AIRCRAFT ACCIDENT REPORT

ADOPTED: August 26, 1959 **RELEASED:** September 1, 1959

RIDDLE AIRLINES, INC., CURTISS C-46R, N 7840B,
ALMA, GEORGIA, MARCH 30, 1959

SYNOPSIS

On March 30, 1959, at approximately 2346, near Alma, Georgia, an intense, uncontrollable fire occurred in a Riddle Airlines, Inc., C-46R, N 7840B, destroying the integrity of the flight control system of the aircraft and causing it to crash.

Prior to the crash the fire was observed by ground witnesses when it burned through the fuselage, allowing burning cargo and debris to be scattered over a large area. After making several left circles, the burning aircraft plunged to the ground. The pilot and copilot, the only occupants, received fatal injuries. A ground fire then partially consumed the wreckage.

The Board believes that this fire was started by ignition of combustible cargo in the aft lower cargo compartment through contact with an unguarded light bulb. It is believed the fire then breached the compartment wall and damaged a hydraulic unit or line in the wing center section area at the rear spar, igniting the flammable hydraulic fluid.

As a result of this accident, the company has installed guards on all cargo compartment lights in its C-46R aircraft. In addition, the lights have been rewired and a switch has been installed on the flight deck. A company procedure has been instituted to require these cargo compartment lights to be off during flight. The company has also instituted a program to design and install both fire detection and fire extinguishing equipment in these lower cargo compartments. Several other equipment modifications are planned as a result of this investigation. These changes, which will add substantially to the safety of the aircraft, are discussed in the report.

Investigation

Riddle Airlines Flight 402 is a regularly scheduled flight from Miami, Florida, to Chicago, Illinois, with intermediate stops at Orlando and Atlanta. The crew for the trip of March 30, Captain E. P. Nesselhaus and First Officer R. H. Gillespie, made normal preparations for the flight.

Flight 402 blocked in at the Riddle cargo terminal at Orlando at 2120.[1/] No maintenance was performed on the aircraft other than routine servicing of

1/ All times herein are eastern standard based on the 24-hour clock.

fuel and oil. During the stop 9,236 pounds of cargo were placed on the aircraft, bringing the total weight of cargo aboard to 9,636 pounds. The main cargo compartment load consisted of human remains, several live animals, live plants, machinery parts, and turkey poults. The "G" compartment (the aft lower cargo compartment) was completely filled with a number of mail sacks containing wearing apparel.

Flight 402 departed Orlando at 2235 for Atlanta. It was cleared IFR via Victor Airway 267 and Victor 5 to cruise at 7,000 feet. The flight proceeded normally, making routine reports. at 2331 an FAA ATCS operator at the Alma, Georgia, Airport relayed a clearance to N 7840B to descend to and maintain 5,000 feet and to report over Alma. The flight acknowledged the clearance and reported it was leaving 7,000 feet. This communication was normal and routine.

At approximately 2340 the ATCS operator at Alma observed Flight 402 as it proceeded along V-5 directly over the airport on a northwesterly course. Approximately one minute after the aircraft crossed the station the observer saw a bright white light, later determined to be an aircraft flare, falling in the vicinity of the aircraft. Very shortly thereafter he heard a radio transmission from 402, "Mayday, aircraft on fire, unable to control." The station operator made several attempts to contact the flight but was unsuccessful. He then returned to the doorway and saw burning debris falling to the ground. Several seconds later, at 2346, a large burning object, the aircraft, struck the ground with a brilliant flash.

Several other witnesses in the area saw the burning aircraft in flight. The flame was described as emanating from the fuselage near the area of the aft center section of the wing and streaming back past the empennage. The aircraft was seen to make several left circles during which the engine sounds increased and decreased intermittently. Burning debris consisting of airplane parts and cargo was strewn over a large area before the crash.

The aircraft struck the ground inverted, at a steep angle, exploding on contact. A ground fire then partially consumed the wreckage. Both engines and propellers were determined to have been capable of normal operation prior to the accident. All damage to the powerplants was found to be the result of impact or ground fire.

