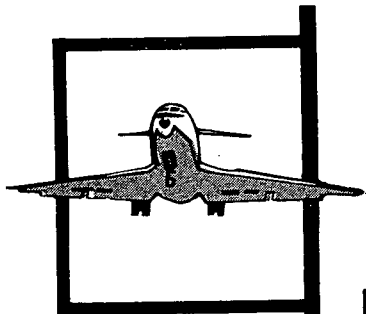


NATIONAL TRANSPORTATION SAFETY BOARD

WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT REPORT

**UNIVERSAL AIRWAYS, INC.
BEECH 70, EXCALIBUR CONVERSION, N777AE
GULFPORT, MISSISSIPPI
MARCH 1, 1979**

NTSB-AAR-79-16

UNITED STATES GOVERNMENT

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. NTSB-AAR-79-16		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Aircraft Accident Report: Universal Airways, Inc., Beech 70 Excalibur Conversion, N777AE, Gulfport, Mississippi, March 1, 1979				5. Report Date September 6, 1979	
				6. Performing Organization Code	
7. Author(s)				8. Performing Organization Report No.	
9. Performing Organization Name and Address National Transportation Safety Board Bureau of Accident Investigation Washington, D.C. 20594				10. Work Unit No. 2613A	
				11. Contract or Grant No.	
12. Sponsoring Agency Name and Address NATIONAL TRANSPORTATION SAFETY BOARD Washington, D. C. 20594				13. Type of Report and Period Covered Aircraft Accident Report March 1, 1979	
				14. Sponsoring Agency Code	
15. Supplementary Notes					
16. Abstract At 1504 c.s.t. on March 1, 1979, Universal Airways, Inc., Flight 76, a Beech 70 Excalibur conversion, crashed on takeoff from runway 17 at the Gulfport-Biloxi Regional Airport, Gulfport, Mississippi. Flight 76, a regularly scheduled commuter flight to New Orleans, Louisiana, had a pilot and seven passengers on board. After liftoff, the aircraft climbed slowly to about 100 ft. The pilot transmitted to the tower that he was returning to land on runway 13. When a right turn was begun, the nose pitched up, the right bank increased, and the aircraft entered a steep dive to the ground. All persons on board were killed, and the aircraft was destroyed. The investigation revealed that the nose baggage door opened at liftoff and was struck by the left propeller. A starter interrupt safety feature, designed to prevent the left engine from starting if the nose baggage door was unsecured, had been deactivated. The National Transportation Safety Board determines that the probable cause of this accident was the failure of the pilot to take proper actions to cope with an emergency after the opening of an unsecured nose baggage door during the critical phase of takeoff. Contributing to the cause of the accident were: (1) The failure of the company maintenance personnel to detect the starter interrupt system bypass wire; (2) a deficient weight and balance program; (3) inadequate corrective measures by the Federal Aviation Administration and the Beech Aircraft Corporation to a known safety					
17. Key Words Beech 70 Excalibur Conversion, nose baggage door opening, beyond aft c.g. limit, starter interrupt safety feature, low altitude stall, inadequate preflight procedures, deficient weight and balance program.				18. Distribution Statement This document is available to the public through the National Technical Information Service, Springfield, Virginia 22151	
19. Security Classification (of this report) UNCLASSIFIED		20. Security Classification (of this page) UNCLASSIFIED		21. No. of Pages 33	
22. Price					

ABSTRACT Continued

problem relating to the nose baggage door; (4) inadequate preflight procedures by the pilot; and (5) inadequate training requirements for Part 135 pilots in maximum gross weight operations in light, twin reciprocating engine aircraft.

TABLE OF CONTENTS

	<u>Page</u>
Synopsis	1
1. Factual Information	2
1.1 History of the Flight	2
1.2 Injuries to Persons	3
1.3 Damage to Aircraft	3
1.4 Other Damage	3
1.5 Personnel Information	4
1.6 Aircraft Information	4
1.7 Meteorological Information	5
1.8 Aids to Navigation	5
1.9 Communications	5
1.10 Aerodrome Information	5
1.11 Flight Recorders	5
1.12 Wreckage and Impact Information	5
1.13 Medical and Pathological Information	10
1.14 Fire	10
1.15 Survival Aspects	10
1.16 Tests and Research	10
1.16.1 Powerplant Examination	10
1.16.2 Aircraft Performance	11
1.17 Additional Information	11
1.17.1 Company Operational Procedures	11
1.17.2 Universal Airways Maintenance Program	12
1.17.3 Company Training Program	13
1.17.4 FAA Surveillance	14
1.17.5 Modification of the Starter Interrupt System	15
1.17.6 Universal Airways, Inc., Management	15
1.17.7 History of Nose Baggage Door	16
2. Analysis	19
3. Conclusions	25
3.1 Findings	25
3.2 Probable Cause	26
4. Recommendations	27
5. Appendixes	29
Appendix A -- Investigation and Hearing ...	29
Appendix B -- Personnel Information	30
Appendix C -- Aircraft Information	31

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C. 20594

AIRCRAFT ACCIDENT REPORT

Adopted: September 6, 1979

UNIVERSAL AIRWAYS, INC.
BEECH 70, EXCALIBUR CONVERSION, N777AE
GULFPORT, MISSISSIPPI
MARCH 1, 1979

SYNOPSIS

At 1504 c.s.t. on March 1, 1979, Universal Airways, Inc., Flight 76, a Beech 70 Excalibur conversion, crashed on takeoff from runway 17 at the Gulfport-Biloxi Regional Airport, Gulfport, Mississippi. Flight 76, a regularly scheduled commuter flight to New Orleans, Louisiana, had a pilot and seven passengers on board. After liftoff, the aircraft climbed slowly to about 100 ft. The pilot transmitted to the tower that he was returning to land on runway 13. When a right turn was begun, the nose pitched up, the right bank increased, and the aircraft entered a steep dive to the ground. All persons on board were killed, and the aircraft was destroyed.

The investigation revealed that the nose baggage door opened at liftoff and was struck by the left propeller. A starter interrupt safety feature, designed to prevent the left engine from starting if the nose baggage door was unsecured, had been deactivated.

The National Transportation Safety Board determines that the probable cause of this accident was the failure of the pilot to take proper actions to cope with an emergency after the opening of an unsecured nose baggage door during the critical phase of takeoff.

Contributing to the cause of the accident were: (1) The failure of the company maintenance personnel to detect the starter interrupt system bypass wire; (2) a deficient weight and balance program; (3) inadequate corrective measures by the Federal Aviation Administration and the Beech Aircraft Corporation to a known safety problem relating to the nose baggage door; (4) inadequate preflight procedures by the pilot; and (5) inadequate training requirements for Part 135 pilots in maximum gross weight operations in light, twin reciprocating engine aircraft.

1. FACTUAL INFORMATION

1.1 History of the Flight

On March 1, 1979, Universal Airways, Inc., operated scheduled commuter passenger flights under 14 CFR 135. The aircraft, a Beech Model 70 with an Excalibur conversion, (N777AE) 1/, had departed Houston, Texas, at 0815 c.s.t. 2/ on March 1, 1979, and was scheduled to make seven flights between various Texas, Louisiana, and Mississippi locations. At the end of the first segment, the pilot was 32 minutes behind schedule. Each subsequent trip fell farther behind schedule so that Flight 75 from New Orleans, Louisiana, to Gulfport, Mississippi, departed New Orleans at 1400, 1 1/2 hours behind schedule. A passenger on Flight 75, an airline pilot, occupied the copilot seat. He stated that the pilot had difficulties starting the right engine at New Orleans, and that the flaps would not operate during the flight to Gulfport. He noticed that when the pilot reached to raise the landing gear shortly after the aircraft lifted off, he simultaneously applied a slight back pressure on the control wheel, which caused the aircraft to pitch up slightly. The remainder of the flight to Gulfport was uneventful, and the aircraft landed at 1430. The flaps were still inoperative.

Flight 76, from Gulfport to New Orleans, had been scheduled to depart Gulfport, at 1330. The Gulfport station agent stated that the flights had been delayed all day, so that departure preparation for Flight 76 was rushed. Another agent prepared the manifest while he unloaded the bags from the rear of the aircraft. When he could not find three of the bags, he opened the nose baggage compartment door. The three bags had been placed in the compartment at New Orleans, although the company specifically prohibited the carriage of passenger luggage in the nose baggage compartment, because the area was too small and because of the inherent hazard of improperly securing the door. The agent did not recall whether he locked the baggage door after he removed the three bags.

