TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. NTSB-AAR-76-2	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle Aircraft Accident Report - Stribling-Puckett Inc., Beechcraft A100, N700SP, Hilton Head Island, South Carolina, April 26, 1975.		5. Report Date January 14, 1976 6. Performing Organization Code
7. Author(s)		8. Performing Organization Report No.
9. Performing Organization Name and Address National Transportation Safety Board Bureau of Aviation Safety Washington, D. C. 20594		10. Work Unit No. 1728 11. Contract or Grant No. 13. Type of Report and Period Covered Aircraft Accident Report April 26, 1975
12. Sponsoring Agency Name and Address NATIONAL TRANSPORTATION SAFETY BOARD Washington, D. C. 20594		14. Sponsoring Agency Code
15. Supplementary Notes		

16. Abstract

About 2155 e.d.t., April 26, 1975, a Beechcraft A100, N700SP, owned and operated by Stribling-Puckett, Inc., crashed after a night, visual meteorological conditions takeoff from the Hilton Head Island Airport. Five Passengers and the pilot were killed and three passengers were injured. The aircraft was destroyed.

The National Transportation Safety Board determines that the probable cause of the accident was the failure of the pilot to maintain a positive rate of climb after a takeoff toward an unlighted area in night, visual meteorological conditions. The failure to maintain a positive rate of climb resulted in a collision with trees in the departure path. An overweight condition of the aircraft may have contributed to the pilot's actions.

17. Key Words	18. Distribution Statement
VMC flight - night flight - weight and balance - overweight aircraft - unlighted terrain - fire - surviving passengers - aircraft performance - climb performance - pilot technique - unlighted obstacle - pilot incapacitation	This document is available to the public through the National Technical Information Service, Springfield, Virginia 22151.

19. Security Classification (of this report)	20. Security Classification (of this page)	21. No. of Pages	22. Price
UNCLASSIFIED	UNCLASSIFIED	29	

NTSB Form 1765.2 (Rev. 9/74)

TABLE OF CONTENTS

File No. 3-0397

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D. C. 20594

AIRCRAFT ACCIDENT REPORT

Adopted: January 14, 1976

STRIBLING-PUCKETT, INC.,
BEECHCRAFT A100, N700SP
HILTON HEAD ISLAND, SOUTH CAROLINA
APRIL 26, 1975

SYNOPSIS

About 2155 e. d. t., April 26, 1975, a Beechcraft A100, N700SP, owned and operated by Stribling-Puckett, Inc., crashed after a night, visual meteorological conditions takeoff from the Hilton Head Island Airport. Five passengers and the pilot were killed and three passengers were injured. The aircraft was destroyed.

The National Transportation Safety Board determines that the probable cause of the accident was the failure of the pilot to maintain a positive rate of climb after a takeoff toward an unlighted area in night, visual meteorological conditions. The failure to maintain a positive rate of climb resulted in a collision with trees in the departure path. An overweight condition of the aircraft may have contributed to the pilot's actions.

1. INVESTIGATION

1.1 History of the Flight

At 1600 [1/] on April 26, 1975, a Beechcraft A100, N700SP, was ferried from Savannah, Georgia, to Hilton Head Island, South Carolina, for a corporate flight to Jackson, Mississippi. The aircraft was owned and operated by Stribling-Puckett, Inc.

The aircraft departed Savannah with 388 gallons of jet A-1 fuel aboard. The auxiliary tanks were not serviced.

1/ All times are eastern daylight time based on the 24-hour clock.

The pilot was briefed on the weather by the Savannah Flight Service Station (FSS) communicator and filed an instrument flight rules (IFR) flight plan which was to be activated after the aircraft left Hilton Head Island.

The flight to Hilton Head Island was completed without reported incident. The pilot of N700SP loaded the passenger baggage: a witness to the loading indicated that the pilot loaded the baggage carefully in the baggage compartment in the aft end of the cabin.

At 2145, the eight passengers boarded the aircraft and occupied the same seats (with one passenger seated in the copilot's seat) that they had occupied on the trip from Jackson, Mississippi, to Hilton Head Island, April 24, 1975. The only seating change was that two passengers in the forward end of the passenger compartment exchanged seats laterally across the cabin.

The engines were started and the aircraft was taxied to runway 3 for takeoff. The aircraft was taxied onto the 300-foot overrun on the south end of the runway, turned 180° on the runway, and made a "running" 2/ takeoff. The position of the landing flaps could not be determined and no one recalled seeing the landing lights during the takeoff. Two pilots, one inside the terminal and another outside, stated that they did not believe the engines were developing full power during the takeoff. However, there were no unusual sounds, and the engines were operating "smoothly." Both of these pilots believed that the takeoff run was excessively long. Other ground witnesses also indicated that the aircraft used most of the runway for takeoff. A surviving passenger stated that the takeoff run seemed long but that the aircraft was airborne before it passed over the runway end lights. None of the survivors noted anything unusual or abnormal about the engine sounds during the takeoff run. The aircraft used about 3,900 feet of pavement to takeoff including most of the 300-foot overrun where the takeoff began.

