

CIVIL AERONAUTICS BOARD

ACCIDENT INVESTIGATION REPORT

Adopted* April 17, 1952

Released April 22, 1952

EASTERN AIR LINES, INC., MIAMI, FLORIDA—SEPTEMBER 14, 1951**THE ACCIDENT**

Eastern Air Lines' Flight 635W, a Douglas DC-4, N 75415, was involved in an accident while making a scheduled landing at Miami, Florida, at 0633,¹ September 14, 1951. Three crew members, 20 adult passengers, and one infant were on board, no one was injured. The aircraft was substantially damaged.

HISTORY OF THE FLIGHT

Flight 635W originated in Boston, Massachusetts, September 13, 1951, with its destination Miami, Florida. Intermediate stops were scheduled at New York, New York, Washington, D C, and Jacksonville, Florida, with a routine aircraft and crew change to be made at New York. The flight proceeded to New York and from there the crew consisted of Captain A C McDonough, Copilot J F Reubert, and Flight Attendant R K Quinn. Departure from New York was made at 2313 the same day, and stops were made as scheduled at Washington and Jacksonville. On departing Jacksonville the total aircraft gross take-off weight was 54,671 pounds, which was within the allowable maximum gross weight of 65,705 pounds, all disposable load was distributed within the approved center of gravity limits. The flight to Miami was routine until the landing was made.

Throughout the entire flight the captain and copilot alternated flying the aircraft, and the last portion of the flight from the vicinity of Vero Beach, Florida, to Miami was flown by the copilot. Captain McDonough was seated in the left pilot's seat (his normal place in the cockpit) and was performing the usual copilot duties.

The crew stated that the IFR (Instrument Flight Rules) flight plan, in accordance with which the flight was flown from Jacksonville

to Miami, was cancelled when the aircraft neared Fort Lauderdale, Florida, and the remainder of the flight was flown VFR (Visual Flight Rules). A few minutes after cancelling the flight plan, the flight was cleared to land on Runway 9L of the Miami International Airport. At an altitude of 1200 feet the "in range" check was completed and the flaps were lowered 15 degrees. The captain said that he personally checked each item on the check list as it was accomplished. Entering the traffic pattern, the flight was again cleared for Runway 9L and a left turn was made to align the aircraft with this runway. At an approximate altitude of 800 feet on the down-wind leg, the "before landing" check was made with the exception of lowering the landing gear, and the flaps were lowered to 30 degrees. Turning on final approach the copilot called for the landing gear to be lowered, and the captain said that he placed the landing gear lever in the full down position. He said, also, that he observed the landing gear red warning light go out, the three green warning lights come on, and that after checking and finding the hydraulic pressure to be normal, he placed the carburetor mixture controls in the full rich position. He then called to the copilot "gear down and locked, three green lights, mixtures rich, you are cleared to land." In addition he stated that the landing gear warning light dimming switch was at the dim position, as they had been flying through the hours of darkness, and that he placed this switch in the bright position and again observed the three green lights to be lighted. At approximately 400 feet above the ground the copilot asked for full flaps. This was done and the aircraft was observed to approach the airport in a normal manner with the landing gear extended. When approximately 200 feet past the approach end of the runway a normal landing was made on the main landing gear wheels. The aircraft was then seen to travel a

¹All times referred to herein are Eastern Standard and based on the 24-hour clock

considerable distance, during which travel the landing gear was observed to retract, permitting the aircraft to settle on the bottom of its fuselage and slide to a stop. A flash fire which developed in number three engine nacelle, was quickly extinguished by the captain's use of an emergency portable hand CO₂ bottle and the airport's fire fighting equipment. All passengers were evacuated in an orderly manner.

The Miami weather at the time of the accident was ceiling unlimited, visibility 12 miles, wind north northwest three miles per hour.

INVESTIGATION

Runway 9L of the Miami International Airport is 7,364 feet long. The aircraft had come to rest 3,290 feet past the approach end of this runway. Because of tire marks from many aircraft on the runway it was impossible to determine where the aircraft initially touched down. First discernible runway marks were gouges made by the aircraft's inboard propellers. These marks were 1,856 feet east of the approach end of the runway, followed 25 feet farther on by similar marks made by the outboard propellers. Nine feet beyond these latter marks the bottom of the aircraft's fuselage made contact with the runway. From this point the aircraft skidded until it finally came to rest, heading in an easterly direction near the center of the runway, with the entire landing gear in an almost fully retracted position. Damage to the aircraft was confined largely to propeller blades, engine nacelles, the bottom of the fuselage, flaps and the main landing gear.

