end of runway 23. (See appendix D.)

A ground check of the ILS following the accident disclosed no discrepancies. An alarm system is located in the FSS and personnel stated that no ILS alarms occurred on January 21. Also, there was no record of an ILS malfunction alarm having occurred between March 1980 and January 21, 1981. The last weekly ground check of the ILS was on January 16, 1981, and the latest monthly ground check was on January 8, 1981. Following replacement of the damaged localizer antennas,, a flight check of the ILS on February 3, 1981, showed satisfactory performance of the equipment. There were no discrepancies found in the equipment during a flight check on December 19, 1980.

1.9 Communications

There were no reported communications difficulties. The Mercer Count); Airport is served by a Federal Aviation Administration (FAA) FSS.

1.10 Airport Information

Mercer County Airport, elevation 2,857 feet msl, is located 4 miles northeast of Bluefield in rugged mountainous terrain. It has one grooved runway, 05/23 which is asphalt surfaced and constructed on a mountain top. The runway is 4,742 feet long and

100 feet wide. The elevation of the threshold of runway 23 is 2,857 feet and the effective gradient is a 0.3 percent downslope. The terrain at either end is a steep, rocky, and mostly wooded downslope. The airport was constructed between 1951 and 1954 and is exempt from the extended runway safety area criteria,

The runway was grooved on December 13, 1980. The first 2,300 feet of the runway contains trapezodial parallel grooves which are 3/8-inch wide at the top, 1/8-inch wide at the bottom, and 3/16-inch deep. The remaining runway has square grooves 1/4-inch deep. All grooves are 1 1/2 inches apart. The runway has no overruns.

Runway 23 is equipped with visual approach slope indicator (VASI) lights, runway end identifier lights (REIL), and medium intensity runway lights (MIRL). All were on at the time of the accident, according to FSS personnel.

An airport maintenance employee stated that on January 21, 1981, he began plowing the runway at 0645, finished plowing about 0830, and began plowing again about 0930. He reported to the FSS after the first plowing that the runway braking action was poor. The airport manager stated that he instructs his runway maintenance crews to check braking action by accelerating to 45 mph and if the vehicle cannot be stopped between two runway lights the braking action is poor. The plow operator further stated that when he began plowing again at 0930 there was about 1/2 inch of snow on the runway.

At approximately 0700, a local Cessna Citation copilot drove his vehicle onto the runway to inspect its condition. He stated that after the initial plowing the runway was covered with an accumulation of slush, the runway grooves were not noticeable, and braking action was nil. A commuter air carrier Beech 99 pilot stated that the entire runway was plowed before he took off at 0809 and that the runway grooves were visible but there was snow on the runway. He further stated that he was unable to operate his aircraft's engines up to full power during a static check on the runway because he was unable to prevent the aircraft from sliding. The Beech 99 pilot's report of poor braking action resulted in the issuance of NOTAM 1006.

Another local Citation pilot who inspected the runway at 0915 stated that the braking action was nil, the runway had been plowed, the runway grooves were full of slush, and about 1/4 inch of snow and slush remained on the runway. He delayed his departure until 1200.

Another pilot who departed Bluefield at 0936 stated that he inspected the runway immediately after the accident and a mixture of ice and slush covered the runway but it was possible to scrape it away to the runway surface. He determined the braking action to be poor. He stated that after takeoff the runway condition from the air looked good, as he could see the runway pavement.

1.11 Flight Recorders

Neither a cockpit voice recorder nor a flight data recorder were installed in the aircraft, and they were not required by regulation.

1.12 Wreckage and Impact Information

Examination of the runway disclosed no evidence of the aircraft's point of touchdown. The aircraft was slightly right of the runway centerline when it departed the end, and the main landing gear wheels remained on the ground for 97 feet before the

aircraft became airborne for 115 feet over a 10-foot deep manmade depression (constructed for the installation of the localizer antennas) and struck 3 of the 15 antennas. The aircraft struck the 21' upslope of an embankment with the main landing gear and bottom of the fuselage about 20 feet beyond the antennas. It continued beyond the embankment for 84 feet on its landing gear and then traveled off the hillside and down a steep slope, striking several trees. It came to rest 785 feet beyond the end of the runway. Evidence of fuel spillage and postcrash fire were in the area of tree impact. (See figures 1 and 2.)

The aircraft was separated in three major sections: the fuselage midsection, including the aft pressure bulkhead; the aft section of fuselage, including the engines; and the empennage section. The cockpit area of the fuselage was destroyed. Both wings also separated from the fuselage. All major sections of the aircraft were destroyed by tree and ground impact and postcrash fire. (See figure 3.)

Several sections of the primary flight control cables remained attached to their respective control surface attachments. All cable breaks exhibited overload tension-type failures. Examination determined that the landing gear was extended and locked, the flaps were extended approximately 15°, and the speedbrakes were retracted at the time of the accident. No valid flight control trim settings were obtained because of the extensive breakup of the aircraft.

The nose gear was equipped with a chine 7/ tire, and the chines were in good condition. The tire was deflated because of impact-forces, but it did not exhibit any significant scuff marks or extensive wear. No significant scuff marks or extensive wear was found on the main landing gear tires. The left main gear tire was also deflated by impact forces.

The left engine remained attached to the aft fuselage. The fan assembly was damaged on impact, and the fan blades were bent in the opposite direction of normal engine rotation. One fan blade was broken off in the middle. The second stage turbine blades were intact. The fan, low pressure turbine, and second stage turbine were seized. The fan duct, aft of the B-flange (diffuser case), was buckled diagonally. The accessory gearbox was broken and displaced. The fuel control arm was in the 90-percent power position. The flow divider was intact and the control arm was in the 70-percent power turbine speed position; however, the control rod was separated from the fuel control rod. The fuel and oil filters showed no contamination.

The right engine remained partially attached to the aft fuselage. The fan assembly showed evidence of foreign object damage, and five blades were broken off about midspan. The remaining blades were bent in the opposite direction of normal engine rotation. The low pressure turbine fan and second stage turbine were free to rotate by hand. The fan duct, aft of the B-flange, was bent and exhibited several diagonal buckles. The B-flange bolts were sheared circumferentially for about 180°. The flow divider was intact and the control arm was in the 90-percent power turbine speed position; the fuel control lever was broken. The fuel and oil filters exhibited no contamination.