After takeoff, the aircraft was leveled off and was flown straight and level for about 1,200 feet. There it struck the top of a tree which was 40 to 50 feet above the ground. One survivor stated that the engine "coughed," and the aircraft dipped to the right before it struck the trees.

2/ A takeoff in which the aircraft transitions from taxiing to the takeoff run without stopping and setting takeoff power.

The other two survivors stated that they thought the aircraft operated normally until it struck the first tree. One of these passengers was looking out the window and reported that the aircraft leveled off and, "... the trees were level with the airplane ...." He also said he, "... could see we were not above the trees ... and instead of climbing, it seemed like the plane leveled off."

After impact with the trees, the aircraft continued 1,200 to 1,300 feet and struck several other trees before it came to rest right side up.

Fire erupted some distance behind the aircraft, but progressed toward the aircraft slowly. The slow progression of the fire allowed the three survivors time to escape through a hole in the left front side of the fuselage.

The accident occurred at night, at an elevation of about 50 feet [3/] at latitude 32° 13.3' N and longitude 80° 41.9' W.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Others
Fatal	1	5	0
Nonfatal	0	3	0
None	0	0	

1.3 Damage to Aircraft

The aircraft was destroyed.

1.4 Other Damage

None.

1.5 Crew Information

The pilot was certificated and qualified in accordance with existing FAA regulations. (See Appendix B.)

3/ All elevations are mean sea level unless otherwise indicated.

1.6 Aircraft Information

The aircraft was certificated and maintained in accordance with FAA-approved procedures. The aircraft had an estimated 360 gallons of jet A-1 fuel aboard at impact. (About 20 gallons were burned on the ferry flight from Savannah.)

The aircraft weight and balance was calculated using estimated baggage weights, known passenger weights and seating locations, and basic weight and balance data provided by the manufacturer. Using standard calculations and assuming a luggage weight of 40 lbs. per person, the aircraft would have been 436 lbs. over the maximum gross takeoff weight. (See Appendix C.) The center of gravity (c. g.) would have been about 189.9 inches, near the rear limit of 191.0 in. Allowing a conservative 205-gallon-fuel-burn for the trip to Jackson, the c. g. would have been near the rear c. g. limit for landing. If the luggage weighed more than 360 lbs., the aircraft would have been more overweight and the c. g. would have been nearer, or aft of, the rear limit.

On April 24, 1975, the aircraft had been flown from Jackson to Hilton Head Island with about the same load distribution but with a slightly lower gross weight.

1.7 Meteorological Information

The 2155 surface weather observations at the stations nearest the accident site, Savannah and Charleston, South Carolina, were:

> Savannah -- scattered clouds at 30,000 feet, visibility -- 7 miles, temperature -- 69°F, dewpoint -- 56°F, wind 100° at 4 kn, altimeter -- 30.14 in.
>
> Charleston -- scattered clouds at 25,000 feet, visibility -- 10 miles, temperature -- 64°F, dewpoint -- 56°F, wind 180° at 4 kn, altimeter -- 30.13 in.

Witnesses and survivors reported that the sky was clear and that the wind was calm. There are few lights away from the airport and the takeoff was made toward a dark land area and a bay. After the accident, witnesses reported that fog or haze caused halos around outdoor lights. The accident occurred in bright moonlight; the full moon rose at 2113.

1.8 Aids to Navigation

Not involved.

1.9 Communications

Not involved.

1.10 Aerodrome and Ground Facilities

The FAA Master Airport Record, FAA Form 5010-1, dated May 2, 1975, indicates that runway 03/21 at Hilton Head Island Airport is 3, 700 feet long and 75 feet wide. The airport elevation is 20 feet. There is a 300-foot paved overrun on each end of the runway. The runway has an effective gradient of 0.16 percent, not including the overruns. The elevation at the threshold of runway 03 is 20 feet and at the threshold of runway 21, 14 feet. The overruns and the runway are paved with asphalt and have a gross weight strength of 12,000 lbs. for an aircraft single-wheel landing gear. The runway surface is reported to be in good condition and the runway is classified as a "utility runway." The runway is lighted but there are no approach lights. The runway lights were illuminated during the takeoff. The approach surface slope ratio for runway 21, the departure end of runway 03, is 19 to 1. The controlling obstacle for this runway is a tree about 1,200 feet north of the runway threshold that is 78 feet high. This tree is about 200 feet left of the extended runway centerline. The tree that was struck by N700SP was outside the airport boundary, on the runway centerline, and about 50 feet high. There were no obstruction lights on the trees north of the airport nor were any required. While same of the trees constituted obstacles that penetrated the plane of the approach surface as defined by 14 CFR 77.25 (d) (2) (i), the tree that was struck by the aircraft did not constitute an obstacle as defined by the regulation.

The FAA Form 5010-1 dated March 29, 1973, reported the runway length to be 4,300 feet. The previous FAA Form 5010-1 dated November 10, 1969, had reported the length to be 3,700 feet. When it was determined that the new pavement was an overrun rather than a runway extension, the FAA changed the reported runway length back to 3, 700 feet.

The current instrument approach chart in the pilot's possession at the time of the accident contained an airport diagram which showed the runway length to be 4,300 feet. The overruns were not indicated on

the chart. The chart did indicate that there were trees about 1,000 feet past the departure end of runway 03, but the heights of the trees were not indicated.