All major components of the aircraft, i. e., wings, control surfaces, and fuselage, with the exceptions noted below, were accounted for in the main wreckage area. All received extensive damage from impact.

A reconstruction was made of the fuselage belly and sides, from the front spar of the wing to a point just aft of the rear cargo bin, to study the inflight fire patterns. Extensive inflight fire damage was found to have destroyed the integrity of the control systems. The aileron bellcrank assembly and the rudder and elevator cable pulley clusters, all located at and just to the rear of the rear spar, were destroyed by fire. Additional heavy inflight fire damage was found from the aft cargo bin forward to and including the ventilating louvers. Several pieces of aircraft structure from this area were found back along the flightpath.

Samples of the cargo which was loaded in "G" compartment were tested and, although found to be capable of supporting combustion, exhibited no unusual ignition characteristics. Studies were also conducted to determine whether a light bulb in contact with a mail sack filled with similar materials could develop sufficiently high temperatures to cause ignition. From these tests and studies of histories of baggage compartment fires, it is apparent that ignition could occur in such a manner.

The "G" compartment on Riddle C-46R aircraft was certificated by the FAA as a class D compartment2/ on the basis of airflow rate tests and engineering specifications submitted by the company. However, the company, as of the date of the accident, had not installed guards to protect the compartment lights from damage by cargo as required by the approval. In addition, no procedures were in existence requiring that these lights be turned off. Further, no procedure existed which required maintenance personnel to check the condition of the tape used to seal the joints of the compartment. This tape is essential to the installation to limit the airflow through the compartment to a rate not to exceed 1,500 cu. ft./hr. An inspection of the "G" compartment of a sister ship revealed that the tape can be scuffed and pulled away from the joints by cargo movement, thus destroying its effectiveness.

Analysis

The extensive damage to the heavy components of the control systems, as well as other heavy structural members in the area of the rear wing spar, occurred in a very short period as a result of an intensive hydraulic fluid fire.

2/ Civil Air Regulations 4b 383 (d) CLASS D

"Cargo and baggage compartments shall be classified as "D" if they are so designed and constructed that a fire occurring therein will be completely confined without endangering the safety of airplane or the occupants. Compliance shall be shown with the following. (Added 4b-6, March 5, 1952)

(1) Means shall be provided to exclude hazardous quantities of smoke, flames, or other noxious gases from entering into any compartment occupied by the crew or passengers. (Renumbered 4b-2, August 25, 1955)

(2) Ventilation and drafts shall be controlled within each compartment so that any fire likely to occur in the compartment will not progress beyond safe limits. (Renumbered 4b-2, August 25, 1955)

NOTE: For compartments having a volume not in excess of 500 cu. ft. an airflow of not more than 1,500 cu. ft. per hour is considered acceptable. For larger compartments lesser airflow may be applicable. (Added 4b-6, March 5, 1952)

(3) The compartment shall be completely lined with fire-resistant material. (Renumbered 4b-2, August 25, 1955)

(4) Consideration shall be given to the effect of heat within the compartment on adjacent critical parts of the airplane. (Renumbered 4b-2, August 25, 1955)."

The exact cause of the ignition of the hydraulic fluid could not be determined. However, from all the physical evidence in this instance the Board believes that the cargo in "G" compartment was ignited by contact with an unguarded light bulb. The fire smoldered and progressed until it burned through the forward aluminum wall. Any break in the compartment wall would be accompanied by an increase in airflow concentrated at that point. The intensity of the fire increased with the increase in airflow (which is normally forward) and was carried into the area of the rear spar where numerous hydraulic units and lines are located. Fire damage to one of these components resulted in a leak which fed the flames to uncontrollable proportions.