The pilot computed the weight and balance from the Universal Airways passenger manifest/weight and balance form, which had been filled out by the station agent. The passenger weights listed on the form reflected average 170-lb weights for each passenger and the pilot. However, the pilot weighed 200 lbs, and a company employee who was on board weighed 230 lbs. The total passenger and pilot weight for the eight persons was listed as 1,360 lbs, whereas their actual weight was about 1,445 lbs. Additionally, the form prepared by the agent specified 100 lbs of baggage and cargo, while the actual weight of the 13 bags was about 278 lbs. There was 900 lbs of fuel aboard. Although the pilot did not question the form, he did ask how much he should allow for baggage. The agent told him to allow as much as possible. The final weight and balance form signed by the pilot reflected a gross takeoff weight of 8,198 lbs, a maximum certificated gross takeoff weight of 8,200 lbs, and a proper center of gravity. Postaccident computation revealed that the actual takeoff weight was about 8,521 lbs and that the aft center of gravity limit was exceeded by about 1.78 inches.

1/ The Beech Model 70 (Excalibur conversion) is a modification of the Beech Model 70 with different powerplants and engine cowlings, a lower thrustline, a different center of gravity envelope, and a modification of the landing gear doors.

Flight 76 was cleared to taxi to runway 17 at 1458. The wind at the airport was from 110° at 5 knots. At 1458:10, the pilot requested runway 13, and Flight 76 left the gate at 1500. At 1500:38 the air traffic controller transmitted, "we can approve runway 17 if you prefer." At 1501:37 the pilot transmitted, "Universal 76 is going to 17." At 1504:23 the tower controller cleared Flight 76 for takeoff. Flight 76 taxied onto runway 17 and began the takeoff roll from the intersection; about 4,500 ft of runway was available. At 1505:28 the tower controller instructed the pilot to contact departure control. At 1505:33, with the aircraft about 100 ft above the ground, the pilot transmitted, "Universal 76 is taking it around, gonna land sir, gonna land on 13."

The aircraft had lifted off the runway about 2100 ft from the start of the takeoff roll. While one witness stated his attention was directed to the aircraft by the sound of its engines during the roll, others recalled a normal takeoff. Once the aircraft lifted off the runway, abnormal engine sounds were reported by several witnesses. These abnormal sounds reportedly were bangs or popping noises. These noises were heard from the point of liftoff through about 50 ft a.g.l. Witnesses watched the aircraft climb on the runway heading to an altitude of about 100 ft before it began to turn right. Many witnesses, including the tower controller, stated that as the right turn began the nose of the aircraft pitched up, the right bank increased, and the aircraft entered a steep dive to the ground.

Two witnesses reported that the aircraft was climbing slowly during the initial climb to 100 ft. The air traffic controller stated that as the pilot was stating his intention to return to land on runway 13 at 1505:33, he saw the aircraft begin the right bank.

The aircraft crashed during daylight hours in an open grassy field on airport property. The point of impact was 500 ft beyond the end of runway 17 and 700 ft to the right of the runway centerline. The initial impact was at a 45° nosedown, right wing down attitude. The coordinates of the accident site were latitude 30°24'N longitude 89°04'W.

1.2 Injuries to Persons

<u>Injuries</u>	<u>Crew</u>	<u>Passengers</u>	<u>Others</u>
Fatal	1	7	0
Serious	0	0	0
Minor/None	0	0	0

1.3 Damage to Aircraft

The aircraft was destroyed.

1.4 Other Damage

None

2/ All times herein are central standard time, based on a 24-hour clock.

1.5 Personnel Information

The pilot of Flight 76 was qualified and certificated for the flight and had received the training required by current Federal Aviation Regulations. (See Appendix B.) He had been off duty for 10 hours 10 minutes before reporting for duty at 0725 on the morning of the accident. On March 1 he had flown 4 hours before Flight 76.

The pilot completed his flight training with Universal Airways on February 25, 1979, and began flying as pilot-in-command on February 26, 1979. He had recorded a total of about 1,528 hours of flying time, 915 hours of which were in multiengine aircraft. Of that total 777 hours were on military multiengine jet centerline thrust aircraft. The remaining 138 hours of civilian multiengine time had been accumulated in the preceding 90 days.

March 1 was his first flight in the Beech 70, Excalibur conversion, although he had flown the Beech A-80. The Beech A-80 is flown identically to the Beech 70 Excalibur conversion and has the same aerodynamic characteristics. However, the Beech A-80 has an 8,800-lb maximum gross takeoff weight.

1.6 Aircraft Information

N777AE was leased to Universal Airways, Inc. It was certificated in accordance with current regulations. (See Appendix C.)

N777AE, originally a Beech 70 Queen Air, was certificated in June 1970. It was purchased by Excalibur Aviation Company at San Antonio, Texas, in May 1976, which transferred ownership to the current owner, the N777AE Group. The N777AE Group then leased the aircraft to Universal Airways, Inc., on December 15, 1978.

The original engines on N777AE were two Lycoming Model IGSO-540-A1E6. In March 1976, Supplemental Type Certificate (STC) SA444SW was applied for by the Excalibur Aviation Company. During modification of the Excalibur conversion, the engines were replaced with Lycoming IO-720-A1B engines. New engine cowlings were installed, the thrustline was lowered by 7 ins., the landing gear doors were modified, and the center of gravity envelope was modified slightly; the aft center of gravity limit did not change. The Excalibur conversion had no effect on the gross weight, the passenger seating arrangement, the electrical system, or the flight characteristics.

Although the Beech 70, Excalibur conversion and Beech A-80 have similar performance capabilities, the conversion was restricted to 8,200 lbs until Excalibur Aviation demonstrated the aircraft was structurally sound to carry the increased weight. Excalibur Aviation did not conduct the necessary tests since there was no market demand for the increased weight. At the Safety Board's public hearing into the accident, Excalibur personnel testified that the aircraft did have performance capabilities similar to that of the 8,800-lb Beech A-80.

At the time of the accident, N777AE had one deferred maintenance item (ADF inoperative) and eight uncorrected discrepancies in the flight log.

Although the wing flaps were operative when the flight began on March 1, 1979, the flaps were inoperative for Flights 75 and 76. The flap motor was functionally tested after the accident and operated satisfactorily.

The aircraft was equipped with a starter interrupt system to prevent starting the left engine if the nose baggage door was not secured properly. The examination of the two magneto-starter switches revealed that a 10-in.-long red wire (No. 18) was connected to the "BAT" terminal of the two engine-starter switches. (See Figure 1.) Since this wire allowed the starter interrupt system to be bypassed, the left engine started with the nose baggage door unsecured.

Although required by regulation, no emergency locator transmitter was installed in N777AE.

1.7 Meteorological Information

The surface observations taken at the Gulfport-Biloxi Regional Airport were, in part, as follows:

1450 - Gulfport Record 5,000 ft scattered, 10,000 ft scattered, visibility--7 miles, wind--150° at 4 kns, altimeter setting--30.08 inHg.

1553 - Gulfport Record 1,000 ft scattered, 5,000 ft scattered, visibility--4 miles, wind--140° at 8 kns, altimeter setting--30.06 inHg.

Some witnesses reported that the surface winds were gusty at the time of the accident.

1.8 Aids to Navigation

Not applicable.

1.9 Communications

There were no known communications malfunctions.

1.10 Aerodrome Information

Gulfport-Biloxi Regional Airport, elevation 28 feet, is located east of the City of Gulfport. Runway 13/31 is 9,000 feet long, but the first 2,500 feet of runway 13 was closed for construction. Runway 17/35 is 5,700 ft long.

1.11 Flight Recorders

No flight recorders were installed nor were any required.

1.12 Wreckage and Impact Information

The aircraft struck the ground in a 45° nosedown attitude. First, the aircraft nose and right wing hit the ground at a heading of about 240°. After



Figure 1. Wire connected to "BAT" terminal.

impact, the aircraft pivoted and came to rest on a heading of 40°. The aircraft remained in an upright position with the landing gear extended and the wing flaps retracted.

The fuselage forward of the windshield, the top of the cockpit, and the top of the cabin were destroyed. The fuselage from the cabin door aft to the tailcone was relatively undamaged. The nose baggage door, located on the left side of the fuselage adjacent to the arc of the left propeller, contained 4-in. cuts made by the left propeller. (See Figure 2.)