The airport was equipped with Unicom, but it was not used for this flight. Firefighting or rescue vehicles were not stationed at the airport, nor were they required.

1.11 Flight Recorders

Flight recorders were not installed in the aircraft, nor were they required.

1.12 Wreckage

General

The first tree struck by the aircraft was broken off about 41 feet above the ground. Numerous fresh, smoothly cut tree limbs, including one about 6 feet long, were found in the area of the initial impact. Trees about 200 feet farther along the flightpath were damaged. Trees were damaged closer to the ground as the aircraft progressed through the wooded area. After the aircraft traveled about 980 feet, it struck a large oak tree; a portion of the left wing and a portion of a landing flap were found in the tree about 10 feet above the ground. The path through the trees deviated slightly to the right. The aircraft continued to descend, struck the ground, and slid to a stop about 2,430 feet from the runway threshold. The left wing, left engine, both propellers, and the horizontal tail surfaces separated from the aircraft. The right wing, right engine, and the vertical stabilizer remained with the fuselage. The landing gear was retracted and the landing flaps were up.

The fuselage came to rest upright on a magnetic heading of 035°; the top half was destroyed by fire and impact. The cockpit was damaged by impact and fire which destroyed most of its contents. (See Appendix D.)

Instruments

The captain's flight director was damaged. The flags were jammed in the "power on" position and the attitude display was jammed on an indication of a level pitch attitude with the right wing down 26°.

Both fuel flow gauges indicated a flow rate of 60 lbs. /hr. The right interstage turbine temperature gauge indicated 740°C. The left engine propeller tachometer indicated 1,600 rpm, and the right engine tachometer indicated 4,000 rpm. The copilot's altimeter was set at 30.03 and indicated 180 feet. The pilot's altimeter was destroyed.

Powerplants

Both propellers separated from the engines and one blade separated from each propeller. All the propeller blades received varying degrees of damage consistent with relatively high power at impact. When the propellers were disassembled, marks were found on the servo piston assemblies which were commensurate with propeller operation in the low-pitch, high-power regime at impact.

Both engines were disassembled and the fuel and oil filters, screens, and propeller governors were removed. The screens and filters were not contaminated. No abnormal conditions were noted other than those caused by impact and fire. There was no evidence of preimpact failure, malfunction, or fire.

Flight Controls

The gust locks were found on the floor of the right side of the cockpit. There was no evidence that they had been forced out of the installed position and the mating holes in the control yoke were not elongated. There was no evidence of preimpact failure or malfunction of the flight controls.

The horizontal stabilizer jackscrew actuator was examined and was found in a position equivalent to 1.98° aircraft nosedown. The aileron trim position could not be determined. The rudder trim knob in the cockpit was set about 1/2 unit left rudder. The pilot's stabilizer trim switch was examined and X-rayed; no discrepancies were found. The copilot's switch was not recovered. The secondary trim switches were broken.

1.13 Medical and Pathological Information

The coroner reported that the passengers died of multiple extreme injuries; autopsies were not conducted on the passengers.

Two of the three survirors were injured seriously; the third was injured slightly.

The pilot was thrown from the aircraft and was not burned. An autopsy indicated that he suffered multiple traumatic and internal injuries. Toxicological examination revealed no evidence of alcohol or significant drugs.

The autopsy did reveal evidence of a granulomatous hepatitis (etiology undetermined) moderate atherosclerosis of the distal aorta, and arterial nephrosclerosis (mild). The heart was transected and only two portions, which weighed about *260* grams, were recovered for examination. The coronary arteries showed mild atherosclerotic changes with no more than 20 percent narrowing. The thoracic aorta appeared free of atherosclerosis; the stomach was empty.

The pathologist reported in part:

"... Of incidental interest is the finding of a granulomatous hepatitis and moderate atherosclerosis of the aorta. These are not considered causative factors in his death; however, we cannot rule out the fact that the disease found in the liver may have contributed to the crash. It is consistent with sarcoidosis which can cause arrhythmia of the heart. Unfortunately the section of the heart that we saved did not show any lesions.

"... therefore ... the deceased.. .came to his demise as a result of multiple traumatic injuries received in an airplane crash.. .. It should also be stated that he had a chronic granulomatosis disease (probably sarcoidosis) which may have caused a cardiac arrhythmia (brief stoppage of the heart) which could have caused the crash."

In view of these findings, the Safety Board requested the Armed Forces Institute of Pathology (AFIP) and the Federal Air Surgeon's Office to investigate the medical history of the pilot and to evaluate the evidence offered by the pathologist. The Federal Air Surgeon's review of the pilot's medical history provided no additional evidence. The AFIP reviewed the pilot's medical history and the specimens obtained from the pathologist. They agreed with the findings with regard to granulomatous hepatitis. They did not

find any abnormalities in the heart specimens. They also reviewed the pilot's previous electrocardiograms and found no trace of any changes that suggested cardiac involvement. AFIP concluded that, in the absence of compelling evidence of incapacitation, there was no evidence of pathologic change, preexisting disease, or toxicologic abnormality which may have contributed to the death of the pilot or to the cause of the accident.

