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At 1950 e.s.t., on January 12, 1975, a Cessna model 411A, N100KC, crashed near Wise, Virginia. The aircraft was on an IFR flight from Savannah, Georgia, to Pontiac. Michigan. Before the crash, the pilot reported that there was an engine problem, that the aircraft was icing up and vibrating severely, and that he needed air traffic control's assistance to find an airport. The air traffic controller vectored the flight to 'Lonesome Pine Airport near Wise, Virginia, where the pilot executed a VOR approach. However, the pilot was unable to see the airport and executed a missed approach. The aircraft crashed at night in an area of low ceilings and freezing rain and while the pilot was receiving vectors toward Tri-City Airport, Tennessee. The aircraft was destroyed, and the seven occupants were killed.

The National Transportation Safety Board determines that the probable cause of the accident was a controlled collision with the terrain, while the flight was receiving radar vectors in night IMC conditions, because structural icing prevented the pilot from climbing to a safe altitude. Contributing to the accident were the pilot's failure to appreciate the severity'of the weather he could expect to encounter and to take the initiative to divert the flight before his options were reduced, and the controllers' failures to take more timely and forceful action to seek more specific information regarding the degree of deterioration of the pilot's and aircraft's ability to deal with the adverse conditions.

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File No. 3-0512

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON. D. C. 20594

AIRCRAFT ACCIDENT REPORT

Adopted: March 8, 1976

CESSNA 411A, N1OOKC
WISE, VIRGINIA
JANUARY 12, 1975

SYNOPSIS

At 1950 e. s.t., on January 12, 1975, a Cessna model 411A, N100KC, crashed near Wise, Virginia. The aircraft was on an IFR flight from Savannah, Georgia, to Pontiac, Michigan. Before the crash, the pilot reported that there was an engine problem, that the aircraft was icing up and was vibrating severely, and that he needed air traffic control's assistance to find an airport. The air traffic controller vectored the flight to Lonesome Pine Airport near Wise, Virginia, where the pilot executed a VOR approach. However, the pilot was unable to see the airport and executed a missed approach. The aircraft crashed at night in an area of low ceilings and freezing rain and while the pilot was receiving vectors toward Tri-City Airport, Tennessee. The aircraft was destroyed, and the seven occupants were killed.

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1. INVESTIGATION

1.1 History of the Flight

At 1644 [1/] e. s.t., on January 12, 1975, a Cessna 411A, N100KC, departed Savannah Municipal Airport, Savannah, Georgia, on an IFR flight

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

plan, via low-altitude airways, to Pontiac, Michigan. The pilot, a dentist accompanied by his wife and five children, was returning home from his vacation. About 8 minutes after takeoff, the pilot of N1OOKC declared an emergency and requested radar vectors back to Savannah. The pilot explained that he had "... a fluctutation on our right engine." At 1700, the pilot reported "... everything seems to be fine ... let's start climbing.." The Savannah controller cleared the flight to maintain 7,000 feet 2/ and vectored the flight to airway Victor 185. The pilot was cleared subsequently to climb to 11,000 feet and to continue to Victor 185 where ha was to resume his own navigation.

At 1717, the pilot requested Jacksonville ARTCC to provide him with weather information along the route. He was advised of a line of thunderstorms ahead but was told that a deviation to the west of course would keep the flight out of "the heavy stuff." The pilot also was advised that the pilot of an MU 2 reported light rime icing and moderate turbulence at 17,000 feet. At that time, the pilot advised the controller that he had weather radar aboard the aircraft. The controller then cleared the flight to "deviate as necessary around the precip areas ...." At about 1728, the pilot reported that he was at 11,000 feet. The flight was requested to change frequencies and, after some repeated transmissions by both the controller and the pilot, communication was established on the new frequency. At 1742, after communication was established on the new frequency, the flight was "handed off" to Atlanta ARTCC so that the Atlanta controller could assist the pilot in avoiding some of the weather. At 1743, the Atlanta ARTCC controller cleared the flight to proceed direct to Anderson VOR, then via radar vectors to Sugar Loaf VOR, then as filed.

At 1746, the flight was requested to change frequencies. After communications were established on the new frequency, the pilot informed the controller that he had weather radar, he was VFR. he was going to use the radar, and "... you know I need your help too." At 1758, the controller provided the pilot with a radar vector which "... will take you through the lightest part I'm showing." The vector was accepted by the pilot. At 1804, the controller issued a vector of 340° which was accepted, and the controller cleared the flight to intercept Victor 222 to Sugar Loaf VOR and continue as filed.

2/ All altitudes herein are mean sea level, unless otherwise indicated.

At 1807, the pilot reported that he was not receiving Sugar Loaf VOR. The aircraft's position relative to Victor 222 airway was given by the controller. At 1817, after changing frequencies again, the flight was cleared "... direct Sugar Loaf now, you're clear of everything I am painting."

Shortly after 1827, the pilot requested that the controller check the weather at Willow Run and at Detroit, Michigan. The pilot stated he could not "... get anybody about weather here..." The weather at Willow Run was not available, but the controller gave the pilot the Detroit Metropolitan Airport weather.

At 1836, the controller advised the pilot that there were some "isolated cells" in the vicinity of Holston Mountain VOR just ahead of the flight and other cells over Whitesburg VOR northwest of the flight. At the pilot's request, the controller cleared the flight to deviate to avoid the weather and agreed to "... give you vectors from the weather I'm painting, though I'm not painting all the weather."

At 1839, the pilot reported that "I'm new with radar here ..." and after discussing what he saw on his radar he asked if a 15° deviation to the left would keep him out of the weather. After further discussion between the pilot and the controller, the pilot accepted a vector to "... get you through the narrowest part of it right now." About 1 minute later, in response to a query from the controller, the pilot reported he was in "... heavy rain."

At 1846, the pilot requested vectors to Victor 53. He was advised he was about 4 miles left of Victor 53, and the flight was cleared direct to Whitesburg VOR and was given a vector toward the station.

At 1851, in response to a query from the controller, the pilot reported that "... the ride's great," and that he was navigating "... on Whitesburg now." At 1856, the pilot requested a report on the cloud tops in his area and was advised that the tops were at 14,500 to 15,000 feet. At 1857, control of the flight was transferred to the Indianapolis ARTCC.