The right wing was crushed and broken from the tip to the fuselage, while the left wing sustained only minor damage. The four sections of wing flap were in the retracted position. The wing flap motor and gearbox were removed and tested. The motor operated when 10 to 12 amperes were applied. The four flap actuators, which were operated by hand to check movement, operated freely.

Each flight control system was traced from the cockpit to the control surface; no preimpact abnormalities were found in any flight control system. The cables from the elevator and rudder control system and the trim tab cables were traced from the cockpit. The elevator could be moved from 20° up to 10° down; the rudder travel was 23° right and 24° left. Full travel for the elevator is 25° up and 15° down, full rudder travel is 24° right and 26° left. The rudder trim tab position was 5° right. The elevator trim tab position was neutral.

Both nacelles and engine assemblies separated from the wings. The engines sustained superficial impact damage, the majority of which was to the air intake hardware, fuel injection system, exhaust stacks, and engine accessories. The fuel selector valves for each engine were open. The Safety Board found no evidence to indicate preimpact damage to either engine.

One blade had broken off the right propeller assembly during impact. The second and third blades were bent rearward 30° and 10°, respectively; both exhibited slight twists to the low-pitch position.

All three blades remained attached to the left propeller assembly. One blade had no significant damage marks; the other blades were bent rearward 30° and 40°, respectively, and were twisted to the low-pitch position. The tips of the propeller blades had not curled. Instead, the blade tips had bent.

Both cockpit seats remained in place but were damaged extensively. The inboard tube which anchored the pilot's seat broke at the weld to the seat-frame. The leg structures on cabin seats 1 through 4 were bent and broken and were torn from the floor track attachments. (See Figure 3.) The floor tracks were broken in numerous places. None of the seatbelts failed. Seat 5 was in place, but most of the screws which held it to the floor had pulled free. The nut plate, which attached the left seatbelt anchorage eyelet, was pulled through the fuselage stringer.

Seat 6, a plywood, side-facing seat, collapsed and failed completely. The insert hardware on the seatbelt faced toward the rear of the aircraft and the buckle hardware toward the front. The belt adjusted only on the buckle side and was found in the full length adjustment.

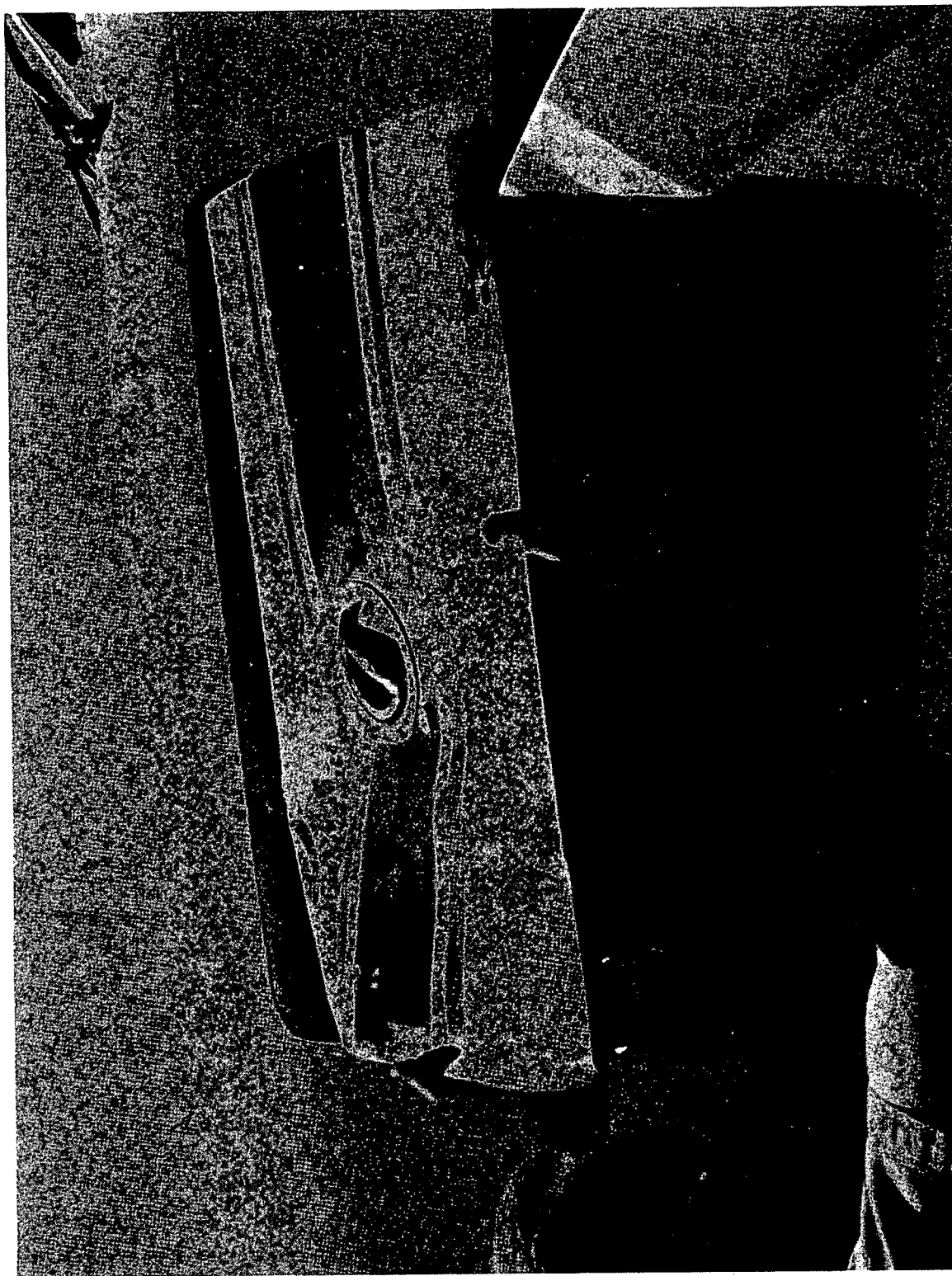


Figure 2. Door from accident aircraft.

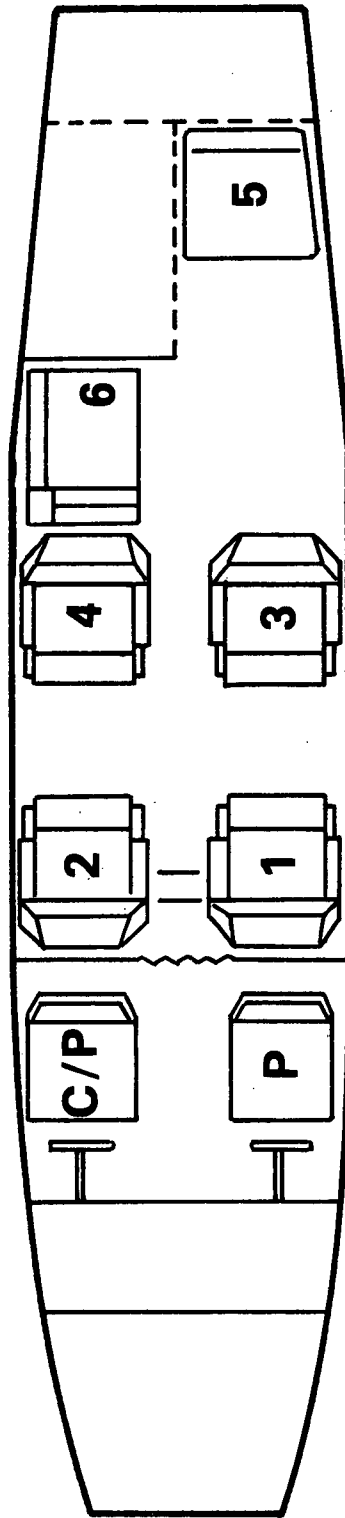


Figure 3. Seat arrangement for N777AE.

The rear baggage area was separated from the passenger area by a bulkhead aft of seat 6 and a net of nylon straps next to seat 5. The net failed, and most of the baggage was found at the seat 6 position.

1.13 Medical and Pathological Information

Six passengers and the pilot died from multiple traumatic injuries. One passenger, a 185-lb male who was seated in seat 5, survived for 6 1/2 days after the accident. He suffered multiple rib fractures on the right side, a dislocated right hip, and fractures of both legs.