1.14 Fire

Survivors reported that there was no fire at the aircraft immediately after the crash. The fire which began some distance behind the aircraft progressed toward the aircraft slowly as the survivors escaped from the wreckage.

Primary fire protection in and around the airport is provided by a volunteer fire department. Full-time fire departments at other points on the Island are available for backup service.

The volunteer fire department was alerted at 2158. The first equipment left the station at 2201 and arrived at the scene at 2209.

When the first vehicles arrived, the fuselage was engulfed in flames and the cabin top had collapsed. Firefighters extinguished the fire in the fuselage in about 10 minutes and all the fire was extinguished in 30 minutes. Although foam and chemicals were available, only water was used as an extinguishing agent.

The vehicles that responded to the alarm included two - 1,000-gallonperminute pumpers, an attack truck, and a water tanker. The volunteers manning these vehicles were not trained in fighting aircraft fires.

1.15 Survival Aspects

The cockpit was destroyed but the cabin structure remained relatively intact. The survivors reported that the cabin seats came out of the floor and the occupants and their seats were thrown forward. It could not be determined if all the passengers used their seatbelts, but there were no reported seatbelt failures.

The passenger in the right rear seat found himself upside down, strapped in the seat. After he had released his belt and escaped from

the aircraft, he heard sounds inside the aircraft and went back into the wreckage to assist the other two survivors. He went back a third time, but was pulled out of the aircraft by local residents who had arrived at the accident scene and who had seen the fire reach the aft section of the wreckage. The survivors had occupied the two rear seats on the right side of the aircraft and the rear seat on the left side. None of the survivors attempted to use the passenger loading door in the left rear side of the fuselage to escape.

1.16 Tests and Research

At the Safety Board's request, Beech Aircraft Corporation provided aircraft performance data so that the Board could evaluate the flight capability of this aircraft.

Beech Aircraft Corporation was given estimated weather conditions, airport data, runway information, and several assumed aircraft weight and balance conditions. They provided the Board with takeoff performance, acceleration performance, climb performance, and stabilizer settings for various conditions of flight.

None of the cases studied required the stabilizer setting found in the wreckage.

The study indicated that the aircraft should have lifted off after takeoff runs of 2,000 to 2,360 feet [4/] depending on the flap setting used and the aircraft gross weight. Following a normal takeoff, the aircraft should have traveled from 810 to 1,340 feet after liftoff to reach an altitude of 50 feet above the ground.

The best angle of climb and best rate of climb airspeeds could have been achieved in less than 4,000 feet of travel from the beginning of the takeoff run. If the aircraft was held at a constant altitude of 50 feet above the ground, acceleration to cruise-climb speed would have required between 5,430 and 5,640 feet [4/] depending on weight and flap position. The distance from the estimated beginning of the takeoff run and the first tree struck by the aircraft was about 5,237 feet. (See Appendix E.)

4/ An additional 50 feet would have been required for a rolling takeoff following a turnaround on the runway.

1.17 Other Information

Although the passenger who was seated in the right cockpit seat held a student pilot certificate, he had no assigned flight duties.

To achieve the normal takeoff performance predicted by the pilot's operating manual, the pilot is expected to:

a. Limit takeoff gross weight to 11,500 lbs;
b. Load the aircraft within the c. g. limits;
c. Set takeoff power before releasing the brakes;
d. Use "O" flaps;
e. Use a paved, level, dry surface runway; and
f. Retract the landing gear after takeoff.

The amount of runway required for takeoff and the distance required to clear an obstacle 50 feet high can be reduced by using the above procedures and extending the landing flaps 30 percent before the takeoff is started.

2. ANALYSIS AND CONCLUSIONS

2.1 Analysis

There was no evidence of an aircraft, engine, or system malfunction that could have caused the accident. The pilot was properly certificated and qualified for the flight. The aircraft was properly certificated and had been maintained in accordance with existing regulations. The weather would not have inhibited control of the flight. There was no evidence of a bird strike or of any interference with the pilot's operation of the aircraft. There is no evidence of a stall warning and no evidence that the student pilot in the right cockpit seat interfered with the operation of the flight controls. The pilot should have been familiar with the airport and its surroundings because he had made two landings and a takeoff within the preceding 3 days. However, they were made in daylight.

The Safety Board was unable to determine if the difference between the actual runway length of 3,700 feet and the runway length of 4,300 feet depicted on the airport chart in the pilot's possession affected his operation of the aircraft.

The trees on the departure end of the runway intruded into the approach surface; however, this was significant only because of the way the aircraft was flown. Had the pilot made a normal takeoff and climb in accordance with the pilot's operating manual, the aircraft should have been well above the trees by the time it had traveled 5,237 feet from the point where the takeoff started. The performance data provided by the manufacturer indicates that if the pilot had used normal takeoff procedures, the aircraft would have been 50 feet above the runway about 3, 700 feet from the point where the takeoff started, or about 1,400 feet before reaching the tree line. A normal climb from that point would have provided adequate clearance from the trees. The takeoff technique which was used did not permit either optimum performance or maximum performance from the aircraft. A rolling takeoff was made rather than stopping the aircraft on the runway, holding the brakes, and establishing takeoff power before releasing the brakes. In addition, the pilot could have enhanced the takeoff performance even more by the use of 30 percent flaps.

