

CIVIL AERONAUTICS BOARD

ACCIDENT INVESTIGATION REPORT

Adopted December 8, 1947

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BURKE AIR TRANSPORT—MELBOURNE, FLORIDA, JULY 13, 1947**The Accident**

At approximately 0430,¹ July 13, 1947, NC-79024, a DC-3C airplane owned and operated by Andrew J. Burke, crashed 4 miles southwest of Melbourne, Florida. The aircraft was destroyed and of the 36 occupants, 12 passengers and the two pilots were fatally injured.

History of the Flight

The flight originated in San Juan, Puerto Rico, July 11, 1947, departing at 1445, for Newark, New Jersey. Henry Hein was pilot for the entire flight, however, Roderick MacKinnon, the co-pilot, joined the flight in Miami, Florida, flying to Miami from San Juan at approximately the same time as co-pilot in another DC-3 airplane, NC-79023. The third member of the crew was Maria Riveria, stewardess. Several intermediate stops were made, the first being at Ciudad Trujillo, Dominican Republic, where additional northbound passengers were taken aboard. The flight then proceeded to Miami, landing at 2235. It was serviced, and at 2354 again took off. The next landing was made at Augusta, Georgia, at 0439, July 12, 1947. After a brief stop there of six minutes the trip continued, and at 0812 the flight arrived in Baltimore where the airplane was fueled to capacity. At 0930, the flight took off for Newark, arriving at Newark at 1035 the morning of July 12, 1947.

In Newark the fuel tanks were filled to capacity, 33 passengers were taken aboard, and at 1845, July 12, 1947, 8 hours after arrival in Newark, the flight took off with the same crew for the return trip to San Juan. A landing was made at Augusta just after midnight, 0013, July 13, 1947, at which time 150 gallons of fuel were taken aboard. At 0134 the flight departed for Miami.

The last communication from the crew was at 0303, the morning of July 13, at which time they reported to the Jacksonville Airway radio that they were at 2,000 feet. One and one-half hours later the aircraft was observed approximately 2 1/2 miles west of Melbourne, Florida, flying southeast at an altitude of from 300 to 500 feet. The engines were heard to sputter and misfire as the aircraft proceeded ahead on a straight course. Altitude was gradually lost, the landing lights were turned on, and seconds later the aircraft struck the ground 3 1/2 miles southwest of Melbourne.

Investigation

No radio contact was made with Melbourne Radio, nor was there any indication that Captain Hein attempted to reach the Melbourne-Eau Gallie Airport. This airport is located 3 miles northwest of the city of Melbourne, and is equipped with a lighted tetrahedron and a revolving beacon. NC-79024 passed 3 miles to the right of this field and crashed approximately 6 miles south of it. Malabar Field could possibly have been used. It was only 2 miles west of the point of the crash, however, this field was not lighted and Captain Hein may not have been aware of its location. The "fasten seat belt" sign over the forward compartment door was never lighted, nor was any warning or instruction given to the passengers to fasten their seat belts. An examination of all safety belts in the aircraft indicated that none, including those in the cockpit, had been buckled.

Propeller markings on the ground, and gouges made by the engine nacelles indicated that the aircraft struck the ground in nearly a level attitude, and at a very low angle of descent. A great deal of tearing and crushing resulted, however, from the trees and tree stumps which studded the area in which the

¹All times stated herein are Eastern Standard and based on the 24-hour clock.

airplane crashed. The left wing was broken into four parts from impact with trees. The right wing had raised toward a vertical position as the airplane progressed along the course of the crash toward its final resting place, and as a result, it remained intact and attached to the fuselage. Though the fuselage and empennage had been badly torn by tree stumps, all control cables and surfaces were accounted for. An inspection of them indicated no structural failure or mechanical malfunction prior to the time of impact. The flaps and landing gear were found in a fully retracted position.

The left main and auxiliary fuel tanks were flattened, and badly torn, consequently, no conclusion could be reached as to the quantity of fuel that was contained in them prior to the time of the crash.² Because of the elevated position of the right wing the right fuel tanks had not been damaged, and 70 gallons of gasoline were found in the right main tank, and 30 gallons in the right auxiliary. Fuel was also found in all fuel lines and in both carburetors. Fuel strainers for both engines were located and found clean. The cross feed valve was found in the "off" position. The fuel selector valves for both engines were found in a "split" position. That is, the fuel selector valve for the left engine was in a position of two-thirds open left main and one-third open left auxiliary, and the fuel selector valve for the right engine was in a position one-third open right main, and two-thirds open right auxiliary.³ Both fuel pumps were recovered, bench checked, and found normal. The D chamber vent valve needle for the left carburetor was found out of its seat. Though this condition may have resulted in the engine running lean, it would not have resulted in power failure. The condition would have resulted in a flow of approximately 20 gallons per hour through the carburetor vent return line to the main tank.