At 1904, the pilot repgrted to the controller that "... 100KC is starting to pick up some ice at 11,000 sir, any report on where we can go to get out of this?" He was advised that he could either climb or descend at his discretion. At 1904:35, the pilot said that he was leaving

11,000 feet and that he was climbing *to* 15,000 feet. At 1904:40, he was cleared to maintain 15,000 feet. At 1905:50, the pilot reported "100KC having problem engine here sir." At 1905:55, in response to a question from the controller regarding a request to descend, the pilot said, "... negative ...." The pilot said that he would stay at his altitude and try to climb again. The controller acknowledged that transmission and at 1906:20, asked the pilot to keep him advised of the situation. Ten seconds later, the pilot reported that "100KC's got a big problem." At 1906:45, the pilot asked the controller to "... keep me ... on radar vectors on my course--I'll fiddle with my engine."

At 1907:55, the pilot stated "... better stay at eleven here sir," and the controller cleared the flight to maintain 11,000 feet.

At 1908:10, the pilot requested vectors back to course and was given a heading of 360°. When advised that he would be about 3 miles east of the airway, he asked to be put on the airway and was given a vector of 350°.

At 1911:15, the pilot reported "100KC extreme vibration again sir." The controller requested the pilot to repeat his call and the pilot, at 1911:20 said "100KC has got extreme vibration again, and you had better lead me to an airport." At 1911:25, the controller replied that there was an airport at Whitesburg and another about 30° to the right of the aircraft heading at 15 miles. At 1911:35, the pilot replied ". .. lead me somewhere. Can I get in there without an approach or what?" The controller responded that he would check and see which was best. He also advised the pilot that "they have had a lot of snow reported on the ground at these two airports.. .."

While the controller was waiting for a report on airport conditions at Paintsville-Prestonburg-Coombs (Coombs), he advised the pilot at 1912:15 that, "... for your information .., the closest airport with an instrument approach is in your ... make it 5-o'clock position (150° right of the aircraft heading) at about 21 miles."

At 1912:30, the pilot asked what state this latter airport was in and requested the name of the airport. The controller advised the pilot, "... Lonesome Pine, it's in Virginia, and ... it's about on the Whitesburg 160° radial and about 17 or 18 miles." About 25 seconds later the pilot again asked for the name of the airport. He was given the name and the frequency of the Lonesome Pine VOR (109.6 MHz). The pilot reported difficulty in hearing the controller, but after several transmissions, at 1913:25, he read the frequency back correctly.

At 1912:35, the Indianapolis ARTCC was advised that there were no lights at "Coombs." During the interphone conversations regarding the Coombs Airport, the controller at Indianapolis stated that 100KC was an emergency.

At 1913:40, the controller gave the pilot a vector to the Lonesome Pine Airport. When the pilot acknowledged the vector he again requested the name of the airport "... so we can get the plate out." After the controller repeated the name of the airport and the state in which it is located several times, the pilot acknowledged the information at 1914:30.

At 1914:45, the pilot transmitted "losing altitude." He was asked to repeat the transmission, but at 1915:00 he asked for the name of the city associated with the airport. After several transmissions and after the name, Wise, Virginia, was spelled out, the pilot reported at 1915:20 that he had "... the plate, I'm at 10,000, very difficult to hold altitude." The pilot then requested a vector to the VOR approach and was cleared to fly a heading of 170°.

At 1915:55, the pilot initiated a series of radio calls to attempt to contact the controller. The controller's replies apparently were not received by the pilot and at 1916:20, the pilot requested another frequency. The controller did not respond.

At 1916:10, the controllers at Indianapolis ARTCC requested the Tri-City, Tennessee, Airport weather from Atlanta Center. They received it at 1917:45.

At 1917:50, the pilot asked for the Lonesome Pine weather. The controller advised "... the nearest station that I can get weather for you is the Tri-City Airport. It's about ... 30 miles due south of Lonesome Pine Airport. Their weather is measured one *six* thousand broken correction one thousand six hundred broken, four thousand overcast seven miles and light rain."

At 1918:15, the pilot responded "100KC is going down sir." The controller acknowledged the call and issued an altimeter setting of 29.94. Five seconds later, the pilot announced a heading of 160° and was advised by the controller that it "... looks pretty good for the airport right now."

At 1918:35, the pilot asked, "Did you tell KC to go down to 6,000?" Although the controller had not previously issued a clearance to maintain any specific altitude, he replied "... roger, maintain

6,000.. .." At 1918:45, the pilot transmitted "100 KC is going down." The controller acknowledged and there were several communications regarding headings and distance to the airport. At 1920:30, the pilot acknowledged that he was receiving the Lonesome Pine VOR. At 1921:55, the pilot reported at 8,000 feet and requested a radio check, the controller acknowledged his call, directed the pilot to maintain 6,000 feet, and advised that the heading to the airport was good and that the flight was about 12 miles from the airport. The pilot responded that the controller's transmission was "breaking up." At 1923:10, 11 miles out, the pilot reported he was at 6,800 feet. The call was acknowledged. At 1923:20, the pilot asked for the winds at the airport. The controller replied, "100KC say again," whereupon the pilot asked ". . . what runway would I use there?" He was told to use runway 24. The pilot had difficulty hearing that response, and at 1924:40 asked if the controller would be able to hear radio transmissions when the aircraft went below 6,000 feet. He was advised that the remote transmitter site was about 15 miles southwest of Lonesome Pine.

At 1924:55, the pilot asked whether he should go lower after he reached 6,000 feet. He was advised that when he reached 6,000 feet, the flight was cleared for an approach to Lonesome Pine to cruise at 6,000 feet. The pilot acknowledged the clearance and asked if the controller was going to lead him to the procedure turn. He was told that he was cleared for the procedure turn and the approach. The clearance was acknowledged. While the flight was inbound to the airport the controller advised the pilot when the flight was 6 miles and 3.5 miles from the airport. At 1927:50, the controller asked if the pilot had ground contact. The pilot stated that he did not. He repeated the statement at 1928:00 and reported that he was at 6,000 feet. Five seconds later, he asked if he could go below 6,000 feet and he was advised that he could start his descent. In reply he asked if he could descend to 4,600. He was advised that 4,600 feet was a satisfactory altitude for the procedure turn.

The controller team determined that the runway lights were on at Lonesome Pine and that the runway end identifier lights could be activated by radio command.