The Safety Board could not establish the engine power used for takeoff and there is no objective evidence to determine whether the pilot used full power. The aircraft was on the runway longer than was required for a normal takeoff. However, this could have been intentional on the part of the pilot. He could have either used less than takeoff power or he could have held the aircraft on the runway to accelerate to a higher than normal takeoff speed. Either event would have caused a longer than standard takeoff run. The first consideration does not appear to have any rational explanation, particularly when considered in light of the fact that the pilot knew that he was operating a heavy aircraft. However, he may have believed that he would get better performance from the aircraft by holding it on the runway and building up more than normal takeoff airspeed before liftoff in an effort to assure that the weight did not adversely affect aircraft performance. There is no evidence to indicate that the long takeoff run was a result of anything other than the pilot's actions.

It was established during the investigation that the aircraft was overweight. However, it was not possible to establish the exact amount of overweight because the luggage was destroyed during the accident. By assuming an average luggage weight of **40** lbs. per person aboard the aircraft, the aircraft would have weighed about 436 lbs. more than the maximum allowable takeoff gross weight. In fact, the aircraft would have exceeded the maximum allowable takeoff gross weight even with no baggage loaded; the estimated weight of the

aircraft, crew, and passengers was 11,576 lbs. There is no indication, other than the position of the horizontal stabilizer, that the center of gravity was outside the aft limit. However, none of the cases examined for the performance study required the nosedown trim setting found after impact.

There is no evidence of a trim system malfunction. None of the survivors heard the audible trim-in-motion warning which would be associated with a runaway trim, and the trim did not go to the electrical limit. While the trim may have started to run away and the pilot may have detected the problem and stopped it in transit before the limit was reached, there is no evidence to support that possibility. The trim setting was probably established by the pilot to accommodate for an actual or anticipated tailheavy condition of the aircraft. The pilot had taken off from Jackson, Miss., with about the same load on the aircraft, distributed in the same manner. Therefore, he should have been able to anticipate the aircraft's response after takeoff.

There is no evidence of any activity in the cockpit or in the cabin of the aircraft that would have distracted the pilot from flying the aircraft. In addition, there is no evidence of any aircraft condition that would have caused the pilot to level off at 50 feet above the ground and maintain that altitude for the time that would have been required to fly from the point of liftoff to the initial contact with the trees. The pilot had considerable experience in the aircraft and was accustomed to flying without a copilot; therefore, he probably had no difficulty manipulating the necessary controls to raise the landing gear and flaps if required, set engine power, or take any of the other actions that are routine after takeoff.

The Safety Board has considered the findings of the pathologist and the AFIP. Based on AFIP's experience in this type of investigation and their evaluation of the evidence, the Safety Board concludes that there is not sufficient evidence in this case to find that the pilot was incapacitated in the manner suggested by the coroner's pathologist.

The evidence indicates that the pilot made a "rolling" takeoff and held the aircraft on the runway until he nearly reached the departure end before he allowed the aircraft to lift off. He then retracted the landing gear and leveled off at about 50 feet. During the acceleration period, the aircraft struck the trees. The initial impact involved the right engine, and the engine speed was severely reduced. This caused the yaw noted by the survivors. The aircraft continued

through the trees, gradually descending until it struck a large oak tree which penetrated the cockpit and killed the pilot and the passenger in the right cockpit seat. The aircraft continued through the trees, breaking up as it progressed, and came to rest in a clear area.

The Safety Board was not able to determine why the pilot operated the aircraft in the manner indicated by the evidence.

The aircraft was equipped with electrically driven attitude instruments which do not normally precess and give false pitch indications. As previously stated, there is no evidence of any aircraft malfunction that would have kept the aircraft from climbing normally. Therefore, the Board must assume that the pilot intentionally leveled off. The survivors' statements indicate that the aircraft remained level and did not descend into the trees.

The performance data suggest one possible explanation of the pilot's actions. If the pilot wished to use a cruise-climb airspeed during en route operation to his assigned cruising altitude, he may have leveled off after takeoff to accelerate to that airspeed. However, a decision to level off about 50 feet above the ground does not seem prudent during a night takeoff toward an unlighted area which contained trees of unknown heights. Unfortunately, the pilot's altimeter was destroyed, and the Board was unable to determine if it was properly set and indicating the correct altitude.

It is also possible that the pilot operated the aircraft by visual reference rather than by instrument reference. However, he should have been able to see the trees in the bright moonlight, as a surviving passenger did, and avoid them.

The excess weight in the aft portion of the cabin may have been more than that calculated by the Board. If so, the pilot's attention may have been diverted to trimming the aircraft to a minimum-stick-force, level-flight condition before beginning his climb to cruising altitude and the aircraft struck the trees before he reinstituted the climb.

Given the circumstances of this accident--a night takeoff toward an unlighted area in an aircraft which the pilot must have known was overweight--the most prudent course of action would have been to use the takeoff procedures established in the FAA-approved flight manual to achieve optimum takeoff and best angle-of-climb performance. Had these procedures been followed, even though the aircraft was overweight, it could have climbed safely over the tree line.