7/ A large circular 'flute near the tire bead used to deflect water away from the intakes of the engines.

Figure 1.—Departure end of runway 23 showing main landing gear wheel tracks and impact damage to the localizer antennas and embankment.

Figure 2.—View of terrain beyond the embankment. The track in the foreground was made by the right main landing gear wheel and is headed in the direction of the accident site as shown by the fire-damaged trees.

Figure 2.—View of terrain beyond the embankment. The track in the foreground was made by the right main landing gear wheel and is headed in the direction of the accident site as shown by the fire-damaged trees.

Figure 3.—View of accident site looking upslope. Fuselage and empennage in the foreground.

1.13 Medical and Pathological Information

Postmortem examination of the flightcrew disclosed evidence of significant impact trauma. There was no evidence of preexisting disease in the pilot. Internal examination of the copilot's heart revealed that the left coronary artery was 95 percent occluded 1 cm from its origin. The occluded part measured 5 mm in length. Serial sections of his myocardium failed to reveal evidence of a recent or old myocardial infarct. The lungs of both pilots were congested and edematous, and showed the presence of soot.

Examination of the passengers showed no evidence of significant traumatic injuries. All of them showed evidence of severe thermal injuries, and their lungs also were congested and edematous, with soot present.

The results of toxicological analyses of the flightcrew and the passengers were negative for drugs and ethyl alcohol. However, carbon monoxide levels ranged from 18 to 29 percent saturation; cyanide levels of 0.89 to 2.56 micrograms per milliliter were detected in the passengers.

1.14 Fire

Evidence at the accident site disclosed a fuel spillage pattern consistent with the breaching of the aircraft's integral wing fuel tanks on impact with the trees.

Airport firefighters who were on the aircraft parking ramp responded immediately after witnessing the aircraft's disappearance down the hillside. They proceeded to the end of runway 23 and ran down the slope to the burning wreckage. The steep terrain prohibited approaching the wreckage with their vehicles. The pilot and copilot were found outside the wreckage. The cabin fire was too intense to rescue the passengers.

The Bluefield Fire Department was notified of the accident at 0853 by the FAA FSS. Two vehicles were immediately dispatched to the site and arrived at 0910. The airport manager notified the Green Valley Glenwood Volunteer Fire Department at 0905 and they arrived on the scene at 0912. Firefighting activities were limited to the use of dry chemical to extinguish the fire and effect recovery of the occupants.

1.15 survival Aspects

The destruction of the cockpit structure and separation of the crew seats compromised the impact survivability of that part of the aircraft. The intense postcrash fire was concentrated in the cabin and all that remained of the cabin were the five passenger seat frames, which precluded a determination of the structural integrity of the fuselage in this area. Seatbelt D-rings remained attached on all but the aft facing corner lounge seat. The aft facing lounge seat at the front of the cabin exhibited the most deformation; the seat pan was displaced to the right about 2 inches. Only the two forward facing seats at the rear of the cabin exhibited any significant amount of deformation. The left forward facing seat had buckled inboard legs which displaced the seat approximately 1/2 inch down.

Piedmont Airlines had discontinued air carrier service to Bluefield in October 1980. However, the Mercer County Airport retained its airport certification in-

accordance with 14 CFR Part 139 as an Index A 8/ airport. Therefore, the airport maintained its emergency plan and mutual aid agreements with the local police, fire, and medical services. Some confusion existed in the execution of the notification of the police for security and no one took charge of security at the scene. Consequently, there was virtually no security at the accident site because the West Virginia State Police were not immediately notified of the accident. They arrived 1 hour 30 minutes after the accident.

1.16 Tests and Research

A review of the Safety Board's accident files for the period 1970 to 1980 disclosed four other Citation overshoot accidents which involved water/ice on the runway under unfavorable wind conditions. A fifth accident involved a loss of control on takeoff and an attempted abort with an 11-knot tailwind and blowing snow. The range of total flight experience of the pilots involved in these accidents was between 2,600 and 10,000 hours and the total flight time in type ranged between 250 and 750 hours.

1.17 Additional Information

Georgia-Pacific Corporation reported that they provide annual recurrent company training for their turbojet aircraft qualified pilots and copilots. Records supplied by the company did not show any recurrent training of the copilot. .According to the chief pilot, he gave the copilot the training required by 14 CFR 61.55, i.e, familiarization with the aircraft's normal and emergency procedures, three takeoffs and three landings to a full stop and engine out procedures, and maneuvers as the sole manipulator of the flight controls.

The company's flight operations manual does not contain specific guidance or policy for landing on wet or icy runways nor are they required to provide such information by regulations; This information is contained in the aircraft operating manual. Furthermore, FAA regulations do not require the inclusion of this information in the approved aircraft flight manual. The chief pilot stated that it is the pilot's decision whether or not a landing can be made safely on a wet or icy runway. It is the pilot's responsibility to cancel or delay a flight if, in his opinion, the flight cannot operate or continue to operate safely as planned.

The chief pilot also stated that he had landed at Bluefield on previous occasions and was forced to go-around after touchdown because he had more than 80 knots and was halfway down the runway.

1.18 Useful or Effective Investigation Techniques

None

8/ The index criteria are outlined in 14 CFR 139.49 and specify the minimum required firefighting and rescue equipment for an airport. The applicable index is determined by the longest large aircraft, operated by an air carrier user, with an average of five or more scheduled departures per day, computed on an annual basis, served or expected to be served by the airport. Index A refers to an aircraft not more than 90 feet long.

2. ANALYSIS

4.1 The Flightcrew

Both the pilot and copilot were certificated and qualified in accordance with current Federal regulations. They held first-class medical certificates with the limitation that correcting eyeglasses shall be worn. The Safety Board, however, could not determine if the pilot and copilot were wearing glasses at the time of the accident. Both crewmembers had an adequate rest period before reporting for duty. The postmortem examination disclosed no preexisting medical factors which would have detracted from either pilots' physical ability to operate the aircraft.

2.2 The Aircraft

The aircraft was certificated, equipped, and maintained in accordance with the manufacturer's recommended maintenance program. Review of the maintenance records confirmed compliance with the program. There were no discrepancies recorded in the aircraft flight log except for the entry made during the flight from Augusta, Georgia, to Bluefield, West Virginia.