At 1929:10, the pilot reported at 5,200 feet but he had no ground contact. At 1929:35, the pilot reported outbound in the procedure turn.. At 1930:00, the controller advised the pilot that the runway lights were on. The pilot had difficulty in hearing that report. At 1931:10, the

pilot reported at 4,000 feet. The controller advised him that he should be at 4,600 until inbound on the procedure turn. The pilot requested that the transmission be repeated and then described his flightpath and asked if it was correct. At 1931:45, the controller told the pilot to stay at 4, 600 feet within 10 miles of the VOR. The pilot reported he could not hear the transmission. It was repeated and the pilot stated he "would go up a little bit here." Communication was established and at 1933:35, the pilot said "tell me when I can go down to two six eight oh, will ya?" The field elevation at Lonesome Pine is 2,680 feet. The pilot again experienced difficulty in hearing the controller. At 1934:20, the pilot, having been observed on radar to be inbound to the airport from the procedure turn, was cleared for an approach to cruise at 4,000 feet. At 1934:25, the pilot asked if he could leave 4,000 feet, and the controller advised him that he could. The pilot asked how far he was from the airport and at 1934:40 he was told that he was 2.5 to 3 miles out. At 1935:10, the controller advised the flight that it was 314 mile from the airport and asked if the pilot had ground contact. The pilot replied that he did not have ground contact, he was at 3,000 feet, and he was too high. The pilot did not see the airport and initiated a missed approach.

The operator of the Lonesome Pine Airport was at his home when he heard a twin engine aircraft make a missed approach; about 10 minutes later he heard what he believed to be the same aircraft make another missed approach. He stated that the weather at the airport was in his opinion, an estimated 200 feet overcast, visibility 1 mile, with freezing rain. He reported that the ground and trees were covered with clear ice about 1/4 inch thick.

At 1937:45, the pilot requested assistance to get the flight to another airport and the controller responded with a vector toward Tri-City Airport, Bristol, Tennessee -- about 25 miles south of Wise, Virginia. The pilot indicated that he was starting to climb, and he was cleared to turn right to 180°, to climb, and to maintain 6,000 feet. The pilot reaffirmed the assigned heading of 180° and asked if there was an ILS at Tri-City. He was told that there was an ILS and a radar approach control there. At 1939:05, the pilot reported his altitude as 3, 300 feet, and he was instructed to maintain 6,000 feet. He replied, "100KC we're trying to climb sir." After being informed of the weather at Tri-City, at 1939:55, the pilot said "100 KC get me there." At 1940:10, in response to a request for his altitude, the pilot reported that he was at 3,000 feet and unable to climb. The controller reaffirmed that report

and in response to the pilot's question, "can we make it at three?" at 1941:00 the controller advised, "One hundred Kilo maintain your altitude." At that time the flight was traversing terrain that was about 3,000 feet. Big Stone Mountain, elevation 4,223 feet, was located about 6 miles off the right wingtip.

The Indianapolis manual controller then contacted Atlanta Center and advised the Tri-City sector controller that the aircraft was, "stuck at three thousand, he can't get up and could you hand him off to Tri-City approach." Coordination was effected between the two Centers and Tri-City Tower. It was determined that the flight could not cross a ridge just north of Tri-City where the elevation exceeded 3,000 feet. The situation grew more serious when the Indianapolis controller discovered that he was unable to communicate with the pilot. Controllers testified that their immediate concern was to reverse the aircraft's course in sufficient time to avoid the ridge ahead of the aircraft.

At 1943:30, communication was reestablished between the pilot and the controller, and the pilot acknowledged an instruction to turn left to a heading of 360°. Course was reversed about 5 miles north of the Clinch Mountain ridge. At 1944:15 the pilot reported "... getting on three *six* zero, sir." He again stated that his altitude was 3,000 feet and that he could not climb any higher. Having resolved their immediate problem, controller personnel coordinated for the next 2 minutes and decided that the flight should be turned to a heading of 240° to take the flight down a valley between the mountain ridges and vector the pilot around the end of the mountain ridge just north of Tri-City. The pilot could then approach the airport from the northwest. However, the planned course of action could not be taken immediately because, at 1945:35, radio communications with the pilot were again lost as the flight proceeded on the assigned 360° heading. The controller could hear the pilot calling, but the pilot could not hear the controller's transmissions. At 1947:10, the Indianapolis Controller transmitted the following message to the flight: "One hundred Kilo Charlie if you read Indianapolis, turn left heading two four zero over." No reply was received. The controller attempted to contact the flight through another aircraft on the frequency but these efforts were also unsuccessful.

Radio communication with the pilot was reeatablished at 1948:25, and the flight was cleared to turn left to a heading of 240°. The pilot acknowledged. According to the IND center controller, the aircraft's radar position at that time was about 10 miles southeast of Lonesome Pine. The flight turned to a heading of 240°, and the controller's

observations indicated that the aircraft track would pass south of Stone Mountain and subsequently over the valley where it could be vectored to Tri-City Airport as previously planned.

Although radio communications had been regained, the pilot had difficulty understanding or hearing the controller. In reply to his question, the pilot was again informed that he was being vectored to Tri-City Airport. The pilot questioned the controller about distances from the airport but apparently did not receive the answers. At 1950:05, the last transmission from the pilot was "100 KC do you read me sir, do you read me?"

A number of ground witnesses indicated that they heard a low flying aircraft in the areas where N100KC was operating. They indicated that when they heard the aircraft pass overhead, the clouds were 100 to 200 feet above the ground and visibility was 1 mile or less in freezing rain.

A witness about 1 mile northeast of the accident site saw aircraft lights pass overhead about 100 feet above the ground. He said that the engines sounded normal.

The accident occurred at night at latitude 36°53.3'N and longitude 82°32.5'W. The ground elevation was 3,240 feet at the impact site.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Other
Fatal	1	6	0
Nonfatal	0	0	0
None	0	0	

1.3 Damage to the Aircraft

The aircraft was destroyed.

1.4 Other Damage

None.

1.5 Crew Information

The pilot was certificated for the flight in accordance with current regulations. (See Appendix B.)

1.6 Aircraft Information

The aircraft was certificated and maintained in accordance with existing regulations. The pilot reported 6 hours of fuel aboard which was equivalent to a full fuel load of about 196 gallons of 100/130 aviation gasoline. The weight and balance were calculated for takeoff and impact. The takeoff weight was about 6,802 lbs. and the maximum gross weight limit was 6,500 lbs. The weight at impact was calculated *to* be 6,346 lbs. The center of gravity was calculated to have been within limits at takeoff and at impact. (See Appendix C.)

1. 7 Meteorological Information

The pilot of NlOOKC was given a personal weather briefing by Savannah flight service station personnel. No record of the contents of the briefing was made and the communicator was unable to recall the details of the briefing. The following data, however, were available to the pilot when he was briefed.

The National Weather Service (NWS) reported that there was a quasi-stationary front which extended from New Jersey southwestward through southern Georgia to the Gulf of Mexico. NWS forecasted that a low-pressure area would develop in the southern Gulf States, move northeastward along the front, and spread considerable moisture into the Ohio Valley and northward to New York by 0200.

The current forecast called for frequent, widespread IFR conditions by evening. Precipitation was forecasted to be in the form of snow or mixed rain and snow. The terrain above 2,000 feet was forecasted to be obscured frequently.