No cause for complete power failure was found from the examination of the

² The DC-3 has four fuel tanks. There is a main tank with a capacity of 202 gallons and an auxiliary tank with a capacity of 200 gallons in both the left and right wings.

³ The positions of the fuel selector valves could have been changed on impact, and accordingly, are not considered significant, however, had the selector valves been in a split position, gas would have been drawn from both the main and auxiliary tanks.

ignition system. The master switch was recovered and found to be badly damaged as a result of the crash. One terminal post had been wrapped with adhesive tape and showed an indication of electrical arcing, however, the switch when tested proved capable of normal operation. The spark plugs in both the left and right engines indicated normal engine operation, with a possibility of slightly higher than normal operating temperatures in the left engine. Four plugs in the left engine and 6 plugs in the right engine were found defective.

Propellers had been broken from the engines. Neither had been feathered, and according to the markings and bends on the blades, only small rotational forces were present at the time of impact. An excessive deposit of sludge was found in the propeller domes, and engine oil screens.

Weather conditions for the entire flight, northbound from San Juan and southbound from Newark, were good. With the exception of a rain area in the vicinity of Washington, D. C., which was encountered on the return trip, visibility and ceiling remained well within the limitations for contact flight. The synoptic weather charts indicated that all points along the entire route were covered by a high pressure area.

Henry Hein, the pilot, was 35 years of age, and had a total of approximately 1,484 flying hours. He had received his training in the Army Air Forces, accumulating a total of 612 hours at the time of his separation from the service. He was issued a commercial pilot rating on the basis of military competency.

Roderick MacKinnon, the co-pilot, had a total of 2,138 hours. He also had been trained in the Army Air Forces and at the time of his separation from the service, he had accumulated a total of 1,120 flying hours. He was issued at that time a commercial pilot rating on the basis of military competency. Both Henry Hein and Roderick MacKinnon held effective instrument ratings.

Andrew J. Burke owned and operated Burke Air Transport. His non-scheduled operating certificate was issued by the Civil Aeronautics Administration's Fourth Regional Office located in Fort Worth, Texas. Galveston, Texas, was designated as the operator's home base. Thirty days subsequent to the issuance of this certificate, Mr. Burke

inaugurated service from San Juan to Newark, and moved his residence to Miami from which all his operations were conducted. Mr. Burke testified, however, that he did keep a bookkeeper in Galveston. No notice of any kind concerning this change in operation was ever given by Mr. Burke to the Civil Aeronautics Administration's Second Regional Office in Atlanta, Georgia, which controls the civil flying activities in the Miami area.

Records were not kept by Mr. Burke of his pilots' flight time, other than those used for pay purposes, and a proper rest period was not always afforded to a pilot before a flight. Henry Hein's log book shows that he had flown as much as 146 hours in a period of 20 days. It also shows that he had made several round trips from San Juan to Newark and return, completing each round trip within a period of approximately 3 days. Such a flight required about 30 hours' flying. Henry Hein and Roderick MacKinnon were engaged in such a round trip on this particular flight. They had departed from San Juan the afternoon of July 11, arrived in Newark the morning of July 12, and at 1845, July 12, approximately 8 hours after their arrival in Newark, had taken off for their return trip to San Juan.

The dispatch of a Burke Air Transport flight consisted of a telegram sent by the pilot from the point of departure to Mr. Burke in Miami, in which it was stated the estimated time of arrival in Miami, and either that the aircraft was fully loaded or the number of passengers aboard. In addition, the pilot was required by a provision in the "Burke Air Transport Operations Manual" to mail to the carrier's home office prior to take-off a copy of the flight manifest. This provision was seldom followed. Although the operations manual described procedures approved by the CAA, and required in the conduct of the carrier's flights, two of Burke's pilots stated that they had never seen a copy of the operations manual, and that they had never sent a passenger list or flight manifest to the carrier's home office. In the present case, the flight manifest was found in the pilot's flight jacket pocket.

According to the "Operations Limitations" (Form ACA 309a) for NC-79024, the maximum take-off weight for the airplane was 25,200 pounds. However, the fuel

load was represented on the manifest to be 600 gallons, and according to statements received from the Newark airport all of the fuel tanks for the airplane had been "topped off," resulting in a fuel load of 804 gallons. A passenger and his son were aboard who were not listed on the weight manifest. According to their statements their combined weight was 210 pounds. There were also aboard three 7-man life rafts, weighing 76 pounds each, totaling 228 pounds. If the amount of the extra fuel, passengers, and the life rafts are considered, the airplane weighed 1,662 pounds more than was shown on the flight manifest. Furthermore, the true empty weight of the airplane was 17,516 pounds rather than 17,050 pounds as represented on the flight manifest. This resulted in a weight of 2,128 pounds more than represented on the flight manifest, or an overload of 2,047 pounds at take-off from Newark.