The Safety Board could not determine the reason for the illuminated right engine ice fail light discrepancy during its examination of the wreckage. The anti-ice systems should be turned on when operating in visible moisture with an outside air temperature between +40° F and -22° F. The amount of time it takes for the engine anti-ice fail lights to extinguish will vary with outside air temperature and engine power setting. The function of the system can be monitored by observing the engine rpm, temperature, ammeter gauges, and engine anti-ice fail lights. An increase in temperature and a decrease in rpm will confirm activation of the engine anti-ice system, indicating the extraction of bleed air from the engines. Turning the inboard wing anti-ice system on will show a corresponding increase in generator load on the ammeters. And, a failure of the temperature controller will cause the light to cycle OFF when the wing leading edges are being heated and ON when the temperature limit is reached. Therefore, the pilot could have determined whether the discrepancy was in the light itself or in another part of the system. It would not have been wise to operate the aircraft in the environmental conditions that existed during the flight with a failure or malfunction in the anti-ice systems.

4.3 weather Conditions

The weather conditions existing at Bluefield and in the vicinity on January 21 showed that the weather forecasts were correct. Based on the high moisture content of the atmosphere observed at Huntington, West Virginia, and the reported clouds in the area, it is considered likely that light to moderate rime ice existed in clouds below 20,000 feet in the vicinity of Bluefield. The winds aloft in the vicinity did not indicate any significant wind shear or turbulence below 20,000 feet.

Between 0057 and 0657, 0.7 inch of snow fell which resulted in a recorded depth of 1 inch of snow. The water equivalent of this snowfall was 0.16 inch which is almost twice the normal amount of water expected for a 0.7 inch snowfall. This condition indicates that some snow melted and that the snow would have been wet at the time of the accident. The Safety Board was unable to determine the actual depth of snow that existed on the runway at the time of the accident because it had been plowed.;

Based on the temperatures over the 6-hour period, however, any residual snow would probably have remained as slush. Witnesses' observations of the runway condition confirm the conclusion based on the weather reports and that there may have been at least 1/4 inch of slush which remained on the runway after it was first plowed.

2.4 Aircraft Performance

Witnesses placed the area in which the aircraft touched down between 500 and 2,000 feet from the threshold of runway 23. Although the glide slope touchdown point is 1,057 feet beyond the threshold of the runway, the tailwind component may have caused the aircraft to touch down farther on the runway than the pilot intended. After the touchdown, thrust would have been at idle, brakes would have been applied, and the spoilers would have been deployed. A perceived lack of deceleration would have prompted the pilot to execute a go-around as soon as he realized that he could not stop the aircraft on the runway. In this case, he failed to promptly recognize the insufficient braking action and therefore, he did not initiate a timely go-around. A go-around becomes marginal at low speeds because of the length of runway required to accelerate to liftoff speed.

The witnesses were consistent in their reports that engine thrust was increased between 1,000 and 1,200 feet from the departure end of the runway. They stated that the aircraft rotated to a takeoff attitude before crossing the end of the runway, but that it did not get airborne. According to the manufacturer, the minimum speed at which the nosewheel can be raised off the runway is about 81 KIAS, and the aircraft can become airborne at a minimum speed of 91 KIAS. Therefore, based on the manufacturer's information and the witnesses' reports, the aircraft could have departed the runway at a speed between 81 and 91 knots. However, since the aircraft did not become airborne, it is evident that it did not reach sufficient speed for liftoff.

The pilot might have achieved the minimum liftoff speed if he had applied full thrust between 1,400 and 1,800 feet from the end of the runway; he would have had between 9 to 15 seconds after he touched down to make the decision. The drag produced by the slush would have extended the distance needed to accelerate and, thus shortened the available decision interval.

Based on the icy runway condition correction factor of 100 percent in the aircraft operating manual, the aircraft would have required about 5,250 feet to stop. This calculated distance includes the increased landing distance with a 10-knot tailwind. However, the aircraft's computed groundspeed at touchdown was 111 knots with the 9-knot tailwind component, resulting in a speed 21 knots above the minimum dynamic hydroplaning initiation groundspeed of 90 knots. Since the icy runway condition correction factor of 100 percent is based on 90 knots, it is not adequate when touchdown groundspeeds are greater. Therefore, under the foregoing conditions, the aircraft's required landing distance would have been greater than 5,250 feet.

The weather conditions that existed at Bluefield were known to the pilot since he had briefed himself on the weather at the NWS office before departure. He had adequate information available to him from which to decide whether or not a safe landing could be made at the airport. If he had inquired about the condition of the runway at Bluefield before departure, he would have been aware of the adverse condition. Moreover, he received the runway condition reports from Roanoke Approach Control and the FSS. He had considerable experience in the aircraft and was familiar with the airport even though 4 months had elapsed since his last flight into Bluefield. The fact that he was

aware of the critical length of the runway was demonstrated by his execution of the circling approach to runway **05** following the first **ILS** approach to runway **23.** It is possible, however, that he may have been misled by the report that snowplows were on the runway when he **was** approaching the airport, and he may have anticipated an improved runway condition following the plowing operation. Also, the freshly plowed runway which he observed during the circling approach to runway **05** may have appeared to be in better condition than it was as was later reported by another pilot following a subsequent plowing. These factors may have influenced the pilot's decision to execute the second approach to runway **23.**

Although a wind of 070° at 10 knots would have reduced the landing distance, a safe landing probably could not have been made on runway **05.** If the pilot had completed his landing approach to runway **05** to take advantage of a 9-knot headwind, the aircraft's groundspeed at touchdown would have been about 93 knots. In order for the aircraft to have had a 90-knot groundspeed at touchdown, its landing weight would have had to be reduced by **400** pounds, to a landing weight of 7,900 pounds if it were made in a no-wind condition. Since the empty weight of the aircraft was **6,700** pounds and the total occupant weight was 919 pounds, only **281** pounds of fuel could have been on board for a landing. The total amount of fuel on board at the time of the landing was **2,431** pounds.