The company employee, who was in the copilot's seat, had fractures in both hands. The fractures indicate that he was not holding the control wheel at impact.

Toxicological examinations of the pilot were negative for alcohol and drugs. The examination of the company employee in the copilot's seat showed blood alcohol of .072 percent.

1.14 Fire

There was no fire.

1.15 Survival Aspects

The accident was not survivable for either the crew or the passengers. The occupiable space in the cockpit was compromised when the instrument panel was displaced rearward. The passenger cabin roof and portions of the sidewalls were ripped away, which permitted passengers to be ejected. Passenger seatbelts, seat structures, or both, failed, which increased the occupants exposure to injury from secondary impact with the interior aircraft structure.

1.16 Tests and Research

1.16.1 Powerplant Examination

During the onsite examination, both engines were rotated and the valve sections appeared to be normal. The cylinders of the left and right engine developed compression. The boost pumps were removed and were found to be undamaged. Fuel was found in the fuel lines, in the strainer body, and in the distribution manifold to the injectors of both engines.

The engines were examined and the damaged parts removed and cleaned. The cylinders were borescoped with negative findings. In order to run the engines, the following parts were replaced: Air induction housing, fuel injector bodies, wiring harnesses, starter gears, and sparkplugs; both magnetos from the right engine were placed on the left engine. Both engines were started and operated in a test cell. The engines operated within normal parameters and exhibited no indications of internal damage.

1.16.2 Aircraft Performance

The FAA-approved Excalibur airplane flight manual contains performance data which are applicable to an 8,200 lb aircraft. However, Excalibur officials stated that the Beech 70 Excalibur conversion exceeded the stated performance capabilities for the 8,200-lb aircraft since the original performance tests were conducted for a Model A-80 at 8,800 lbs. The calculated performance for an 8,200-lb aircraft, operating in the meteorological conditions existing at Gulfport, Mississippi, on March 1, 1979, follows:

Takeoff distance to clear 50 ft	2,350 ft
Rate of climb--max power, gear and flaps up	1,500 ft/min
Normal climb speed	132 mph
V _Y	86 mph
V _{MC} Liftoff speed	105 mph
Stall speed, maximum weight, power on, flaps up, gear up	0° Bank--95 mph

Performance based on 8,521 lbs, a 162.18-in. moment, and the existing weather conditions was also calculated. A takeoff roll of 2,000 ft and an altitude of 100 ft were based on witness observations. At the point where the aircraft reached 100 ft, normal two-engine climb altitude would have been about 300 ft with the gear down and the flaps retracted.

At the Safety Board's public hearing, witnesses qualified in the Beech 70, Excalibur conversion and the 8,800-lb version of the same aircraft testified that, given the accident conditions, the aircraft would be more sensitive to control wheel forces and that a pilot would have to be more careful when he moved the control surfaces. However, they believed that the aircraft could be flown safely providing proper thrust was available and no excessive back pressure was applied. Since the aircraft has never been flight tested with a center of gravity beyond the aft limit, witnesses could not state positively what the handling characteristics would be for the accident conditions.

A witness, who had conducted performance tests in a Beech B-80 following an accident in 1972 ^{3/} testified that a Beech 65-B80 has identical aerodynamical handling characteristics to that of N777AE. The witness stated that, if the nose baggage door opens in flight, it will add less than 4 percent parasitic drag and will not affect the performance or handling characteristics of the aircraft significantly.

1.17 Additional Information

1.17.1 Company Operational Procedures

The pilot-in-command was responsible to insure that the proper flight dispatch procedures were followed. These included, in part, weather briefings, flight planning, proper loading of passengers and bags, and correct center of gravity computations. The pilot alone decided if the aircraft was airworthy and if the trip could be accomplished.

^{3/} Aircraft Accident Report: Ross Aviation Inc., Beechcraft 65-B80, Queen Air, N841NS, Albuquerque, New Mexico, May 19, 1972. (NTSB-AAR-72-32.)

The station agent was responsible for preparing a passenger manifest/weight and balance form, which listed the names of the passengers, the weight of each, the weight of the baggage and cargo, and the aircraft's basic empty weight. From this information, the pilot determined the weight and balance and center of gravity. All of the forms reviewed during the investigation indicated that average passenger weights were used. Although Universal Airways had not been authorized by the FAA to use average weights, the former Director of Operations stated that he did not know that average weights were not authorized. In addition, the average baggage and cargo weights entered on the forms were 100 or 200 lbs. The Universal Airways operations manual does not specify any procedure for weighing or determining the weight of baggage; there was no policy which directed the assignment of seats to passengers to satisfy center of gravity requirements.

14 CFR 135.136 (b) states: "No certificate holder may assign a flight crewmember, and no flight crewmember may accept an assignment, for duty during flight time unless that assignment provides for at least 10 consecutive hours of rest during the 24-hour period preceding the planned completion of the assignment."

A review of the Universal Airways pilot schedules indicate that some pilots were scheduled for flights without the required 10-hour rest period. Universal pilots testified that they had exceeded the duty time regulations, but usually when flight sequences were delayed.

Universal Airways operated five aircraft. A review of the aircraft requirements indicate that the schedules often required the operation of all the aircraft. As a result, if an aircraft was grounded for maintenance difficulties or for scheduled maintenance, trips had to be canceled or combined with other trips.

A review of the published schedule revealed that many flights were scheduled with a 20- to 30-minute turnaround. A Universal Airways station agent testified that if a flight arrived late, an effort was made to reduce the ground time and depart on schedule. As a result, deplaning, enplaning, baggage handling, weight and balance preparation and other ground activities were rushed.

1.17.2 Universal Airways Maintenance Program

Universal Airways had one maintenance facility, located in Houston, Texas. Any maintenance support required at stations other than Houston was arranged by the pilot. The Director of Maintenance or the shop foreman would discuss with a mechanic the required maintenance the pilot chose. In addition to the Director of Maintenance and the shop foreman, Universal Airways employed two to three other mechanics. The Director of Maintenance had 3 years of experience as an airframe and powerplants mechanic; the foreman had two years experience. Neither had held maintenance management positions before they assumed their current positions.

Universal Airways, Inc., operated on a 100-hr inspection program until February 9, 1979. At that time the FAA approved a progressive program--Approved Airplane Inspection Program (AAIP) for Beechcraft Excalibur Queen

Airs. The AAIP was designed to provide a continuous airworthy condition for the Beechcraft operated by Universal Airways, Inc. The first AAIP was completed on N777AE on February 9, 1979, and the second AAIP on February 21, 1979. No reference to the starter interrupt system was noted in the nose baggage door or the powerplant portions of the inspection guide. However, the Beech shop manual for the Model 70 Queen Air, which was the FAA-approved maintenance manual, discussed and illustrated the microswitch and its relation to the starter for the left engine.

The original copy of daily flight logs was kept in the logbook for each aircraft. These documents contained, a list of the uncorrected deficiencies on the aircraft, total airframe time, the time flown that day, and any action taken by mechanics to correct discrepancies noted by the pilot. The logsheets also contained a block labeled, "Airworthiness Release-Time-By Title Date," and a block labeled, "Inspection-Date-Station-By." Both blocks were blank on every log reviewed by the Safety Board except one. As a result, it was not possible to determine the status of an aircraft by inspection of the logsheets or the logbook. Furthermore, testimony by Universal employees indicated that the blocks were not used to signify airworthiness of an aircraft, and that there had been no clear method of signifying the airworthiness of an aircraft. Finally, no system had been established to enable a pilot to judge the airworthiness of an aircraft away from Houston. Yet, by accepting an aircraft, a pilot was in effect forced to make such a judgment. As a result, N777AE was operated on the day of the accident with the flap system inoperative, although several witnesses, including a former training pilot, testified at the public hearing that the aircraft should have been grounded.

The Safety Board's review of the maintenance program indicated that many logsheets were missing and that the maintenance records system was not complete. As a result, the following information was not available:

- (1) Total time on the right engine
- (2) Total time and time since overhaul for the left propeller
- (3) Total time on the right propeller

1.17.3 Company Training Program

Universal Airways, Inc. required new pilots to undergo ground and flight training before assignment as pilot in command on scheduled trips. The ground school was 40 hours of classroom study. Although there was no documentation that the pilot of Flight 76 had received the classroom training, the training pilot stated that the pilot did receive the required ground school. The pilot's training folder did include two written tests, dated February 5 and 8, on ground school subjects. One question concerned the maximum gross takeoff weight for N777AE; the question had been answered correctly.

