

File No. 2-0347

CIVIL AERONAUTICS BOARD  
AIRCRAFT ACCIDENT REPORT

Adopted: June 5, 1963

Released: June 7, 1963

ASHLAND OIL COMPANY, LOCKHEED LODESTAR, N 1000F,  
LAKE MILTON, OHIO, SEPTEMBER 4, 1962SYNOPSIS

On September 4, 1962, at 2100 e.d.t., a Lockheed Lodestar, N 1000F, owned and operated by the Ashland Oil Company, Ashland, Kentucky, lost its right wing in flight, crashed and burned in a field near Lake Milton, Ohio, seven-tenths of a mile south of Ohio State Highway Route 18.

The pilot and copilot of the aircraft and 11 passengers perished. The aircraft was destroyed by fire after impact.

The Board determines that the probable cause of this accident was a malfunction of the electric elevator trim tab unit which resulted in aircraft uncontrollability and subsequent structural failure of the wing.

*file*

### Investigation

At approximately 1822 e.d.t., <sup>1/</sup> the pilot of N 1000F, a Lockheed Lodestar, owned and operated by Ashland Oil Company, called Buffalo Flight Service Station and filed a flight plan in accordance with Instrument Flight Rules (IFR) from Buffalo to Ashland, Kentucky. The proposed route of flight was from Buffalo via airways to York, Ohio, then direct to Ashland. The cruising altitude was 8,000 feet. The flight plan listed a crew of 2 and 11 passengers. The pilot requested and received the current weather for Buffalo, Erie, Cleveland, Parkersburg, Knoxville, Louisville, Lexington, and Huntington, and the winds aloft for Buffalo and Pittsburgh.

The gross weight of the aircraft was computed to be 19,300 pounds, which was below the maximum allowable takeoff weight for the aircraft. Its center of gravity was within allowable limits.

The aircraft's crew consisted of Captain Arthur Blaine Berkstresser and Copilot Ronald D. Roberts.

At approximately 1951, N 1000F contacted the Buffalo Tower for taxi instructions and was cleared to runway 13, and shortly thereafter the flight was cleared for takeoff. N 1000F departed Buffalo at 1959.

The flight operated routinely to the vicinity of Youngstown, Ohio. It reported over Youngstown at 2051 at 8,000 feet, estimating arrival over the Briggs Very High Frequency Omnidirectional Range (VOR) at 2109. When the aircraft failed to report over Briggs, numerous attempts were made to establish communications with negative results.

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<sup>1/</sup> All times herein are Eastern daylight based on the 24-hour clock.

N 1000F had crashed and burned at 2100. The time of the accident was established by an electrical power interruption which was caused by the aircraft's flying debris. The pilot, copilot, and 11 passengers were killed.

The components of the aircraft that were shed in flight fell nearly in a straight line on a magnetic heading of 260 degrees to the main impact site. The portion of wreckage located farthest from the main wreckage site was the outboard 20 feet of the right wing, which was recovered from Lake Milton, 200 feet from the west shore and 3/4 of a mile from the main wreckage site. An examination of the wing panel revealed that the failure and separation resulted from a negative airload - the separation being downward and rearward.

Two flap roller supports and a small piece of flap rib were found 500 feet from the location of the right wing toward the main wreckage site. It was established that these parts were from the right wing. No evidence of in-flight shedding from other areas of the aircraft was found. The aircraft, minus the right outer wing panel, struck the ground at a high velocity in an inverted, 85-degree nosedown attitude, penetrating the hard soil to a depth of approximately eight feet.

Impact damage and the fire that followed resulted in almost complete disintegration of the aircraft. Fragments were found as far as 300 feet from the crater with a concentration of pieces to the southwest.

The engines and accessories were found with the main wreckage. The relative position of the landing gear and engines with respect to the left wing indicated that the aircraft struck the ground in an inverted attitude. The high velocity of the aircraft at impact was indicated by the high degree of engine disintegration. The engine nose accessory and supercharger casings were fragmented at impact.

The right and left propellers were separated from their engines and their hubs were broken open. Shim plate markings showed that the right propeller blade setting was approximately 30 degrees at impact. The left propeller shim plates could not be used to determine the blade setting because of extensive impact damage. The right propeller dome index ring was found at a position which indicated a pitch setting of 18 degrees. The left propeller dome index ring was found at a pitch setting of 22 degrees, 4 degrees off low pitch setting.