The Safety Board could not positively determine whether the aircraft encountered hydroplaning because there was no evidence on the runway following the second plowing to indicate that the wheels failed to spin up. The tires exhibited normal wear which indicates that viscous hydroplaning was not a factor. In any event, the runway condition would have reduced the effectiveness of the braking action considerably, and the higher-than-normal groundspeed at touchdown made the increased runway distance factors in the aircraft operating manual completely inadequate. Furthermore, the **5,250** feet required because of the icy runway condition exceeded the total length of runway **23,** and the pilot should have known this information.

In view of the pilot's considerable experience in the Citation, he should have been thoroughly familiar with its performance and characteristics, and therefore he exercised poor judgment in attempting the landing. It is possible that the pilot intended to land for the purpose of checking the braking action with the subsequent intention to go around, a procedure alluded to by the chief pilot as having been previously used. The decision to attempt a go-around apparently was delayed because he failed to immediately recognize the insufficient braking action and failed to consider the drag produced by the slush on the runway. Since a landing was made, the pilot should have been aware of the fact that a timely decision to execute a go-around would be absolutely necessary under the circumstances and that any delay would jeopardize the success of such a maneuver. Since a delay occurred, a decision by the pilot not to attempt a go-around but to continue braking probably would have decreased the severity of the impact and may have resulted in a survivable accident.

The Safety Board notes that company policy did not preclude the pilot from landing under the existing conditions nor was any guidance given in the company operations manual. The Safety Board recognizes that this information was provided to the pilot in his training program and was also available in the operating manual which was maintained by the company. We believe that this information in addition to his training and experience should have been sufficient to make a proper decision. However, in the Safety Board's opinion, it is essential that this information be consolidated and be presented clearly in the AFM and emphasized in training **so** that a pilot thoroughly understands the information and its implications.

3. CONCLUSIONS

3.1 Findings

1. The flightcrew was properly certificated and qualified for the flight. They were familiar with the Mercer County Airport.

2. There was no medical evidence indicating any impairment in the flightcrew's physical ability to operate the aircraft.

3. The aircraft. was certificated and maintained in accordance with approved maintenance procedures.

4. The right engine anti-ice fail light discrepancy did not cause or contribute to the accident; the source of the discrepancy could not be determined.

5. There was no other evidence of a mechanical failure or malfunction of the aircraft which either would have caused or contributed to the accident.

6. The weather forecasts covering the period of the flight were substantially correct.

7. There was light to moderate rime icing in clouds below 20,000 feet; there was no significant wind shear or turbulence present below 20,000 feet in the vicinity of the airport.

8. There was a thin layer of slush on the runway at the time of the landing.

9. The pilot was aware of the weather and runway conditions prior to the landing approach.

10. The aircraft operating manual contained data which showed that the aircraft could not have stopped safely on runway 23.

11. The aircraft touched down at a higher-than-normal groundspeed which further degraded the runway braking coefficient of friction.

12. The pilot failed to immediately recognize the insufficient braking action and delayed his attempted go-around until the aircraft was about 1,200 feet from the end of the runway.

13. There was insufficient runway remaining for the go-around.

14. There was no physical evidence to indicate that the aircraft was in a hydroplaning condition when it overran the runway.

15. The crash was impact-survivable for the passengers since the decelerative forces were within the limits of human tolerance.

16. The flightcrew died as a result of blunt impact trauma.

17. There was an intense postcrash fire.

18. The passengers died as a result of thermal injuries sustained in the postcrash fire.

19. The unsuccessful attempted go-around increased the severity of impact forces and the possibility of a postcrash fire and fatal injuries. The accident may have been survivable had the pilot continued to decelerate the aircraft.

20. The pilot exercised poor judgment in attempting the landing under the conditions that existed.

21. The AFM did not adequately emphasize the required landing distances under wet and icy runway conditions.

32 Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was the pilot's attempt to land on a slush covered runway with insufficient stopping distance available, and his delayed initiation of a go-around which resulted in there being insufficient runway available to complete the maneuver successfully. Contributing to the accident was the lack of adequate emphasis in the manufacturer's aircraft flight manual regarding the required aircraft landing/stop distances under wet and icy runway conditions.

4. RECOMMENDATIONS

As a result of its investigation and previous overshoot accidents with the Citation, the Safety Board made the following recommendations to the Federal Aviation Administration:

Require Cessna to include in the appropriate sections of all Citation aircraft flight manuals the portion on page IV-3 of the manufacturer's aircraft operating manual which pertains to landing on slippery runways. (Class II, Priority Action) (A-81-65)

Require Cessna to include in the appropriate sections of all Citation aircraft flight manuals a warning that solid ice, snow, or slush corrected landing distances may not be adequate in operations. (Class II, Priority Action) (A-81-66)

Through advisory circulars and/or operations bulletins, emphasize and reinforce in the training curricula for at least all turbojet initial and recurrent phases the limitations and the hazards that may be encountered when landing on slippery runways. (Class II, Priority Action) (A-81-67)

Review and require revisions as appropriate of manufacturer's aircraft flight manuals to include sufficient slippery runway condition correction factor information or require an appropriate warning that landing distances under slippery runway conditions are unknown. (Class II, Priority Action) (A-81-68)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ ELWOOD T. DRIVER
Vice Chairman

/s/ FRANCIS H. McADAMS
Member

/S/ G. H. PATRICK BURSLEY
Member

JAMES B. KING, Chairman, and PATRICIA A. GOLDMAN, Member, did not participate.

June 10, 1981.

5. APPENDIXES

APPENDIX A

INVESTIGATION AND HEARING

1. Investigation

The Safety Board was notified of the accident about 0930 on January 21, 1981, and a team of seven investigators was immediately dispatched to the scene. Working groups were established for operations, human factors, weather, and airworthiness.

Parties to the investigation included representatives of the Federal Aviation Administration, Georgia Pacific Corporation, Cessna Aircraft Corporation, and Pratt & Whitney.

2. Public Hearing

No public hearing was held, and depositions were not taken.

APPENDIX B

CREW INFORMATION

Pilot Bobby Gene Martin

Pilot Bobby Gene Martin, 46, held Airline Transport Pilot (ATP) Certificate No. 1380117 with the following category, class, and type ratings: airplane multiengine land, Cessna 500 Citation, and Lear Jet; and commercial privileges in single-engine land airplanes, and rotorcraft-helicopter aircraft. His ATP certificate was issued January 27, 1975. He received his type rating in the Citation on October 30, 1971. His last recurrent training was received at American Airlines Training Corp., Dallas-Fort Worth, Texas, on June 12, 1980, where he completed 6 hours of ground school and 3 hours in the flight simulator.