The pilot's records did not contain documentation of initial flight training. Although a flight training record was provided to the Safety Board 9 days after the accident, the record was reconstructed from the memory of the training pilot. The training record indicated that on February 24, 1979, the pilot received 4 hours of flight training and VFR check in a Cessna 402, as required by 14 CFR

135.138. On February 25, 1979, the pilot received 6.5 hours of flight training and the checks required by 14 CFR 135.77, .122, .131, and .138. No training was given in aircraft at or near the maximum gross takeoff weights. The pilot's logbook contained an entry for February 24, 1979, for a 5.2-hour Cessna 402 flight, and a 4.9-hour flight on February 25, 1979, in a Beech A-80 Queen Air.

The Universal Airways's Operations Manual, Training Program, states: "Each pilot will complete an enroute evaluation flight on a scheduled flight with the chief pilot, or an instructor pilot assigned by the chief pilot, before he is scheduled to fly that scheduled route as Pilot in Command." There is no indication that this requirement was completed, although the route structure was discussed during ground school.

1.17.4 FAA Surveillance

The Universal Airways, Inc., air taxi certificate was issued by the FAA Houston General Aviation District Office (GADO). In addition, the GADO held the certificates of 70 other air taxi operators. The GADO was responsible for two commuter air carriers . . . Universal Airways and a second, much larger commuter air carrier. On January 19, 1979, the Houston GADO requested that the Southern Region provide surveillance of that portion of Universal's operation in the Southern Region.

Two FAA inspectors — operations and maintenance - were assigned to perform surveillance of Universal Airways. The surveillance was on a part-time basis, since each inspector also was responsible for many of the 70 air taxi operators as well as other GADO duties. The maintenance inspector was assigned 35 to 37 air taxi operators.

The principal maintenance inspector stated that he attempted to inspect Universal's maintenance facility at least once every 60 days. The operations inspector believed that more man-hours were necessary to perform surveillance to the degree that was desirable for a commuter air carrier. The Chief, Maintenance Unit, stated that more man-hours were required for surveillance of air taxi/commuter operators, and that he believed that the proper surveillance of the two commuter operations for which he was responsible would require the attention of one inspector full time.

The Houston GADO conducted 12 ramp checks and 13 pilot en route checks on Universal Airways pilots and aircraft between June 1978 and February 1979. In January 1979, the GADO increased its surveillance efforts on Universal Airways because the inspectors had noted discrepancies in the maintenance and recordkeeping practices. On January 26, 1979, the President, Universal Airways met with FAA representatives to discuss FAA's findings. The discrepancies were not of sufficient magnitude to warrant formal action against the airline. According to FAA correspondence, "The crux of the problem lies within (the President's) management/supervisory staff who are not monitoring aircrew/maintenance personnel properly and probably pressuring both to remain operational and make published schedules." As a result of these findings, Universal Airways agreed to change its procedures and strengthen its training program.

On September 18, 1978, the principal operations inspector conducted an en route check of a Universal airways pilot. Afterward he recommended in writing that the company change its weight and balance procedures. The company was in the process of changing the procedure at the time of the accident.

1.17.5 Modification of the Starter Interrupt System

N777AE was leased by Universal Airways, Inc., on December 15, 1978. Because of difficulties in starting the engines, in December, 1978, Universal Airways maintenance personnel replaced the right engine starter switch.

On January 2, 1979, while the aircraft was in Gulfport, Mississippi, the pilot could not start the left engine. The writeups in the flight log stated, "1. #1 (LT) Engine Starter inop 2. #2 (RT) Engine Spins over but does not fire until starter is released to 'Both'." As a result, the pilot contacted an airframe and powerplant mechanic at a local fixed-base operation. The mechanic examined the aircraft that evening, but made no repairs. On January 3, the mechanic talked with Universal Airways maintenance personnel in Houston concerning the problem. Since he suspected that the left starter switch was defective, a new starter switch was sent from Houston. The pilot, the mechanic and Universal maintenance personnel stated that they were not aware of the starter-interrupt feature. Had they known, it would have been the first area checked, since a defect in the microswitch of the nose baggage door would have made it impossible to start the left engine.

On the morning of January 4, the mechanic pulled the starter switches from under the control panel — he did not disconnect them. Before he removed the left starter, he noticed that a screw was missing from a terminal on the left starter and that two or three wires were loose. He connected the wires and the starter became activated. He replaced both starter switches in the control panel and signed off the aircraft logsheet as "Repaired starter circuit." The new starter switch was found in the wreckage of N777AE on March 1. The mechanic stated that when he repaired the left starter, he saw wires of different colors; he did not specifically remember seeing the red bypass wire. The Universal Airways employee who made the December repair could not recall ever seeing the red bypass wire.

The logsheet for January 5, contained the following writeup: "5. Mechanics GPT (Gulfport) turned left engine with nose bag door open and prop cut gash in it." No Universal employee recalled the propeller cut in the door before January 5. Even after the cut in the door was found, no Universal employee determine how it was done, who was responsible for it, or what its relationship might be to the bypass wire. The Gulfport mechanic stated he did not damage the door.

1.17.6 Universal Airways, Inc., Management

Universal Airways, Inc., was approved as a 14 CFR 135 air taxi operator on April 21, 1978. The company bought an existing air taxi and changed the name, the principal business office address, and the chief pilot. Universal Airways

purchased two Cessna 402 aircraft from the previous operator, and by December 1978, had acquired two Beech Queen Air's. During the April 1978 - January 1979 period, Universal Airways expanded its flight schedule and hired additional employees. Although the chief executive officer did not change, there were at least three Director's of Operations, several chief pilots, two Director's of Maintenance, and many different training captains between April 1978 and January 1979.

In addition to management positions, company managers also functioned as either full-time line pilots or mechanics. For example, the Director of Maintenance spent less than half of his time as Director of Maintenance. During the remainder of his time he was a mechanic or performing other company duties such as working in reservations. The Director of Operations, the chief pilots, and the training pilots were also line pilots. The training pilot stated that he spent about 80 percent of his time as a line pilot.

The FAA Principal Operations Inspector stated that the lack of continuity in management did not help the company's management and made surveillance of the carrier more difficult. In addition, he indicated that individuals in management positions should restrict their activities to management functions if they were to manage the company properly.

1.17.7 History of Nose Baggage Door

The nose baggage door was equipped with a microswitch which was mounted in the door frame. The door latching mechanism incorporated three bayonets which secured the door. When the door was latched properly, the forward bayonet would actuate the microswitch, which in turn completed the circuit and allowed the left engine to start.

On May 19, 1972, a Beech 65-B80 crashed on takeoff when the nose baggage door came open. The investigation of that accident revealed that the microswitch had been disabled, which allowed the left engine to be started with the baggage door unsecured. As a result, on July 3, 1972, the Safety Board issued Safety Recommendations A-72-78 through 81 to the FAA. These recommendations follow:

- "1. Provide for double failure protection by means of a secondary locking device or cargo restraint system on those cargo doors where inadvertent opening in flight would seriously jeopardize the safety of flight of the aircraft or the safety of its occupants on all so affected aircraft. (A-72-78)
2. Issue an alert to all air taxi operators, advising them of the hazards associated with the improper security of cargo doors. (A-72-79)
3. Consider rulemaking under Part 135 to require a door warning system, double locking devices, and cargo restraint systems for those cargo compartment doors where inadvertent opening in flight would seriously jeopardize the safety of flight of the aircraft or the safety of its occupants. (A-72-80)

4. Evaluate the applicability of 14 CFR 23.787 (b) for this type of nose cargo compartment and the attendant hazard of cargo shifting such as occurred in this accident. (A-72-81)"

On July 13, 1972, the FAA responded:

"We wish to advise you that corrective action has been taken to assure a safe and proper use of the nose cargo door actuating system on Beechcraft 65-80 airplanes. As a result of the cited Albuquerque accident which investigation indicated was caused by non-latched nose cargo door, the FAA issued a safety alert to all owners and operators on May 31, 1972. This alert covered the need for positive door closure and rigging of door actuating mechanism in accordance with the manufacturer's instructions. Subsequent examination of the door's three-pin latching design indicated that if properly maintained and fully secured by operator, such provisions as specified under FAR 23.787(b) would continue to be satisfied."