Although a considerable amount of the control system assemblies were heavily damaged by impact and subsequent fire, examination of those parts of the systems remaining, with the exception of the elevator system, did not reveal any indication of faulty operation prior to impact. The elevator trim drive and both manual elevator trim cable drums were found in a position that corresponds to an aircraft full nosedown setting. Rudder and aileron trim systems were found in the neutral trim position.

A review of the weather reports indicates that the Youngstown, Ohio, weather, 20 nautical miles northeast of the crash site, at the time of the accident was: measured 2,000-foot ceiling, broken clouds with higher broken clouds. The visibility was five miles in haze, the temperature 70 degrees, with a dewpoint of 65 degrees, and the surface wind was calm. The Akron, Ohio, weather, 23 nautical miles west of the crash site, at the time of the accident was: high scattered cloud cover, visibility five miles, ground fog, temperature 69 degrees, with a dewpoint of 67 degrees. The surface wind was from the west at three knots.

The weather radar at Akron, Ohio, displayed no significant weather echoes in the vicinity of the accident site for a period of 15 minutes before and after the crash of N 1000F. The pilot of an aircraft who traversed the area approximately two hours before the accident indicated the weather was clear. Witnesses reported the sighting of aircraft passing through the area and the observation of stars in the sky.

The separated right wing panel was examined and found to be free of corrosion and fatigue in the break area extending approximately four feet spanwise and the area adjacent thereto. All breaks were the result of loading beyond the ultimate strength of the material. The separation of the wing in a negative direction was revealed by the tensile failure of the upper chord member of the main spar, the top skin, the corrugated top skin stiffener panel, and the local compressive buckling of the lower wing surface stringers.

An examination of the record of a sister ship, N 1000W, indicated that unwanted elevator trim in a positive G direction had occurred on one occasion. This aircraft had a Spartan electric longitudinal trim system identical to that of N 1000F. In examining the installation in N 1000W and from data secured in the operation of the trim system, it was established that neutral to full nosedown trim required 5-1/2 seconds, while neutral to full noseup trim required 7-1/2 seconds. The trim tab travel was found to be 25 degrees in each direction. It was possible to stop the rotation of the trim wheel with the right hand and also roll it gradually against the clutch and motor direction by a manipulation of the fingers. The deactivation switch for the electric trim is located on the instrument panel to the right of the pilot's control wheel. The switch is of a toggle lever type. Power to the electric trim actuator is turned off by a "down" position of this switch allowing manual control of the trim system.

It was found from Lockheed data that the positive design limit load factor was 3.125, while the negative design limit load factor was -0.95 at a designed gross weight of 18,500 pounds. N 1000F, however, was recertificated to a new gross weight of 19,605 pounds and a landing weight of 18,500 pounds. The increase in gross weight lowers these design limit load factors by 5.5 percent at maximum gross weight. While the actual gross weight of N 1000F at the time of the accident is not known, it was computed to be 18,783 pounds.

N 1000F was southwest bound on Victor Airway 43 (NE-SW). This airway intersects with Victor Airway 30 (E-W) near the accident site. Because of the proximity of the accident site to the intersection of these airways, and certain witness statements, the possibility of a collision avoidance maneuver resulting in a pilot induced negative loading of the wing was investigated. An extensive search produced some evidence of air traffic in the area at the time of the accident; but none, however, which might have conflicted with N 1000F.

#### Analysis and Conclusion

It is determined from the investigation that the aircraft was loaded within allowable weight limits; that the crew and the aircraft were properly certificated; that the aircraft was properly maintained; that there was no in-flight fire; that there was no evidence of an in-flight strike with a foreign object; that the weather was not a factor; and that the presence of conflicting air traffic is not supported by available evidence.

The negative failure of the right wing panel and the full nosedown trim indication appear to be interrelated. The electric longitudinal trim system installed in N 1000F would require large control column forces to override unwanted elevator trim. The amount of force would be approximately 30 pounds

per degree of aircraft nosedown trim with the aircraft near maximum gross weight, with an aft center of gravity position and a true airspeed of 170 knots. At an airspeed of 220 knots the override force would be approximately 50 pounds for each degree of aircraft nosedown trim. The rate at which this elevator tab moves, if unchecked, is approximately 5 degrees per second, requiring about 5.5 seconds from the neutral position to its full aircraft nosedown setting of 25 degrees.