The freezing level was forecasted to be on the surface in Ohio rising to 4,000 to 6,000 feet over the eastern slopes of the mountains and to near 12,000 feet over the Carolinas. Locally severe icing was forecasted in cumulonimbus clouds and thunderstorms and occasional moderate mixed or rime icing in clouds and precipitation above the freezing level, especially in freezing precipitation.

This forecast was supplemented by several AIRMETS and SIGMETS which warned of low ceilings, restricted visibilities, snow and rain, and moderate to locally severe clear or mixed icing in clouds and precipitation. Thunderstorms were also predicted along the flight's intended route.

The weather in the accident area was described as low ceilings with visibility about 1 mile in freezing rain. One witness near Lonesome Pine Airport reported 1/4 inch of clear ice on the ground and trees at the time the aircraft was making this approach. In the accident area, there was 1/4 to 1/2 inch of clear ice on the trees 2 days after the accident. Small amounts of ice remained on some portions of the wreckage when it was found the afternoon following the accident.

The accident occurred in darkness, in or below clouds, and in an area where there were few, if any, ground lights.

1.8 Aids to Navigation

There were no known discrepancies or malfunctions of the ground navigational aids used by N100KC. On two occasions the pilot reported that he could not receive VOR stations. However, in each case, he later reported he was receiving the signal and navigating with those aids.

The published instrument approach procedure for Lonesome Pine Airport was based on a VOR facility on the airport. The initial approach altitude was 6,000 feet in all quadrants. A procedure turn was authorized within 10 miles of the airport with a minimum altitude of 4,600 feet until established inbound on a heading of 242°. A straight-in approach to runway 24 was authorized with a minimum descent altitude of 3,360 feet, 680 feet above the ground. The minimum visibility applicable to N100KC was 1 mile. The airport elevation and the runway elevation in the touchdown zone was 2,680 feet.

The aircraft operated under radar control throughout the flight. The recorded radar data indicated that there were only *two* occasions when the aircraft target was not depicted on the controller's radar display. These two occasions were in the latter stages of the flight when the aircraft was operating at 3,300 feet and there was high terrain between the radar antenna and the aircraft. (See Appendix D.)

1.9 Communications

On several occasions, the pilot reported difficulty hearing or understanding communications from the Indianapolis ARTCC. Some difficulty was encountered after the pilot reported that he was accumulating ice on the aircraft and during the descent on his instrument approach to the Lonesome Pine Airport. Following the missed approach at Lonesome Pine, there were two occasions during which radio communications were lost

when the aircraft was operating at 3,300 feet with high terrain between the radio transmitter/receiver site and the aircraft. The ARTCC remote radar/radio antenna site which served that area was located at Lynch, Kentucky, about 15 miles southwest of Wise, Virginia, in the mountains.

The controller reported no difficulties hearing transmissions from the flight; however, some of the pilot's transmissions had to be repeated because their content was unclear or because other transmissions overlapped those from the aircraft,

1.10 Aerodrome and Ground Facilities

Lonesome Pine Airport has one runway -- 06/24. The runway is 4,700 feet long and 100 feet wide and is equipped with medium intensity runway lights and runway end identification lights (REIL). The runway lights and a rotating beacon are illuminated at night, but the airport is unattended from 1800 to 0800. The REIL's can be turned on by tuning a radio transmitter to 122.8 MHz and depressing the microphone key five times. This information was published on the Jeppesen instrument approach chart used by the pilot. The center controller attempted to pass this information to the pilot after he executed the missed approach but the pilot's comments indicate that he did not hear the frequency correctly.

There are no weather-observation or weather-reporting facilities at Lonesome Pine Airport. The Tri-City airport altimeter setting is used for instrument approaches to Lonesome Pine.

1.11 Flight Recorders

No flight recorders were installed on N1OOKC nor were any required.

1.12 Aircraft Wreckage

The aircraft crashed in hilly, wooded terrain. The first indications of impact were broken tree tops in a swath about 20 feet wide. The tree tops were about 50 feet above the ground, or about 3,300 feet m.s.l. Other damaged trees were found on the west side of a draw, about 600 feet wide, where the aircraft struck the ground in a left wing-down, nosedown attitude and came to rest inverted. The damaged trees were aligned about 249° magnetic.

There was no evidence of preimpact failure or malfunction of the aircraft structure or systems.

Propeller slashes from both propellers were found in the trees on both sides of the draw.

The landing gear and flaps were retracted. The left fuel tank selector was set on the main tank and the right fuel selector was set on crossfeed.

The rudder trim tab was set 2° right and the rudder trim indicator showed full left rudder. The elevator trim tab was neutral and the trim indicator showed slightly nose down.

The engines were disassembled and examined. There was no evidence of malfunction or preimpact failure that would have prevented normal operation or that would have required either engine to be shut down. Both engines exhibited evidence of rotation at impact.

Examination of the propellers indicated that they were in the low-pitch (high rpm) range and were rotating at impact. There was no evidence of preimpact malfunction of either propeller.

1.13 Medical and Pathological Information

An autopsy of the pilot revealed no evidence of disease or pre-impact incapacitation.

1.14 Fire

There was no fire.

1.15 Survival Aspects

This was not a survivable accident.

1.16 Tests and Research

None.

1.17 Other Information

1.17.1 Air Traffic Control

FAA Handbook 7110.9D, "En Route Air Traffic Control," prescribes air traffic control procedures, and controllers are required to be familiar with the provisions of the Handbook. Controllers are instructed to use their best judgment if they encounter a situation not discussed in the book.

Chapter 5 of the Handbook, "Emergencies," advises the controller that when he believes an emergency exists or is imminent, he is to pursue a course of action most appropriate under the circumstances and which most nearly conforms to the instructions in the manual. Further, the manual states that because of the infinite variety of possible situations, specific procedures cannot always be prescribed for every situation which might be considered an emergency. As a general rule, an emergency would include any situation which places an aircraft in danger, uncertainty, lost, **or** in distress.

The Handbook instructs the controller to obtain enough information to handle the emergency intelligently. The controller should base his decision as to the type of assistance required on information and requests from the pilot, because the pilot is authorized by 14 CFR 91 to determine a course of action.

The controller is instructed to provide maximum assistance to an aircraft in distress and to enlist the assistance of other available facilities when requested by the pilot **or** when deemed necessary by the controller.

1.17.2 Aircraft Owner's **Manual**

The Owner's Manual contained a section on weight and balance calculations, the established limits for the aircraft, and loading charts.