The Safety Board has closed these recommendations, but considers the FAA's actions unacceptable.

The Operations Alert 72-2, issued May 31, 1972, was included in FAA Handbook 8430.1A, which was used by the FAA inspectors at the Houston GADO.

In 1976, Beech Aircraft Corporation conducted a field survey to gather information on the overall condition of nose baggage doors on Beech Queen Air aircraft. Sixty-six aircraft were surveyed. The findings of the report were:

1. Bayonet travel was sufficient to lock the door in almost all aircraft.
2. Only 10 of 66 aircraft complied with Beech Service Instruction (Class II) No. 0485-351 Rev. 1, Subject - Electrical Modification or Addition of Nose Baggage Door Safety Switch.
3. Only 17 of 66 had the original inside door covering, which protected the door latching mechanism from damage from cargo.
4. The three placards which indicate the direction of rotation and the alignment marks for the open and closed positions were missing from almost all aircraft.

Beech Aircraft Corporation sent individual letters to the owners of the aircraft surveyed to inform them of the findings for each aircraft. The N777AE Group received a letter containing the results of the inspection on April 1, 1977. The remarks did not mention the microswitch. There was no indication that Universal Airways received a copy of the letter when N777AE was purchased in December 1978.

After the accident involving N777AE, the FAA reissued Operations Bulletin No. 75-1 on March 14, 1979. The bulletin, "Hazards Associated with Improper Security of Nose Section Exterior Cargo Doors," had been issued initially on May 25, 1975, and was placed in FAA Handbook 8440.5A. The Bulletin stated, in part:

"DISCUSSION. A recent accident and several aircraft incidents have indicated that a safety problem exists on small twin-engine aircraft with exterior doors for baggage compartments located in the nose section.

This accident and five of the reported incidents are similar in nature (in that a nose cargo door opened) to a 1972 air taxi accident during which nine occupants were fatally injured when the nose cargo door opened during takeoff. Pieces of the unsecured cargo struck the propeller causing loss of the powerplant, and the aircraft crashed.

ACTION. Flight Standards Field Offices shall contact all small twin-engine operators in their areas and advise them of the hazards associated with the improper security of nose section exterior cargo doors and cargo restraint systems.

Inspectors should request each light-twin operator to establish a procedure to ensure the security of all cargo, including baggage, and ALL CARGO DOORS, prior to flight. All door warning systems and safety devices should be operating properly. Installations of secondary locking devices or cargo restraint systems on those doors where inadvertent opening in flight can seriously jeopardize safety of aircraft or occupant is recommended."

When FAA reissued the bulletin, it instructed its inspectors to inform operators of light twin-engine aircraft of the hazards of an improperly secured nose cargo door. In addition, airworthiness inspectors were told to determine if the safety interlock systems were operational. FAA inspectors testified that Bulletin No. 75-1 had been mailed to the Part 135 operators assigned to the Houston GADO. However, no Beech aircraft had been inspected for compliance with the bulletin. Maintenance managers for Universal Airways stated that they had not seen the bulletin.

In addition to the starter interrupt mechanism, a second optional warning system was available to indicate that the nose baggage door was not secured properly. The system, which is represented by a warning light in the cockpit, was not installed in N777AE.

After the accident involving N777AE, Beech Aircraft Corporation developed an additional lock for the nose baggage door on the Beech Queen Air. The lock consists of a latch which rides over a striker plate when the door is closed. Even if the door is not closed properly the latch will retain the door.

2. ANALYSIS

The meteorological conditions did not adversely affect the flight. The visibility was satisfactory. Although some witnesses reported gusty winds, the recorded surface winds before and after the accident were only 4 to 8 kns. Therefore, the Safety Board concludes that the winds should not have hampered control of the aircraft.

The aircraft was certificated in accordance with regulations and approved procedures. All flight control systems were determined to have functioned properly. The inspection and operation of the engines indicated that there were no preimpact malfunctions which would have reduced the efficiency of the engines or the thrust available at the time of the accident. The propeller examinations did not indicate any preimpact damage. Although both engines were capable of developing the required thrust, four of the six propeller blades had been bent at the tips, which indicated that the engines were not developing significant power at impact, since propellers which strike the ground while power is being developed will curl at the tips. Based on the evidence, the Safety Board concludes that the engines were capable of providing the required thrust and that the engine and propeller were not damaged significantly when the left propeller blades struck the nose baggage door.

Since Flight 76 lifted off the runway after a ground roll of about 2,100 ft, proper thrust was available and used for takeoff. Although 2,100 ft is more than the expected computed takeoff value, pilot technique could have accounted for the additional distance. Since witnesses stated that engine sounds were unusual after liftoff and that the aircraft climbed slowly, the nose baggage door evidently came open and was struck by the left propeller just after liftoff. This conclusion is substantiated by the flight test conducted after the 1972 Ross Aviation Accident, which indicated that the rotation upward of the aircraft fuselage will cause the door to open. The landing gear, which was normally raised a few seconds after liftoff, remained extended during the accident sequence. Had the door been struck sometime into the initial climb, the pilot would have had time to raise the gear.

After the aircraft lifted off the runway, it was aerodynamically capable of climbing with a gross weight of 8,521 lbs, a center of gravity 1.78 in. aft of the aft limit, the landing gear extended the nose baggage door open, and both engines functioning properly. At the point where witnesses state the aircraft reached about 100 ft in altitude it should have been at about 300 ft. In fact, with one engine secured, the propeller feathered, and the landing gear retracted, the aircraft would have been capable of climbing at a rate of about 240 ft/min. Therefore, the Safety Board concludes that the aircraft did not climb as expected as a result of the pilot's actions or reactions.

Since the pilot could see the nose baggage door when it opened, and he could hear the unusual engine noises, he probably reduced power at least on the left engine. Simultaneously, the unusual noises, which were being produced by the propeller striking the door, would have ceased, not because of the reduction of power but because the propeller would have cut through the door and the door

would have opened fully, removing itself from the path of the propeller. However, when the noise ceased, it probably reinforced the pilot's belief that reduction of power had corrected the problem, and he probably continued to maintain a reduced level of power on the left engine.

The reduced thrust condition and the extended landing gear probably resulted in a substantial reduction in airspeed below the liftoff speed of 105 mph because the pilot probably maintained the same aircraft pitch attitude after liftoff. A turn, which would have increased the stall speed, caused a stall since the stall speed would have been about 95 mph. The aft center of gravity, under these conditions, would have added to the pilot's difficulties in controlling his airspeed.

Therefore, when the pilot began the right turn, the aircraft stalled immediately at a low altitude from which recovery was impossible. Since neither propeller exhibited significant rotational damage, the pilot evidently reduced power on both engines just before impact. In summary, had the pilot raised the landing gear and/or maintained thrust on both engines after liftoff, and not immediately initiated a turn, the aircraft's performance would have been significantly enhanced and the accident probably could have been avoided. This assumption is supported by the significantly lower rate of climb after liftoff and the observably slower airspeed. That situation, coupled with the aft center of gravity, and the extended landing gear kept the airspeed near the 105 mph liftoff speed. Additionally, the pilot probably allowed the airspeed to decay below 105 mph during the initial climb. Since the stall speed was about 95 mph, a turn or any reduction of airspeed below liftoff speed would have placed the aircraft near a critical flight regime. Therefore, when the pilot began the right turn, the aircraft stalled immediately. The aircraft weight and aft center of gravity aggravated recovery since the pitch control would have been sensitive. Since neither propeller exhibited significant rotational damage, the pilot evidently reduced power on both engines just before impact.

The pilot was certificated properly and was qualified by Federal regulations for the flight. He had received the off-duty time which was required, and there was no evidence that medical factors might have affected his performance.

Although Universal Airways had not adequately documented the pilot's training, the testimony of the training pilot, the pilot's logbook, and the reconstructed company records indicate that the ground school and flight training was conducted according to regulations. Contrary to company training policy, the pilot had not received a route orientation with a training pilot. Although lack of ground school documentation and the omission of a route orientation did not contribute to the accident, they indicated that the company emphasis was not on training. Furthermore, a flight training program which consists of 4 hours in one type of aircraft and 6.5 hours in another on consecutive days not only strains the ability of the student to concentrate and learn, but demonstrates the accelerated pace of the program. In fact, the training pilot testified that the company was anxious to complete the program in order to assign the new pilots to line operations.