Mr. Martin held a first-class medical certificate issued September 26, 1980, with the limitation that, "holder shall wear lenses that correct for distance vision and possess glasses that correct for near vision while exercising the privileges of this airman certificate."

The following information on pilot Martin is based on a review of company records:

Total Time	-	10,463 hrs.
Pilot in Command	-	7,609 hrs.
Multi-Engine	-	9,193 hrs.
Multi-Engine (Jet)	-	5,002 hrs.
CE-500	-	3,642 hrs.
Instrument	-	470 hrs.
Night	-	350 hrs.
Last 30 Days	-	23.4 hrs.
Landings Last 30 Days	-	13
Last 24 hours	-	1.2 hrs.
Prior Flight	-	1-17-81
Prior Flights into Bluefield	-	9-3-80(2), 9-4-80, 9-5-80, 9-24-80, 9-25-80

Work/Flight Schedule

1-21-81	-	Work 0600-0845 Flight 1 hr. 8 mins.
1-20-81	-	Work 0830 - 1600
1-19-81	-	Work 0700 - 1600
1-18-81	-	Off duty
1-17-81	-	Flight 2 hrs. 52 mins.
1-16-81	-	Flight 4 hrs. 38 mins
1-15-81	-	Work 0700 - 1730 Flight 1 hr. 24 mins.

Copilot Larry Allen Rodeffer

Copilot Larry Allen Rodeffer, 32, held ATP Certificate No. 212561853 with the following category, class, and type ratings: airplane multiengine land, Cessna 500 Citation; and commercial privileges in single-engine land airplanes. His ATP certificate was issued July 5, 1978. He received his type rating in the Citation July 5, 1978. He also held a flight instructor certificate, issued July 19, 1975. There was no record available of his recurrent training. However, the Company chief pilot stated that he gave the copilot the training required by 14 CFR 61.55.

The copilot held a first-class medical certificate issued February 2, 1980, with the limitation that, "holder shall wear correcting lenses while exercising the privileges of this airman certificate."

The following information on copilot Rodeffer is based on a review of company records:

Total Time	-	4748 hrs.
Pilot in Command	-	3725 hrs.
Multi-Engine	-	2043 hrs.
Multi-Engine (Jet)	-	1216 hrs.
CE-500	-	1216 hrs.
Instrument	-	472 hrs.
Night	-	732 hrs.
Instructor	-	1800 hrs.
Last 30 Days	-	36.2 hrs.
Landings Last 30 Days	-	30
Last 24 hours	-	12 hrs.
Prior Flight	-	1-17-81
Prior Flight into Bluefield	-	9-4-80, 9-24-80, 9-25-80,

Work/Flight Schedule

1-21-81	-	Work 0630-0845 Flight 1 hr. 8 mins.
1-20-81	-	Work 0830 - 1600
1-19-81	-	Work 0700 - 1600
1-18-81	-	Off duty
1-17-81	-	Flight 2 hrs. 52 mins.
1-16-81	-	Flight 42 mins.

APPENDIX C

AIRCRAFT INFORMATION

N501GP, a Cessna **CE-500** Citation, serial **No. 500-0026,** was manufactured and certificated in the transport category as a dual piloted aircraft on June **21, 1972.** The aircraft was delivered to the Georgia Pacific Corporation on June **23, 1972,** and it had been operated by the company that time. Before departing for Bluefield, West Virginia, the total time on the aircraft was **4,439.23** hours. The last inspection, phase **4,** was accomplished on January **14, 1981,** at a total time of **4,435.8** hours. The last static system check was accomplished on December **22, 1980.** The last transponder check was performed on December **8, 1980.**

A review **of** all pertinent airworthiness directives showed that they had been accomplished on the aircraft.

The aircraft was equipped with two Pratt & Whitney JT15D-1 turbofan engines each rated at 2,200 pounds of static thrust. The engines were not equipped with thrust reversers.