Relating control column force to time, a pilot would be required to exert a force of approximately 150 pounds to override the first second of unwanted nosedown trim when the aircraft is cruising at a true airspeed of 170 knots. At the end of two seconds the override force would approximately double.

If, prior to the subject accident, longitudinal trim was applied to N 1000F in a nosedown direction, either intentionally or inadvertently, and at this time a runaway trim condition developed, the pilot's reaction would probably have been to resist the nose heaviness of the aircraft with the control column or by reversing trim or both. The time involved in any corrective action would have to be within slightly over one second, since in this interval of time the control forces would have reached the limit of human capabilities. If it is assumed that this occurred before the trim could be deactivated there would follow an abrupt downward pitching of the aircraft. At cruising or higher speeds this could induce loads beyond the design limits of the surface involved.

For N 1000F, the time from unwanted nosedown trim initiation to catastrophic failure of the right wing panel was probably a matter of a very few seconds; therefore, the aircraft would be near its cruise altitude of 8,000

feet at the time of wing failure. The initial downward pitch acceleration might have incapacitated the crew but the gyrations which followed immediately after the loss of this wing would be more likely to do so. The latter gyration would probably be a roll to the right while in a steeply descending nosedown attitude and would produce a general deviation to the right of the proposed flightpath as indicated by the wreckage distribution.

Probable Cause

The Board determines that the probable cause of this accident was a malfunction of the electric elevator trim tab unit which resulted in aircraft uncontrollability and subsequent structural failure of the wing.

Recommendations

As a result of a recommendation made by the Board to the Federal Aviation Agency, an order for immediate deactivation of Spartan electric longitudinal trim systems in L-18 aircraft was issued by that Agency. This order was followed by a modification of S.T.C. SA2-183 which now requires a driving motor rated at 0.12 horsepower at 4000 r.p.m. as opposed to the original motor which produced 0.167 horsepower and operated at 8500 r.p.m. In addition, this modification limits the travel limits of the elevator trim tab to 5 degrees nosedown trim and 10 degrees noseup. All L-18 aircraft, in order to utilize the Spartan electric longitudinal trim system, must now comply with the provisions of this modification.

BY THE CIVIL AERONAUTICS BOARD:

/s/ ALAN S. BOYD  
Chairman

/s/ ROBERT T. MURPHY  
Vice Chairman

/s/ CHAN GURNEY  
Member

/s/ G. JOSEPH MINETTI  
Member

/s/ WHITNEY GILLILLAND  
Member



## S U P P L E M E N T A L   D A T A

### Investigation

The Civil Aeronautics Board was notified of this accident at approximately 0827 e.d.t., September 5, 1962, and an investigation was initiated in accordance with the provisions of Title VII of the Federal Aviation Act of 1958.

### Aircraft Owner

Lockheed Lodestar N 1000F was owned by the Ashland Oil and Refining Company, Ashland, Kentucky.

### Air Crew

Arthur B. Berkstresser, age 49, was employed by Ashland Oil and Refining Company on January 16, 1949, as Chief Pilot and had accumulated a total of approximately 13,250 hours of flight time. He held a currently effective multi-engine land airline transport certificate No. 222186 which was issued to him on February 23, 1951, with an appropriate rating for the type of aircraft involved. Records indicate that he was issued a first-class medical certificate on August 7, 1962, with a "correcting glasses" limitation.

Ronald D. Roberts, age 31, was employed by the Ashland Oil and Refining Company on June 1, 1960, and had accumulated approximately 1,000 hours of flight time. He held currently effective commercial pilot certificate No. 1386274 issued October 8, 1958, with airplane single-engine land and instrument rating.

Records indicate that he was issued a first-class medical certificate on February 1, 1962, which contained no waivers or limitations.

## The Aircraft

Lockheed Lodestar N 1000F Model 18, manufacturer's serial number 2463 was owned and operated by the Ashland Oil and Refining Company, 1409 Winchester Avenue, Ashland, Kentucky. Total time on the aircraft was 6557.44 hours. The last periodic inspection was accomplished on April 26, 1962, by the Spartan Aircraft Company, Tulsa, Oklahoma. The aircraft had accumulated 401.10 hours in service for the twelve month period prior to the last periodic check.

The aircraft was equipped with two Wright Model 1820.87 engines and the propellers were Hamilton standard model 23E50-473 with DWG 6339-A-12 blades.