The Safety Board is concerned by the fact that pilots were not trained to cope with problems encountered in aircraft at or near the maximum allowable gross weight. Although this training is not required by regulation, pilots are frequently required to operate flights at gross weights well above those at which training is conducted. In addition, many aircraft used by air taxi operators exhibit performance capabilities and handling qualities at high gross weights that are markedly different from those exhibited at lower gross weights. As a result, pilots encounter situations during revenue operations for which they are not trained and which may lead to accidents. The Safety Board believes that pilots involved in Part 135 operations should be thoroughly trained on the performance capabilities and handling qualities of aircraft that are loaded to their maximum certificated gross weight or to the limits of their c.g. envelope, or both.

Even though the pilot had been trained in accordance with the regulations, the Safety Board believes that an operator should consider the type of aircraft flown by a pilot before he is hired and especially during training. The pilot of Flight 76 had 916 hrs of multiengine flight experience; however, 777 hrs of his total time were in military centerline thrust jets. The flight characteristics and handling qualities of the centerline thrust twin engine jet differ significantly from those of the light twin reciprocating engine aircraft. In addition, the pilot was relatively inexperienced in twin-engine aircraft--his total time was only 138 hours in light twin-engine aircraft. The Safety Board believes that flight-hours obtained in centerline thrust multiengine aircraft should be separated from the conventional definition of multiengine flight-hours, so that the actual experience of the pilot can be determined. Furthermore, a minimum number of multiengine, pilot-in-command flight-hours should be required before a pilot is allowed to fly as pilot-in-command of a Part 135 operation.

In view of the above, the Safety Board concludes that, although the pilot was qualified according to regulations, he was not sufficiently experienced in light twin-engine aircraft, nor had he been trained to cope with problems he could encounter in an aircraft at high gross weights.

Operational Procedures

Universal Airways operational procedure placed the burden of trip completion on the pilot without adequate support or guidelines from management. However, the principal operational shortcoming was a lack of organization, procedures, and knowledge rather than an effort to evade the requirements of 14 CFR 135. As a result, flight schedules were approved which did not afford adequate time between trips to prepare for the next trip. The schedule also insured that a delay would be passed on to subsequent trips during the day. Finally, the scheduling of trips versus the available aircraft left no room for correction of mechanical deficiencies. As this investigation revealed, pilots often felt pressure to expedite turnarounds to spend less time than necessary on flight planning, or to overlook potentially grounding maintenance deficiencies.

The company lacked proper weight and balance procedures and operation control, which was a critical shortcoming since weight and balance is

critical to light twin-engine aircraft. The use of average weights was not only unauthorized, but was inaccurate and the company was not aware of the proper requirement. In the accident case, the two station agents as well as the pilot should have been more attentive to weight and balance, especially in view of the unrealistic estimates used. The lack of any procedure to verify baggage weights resulted in consistently underestimating actual baggage weights on virtually every flight. Those flights which were manifested at maximum gross takeoff weights probably departed over weight and beyond the aft center of gravity range. In fact, two pilots testified that they had operated regularly scheduled flights which were overweight. Finally, the weight and balance form for Flight 76 reflected incorrect weights and center of gravity limits.

The poor operational procedures and weak control were the direct result of the lack of a sound management structure. The chief executive officer had no operational or maintenance background. The operational policies were developed and implemented by the chief pilot, the Director of Operations, and the training pilot. However, these positions were occupied by several persons during the preceding year, without continuity. In addition, although in management positions, they were also line pilots which reduced the time available to engage in the required management functions.

Maintenance Procedures

The Safety Board was unable to determine when the red bypass wire was installed or who installed it. However, if it had been installed before Universal Airways acquired N777AE, we believe that it should have been discovered when the right starter switch was replaced in December 1978. Furthermore, after the left starter switch was repaired in Gulfport on January 4, 1979, the work should have been verified when the aircraft returned to Houston on January 5. Again, the wire should have been detected. Since the mechanic who worked on the aircraft on January 4 recalled only that there were different colored wires on the battery terminals, no conclusion can be drawn regarding whether the bypass wire was installed before or after the work in Gulfport. Finally, maintenance personnel should have been aware of the starter interrupt system so that a nose baggage door propeller strike would alert them that the safety system was inoperative. However, the fact that the safety system was bypassed reflects poorly on the management and quality control of the Universal Airways' maintenance program, since the initial cut in the door should have indicated the presence of the bypass wire.

In addition to the failure to correct the bypass, there are further indications that the overall organization and management of the Universal Airways' maintenance program was inefficient. The principal shortcoming was the lack of proper recordkeeping, which in turn disrupted the correction of deficiencies and ultimately the airworthiness of the aircraft. During the Safety Boards investigation, there was evidence, however, that the revised AAIP and the recommendations which resulted from the January 1979 surveillance by the FAA were improving the maintenance effort.

Another principal deficiency of the maintenance program was the improper use of aircraft flight log pages. The Safety Board has found this deficiency during two recent accident investigations involving Part 135 operators. ^{4/}The logsheets rarely reflected the airworthiness of the aircraft, although a space was provided for that certification. In addition, several logsheets were missing. Control of logsheets is vital to a maintenance program, since the accuracy of engine and airframe hours and inspection schedules depend on the information from the logsheets. As a result of incomplete logs, the Safety Board could not determine total times of two propellers and the left engine from N777AE.

In addition to the inadequate recordkeeping, the lack of maintenance management was indicated by the following:

- (1) There was no procedure which required that a qualified mechanic certify the airworthiness of an aircraft before it was released for passenger operations.
- (2) There were no guidelines on which to base a determination that aircraft should be grounded for maintenance. As a result Flights 75 and 76 departed with the flap system inoperative.
- (3) There was no ELT on the aircraft.
- (4) Eight discrepancies were uncorrected in the flight log of N777AE at the time of the accident, which made the airworthiness of the aircraft questionable.
- (5) Flight schedules which required aircraft to remain overnight in outlying stations resulted in no maintenance inspections except for those performed by the pilot. Deficiencies which did not require grounding the aircraft were not corrected at these stations, since there was no Universal Airways maintenance support or contract maintenance.
- (6) FAA testimony and surveillance records indicated that there was probably pressure for aircraft to remain operational and to complete the published schedules.

Again, the Safety Board believes that the poor maintenance management was the direct result of the lack of a sound management structure. The size of the maintenance staff was too small and the responsibilities that the management of a commuter airline maintenance program of the Director of Maintenance too diverse. The Safety Board has found that situation is not uncommon with 14 CFR 135 operators.

4/ Aircraft Accident Report: Alaska Aeronautical Industries, Inc., DHC-6-200, near Illimna, Alaska, September 6, 1977 (NTSB-AAR-78-5). Aircraft Accident Report: Antilles Air Boats, Inc., Grumman G21A, St. Thomas, Virgin Islands, September 2, 1978. (NTSB-AAR-79-9)

FAA Surveillance

FAA surveillance of Universal Airways detected the major operational and maintenance shortcomings. In September 1978, the FAA had faulted Universal Airways' weight and balance procedures; however, no followup surveillance was conducted. The numbers of surveillance inspections conducted by FAA indicate that a regular program was in effect. Also, the FAA principal operations inspector had cited Universal's lack of operational management continuity as a shortcoming. However, the surveillance of Universal Airways was being conducted on a part-time basis by the maintenance and operation inspectors. FAA witnesses at the public hearing testified that the surveillance of air taxi and commuter operators required more man-hours than were currently available; the FAA maintenance unit chief stated that the two Houston based commuters would occupy the time of one full-time maintenance inspector. Therefore, the Safety Board reiterates Safety Recommendations A-78-37 and 38, which addressed FAA manpower and surveillance of 14 CFR 135 operators.

If the FAA had been able to monitor Universal Airways more carefully, the deficiencies of the weight and balance procedures, the scheduling of pilots, and the consequences of the flight schedule versus the available aircraft could have been detected and corrected earlier. Furthermore, inadequate maintenance practices could have been corrected before January 1979 if the maintenance inspector had been able to spend more time with the Universal maintenance program.

The Safety Board believes that adequate surveillance of 14 CFR 135 operators is critical to aviation safety because management personnel frequently have dual functions in a commuter airline. As a result, management of the company suffers. In addition, the high turnover of managers and pilots could destroy continuity within the company and result in poor or unsafe operational and maintenance procedures. Increased FAA GADO manpower and surveillance of Part 135 operators would provide a check against poor company management by insuring that approved procedures are followed.