Upon arrival of the Board's investigators, a complete record of cockpit controls, switches and hydraulic pressure gauge indications was made. It was found that all switches, including the ignition, generator and battery switches, were in the OFF position. The carburetor mixture controls were at idle cutoff position and the carburetor air controls were in the cold position. The main auxiliary fuel and the fuel cross feed valves were off, and the hydraulic fluid bypass and hand pump valves were closed. The emergency brake pressure gauge registered a normal 1000 psi, and the hydraulic system pressure gauge registered a normal 1200 psi.

Other controls were positioned as follows: cowl flaps closed, propeller controls full forward, flap indicator and flap lever full down, landing gear lever down and the landing gear lever solenoid safety pin in the safe lock position, and the landing gear warning light switch at the bright position. An external examination of the aircraft revealed the flaps to be in the full down position and badly damaged by contact with the runway's surface.

In order to determine the extent of damage and to examine the landing gear, the aircraft was raised. It was found that the nose gear doors were damaged by contact with the runway, however, the nose gear itself was undamaged. When allowed to fall free, the nose gear extended to the full down position and locked. Examination of the main landing gear disclosed that the actuating cylinder rods of each gear's retract strut were bent approximately 90 degrees. These rods had retracted approximately five inches into their respective cylinders and were bent at a point where they emerged from the packing nuts. The lower drag links of each gear were also bent a few degrees. The hydraulic fluid reservoir was examined and it contained a normal amount of fluid.

Functional tests were then performed. Since the main landing gear doors were also damaged, all doors were removed. The hydraulic system was connected to an outside power source and the bent main gear retract struts were disconnected from their respective landing gear assemblies. The nose gear was then extended and retracted under pressure. It operated in a normal manner and no fluid leaks were found. When pressure was applied, the actuating rods of the main landing gears retract struts extended their full travel distance and retracted in a normal manner until stopped by the bent portion of the rods. No fluid leak was found during this operation.

The damaged actuating rods and drag links were then replaced by similar new parts of correct lengths and tolerances and the gear was again tested under pressure. All three landing gears functioned in a normal manner. During this test the green warning light for the right landing gear did not operate, however, it was found that the micro switch operating arm for this light had been broken by

impact and under finger pressure the light functioned in a normal manner. The hydraulic system from the landing gear selector valve to the reservoir was checked. No obstruction was found and the reservoir filter was clean. The fluid was drained from the reservoir and strained, no foreign matter was found. The two engine driven hydraulic pumps were removed and tested and found to function in a normal manner. The landing gear warning horn operated normally, however, the throttles had to be in the nearly closed position to actuate the horn.

The aircraft's maintenance records were reviewed and these indicated that normal inspections and maintenance had been performed. All airworthiness directives had been complied with.

The crew stated that the approach and the landing were made in the usual manner, that after the landing gear control lever was placed in the down position prior to landing it was not moved from that position, and also, that the landing gear warning horn did not sound at any time.

ANALYSIS

Since tests made subsequent to the accident showed that the aircraft's landing gear mechanism and hydraulic system was capable of functioning in a normal manner, it is necessary to analyze the system to determine what could cause the gear to retract under such conditions. Normal lowering of the landing gear is accomplished by moving the landing gear control lever, located in the pilot's cockpit, to the DOWN position. This mechanically releases the up-latches and permits hydraulic fluid under system pressure to enter the down-lines, and at the same time the fluid in the up-lines is allowed to return to the reservoir. The landing gear then extends and locks, and the system pressure builds up to 2700-3000 psi. As the down-latches engage, the green lights come on and the red warning light goes out. The landing gear is then held in the extended position by the down-latches and the system pressure which is applied to the down-lines. Strong spring bungees hold the down-latches in the locked position. The hydraulic fluid in the down-lines is then trapped by means of a check valve at the in-port of the control valve and cannot escape until the control valve is placed in the UP position.