Maintenance was at first accomplished in Newark and Miami. Two months prior to the accident Mr. Burke transferred this activity to a repair agency in San Juan after which only "turn around" maintenance was done in Newark. The facilities of the repair agency in San Juan were inspected. It was found that no hangars were available, that many parts installed in engines and aircraft were used parts, and that equipment to test spark plugs, ignition harnesses, and other engine and aircraft components either did not exist, or had to be borrowed.

An examination of the aircraft log disclosed that several 100-hour inspections had been completed after the aircraft had been flown more than 100 hours. Detailed information concerning repair and maintenance work was missing from the log, and basic data concerning aircraft description, weight, engines and propellers was also missing. The engine log books were likewise poorly kept. The log for the right engine contained no serial number or identification, consequently it was impossible from the record even to determine that the engine had been installed in the airplane.

Discussion

Many deficiencies in maintenance and operation have been found in the activities of this particular non-scheduled carrier. These irregularities do not

constitute sufficient facts from which to state categorically the cause of the accident. Considerable evidence does exist, however, from which the probable cause can be deduced.

The existence of 70 gallons of gasoline in the right main fuel tank and 30 gallons in the right auxiliary would seem to eliminate the possibility of fuel starvation. The flight actually had sufficient fuel in the two right tanks alone to continue to Miami. Since all fuel strainers were found clean and fuel was present in the lines and the carburetors, it appears unlikely that any difficulties were experienced in the operation of the fuel system. However, as stated above, the D chamber vent valve needle in the left carburetor was found out of its seat, and this condition would allow the gasoline under pressure in the left carburetor fuel chamber to flow back to the left main fuel tank through the carburetor return vent line. Though this condition would not, when cruising at low altitude, cause the engine to fail or to even lose power, it would result in draining the auxiliary tank much sooner than could be normally expected.

It is estimated that the left carburetor condition would result in a return of fuel to the left main tank from the carburetor at the rate of 20 gallons per hour. This would result in a flow of fuel from the auxiliary tank of 20 gallons per hour greater than normal. If the engine had consumed fuel at the normal rate of 45 gallons per hour, at the end of 2 hours flight from the left auxiliary tank only 70 gallons of gasoline would remain in that tank instead of the expected 110. At the end of 3 hours, only 5 gallons would be available instead of 65, and within the next few minutes of flight the auxiliary tank would be dry. The other 52 gallons of fuel would have returned to the left main tank. Had no fuel been taken from the main tank during the course of the flight the excess would have escaped through the left main tank overflow line.

It will be remembered that this flight was observed flying 2 1/2 miles west of Melbourne at 300 to 500 feet. Had the left engine stopped at that time for want of fuel, Captain Hein most certainly would have attempted to obtain additional power from the right engine.

Since six spark plugs were defective in that engine, it may have failed to respond to the sudden increase in manifold pressure. Instead of producing full power it may have sputtered and misfired as one of the engines was observed to do by those on the ground.

The most significant facts are that no warning was given to the passengers to fasten their seat belts, and that the crew did not fasten their own. Had the pilot anticipated a crash landing, it could be expected that he would have turned the "fasten seat belt" warning sign on, or would have at least secured himself. It is also significant that 6 miles, or 2 to 3 minutes, before crashing the pilot passed within 3 miles of an airport equipped for night landing without turning toward that airport or making any attempt to reach it. The only possible conclusion to be reached from these facts is that the emergency, regardless of what its nature may have been, came to the notice of the flight crew suddenly.

Had mechanical trouble developed in the vicinity of Melbourne, and had Captain Hein maintained the 2,000 foot altitude he reported having over Jacksonville, he would have had little difficulty in reaching the Melbourne-Eau Gallie airport for an emergency landing. If trouble occurred prior to the time of reaching the vicinity of Melbourne while the flight was cruising at 2,000 feet, ample time would have been available to report the emergency before descending to 500 feet over Melbourne. It appears, therefore, that not only did the emergency develop suddenly, but also that the low flight over the vicinity of Melbourne did not result because of any mechanical difficulty.

An additional factor was present. This is to be found in an examination of the pilot's and co-pilot's flying time and rest periods during the course of the flight. They both left San Juan at approximately 1445, July 11, and arrived in Miami 7 hours and 47 minutes later. This flight in itself would normally be considered a full day's flying. But, within an hour and 20 minutes after landing at Miami, Captain Hein and Mr. MacKinnon took off for Newark, arriving at 1035 the next day. These two pilots had at that time been flying, with the exception of short stops at Ciudad Trujillo, Miami, Augusta, and Baltimore,

for a period of 19 hours and 45 minutes. Eight hours after their arrival at Newark, they again took off for San Juan. Certainly, the period of 8 hours in Newark was not sufficient for adequate rest, especially in view of the fact that a considerable part of that time was necessarily expended in caring for the aircraft after landing, eating, and in preparation for the flight South. At 1845, the evening of the same day that they had arrived in Newark, they started back on their return trip, and with the exception of an hour and 20 minutes stop at Augusta, flew until 0430 the next morning, the time of the crash.