2.2 Conclusions

(a) Findings

1. The aircraft was loaded in excess of the maximum gross takeoff weight.

2. The center of gravity could not be determined, but it was probably near or behind the rear limit.

3. The pilot did not use the optimum takeoff procedures to achieve normal takeoff performance.

4. The pilot leveled off about 50 feet above the ground.

5. The performance capability of the aircraft was adequate to clear the obstruction.

6. The pilot apparently did not see the trees although they were clearly visible to a surviving passenger.

7. There is not sufficient evidence to find that the pilot was incapacitated.

(b) Probable Cause

The National Transportation Safety Board determines that the probable cause of the accident was the failure of the pilot to maintain a positive rate of climb after a takeoff toward an unlighted area in night, visual meteorological conditions. The failure to maintain a positive rate of climb resulted in a collision with trees in the departure path. An overweight condition of the aircraft may have contributed to the pilot's actions.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JOHN H. REED
Acting Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ LOUIS M. THAYER
Member

/s/ ISABEL A. BURGESS
Member

/s/ WILLIAM R. HALEY
Member

January 14, 1976

APPENDIX A

INVESTIGATION AND HEARING

1. Investigation

At 2330 e. d. t., April 26, 1975, the National Transportation Safety Board was notified of the accident by the Columbia, South Carolina, GADO-9--Federal Aviation Administration.

An investigator-in-charge was dispatched from the National Transportation Safety Board's Miami field office and arrived at Hilton Head Island, April 27, 1975, where he was joined by investigators from the Board's Washington Headquarters. The Federal Aviation Administration, Beech Aircraft Corporation, and Pratt and Whitney Aircraft Division of United Technologies Corporation participated in the investigation. Working groups were established for operations, powerplants, systems, and aircraft performance. A human factors specialist was subsequently assigned to coordinate work by the Armed Force Institute of Pathology and the Federal Air Surgeon's staff.

2. Public Hearing

No public hearing was held.

APPENDIX B

CREW INFORMATION

The pilot, Gordon T. Ellison, 55, was hired by Stribling-Puckett, Inc., January 1, 1971. He held Airline Transport Pilot Certificate No. 257937, with airplane multiengine land, Convair 240/340/440, Fairchild F-27/227, and Douglas DC-3 ratings. He also had commerical privileges for airplane, single-engine, land.

Mr. Ellison was checked out in the Beechcraft A100 on December 7 1973. His checkout included 7.1 hours of flight and about 3 hours of training in weight and balance calculations.

Company records indicated that Mr. Ellison had flown about 15,657 hours including 549 hours in the Beechcraft A100. He had flown 20 hours in the 30 days preceding the accident, 55 hours in the preceding 60 days, and 80 hours in the preceding 90 days. His biennial flight review was completed May 19, 1975, and he had made three take-offs and landings at night within the 90 days preceding the accident.

Mr. Ellison's last first-class medical certificate was issued January 8, 1975, with a limitation: "Holder shall possess correcting glasses for near vision while exercising privileges of airman certificate."

APPENDIX C

AIRCRAFT INFORMATION

N700SP was a Beechcraft A100, serial No. B 92, and had a standard airworthiness certificate issued October 27, 1971. The aircraft was purchased by Stribling-Puckett on December 7, 1973, with registration No. N6739. The registration number was changed to N700SP on January 14, 1975.

The aircraft had accumulated about 1,280 flighthours at the time of the accident. The last 100-hour inspection was completed April 21, 1975, and the aircraft was test flown by Mr. Ellison. No discrepancies were entered into the aircraft logbook following that test. The flight from Jackson, Mississippi, to Hilton Head Island; Hilton Head Island to Savannah, Georgia; and Savannah to Hilton Head were completed without entry in the aircraft logbooks of any maintenance discrepancies.

The aircraft was equipped with two United Aircraft of Canada Limited Pratt and Whitney Aircraft PT6A-28 turbopropeller engines and Hartzell HB-B4TN-3A propellers and T101173FB-12 propeller blades. Both engines and propellers had accumulated 1,277.4 hours operating time. The last hot section inspection of the engines was completed 783.7 hours before the accident.

The aircraft basic weight and balance was 7,165 lbs. at a c. g. of 183.9 inches aft of the datum. The maximum zero fuel weight for the aircraft was 9,600 lbs. and the c. g. limits were 177. 0 in. forward and 191. 0 in. aft. The c. g. limits with the landing gear down at a maximum gross takeoff weight of 11,500 lbs. was 184.5 in. forward and 191.0 in. aft. No changes to the original weight and balance calculations were recorded in the aircraft logbook.

The weight and balance calculations for the last takeoff were based on known passenger weights and seating positions, an estimated fuel load which allowed for a 20 gallon expenditure of

APPENDIX C

fuel between Savannah and Hilton Head, and estimated baggage weights based on witness statements and recovered, partially burned luggage. Weight and balance calculations were made in an effort to bracket the most likely condition that existed at takeoff. These data were provided to the manufacturer and used in their performance calculations.