Beech Nose Baggage Door

The Safety Board is very concerned with the involvement of the nose baggage door in this accident. The problem of an unsecured nose baggage door is obvious, and has been known to Beech Aircraft Corporation and the FAA since before 1972. Although the preventive measure which could have been taken was simple in a technological sense, and despite a response by the FAA "that corrective action has been taken to assure a safe and proper use of the nose cargo door actuating system on Beechcraft 65-80 aircraft," another nose baggage door fatal accident occurred.

It is apparent that the FAA's corrective action was of a limited and ineffective nature. This is substantiated by the findings of the 1976 Beech survey, where ample evidence was gathered to indicate that the starter interrupt safety feature was not operational on many of the aircraft inspected. In addition, the survey indicated that proper care was not being taken to protect the locking mechanism and that the visual alignment marks were not present. While Beech

Aircraft Corporation was responsive in identifying the problems to the aircraft owners and the FAA, the results suggest that the intent of the starter interrupt safety feature was not effective. For the FAA's part, the survey indicates that their initial response to the problem was inadequate and that there was no subsequent followup. While the Safety Board does not expect the FAA to police each operator of an aircraft with a nose baggage door, the ineffectiveness of the initial corrective action dictated that a new measure would be mandated which would prevent a similar occurrence. The additional lock developed by Beech after the accident could provide the necessary redundancy in the future. However, a measure of this nature should have been introduced when the seriousness of the situation was discovered.

3. CONCLUSIONS

3.1 Findings

1. Powerplants, propeller, and control systems operated properly.
2. The preflight preparations were inadequate because the aircraft was over gross weight, and beyond the aft center of gravity limit, and the nose baggage door was not secured.
3. The nose baggage door was left unlocked by the station agent, and went undetected by the pilot.
4. The left engine started with the nose baggage door unlocked because the starter interrupt safety feature had been bypassed. The Safety Board could not determine who disabled the starter interrupt switch.
5. The nose baggage door was struck by the left propeller just after the aircraft lifted off the runway; the left propeller was not damaged significantly.
6. Once the initial cut was made by the propeller strike the left engine could have been operated at takeoff thrust without damaging the engine.
7. The pilot could see the door when it opened and, therefore, reduced thrust on the left engine.
8. The pilot failed to minimize drag, allowing the engine to continue running at reduced power and leaving the gear extended.
9. The aircraft did not accelerate much beyond the liftoff speed of 105 mph since thrust was reduced on the left engine and the landing gear remained extended.
9. The airspeed decreased as the pilot attempted to trade airspeed for altitude.
10. The aircraft was capable of adequate climb performance after takeoff.
11. The drag combined with a c.g. beyond the aft limit degraded the handling qualities of the aircraft resulting in a low-altitude stall with subsequent loss of control.
12. The pilot was unable to recover from the low altitude stall.

13. The bypass wire should have been detected by Universal Airways maintenance personnel.
14. The pilot was certificated and trained properly according to regulations.
15. The pilot was qualified but inexperienced in reciprocating multiengine aircraft.
16. Many air taxi operators exhibit performance capabilities and handling qualities at high gross weights that are markedly different from those exhibited at lower gross weights and current training does not provide for familiarization with those qualities.
17. The management of the operational and maintenance aspects of the company were inadequate.
18. The company weight and balance procedures were inadequate.
19. The scheduling of pilots and aircraft in support of the flight schedule was detrimental to sound operations and maintenance practices.
20. The maintenance records system was inadequate.
21. Increased FAA GADO manpower and surveillance of Part 135 operators would provide a check against poor company management by insuring that approved procedures are followed.
22. The corrective action and followup by Beech Aircraft Corporation and the FAA to the previously identified nose baggage door security problem was inadequate (Safety Recommendation A-72-78, 79, and 80); a more positive "fix" should have been instituted after it was apparent that the starter interrupt was not effective.

3.2 Probable Cause

The National Transportation Safety Board determines that the probable cause of this accident was the failure of the pilot to take proper actions to cope with an emergency after the opening of an unsecured nose baggage door during the critical phase of takeoff.

Contributing to the cause of the accident were: (1) The failure of the company maintenance personnel to detect the starter interrupt system bypass wire; (2) a deficient weight and balance program; (3) inadequate corrective measures by the Federal Aviation Administration and the Beech Aircraft Corporation to a known safety problem relating to the nose baggage door; (4) inadequate preflight procedures by the pilot; and (5) inadequate training requirements for Part 135 pilots in maximum gross weight operations in light, twin reciprocating engine aircraft.

4. RECOMMENDATIONS

As a result of this investigation, the Safety Board reiterates Safety Recommendations A-78-37 and -38, issued to the Federal Aviation Administration on May 17, 1978:

"Revise the surveillance requirements of commuter airlines by FAA inspectors to provide more stringent monitoring. (A-78-37) (Class II - Priority Action)

"Identify FAA offices responsible for the surveillance of large numbers of air taxi/commuter operators and insure that an adequate number of inspectors are assigned to monitor properly each operator." (A-78-38) (Class II, Priority Action)

Also as a result of this investigation, the Safety Board issued the following recommendations to the Federal Aviation Administration:

Require that pilots involved in 14 CFR 135 operations be thoroughly trained on the performance capabilities and handling qualities of aircraft where loaded to their maximum certificated gross weight or to the limits of their c.g. envelope, or both. (Class II, Priority Action) (A-79-80)

Expedite rulemaking which would make the flight time and duty time limitations, and rest requirements for commuter air carriers the same as those specified for domestic air crewmembers under 14 CFR 121. (Class II, Priority Action) (A-79-81)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JAMES B. KING
Chairman

/s/ ELWOOD T. DRIVER
Vice Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ PATRICIA A. GOLDMAN
Member

/s/ G.H. PATRICK BURSLEY
Member

September 6, 1979

5. APPENDIXES

APPENDIX A

INVESTIGATION AND HEARING

1. Investigation

The National Transportation Safety Board was notified of the accident about 1630 e.s.t. on March 1, 1979, and immediately dispatched an investigative team to the scene. Investigative groups were established for operations, human factors, structures/systems, and powerplants.

Parties to the investigation were the Federal Aviation Administration, Universal Airways, Inc., and Beech Aircraft Corporation.

2. Public Hearing

A 4-day public hearing was held in Gulfport, Mississippi, beginning May 8, 1979. Parties represented at the hearing were the Federal Aviation Administration, Universal Airways, Inc., and Beech Aircraft Corporation.

APPENDIX B

PERSONNEL INFORMATION

Captain John R. Taylor, 29, was employed by Universal Airways, Inc., in February, 1979. He held Commercial Pilot Certificate No. 242841224 with airplane multiengine land and instrument airplane ratings. His pilot's certificate was issued December 28, 1978. His first-class medical certificate was issued December 11, 1978, and contained no limitations.

Captain Taylor completed initial training on February 25, 1979, and was assigned as pilot in command on February 26, 1979. He had flown about 1,528 hrs of which 139 hrs were in multiengine reciprocating twin engine aircraft and 15 hrs in Beech Queen Airs. During the last 90 days he had flown 139.8 hrs. In the preceding 24 hrs he had flown 9 hrs. At the time of the accident he had been on duty 7 hours, and 40 minutes of which about 4 hours had been flight time. He had been off duty for 10 hours 10 minutes before reporting for duty on the day of the accident.

APPENDIX C

AIRCRAFT INFORMATION

Beech 70, Excalibur Conversion, N777AE S/N LB-34

Total time	3,098.5 hours
Last inspection - AAIP 1-5 and 6	40.2 hours

Engines - Lycoming IO-720-A1B (STC 5A 4445W)

Left	S/N L-257-54	
	Total Time	2,117.9 hours
	Time Since Overhaul	748.7 hours
Right	S/N L-541-54	
	Total Time	Unknown
	Date of Overhaul	8-32-78
	Installed	10-19-78

Propellers

Left	S/N BJ-1223 model HCA 3VK-3	
	New -	8-2-76
	Total Time and Time	
	Since Last Overhaul	Unknown
Right	S/N BJ-1070	
	Overhauled	2-9-79
	Total Time	Unknown
	Time Since Overhaul	94.4 hours