The manual also contained operating instructions for the installed deicing system on the wings, empennage, and propellers. The manual contained a note:

> "Since wing, horizontal stabilizer, and vertical stabilizer deicer boots alone do not provide adequate protection for the entire aircraft, **known** icing

conditions should be avoided whenever possible. If icing is encountered, close attention should be given to the Pitot-static system, propellers, induction systems, and other components subject to icing."

A supplement to the manual, applicable to this aircraft, recommended limiting engine operation in the 2,100 to 2,350 rpm range. Magneto checks were not to be performed in the rpm range, and in a climb continuous operation was to be avoided in that range. The purpose of this limitation was to minimize the possibility of operation with a rough or malfunctioning engine in that rpm range because certain malfunctions within the engine cause torsional vibrations which can become destructive to engine components and possibly the propeller and its attachment.

The supplement further stated that if it was necessary to continue to operate a rough engine, the best operating rpm was 2,000; however, it recommended that a rough engine be shut down whenever possible. An inspection was required after any rough engine operation.

2. ANALYSIS AND CONCLUSIONS

2.1 Analysis

The pilot was properly certificated for the flight and there was no evidence of physical incapacitation. The aircraft was properly certificated and equipped for night flying in instrument meteorological conditions. The controller was properly certificated and trained for the position he occupied. There were no reported deficiencies or malfunctions of the ground navigation aids, including the ARTCC radar and communications equipment.

The aircraft's gross weight at takeoff exceeded the maximum limits established by the owner's manual; however, the load was distributed in the aircraft so that the center of gravity was within established limits. The center of gravity stayed within established limits as fuel was consumed and the aircraft's gross weight decreased. The Safety Board could not determine the distribution or the amount of ice that had accumulated on the aircraft.

The evidence indicated that the pilot could maintain straight and level flight. The major problem was his inability to regain altitude after he had descended to 3,000 feet during the approach to Lonesome Pine.

The evidence relating to the powerplants indicates that full engine power was available and was being used. The Safety Board could not determine the specific engine malfunction being described by the pilot; however, it is possible that induction icing caused the malfunction. Since the fuel (right engine) selector was found set on the left main fuel tank, the pilot may have believed that he had a fuel-flow problem and decided to operate both engines from the left tank. However, both propellers were in the high rpm range and showed evidence of relatively high rotational speed at impact. The tree damage attributed to propeller slashes indicated that the engines were developing relatively high power.

The first communication problems were encountered at 1728, when the pilot changed communications frequencies. However, there were other communications problems later in the flight; these may have been caused by icing of the aircraft radio antennas, by signal obstruction by high terrain, or by some unidentified problems with the aircraft's radios. Additionally, the pilot twice reported difficulty in receiving VOR stations; however, as he came closer to the stations, he was able to receive them and used them for navigation.

After the pilot first reported icing at 1904, about 46 minutes before the crash, the remainder of the flight was flown in conditions conducive to structural icing. The aircraft was equipped with vacuum-operated deicing boots on all the leading edges and an electric deicing system on the propellers. The pilot did not mention using these devices and the Safety Board was not able to determine from the wreckage whether they had been used.

Clear ice caused by freezing rain can cover all the upper surfaces of an aircraft in flight and the deicing equipment will remove only the ice in the area of the equipment. Because the propellers were deiced by electrical heating of the boot, there probably was little, if any, ice on the propellers and they retained their efficiency. The vacuum-operated deicing boots on the leading edges of the airfoils would be able to remove only that ice immediately adjacent to and on the boot, leaving a large area of the airfoils subject to ice accretion. This latter ice could only be removed by operating the aircraft in an area where the ambient temperature would melt the ice.

In view of the above, the Safety Board concludes that the most likely reason for the inability to climb to a higher altitude was an accretion of ice which increased the aircraft's gross weight and decreased the lifting efficiency of the airfoils,

The pilot, accompanied by his wife and five children, was returning to his home in Michigan. He received a personal weather briefing at the flight service station at Savannah. Although no record of the contents of the briefing was made, routine briefings normally include information from the current surface weather chart, terminal sequence reports, SIGMETS and AIRMETS. radar summary reports, and winds aloft reports--all of these data were available to the briefer and to the pilot.

From the weather information that was available to the pilot, he should have known that moderate-to-severe icing was forecasted for part of his intended route. In addition, he should have known that the owner's manual advised pilots to avoid known icing conditions whenever possible.

The pilot's radio communications through various stages of the flight indicated that he was concerned about the avoidance of thunderstorms, about icing conditions, about the erratic operation of one of the engines, and about his occasional inability to receive VOR stations. Nevertheless, the pilot continued on his preplanned flight and at 1911:20, following a series of radio communications with ATC about icing, about the aircraft's climb performance, and about vibrations, he requested ATC assistance to get to an airport.

The controller recognized the need for assistance and began to collect airport and weather information to provide priority service to the distressed pilot. Although the pilot did not, on this occasion, declare an emergency, the controllers treated the situation as an emergency and initiated actions to provide priority handling for the flight. The controller did not, nor was he required to, notify the pilot that the flight was receiving priority handling. Possibly, had the controller told the pilot that he was considered to be an emergency and had he requested specifically the pilot's desire, the pilot might have been able to participate more actively in planning a course of action.

The controller interpreted the pilot's transmission at 1911:35 "... lead me somewhere. Can I get in there without an approach or what?" to be a request to be vectored to the nearest airport with an instrument approach. For that reason he responded "... for your information ... the closest airport with an instrument approach is in your.. . make it 5 o'clock position and about 21 miles. " The pilot's

responses indicated that this airport was acceptable, and the controller acted accordingly by providing assistance to help the pilot reach the Lonesome Pine VOR and coached the pilot through an instrument approach to that airport.

While on an ATC vector toward Lonesome Pine, the pilot asked for the Lonesome Pine weather. The controller advised that, "The nearest station that I can get weather for you is the Tri-City Airport. It's about ... 30 miles due south of Linesome Pine Airport. Their weather is measured on six thousand broken correction one thousand six hundred broken, four thousand overcast, seven miles, and light rain."

Possibly, had the controller at this time placed more emphasis on the lack of weather information at Lonesome Pine Airport, the communication might have caused the pilot to try to proceed to the Tri-City Airport, where the weather was known. However, he may have assumed that, because of their proximity, the weather at both airports would be similar. Or, possibly he did consider going to Tri-City but decided that his best course of action was to continue to Lonesome Pine.

At 1923:10, the pilot reported that he was at 6,800 feet. At that time the airplane was 11 miles from the airport. The pilot was concerned about a possible disruption of two-way radio communications below 6,000 feet and wanted the controller's guidance through the approach. The controller maintained communications with the pilot and gave the pilot advisory service throughout the approach.