Should hydraulic pressure be unavailable, the landing gear could extend and lock by its own weight by operating the control lever to the DOWN position. The design of the main landing gear is such that the weight of the aircraft will hold the gear in the extended and locked position. With the entire weight of the aircraft on the gear, the application of full system pressure applied to the up-lines will not retract the gear.

The nose gear down-latch is actuated by a spring-loaded hydraulic bungee cylinder. To unlock this gear, up-line pressure must overcome the force of the spring. With the weight of the aircraft on the gear, up-line pressure in excess of 2500 psi is required to unlock and retract the nose gear. When the weight of the aircraft is on the landing gear and the right main landing gear shock strut has been compressed, a safety switch actuates and engages the landing gear control lever safety latch. When this safety latch is engaged the landing gear control lever is locked in the DOWN position.

Since the crew stated that they observed the green warning lights to be on and since when subsequently tested the landing gear mechanism functioned properly, it can be assumed that at that time the gear was down and locked. From the above brief analysis of the landing gears operation it would be necessary, under the conditions described, for numerous simultaneous malfunctions to occur. Although the crew stated that the landing gear control lever was placed in the fully down position and was not moved again, it is probable that this lever was inadvertently moved upward instead of the flap control lever after landing. This must have occurred when wing lift was still present and there was insufficient weight on the landing gear strut to actuate the landing gear control lever safety latch. This is substantiated by the manner in which the actuating cylinder rods were partially retracted.

FINDINGS

On the basis of all available evidence the Board finds that

- 1 The carrier, the crew and the aircraft were properly certificated.
- 2 The copilot was sitting in the right pilot's seat and was flying the aircraft.

3 The flight was cleared to enter the Miami traffic pattern and landing gear was lowered

4 Following the lowering of the landing gear, the green warning lights came on indicating the gear was fully extended and locked, pressure normal

5 A normal landing was effected and during the landing roll the entire landing gear retracted

6 The landing gear was found capable of functioning in a normal manner when tested after the accident

PROBABLE CAUSE

The Board determines that the probable cause of this accident was the inadvertent moving of the landing gear control lever upward during the landing roll, causing the landing gear to retract

BY THE CIVIL AERONAUTICS BOARD

/s/ DONALD W NYROP
/s/ OSWALD RYAN
/s/ JOSH LEE
/s/ JOSEPH P ADAMS
/s/ CHAN GURNEY

Supplemental Data

INVESTIGATION AND HEARING

The Civil Aeronautics Board received notification of the accident through the Eastern Air Lines' office at the Miami International Airport at 0725, September 14, 1951. An investigation was immediately initiated in accordance with the provisions of Section 702 (a) (2) of the Civil Aeronautics Act of 1938, as amended. A public hearing was held in connection with the investigation of this accident at Coral Gables, Florida, October 30 and 31, 1951.

AIR CARRIER

Eastern Air Lines, Inc., is a Delaware corporation with its principal place of business at Miami, Florida. Eastern Air Lines possesses a certificate of public convenience and necessity issued by the Civil Aeronautics Board and an operating certificate issued by the Civil Aeronautics Administration. These certificates authorized the carriage of persons, property, and mail over the routes described in this report.

FLIGHT PERSONNEL

Captain A C McDonough, age 40, was employed by Eastern Air Lines October 9, 1939.

He was the holder of a valid airman certificate with an airline transport, multi-engine land 820-12500 h p ratings. Captain McDonough had a total of approximately 12,872 flying hours, of which 2,145 were in DC-4 type equipment. His last instrument check was accomplished May 4, 1951. His last CAA physical examination was successfully passed July 26, 1951.

Copilot J F Reubert, age 30 was employed by Eastern Air Lines July 15, 1946. He held an airman certificate with a commercial pilot, single and multi-engine land and instrument ratings. He had a total of 2,451 flying hours, of which 336 were in DC-4 type equipment. His last CAA physical was accomplished May 3, 1951.

The other crew member was Flight Attendant Rowland Quinn.

THE AIRCRAFT

N 75415, a Douglas DC-4, was manufactured July 5, 1944. An examination of all historical maintenance and inspection records of this aircraft disclosed no items which had any particular significance in respect to this accident.