Engine Data

No. **1** Engine **S/N 76083**

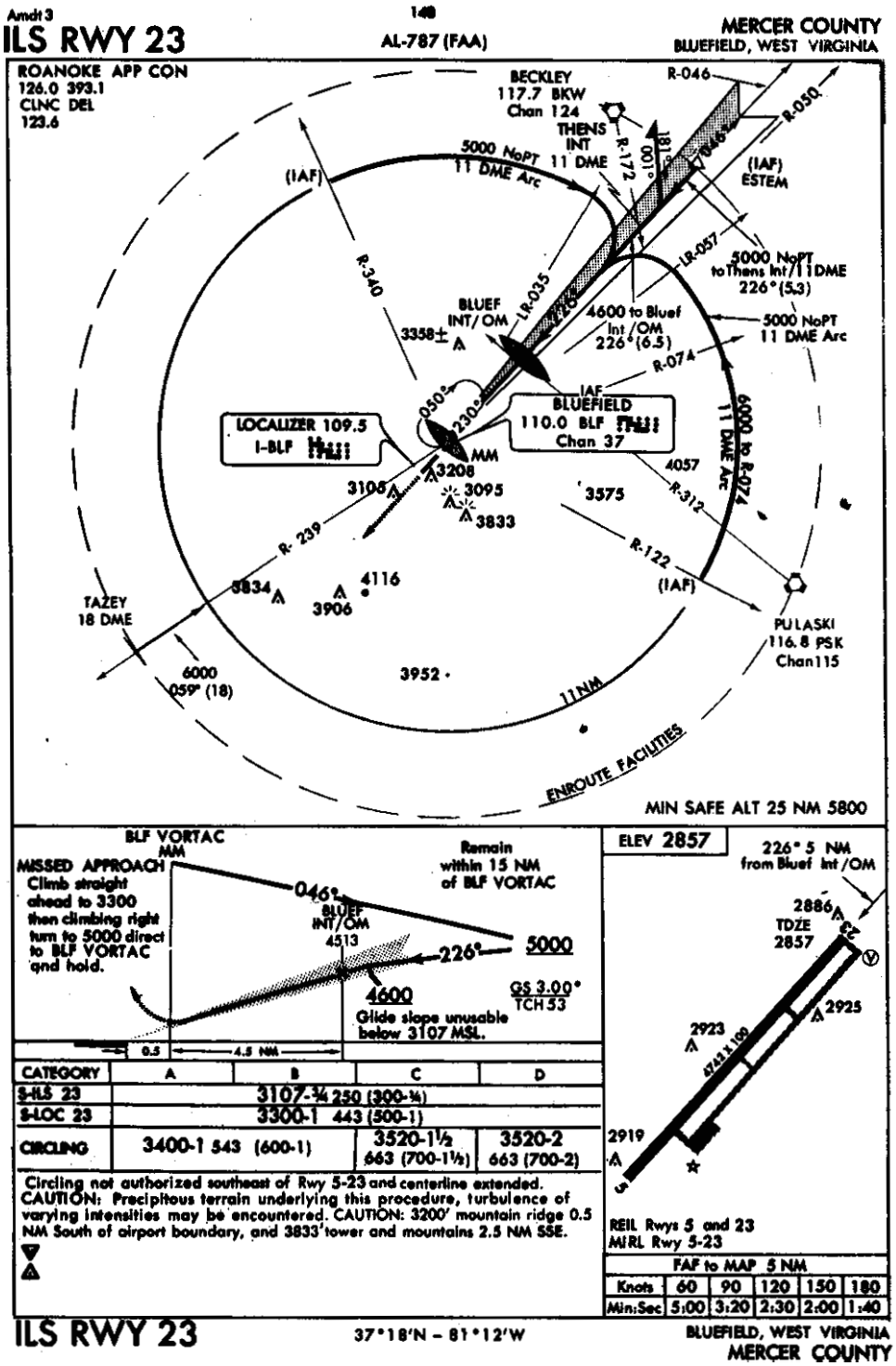
Date Installed	-	May **4, 1979**
Time Since New	-	3,781:00 hrs.
Time Since Major Overhaul	-	**2,011:04 hrs.**
Time Since Installation	-	858:00 hrs.
Time Since Hot Section Inspection	-	858:00 hrs.
Time Since last Inspection	-	**404** hrs.
Total Cycles	-	**2,866**

No. 2 Engine S/N **76077**

Date Installed	-	February **16, 1979**
Time Since New	-	3,550:00 hrs.
Time Since Major Overhaul	-	1,351:55 hrs.
Time Since Installation	-	959:00 hrs.
Time Since Hot Section Inspection	-	959:00 hrs.
Time Since Last Inspection	-	**404** hrs.
Total Cycles	-	**1,746**

APPENDIX D

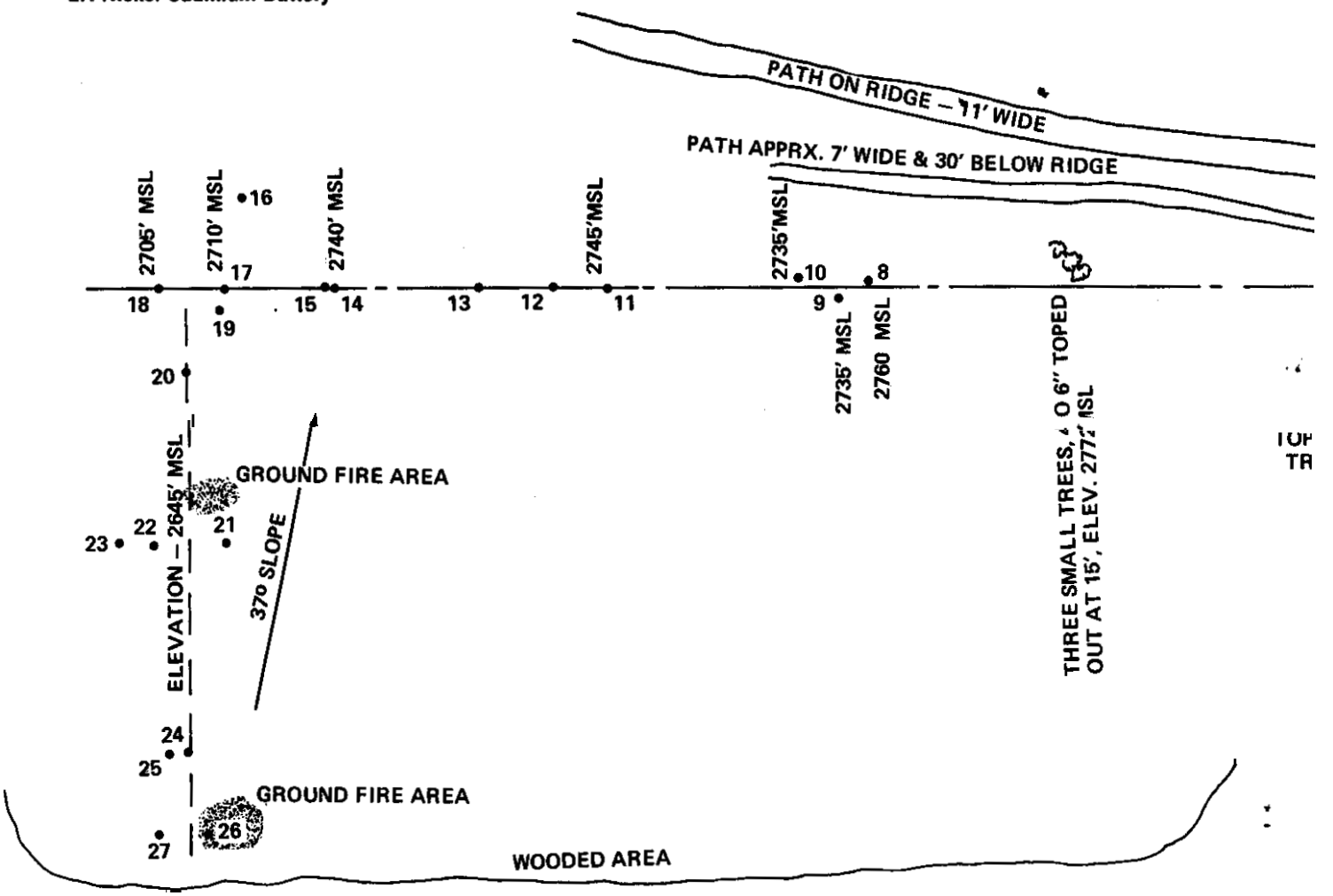
INSTRUMENT APPROACH CHART



"ILLUSTRATION ONLY - NOT TO BE USED FOR NAVIGATIONAL PURPOSES"