When the flight was near the airport, the pilot reported that he did not have ground contact, that he was at 3,000 feet, and that he was too high. At that point, the aircraft was 360 feet below the MDA. The pilot initiated a missed approach and requested assistance to get to another airport. The controller issued a vector to Tri-City Airport and cleared the flight to climb and maintain 6,000 feet.

The pilot's desperation was indicated at 1939:35 when after the controller gave him the Tri-City weather, the pilot responded, "... get me there." At 1940:10, in response to a request for his altitude, the pilot reported that he was at 3,300 feet and unable to climb.

In response to this development and to the fact that the aircraft was traversing an area of dangerously high terrain, coordination

with other ATC facilities was required and it was effected promptly. The Safety Board notes that radio communications with the pilot were lost for about 2 1/2 minutes while the flight was southbound heading for a mountainridge -- a critical stage of the flight. While other controller personnel were working on a planned course of action for vectoring the aircraft safely to Tri-City, the Indianapolis radar controller reestablished radio contact with the pilot and reversed the aircraft's course from 180° to 360°. At 1945:45, the controllers decided to vector the aircraft to a heading 240° which would have placed the aircraft on a course paralleling a valley between two areas of high terrain. The controller team planned to keep the flight over the lower terrain of the valley until it cleared the high terrain south of the flight track and then vector the flight to Tri-City from the northwest.

However, before the initial vector was issued, radio communications were lost again for 3 minutes and 25 seconds. During this period several broadcasts were made to the flight in the blind. At 1948:15 radio communications were reestablished and, after some difficulty, the pilot acknowledged (1948:40) the instruction to "turn left heading two four zero." After advising the pilot of the approximate mileage to Tri-City, communications were again lost. These communication losses prevented the controller from vectoring the aircraft over the planned route or correcting the flight course after the pilot turned to 240°.

In view of the circumstances, the Safety Board concludes that the lack of radio communications at critical points prevented controllers from effectively carrying out the emergency course of action planned for the flight. The Safety Board further notes that when the heading of 240° was finally issued to the pilot, it was the judgment of the controller involved that the aircraft would clear safely the high terrain of Big Stone Mountain (4,223 feet) and would overfly approximately the same terrain traversed earlier when the aircraft departed Lonesome Pine heading southbound. However, the actual track of the aircraft took it over terrain where the elevation of tree tops was approximately 3,300 feet, -- a point about 6 1/2 miles abeam of Big Stone Mountain where the aircraft struck the trees. The track flown was about 5 miles north of the track that the controller believed the aircraft would fly. This difference resulted from the unavoidable delay in communicating the vector to the pilot, and the difference between the controller's radar estimate of the aircraft's position and the position of the aircraft over the ground.

The Indianapolis and Atlanta ARTCC's, in conjunction with the Tri-City Tower, coordinated efforts to communicate and vector the aircraft to the Tri-City Airport. A serious problem existed since the aircraft was unable to climb to an altitude that would provide the required terrain clearance. Furthermore, the center radar and radio equipment was not capable of providing reliable service to the controllers.

The Board has reviewed ATC Handbook 7110.9D, Chapter 5, Emergencies. Note 907 of this Handbook states, "Because of the infinite variety of possible situations, specific procedures cannot always be prescribed for every situation which might be considered an emergency."

The Safety Board recognizes that the controllers were confronted with an in-flight emergency that required decisions which affected the safety of the persons on the aircraft. Although the procedures for air traffic control provide guidance for giving emergency assistance to pilots, this accident illustrates the difficulties that the controller faces while attempting to assist a pilot in distress.

In this case, the pilot accepted the first airport with an instrument approach that was suggested. The Safety Board believes that, in view of the adverse situation which the pilot faced, his ability to make decisions had been degraded and that he probably would have been inordinately susceptible to accepting suggestions from ATC.

The controller should have volunteered more detailed information and had he done so, the pilot might have decided to divert to the Tri-City Airport where favorable weather was known to exist. The earlier in the emergency that such information was offered, the more likely the pilot's decision to fly the additional distance to Tri-City might have been made. While it may be beyond the scope of the provisions of the controller's manual, the controller, in an effort to facilitate the pilot's decision-making process, should have asked the pilot specifically if the flight could fly the additional distance to Tri-City.

In summary, the Safety Board believes that had the pilot assessed the weather properly in conjunction with his capabilities and those of his aircraft, he would not have attempted the flight. It appears that either the pilot did not understand the weather and he overestimated both his capabilities and those of his aircraft, or he allowed his motivation to get home to dictate that the flight should be made and continued. The Board also believes that, in view of the pilot's experience, he should have familiarized himself with the terrain and with the IFR-equipped airports along his route.

After initiating the flight and after experiencing difficulty with the right engine shortly after takeoff, the pilot should have landed at the nearest suitable airport, particularly in view of the adverse weather. After proceeding to the point where flight became perilous -- unable to climb in icing conditions -- the pilot should have communicated clearly and emphatically that he was in distress and thereafter requested specific assistance based on a previously acquired knowledge of the facilities available to him in the area where the emergency occurred.

The Safety Board believes that the pilot's motivation to return to his home may have affected his decision to continue the flight, as planned, after his first emergency in the Savannah area and again when he encountered the problems he reported to the Indianapolis controller. In the latter situation, a more prudent pilot would have altered his route of flight, in coordination with ATC, to avoid the icing conditions.

The Safety Board believes that when an emergency develops in night IFR conditions, a prudent pilot should be prepared to ask the controller to vector the flight to: **(1)** The nearest VFR airport; (2) an IFR airport with the best available weather, or **(3)** an IFR airport with precision approach facilities. Since this pilot apparently was not aware of **his** position relative to well equipped airports along his route, his immediate reaction was to ask the controller to lead him to an unspecified airport.

After the flight began its diversion to Lonesome Pine, the Safety Board believes that a key factor which influenced the pilot's decision to make the approach to Lonesome Pine airport was an assumption that the weather conditions at that airport would be similar to the conditions reported at Tri-City Airport.

The Safety Board does not criticize the pilot's decision to execute **an** approach to Lonesome Pine Airport if he believed that he was losing control of the aircraft and could not risk continued flight beyond Lonesome Pine.

2.2 Conclusions

(a) Findings

1. The maximum gross takeoff weight was exceeded at takeoff; the center **of** gravity was within limits. The weight and balance cannot be computed for the time of the impact because the amount and distribution of airframe icing cannot be determined.

2. There is no evidence of a preimpact malfunction of either powerplant. Both engines were developing relatively high power when the aircraft struck the trees.