In a period of 37 hours and 45 minutes, these two pilots were in the air for more than 23 hours, and had little, if any, opportunity for rest on the ground. There is no direct evidence in the record to indicate that the pilots were asleep, but under such circumstances, it would not be surprising if they were. In fact, it would be more surprising, if while cruising on automatic pilot during the early morning hours, they did not fall asleep.

Many events in the cockpit immediately prior to the crash can only be surmised. Little imagination is required, however, to visualize the pilots sitting in the semidarkness of the cockpit, fatigued by long hours of flying, actually asleep as the aircraft cruised on automatic pilot, gradually losing altitude. Then, either by virtue of the loss of power in the left engine, or because of the very imminence of the crash itself, they awoke, confronted with an emergency which neither time or immediate available power permitted them to correct. We cannot know what transpired in the cockpit, but all evidence of record indicates this to be the most probable cause of the accident.

Findings

Upon due consideration of all available evidence, the Board finds that

1 Burke's Air Transport, a non-scheduled carrier, was issued an

operating certificate from the Civil Aeronautics Administration's Fourth Regional Office at Fort Worth, Texas.

2. The home office and the operating base for the carrier were reported to be in Galveston, Texas at the time the operating certificate was issued. Approximately 30 days later the carrier transferred all operations to Miami and inaugurated a service between Newark and San Juan

3. No application was made for a new operating certificate to the Civil Aeronautics Administration's Second Regional Office, which controls civil flying in the Miami area, nor was any official notice of the change of operation ever given to the Civil Aeronautics Administration.

4. The pilot and the co-pilot held airman certificates with commercial pilot ratings.

5. Aircraft NC-79024, the DC-3C airplane involved in this accident, was certificated December 20, 1946.

6. Proper records for the maintenance and the operation of the aircraft were not maintained from the date of certification.

7. The carburetor on the left engine, and 10 spark plugs from both engines were found defective.

8. The aircraft departed from Newark for subject flight with an overload of 2,047 pounds.

9. The pilot and the co-pilot had less than 8 hours rest on the ground in a period of 37 hours and 45 minutes, 23 of which were spent in the air.

10. No contact was made by the flight with any airway radio station to report an emergency.

11. No attempt was made by the crew to land at the Melbourne-Eau Gallie airport, which was equipped for night landing, and located 3 miles east of the aircraft's flight path, and 6 miles north of the crash.

12. The safety belts for the flight crew were not fastened, nor did the flight crew warn the passengers to fasten theirs prior to the crash.

13. The airplane was observed flying $2\frac{1}{2}$ miles west of the city of Melbourne at an altitude of from 300 to 500 feet at which time an engine was heard to misfire. The aircraft lost altitude gradually until it struck the ground in nearly a level attitude.

Probable Cause

The Board determines that the probable cause of this accident was the

pilots flying for long periods of time without adequate rest resulting in their inability to remain fully awake and alert.

BY THE CIVIL AERONAUTICS BOARD

/s/ J M LANDIS

/s/ OSWALD RYAN

/s/ HARLEE BRANCH

/s/ JOSH LEE

Supplemental Data

Investigation and Hearing

The Civil Aeronautics Board, Region II, received notification of the accident at 0723, July 13, 1947, through CAA communications. An investigation was immediately initiated in accordance with the provisions of section 702 (a) (2) of the Civil Aeronautics Act of 1938, as amended. An air safety investigator departed from the Civil Aeronautics Board's Miami office at 0801, July 13, 1947, and arrived at the scene of the accident at 1330, the same day. A public hearing was ordered as a part of the investigation, and held in Melbourne, Florida, July 25, 1947.

Air Carrier

Burke Air Transport was a non-scheduled air carrier, owned and

operated by Andrew J. Burke. The operating certificate for the carrier was issued by the CAA's Fourth Regional office in Fort Worth, Texas. Operations of the carrier were actually conducted in Miami, Florida, where flights were made between San Juan, Puerto Rico, and Newark, New Jersey.

The Aircraft

NC-79024 was a DC-3C airplane certificated by the Civil Aeronautics Administration December 20, 1946, in Galveston, Texas. According to CAA records the aircraft had been previously operated by the Army Air Forces, sold to Mr. Burke through the War Assets Administration, and converted for commercial use by the Atlantic-Pacific Airlines at Galveston, Texas.