The Safety Board's estimate of the weight and balance conditions at takeoff follows:

APPENDIX C

WEIGHT AND BALANCE CALCULATION
N700SP BEECHCRAFT A100

ITEM	Fuselage Station	Weight (lbs.)	Moment/100
Basic Empty Weight 1/	--	7,165	13,178
Pilot	129	200	258
Crew baggage 2/	145	40	58
Passenger	129 3/	190	245
Passenger	174 3/	200	348
Passenger	162 3/	235	381
Passenger	182 3/	135	246
Passenger	220 3/	185	407
Passenger	220 3/	200	440
Passenger	254 3/	300	762
Passenger	254 3/	235	597
Ice Chests	254 3/	25	64
Luggage	325	360 4/	1,170
Payload		2,065	4,460
Zero Fuel Weight		9,470	18,154
Fuel 5/		2,466	4,513
Takeoff Weight		11,936	22,667
C. G.		189.9	

Maximum zero fuel weight 9,500 lbs.
Maximum takeoff weight 11.500 lbs.
Takeoff C.G. Limits Forward - 184.5 Aft - 191.0
Landing C. G. Limits Forward - 183.4 Aft - 191.0
Calculated Landing
Conditions at Jackson, Miss. Weight 6/ 10,643 C. G. 191.0

1/ Taken from aircraft records.

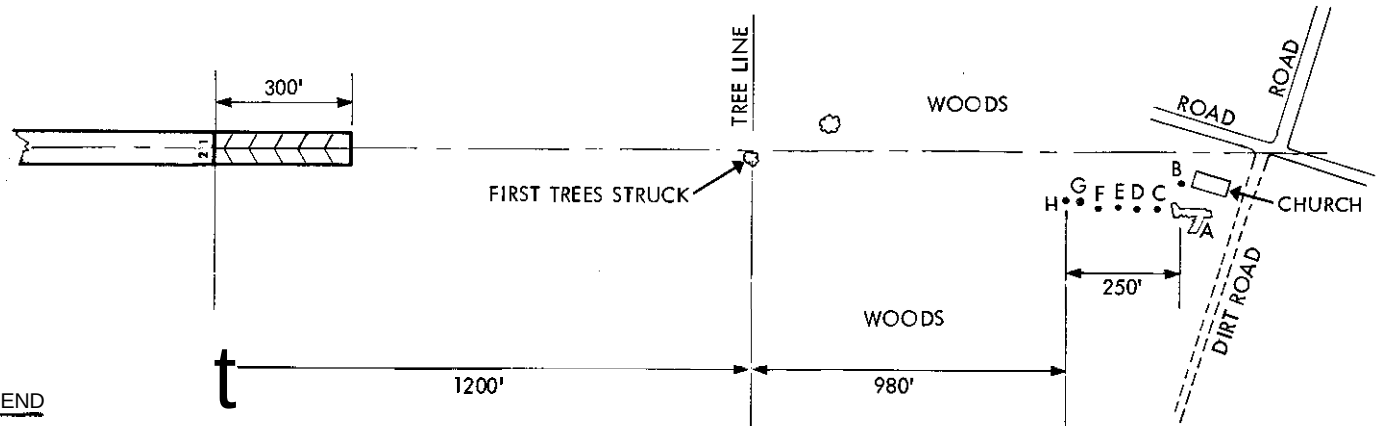
2/ Navigation kit, etc.

3/ Based on survivors' statements.

4/ Estimated 40 lbs. /person.

5/ Estimated 386 gal. @ 6.7 lb. /gal.

6/ Estimated 175 gallons remaining at landing.



LEGEND

A. FUSELAGE. RT. WING & ENGINE
B. LT. PROPELLER
C. RT. PROPELLER
D. HORIZONTAL TAIL SURFACES
E. LT. ENGINE
F. LT. MAIN GEAR
G. 3FT. DIA. OAK TREE
H. SECTION LT. WING & LT. FLAP IN TREE

0 300' 600'

SCALE: 1" = 300'

NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C.

WRECKAGE DISTRIBUTION CHART
STRIBLING-PUCKETT, INC. BEECHCRAFT
A100 N700SP, HILTON HEAD
ISLAND, SOUTH CAROLINA
APRIL 26, 1975

APPENDIX D

APPENDIX E

PERFORMANCE CALCULATIONS
BEECHCRAFT A100 N700SP

1. The weather data assumed for this work was: Temperature 19°C, wind less than 6 kn. light and variable; and altimeter 30. 14.

2. The runway was asphalt, 3,700 feet long with a 300-foot paved overrun on each end. The elevation at the runway threshold of runway 03 was 20 feet msl and at the threshold of runway 21 is 14 feet msl. The average runway slope was 0.16%. The aircraft used runway 03 for takeoff. There was an obstacle about 50 feet high, 1,237 feet past the north end of runway 03, on the runway centerline.

3. Three aircraft weight and moment conditions were examined. These values were selected to bracket and include the most likely conditions that existed aboard the aircraft at the time of the accident. Stabilizer deflections were calculated only for the 12,046 lb. case because it had the most forward c. g.

CASE	WEIGHT (lbs.)	MOMENT/100
1.	12,231	23.592
2.	12,046	22,291
3.	11,866	22,406

4. Two takeoff conditions were examined. First, a takeoff made from a static condition with takeoff power set before brake release. Second, a rolling takeoff made after making a 180° turn on a 75-foot wide runway. Each takeoff was considered using both 0° and 30° flap settings.