3. The flight operated in conditions conducive to airframe and induction icing for about 46 minutes.

4. The Safety Board could not determine if the installed deicing equipment was used or if the equipment was used properly.

5. The pilot planned, initiated, and continued a night IFR flight in an area of thunderstorms and forecasted and reported icing.

6. The communications difficulties experienced by the pilot probably resulted from a combination of ice accretion on the aircraft radio antennas and terrain interference at the lower flight altitudes.

7. The pilot's ability to make a decision was degraded by the stress of the numerous problems he encountered.

8. While the air traffic control personnel provided assistance to the pilot in accordance with their understanding of the established procedures, the controllers failed to seek specific information regarding the degrees of deterioration of the pilot's and the aircraft's abilities to deal with the adverse conditions.

(b) Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was a controlled collision with the terrain, while the flight was receiving radar vectors in night IMC conditions, because structural icing prevented the pilot from climbing to a safe altitude. Contributing to the accident were the pilot's failure to appreciate the severity of the weather he could expect to encounter and to take the initiative to divert the flight before his options were reduced, and the controllers' failures to take more timely and forceful action to seek more specific information regarding the degree of deterioration of the pilot's and aircraft's ability to deal with the adverse conditions.

3. RECOMMENDATIONS

The Safety Board recommends that pilots and controllers study the circumstances of this accident and decide how they could have responded to the conditions involved in this flight in a way that would have prevented the accident.

Pilots, as certificated airmen, must understand the importance of a thorough preflight weather analysis, particularly with respect to forecasted and known icing conditions or other severe weather along the intended route of flight. Pilots should know and heed the precautions and operating limitations set forth in the airplane owner's manual, aircraft operating manual, and other approved operating instructions. Pilots should plan their flights with regard to those precautions and operating limitations and avoid encounters with icing or other severe weather. Pilots should be conservative in their decisions to exercise the privileges of their airman's certificates and consider their level of experience, recency of experience, the aircraft's capability, and pilot workload before committing themselves to a flight. It is extremely important that pilot's carefully weigh the need to complete the flight against the potential hazards of attempting the flight.

The Board also wishes to stress the need for controllers to be totally aware of the safety function they can provide by anticipating assistance that pilots may need to avoid an in-flight emergency. The controller's role in such circumstances should be one of providing all pertinent information and advice on alternatives to enable the pilot to make sound decisions to avoid an impending emergency or to recover from an in-flight emergency.

The Board points out that when a pilot is under stress, the power of suggestion can influence his decisionmaking process. Controllers should be aware of this and always communicate timely and useful information and advisories to pilots in distress to assist the pilot in making sound decisions.

As a result of its investigation of this accident, the Safety Board has issued the following recommendations to the Administrator, Federal Aviation Administration:

"1. Review its regulations and procedures to determine whether any deterrents exist to either ground or flight personnel which would inhibit them from the earliest possible recognition and subsequent declaration of emergency, and if so:

(a) change controller training and the Controller's handbook, and

(b) change its regulations governing pilot training and certification procedures.

"2. Modify its ATC handbook to require the controller to seek further information from any pilot who is unable to execute an ATC clearance during adverse conditions.

"3. Review its regulations surrounding the formal declaration of an emergency to remove any doubt which may exist between the pilot and the controller as to:

(a) the existence and extent of the emergency,

(b) the ability of the pilot and airborne equipment to deal with it, and

(c) the realistic options which are available to the pilot. "

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ WEBSTER B. TODD, JR.
Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ LOUIS M. THAYER
Member

/s/ ISABEL A. BURGESS
Member

/s/ WILLIAM R. HALEY
Member

March 8, 1976

APPENDIX A

INVESTIGATION AND DEPOSITION

1. Investigation

At 0930 e. s. t. on January 13, 1975, the National Transportation Safety Board's Dulles International Airport, Virginia, Field Office was notified of the accident by the Federal Aviation Administration. Parties to the investigation included the Federal Aviation Administration, Cessna Aircraft Company, Garrett Corporation, and the estate of Paul E. Jatkoe.

2. Depositions

The National Transportation Safety Board deposed the controllers at the Indianapolis ARTCC and the Atlanta ARTCC. Parties present during these depositions included the Federal Aviation Administration, the Professional Air Traffic Controllers Association, and the estate of Paul B. Jatkoe.

APPENDIX B

AIRMAN INFORMATION

Pilot

Paul Bernard Jatkoe, 40, held Private Pilot Certificate No. 1617096, with airplane single-engine, multi-engine land and instrument privileges. Since July 1964, he had accumulated 786 flight-hours of which 523 were in a single-engine aircraft and 263 were in a multi-engine aircraft. Of the 263 hours multi-engine time, 236 were accumulated in the Cessna 337, a centerline thrust aircraft. The remaining 30 hours were accumulated within the 90 days preceding the accident in the Cessna 411A aircraft. Mr. Jatkoe had 134 hours of dual flight time, the last being the multi-engine rating ride conducted on November 30, 1974. He had logged 105 hours of night time, 24 hours of simulated instrument time, and 93 hours of actual instrument time. His third-class medical certificate, dated March 28, 1973, showed no limitations.

Controller

Larry J. Slusser, an Air Traffic Controller, had served the FAA in that capacity for about 6 years at the Indianapolis Air Traffic Control Center. He possessed an Air Traffic Control Specialist card and a current Class II medical certificate. He had previously been a SAGE Interceptor Technician for 4 years in the USAF. Mr. Slusser qualified on the sector in which the accident occurred in 1971, and was radar qualified in the Indianapolis facility in 1972. His first radio contact with NlOOKC occurred about 12 minutes after he assumed his duties at the radarscope. Mr. Slusser did not hold any aeronautical ratings.

Supervisor

Warren T. Hurst, Supervisor of Air Traffic Control Specialists, had served in that capacity since 1962. He had been assigned to the Indianapolis Air Traffic Control Center since 1956. He possessed an Air Traffic Control Specialist card and a current Class II medical certificate. Mr. Hurst had no aeronautical experience. He had been a supervisor of the involved sector for about 8 years. His last semiannual proficiency evaluation was completed August 3, 1974, and no deficiencies were identified by the evaluator. Mr. Hurst issued the last vector to the pilot about 35 seconds before the aircraft crashed.

APPENDIX C

AIRCRAFT INFORMATION

The aircraft was owned and operated by Mr. Paul B. Jatkoe. N1OOKC was a Cessna 411A, Serial No. 411-0296, manufactured in 1968. The aircraft had accumulated 2,341 hours in service.

The aircraft was equipped with two Continental GTISO 520 engines. The No. 1 engine had 2,103 hours total time with 945 hours since overhaul. The No. 2 engine had 970 hours total time.