In determining the cause of this fire the Board considered, among other things: a. previous baggage compartment fires caused by cargo contacting unguarded light bulbs which have been experienced by other airlines; b. the unguarded light bulbs as installed in N 7840B; c. the probability that one or more of the mail sacks containing clothing pressed against an unguarded and lighted bulb; d. the probability that the compartment sealing tape was deteriorated permitting an airflow exceeding a rate of 1,500 cu. ft./hr. A flow greater than this rate would supply sufficient oxygen to support combustion within the compartment; e. in compartment "G", the normal airflow in this area which would carry fire forward to the rear spar.

A second possibility considered by the Board was that of a hydraulic leak in the area of the rear spar. This was considered unlikely as a second element would have had to have been present simultaneously, i. e., an electrical fault of a nature sufficient to generate enough heat to ignite the fluid. Also, had the fire originated in this manner, there would be no accounting for its rearward progress against the normal air flow through the rear cargo compartment.

The bright fire the ATC operator observed falling from the aircraft was a flare. It is believed that this flare was released either by fire damage in the area or by fire damage to the flare release circuit and adjacent circuitry which resulted in voltage being applied to the flare circuit.

Conclusions

As a result of this investigation the Board has made a number of recommendations for corrective action to the FAA and to the company, several of which have already been accomplished. One of these recommendations was that the company require cargo lights to be "off" during flight and that attention be directed to the requirement that guards be installed over these lights; in addition, electrical relays and electrical terminals in the hydraulic compartment area should be protected. Further, it has been recommended that the tape which is used to seal class "D" cargo compartments be subjected to periodic inspections to insure that the proper control of airflow is maintained.

The company has also instituted a program to design and install fire-detection and fire-extinguishing equipment in these lower cargo compartments.

Probable Cause

The Board determines that the probable cause of this accident was the ignition of cargo in the aft belly compartment caused by contact with an unguarded light bulb.

BY THE CIVIL AERONAUTICS BOARD:

/s/ JAMES R. DURFEE

/s/ CHAN GURNEY

/s/ HARMAR D. DENNY

/s/ G. JOSEPH MINETTI

/s/ LOUIS J. HECTOR

SUPPLEMENTAL DATA

Investigation and Taking of Depositions

The Civil Aeronautics Board was notified of the accident at 0110 March 31, 1959. An investigation was immediately initiated in accordance with the provisions of Section 701 (a) (2) of the Federal Aviation Act of 1958. Depositions, ordered by the Board, were taken at Alma, Georgia, May 19, 1959; Orlando, Florida, May 20, 1959; and Miami, Florida, May 21 and 22, 1959.

Air Carrier

Riddle Airlines, Inc., is a Florida corporation with its principal place of business in Miami. It operates as a scheduled air cargo carrier under a currently effective temporary certificate of convenience and necessity issued by the Civil Aeronautics Board and a cargo carrier operating certificate issued by the Federal Aviation Agency. These certificates authorize the company to transport cargo over the route involved.

Flight Personnel

Captain Eugene P. Nesselhaus, 39, was employed by Riddle Airlines January 7, 1952. He held a current airman certificate with all appropriate ratings. He had a total of 13,496 flying hours, of which 5,950 were in C-46 aircraft.

First Officer Robert H. Gillespie, 36, was employed by Riddle Airlines February 17, 1956. He held a current airman certificate with all appropriate ratings. He had a total of 6,304 flying hours, of which 6,043 were in C-46 aircraft.

Aircraft

N 7840B, serial number 30242, was manufactured by Curtiss-Wright Corporation. It was transferred several times before being acquired by Riddle Airlines. It had approximately 3,278 flying hours at that time. Riddle Airlines performed extensive alterations on the aircraft converting it, according to transport category criteria, to a C-46R model. An airworthiness certificate was issued for the aircraft October 4, 1957. The aircraft received a No. 2 equalized service inspection on March 25, 1959, at which time the airframe had flown a total of 2,152 hours since overhaul. The approximate total time on the airframe since manufacture was 5,455 hours.

The aircraft was equipped with two Pratt & Whitney R2800-34 engines and Hamilton Standard, model 33E60-6801-6, propellers.