5. The specific data requested for cases 1 and 3 for each takeoff condition were:

1. Liftoff speed
2. distance to liftoff
3. time to liftoff
4. distance required to clear a 50-foot obstacle
5. time to reach a 50-foot obstacle clearance

APPENDIX E

6. indicated speed at time reaching the 50-foot obstacle clearance
7. altitude and airspeed after traveling 1,337 feet from liftoff
8. distance and time required to accelerate to best angle of climb speed
9. distance and time required to accelerate to best rate of climb speed
10. distance and time required to accelerate to cruise climb speed (indicate climb speed for each case in 8, 9, 10)
11. stabilizer setting in degrees for each takeoff condition
12. stabilizer setting for zero stick force in the climb.

6. It was assumed that the aircraft, at each of the above listed weights and moments, made a rolling takeoff after making a 180° turn on a 75-foot-wide runway and that liftoff occurred after 3,900 feet of ground roll. The airspeed at liftoff was calculated for both 0° and 30° flap settings. The stabilizer setting was determined to keep stick force near zero at liftoff in each case.

7. It was further assumed that in each case, the aircraft climbed to 50 feet, leveled off, and accelerated for the length of time required to travel 1,337 feet. No power reduction was considered. Normal landing gear or landing gear and flap retraction was assumed. In each case, the airspeed at the end of 1,337 feet of travel after liftoff was calculated. In addition, the airspeed at the end of that travel, and the stabilizer setting required for zero stick force in level flight was determined,

APPENDIX E

STABILIZER DEFLECTIONS FOR STANDARD TAKEOFF

These data relate to paragraph 5, items 11 and 12

Weight (lb.)	Flap Deflection (%)	Stabilizer Deflection For Zero Control Force @ Liftoff (Deg)	Stabilizer Deflection For Zero Control Force @ 50 Ft. (Deg)
12,231	0	.9 LED* @ 102 KT	.2 LED @ 120 KT
	30	.4 LEU** @ 97 KT	.8 LEU @ 108 KT
12,046	0	3.1 LED @ 101 KT	1.8 LED @ 120 KT
	30	1.7 LED @ 96 KT	.8 LED @ 108 KT
11,866	0	1.9 LED @ 100 KT	1.0 LED @ 119 KT
	30	.9 LED @ 95 KT	.2 LED @ 107 KT

* Leading edge down.

** Leading edge up.

APPENDIX E

STABILIZER DEFLECTIONS FOR 3,900 FT. GROUND ROLL

These data relate to paragraph 6, above

Weight (lb.)	Flap Deflection (Deg)	Speed @ Liftoff (Kcas)	Stabilizer Deflection For Zero Control Force @ Liftoff (Deg)
12,231	0	130	.1 LEU
	30	130	1.5 LEU
12,046	0	131	1.2 LED
	30	131	.3 LEU
11,866	0	133	.4 LED
	30	133	1.0 LEU

TAKEOFF DATA

WEIGHT (LB)	FLAP DEFLEC (%)	LIFT-OFF SPEED (KCAS)	LIFT-OFF DIST (FT)	LIFT-OFF TIME (SEC)	50 FT. ALT. SPEED (KCAS)	50 FT. ALT. DIST (FT)	50 FT. ALT. TIME (SEC)	1337 FT. FROM LIFT-OFF SPEED (KCAS)	1337 FT. FROM LIFT-OFF ALT (FT)	BEST ANGLE-OF-CLIMB 50 FT. ALT. SPEED (KCAS)	BEST ANGLE-OF-CLIMB 50 FT. ALT. DIST (FT)	BEST ANGLE-OF-CLIMB 50 FT. ALT. TIME (SEC)	BEST RATE OF CLIMB 50 FT. ALT. SPEED (KCAS)	BEST RATE OF CLIMB 50 FT. ALT. DIST (FT)	BEST RATE OF CLIMB 50 FT. ALT. TIME (SEC)	CRUISE CLIMB 50 FT. ALT. SPEED (KCAS)	CRUISE CLIMB 50 FT. ALT. DIST (FT)	CRUISE CLIMB 50 FT. ALT. TIME (SEC)
12231	0	102	2360	25	120	3700	32	120	50	114	3340	30	124	3920	33	150	5620	40
	30	97	2120	23	108	3070	29	116	50	114	3360	30	124	3940	33	150	5640	40
11866	0	100	2210	24	119	3470	30	120	50	114	3220	29	124	3780	32	150	5430	39
	30	95	2000	22	107	2870	28	116	50	114	3240	29	124	3800	32	150	5450	39
Remarks		Standard Takeoff Relating to Items 1 through 6 of Paragraph 5.						Data Relating To Item 7 of Paragraph 5 and Paragraph 7.		Data Relating To Item 8 of Paragraph 5.			Data Relating To Item 9 of Paragraph 5.			Data Relating To Item 10 of Paragraph 5.		

Add 50 Ft. for Rolling Start Following Turnaround. This is based on an Assumed Turn Radius of 25 Ft. with Center 40 Ft. from End of Runway, an Assumed Rolling Speed of 12 Kt, and a 2 Sec. Delay Between the End of the Roll and Application of Takeoff Power.