LEGEND

1. Bottom Fuselage Communication Antenna
2. Left Flap Trailing Edge Filler and Skin approx. 5" X 8"
3. Several pieces of Lower Fuselage Rotating Beacon Red Lens
4. MLG Door to Strut Linkage Rod, Left MLG Actuator Bearing, Brake Housing pieces, end pieces of Rotating Beacon Red Lens
5. 5" piece of Right Hand Brake Tubing
6. A Spoiler from inboard Flap Loading Edge
7. Piece of Spar Cap—IO" long
8. 62" section of Right Flap—inboard End
9. Left Elevator, Left Hand Forward Baggage Door. and section of Left Hand Outboard LE Horizontal Stabilizer
10. Pitot Tube, 2 placer of Bottom Wing Skin and Left Aileron
11. 57" Long Left Hand Flap, Right Wing Inboard Leading Edge Skin, piece of Speed Brake, Main Gear Mount
12. 12'8" section of Right Wing and complete Aileron
13. 4'6" piece of Left Wing Outboard Section, Left Wing Fuel injector Pump
14. 4'8" section of Inboard End of Right Wing Flap, Left Main LQ Assembly, Left Wing Spar with Bottom Speed Brake Panel and Actuator, 41" section of Left Aileron and a small section of Left Flap End
15. Portion of Left inboard Wing—69" long and 24" wide
16. Right Engine Starter/Generator
17. Aft portion of Fuselage with Left and Right Engines end Nose Gear Assembly
18. Right Hand Baggage Door
19. Portion of Forward Fuselage, Oxygen Bottle and Avionics Boxes
20. Emergency Exit Window
21. Right Main Landing Gear Assembly and Actuator
22. Section of Engine Inlet
23. Rudder Bellcrank
24. Section of Cabin Fuselage from FS 304 aft to Pressure Bulkhead
25. Empennage Assembly including Right Horizontal Stabilizer, Right Elevator, Rudder, portion of Left Stabilizer
26. Copilot Seat
27. Nickel Cadmium Battery