The aircraft had accumulated 9 hours since the last annual inspection which was conducted on December 19, 1974.

At the time of the accident, the aircraft was carrying the pilot, P. Jatkoe, his wife, and their five children. The following weight and balance is assumed to be representative of the aircraft takeoff weight at Savannah, Georgia.

	Item	Weight	Arm	Moment x 1000 lbs.
1.	Licensed Empty Weight	4,518	147.4	666.0
	Oil (26 qts. x 1.875)	49	115.4	5.7
2.	Pilot & Front Passenger	330	137.0	45.2
	Center Passengers	210	175.5	36.9
	Rear Passengers	105	215.5	22.6
	7 Place Passenger	50	246.5	12.3
3.	Fuel: Main Tanks	600	152.0	91.2
	Aux. Tanks 96 gal.	576	164.0	94.5
5.	Baggage: Nose	Unknown	71.0	----
	Wing Lockers	240	186.0	44.6
	Cabin	124	246.5	30.6
		6,802	154.3	1,049.6

1. Latest empty weight from weight and balance as of 1973 - Reference aircraft records obtained from the wreckage.

APPENDIX C

2. The occupants of the aircraft were arbitrarily placed in the seats in the following manner:

Left front: Pilot: P. Jatkoe - 210 lbs.
Right front: Copilot: Wife - 120 lbs.
Center Passengers: Left: Oldest daughter - 110 lbs.
Right: Middle daughter - 100 lbs.
Rear Passengers: Left: Youngest daughter - 60 lbs.
Right: Youngest son - 45 lbs.
7 Place: Oldest son - 50 lbs.

3. The flight plan listed 6 hours of fuel. It is, therefore, logical to assume the pilot had a full fuel load onboard at takeoff. This would have consisted of 100 gallons (600 lbs.) in the maintanks and 96 gallons (576 lbs.) in the auxiliary tanks.

4. The personal effects of the family, which remained relatively intact, were removed and weighed. The personal effects weighed 364 lbs. This does not include any of the loose articles located around the wreckage site. The baggage was distributed between the wing lockers and the aft cabin baggage area. The following arbitrary loading was used: 210 lbs. in the wing lockers and 124 lbs. in the aft cabin.

Flight Plan Route:

From	To	VIA	Miles
Savannah (SAV)	Greenwood (GRD)	V185 Augusta (AGS)	164
Greenwood (GRD)	Sugarloaf Mt. (SUG)		79
Sugarloaf Mt. (SUG)	Whitesburg (BRG)	v 53 Holston Mt. (HMV)	71 67 131
Whitesburg (BRG)	Newcombe (ECB)	V331	64
Newcombe (ECB)	York (YRK)	Direct	33

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From	To	VIA	Miles	
York (YRK)	Waterville (VWV)	v493	105	209
		Appleton (APE)	104	
Waterville (VWV)	Pontiac (PTK)	Direct	53	84
			31	

Total Miles (Statute) 771 (Nautical) 662

Ref: World Aeronautical Chart: CG-21
Sectional Aeronautical Chart: Cincinnati
Detroit

FLT PLAN: Listed cruise speed 180 kns
Listed cruise altitude 10,000 ft.
Actual altitude 11,000 ft.
Listed flying time 4 hrs.
Listed fuel onboard 6 hrs.

(180 KNS) (1.151) - 207.180 207 MPH

Data from corresponding Owner's Manual

Assumptions: STD Day (23° F)
ZERO wind
Listed cruise altitude 10,000 ft.

2100 rmp, 61.8% BHP, TAS 205, 30.3 gal/hr. Listed endurance 6.47 hrs. (196 gals) no reserves.

Flight time required to cover total distance - 662 nautical miles/ 180 kns - 3.7 hrs.

ESTIMATED FUEL CONSUMPTION

Cruise climb to 10,000 ft. (23°) from sea level, power setting 2100 rpm, 29.0 M.P., IAS 140 mph, fuel flow 22 gal/hr/engine

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Distance covered: 33 miles
Time: 13 minutes
Fuel used: 15 gallons [1/] has pretakeoff allowance

Actual distance covered by 411-0296:

SAV GRD	164 miles
GRD SUG	79
SUG BRG	138
Approximately [2/] 7 miles beyond BRG	7
	388 miles

Return to Lonesome Pine VOR from farthest point beyond BRG: Approximately 29 miles. Assume all of the distance was covered at cruise power:

388 t 29 = 417 miles
Total hours at cruise 417/107 = 2.01 hours
Fuel consumed = (2.01) (30.3) = 60.9 or 61 gals.

Total fuel consumed at the arrival over Lonesome Pine VOR:

T = 61 gals. t 15 gals.= 76 gals. or 456 lbs.

Aircraft weight at the arrival over Lonesome Pine VOR:

W = 6,802 lbs. - 456 lbs. - 6,346 lbs.

The maximum certified gross weight is 6,500 lbs.

The pilot would have conducted the initial portion of the flight on the main tanks. The Owner's Manual states the first 60 minutes of flight will be conducted on the main tanks before switching to the

1/ Model 411A Owner's Manual D-463-13.

2/ The pilot was approximately 7 miles beyond Whitesburg VORTAC when he requested the nearest airport.

auxiliary tanks. The takeoff and climb would have consumed 15 gallons of fuel in the required 13 minutes. Assume 45 minutes later the pilot would select the auxiliary tanks. The fuel consumed from the main tank would be:

F = (.75) (30. 3) = 22.73 gals. 23 gals.

Total fuel consumed = 23 t 15 = 38 gals.

Fuel remaining in the mains = 100 - 38 = 62 gals.

Total cruise fuel removed from the auxiliary tank:

F = 61 gals. - 23 gals.= 38 gals.

Fuel remaining in the auxiliary tanks:

F = 96 gals. - 38 gals.= 58 gals.

The aircraft weight and balance would be representative of the aircraft at the time the accident occurred.

Item	Weight	Arm	Moment x 1000 in. lbs.
Licensed Empty Weight	4518	147.4	666.0
Oil (26 qts. x 1.875)	49	115.4	5.7
Pilot & Front Passenger	330	137.0	45.2
Center Passengers	210	175.5	36.9
Rear Passengers	105	215.5	22.6
7 Place Passenger	50	246.5	12.3
Fuel: Main Tanks	372	152.0	56.5
Aux. Tanks	348	164.0	57.1
Baggage: Nose	Unknown	71.0	----
Wing Lockers	240	186.0	44.6
Cabin	124	246.5	30.6
	6,346	154.03	977.5

The weight and balance calculated falls withii the limits defined by the Owner's Manual.

APPENDIX D