and pieces of Rotating Beacon Red Lens

LE Horizontal Stabilizer

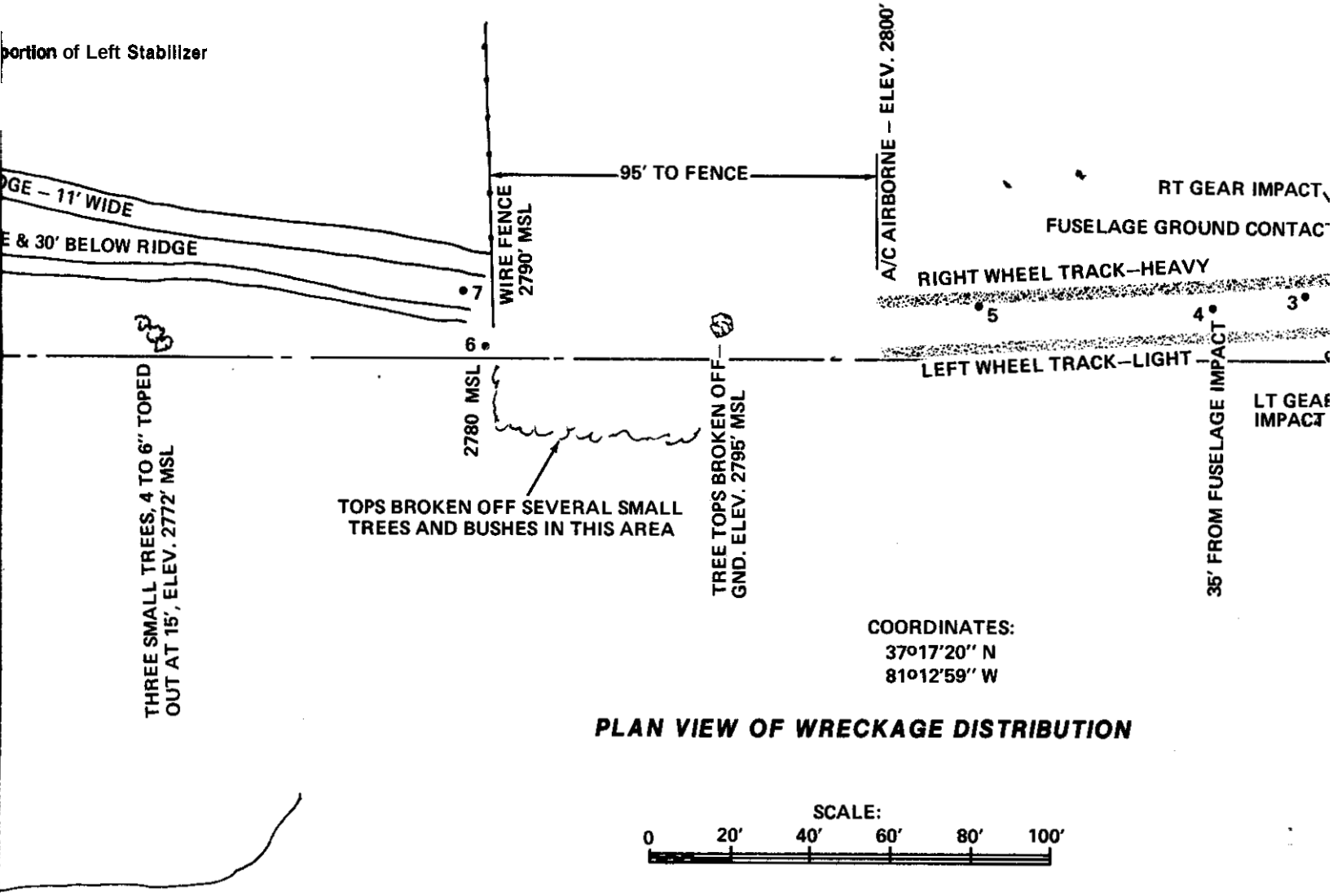
ake, Main Gear Mount

par with Bottom
Cell Flap End

portion of Left Stabilizer

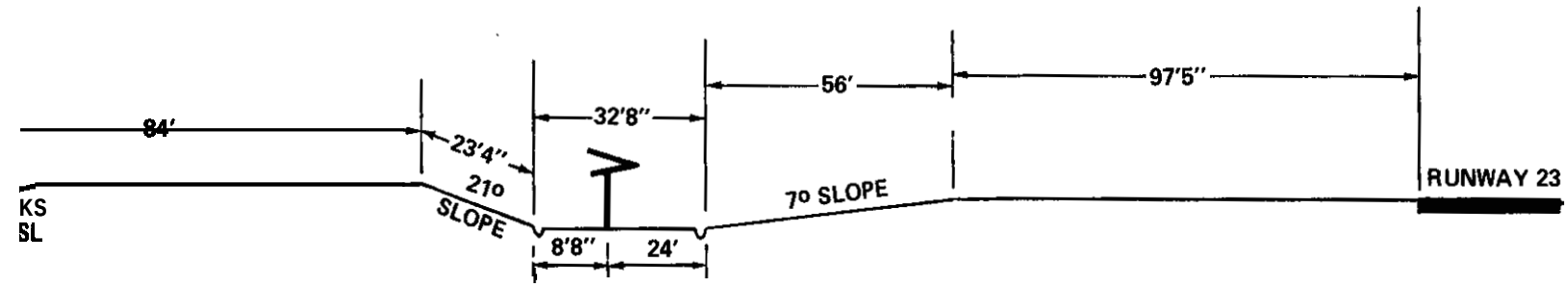
END OF TRACKS
ELEV. 2800' MSL

S

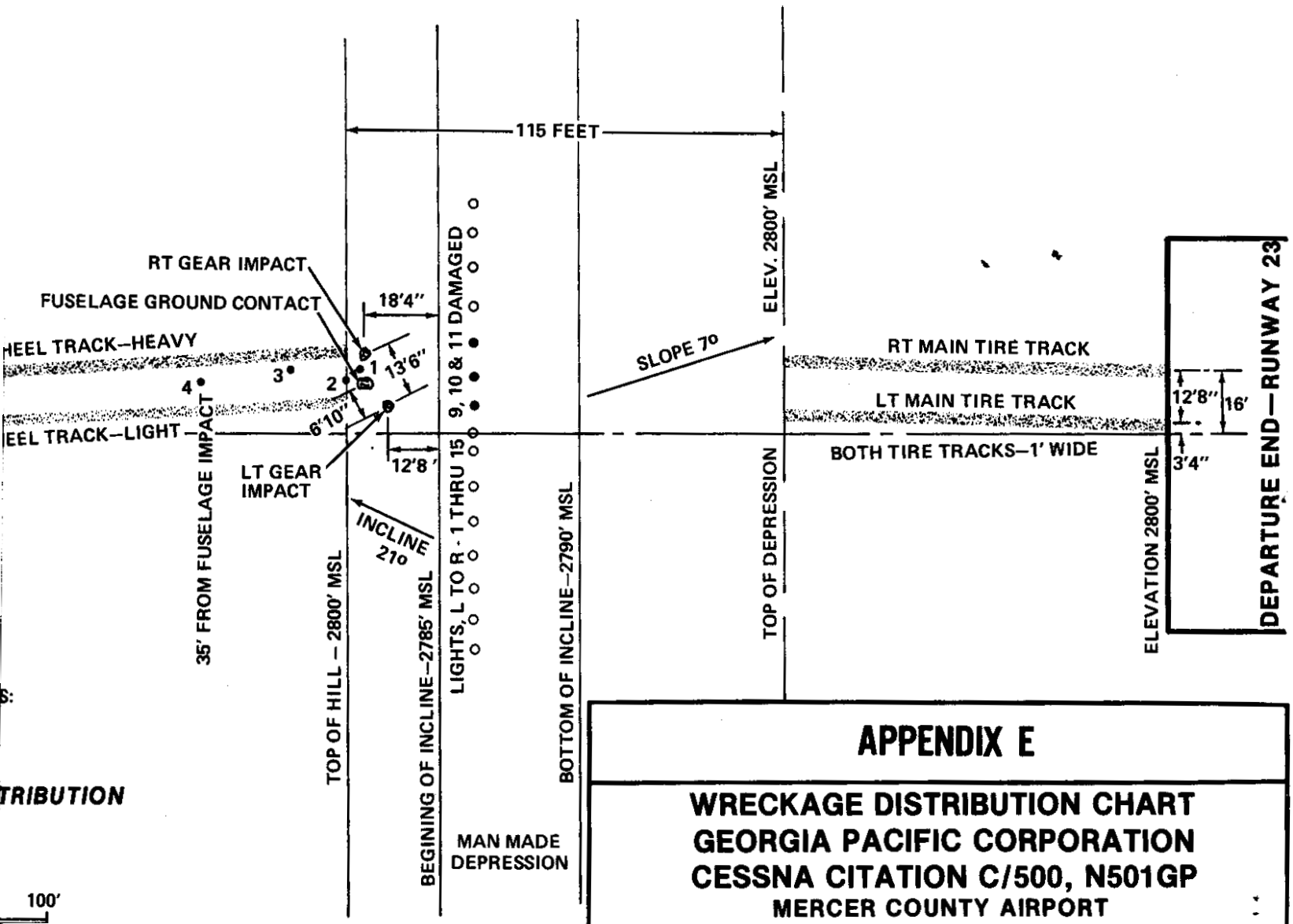


COORDINATES:
37°17'20" N
81°12'59" W

PLAN VIEW OF WRECKAGE DISTRIBUTION



SIDE VIEW — MAN MADE DEPRESSION



APPENDIX E

WRECKAGE DISTRIBUTION CHART
GEORGIA PACIFIC CORPORATION
CESSNA CITATION C/500, N501GP
MERCER COUNTY AIRPORT
BLUEFIELD, WEST VIRGINIA
JANUARY 21, 1981

*U.S. GOVERNMENT PRINTING OFFICE: 1981-0-341-828/32