

DEPARTMENT OF COMMERCE
Washington

July 2, 1938

REPORT OF AIRCRAFT ACCIDENT INVESTIGATION

Statement of probable cause concerning an accident which occurred to an airplane of Pan American Airways at Kingston, Jamaica on April 25, 1938

TO THE SECRETARY OF COMMERCE:

On April 25, 1938 at about 20:18 P.M., G.C.T. at sea about 10 miles south-east of Kingston, Jamaica, an airplane of United States registry while being operated in foreign air commerce carrying mail, passengers and express met with an accident resulting in the loss of the airplane but no injuries to passengers and crew and no loss of mail and cargo.

On April 27, 1938, the Secretary of Commerce issued an order appointing a Board to investigate this accident. Pursuant to said order, an investigation was made and in connection therewith, hearings were held at Miami, Florida, April 28 to May 7, 1938, inclusive. A transcript of the testimony obtained at said hearings is transmitted herewith for your information and for the records of the Department.

The pilot of the aircraft, designated by the company as Captain, was Joseph H. Hart. Captain Hart holds a current Transport pilot's license (now known as a "certificate of competency") and the necessary ratings and route qualifications. The report of his last physical examination as required by the Department of Commerce and taken on January 11, 1938, showed him to be physically qualified. Pilot Hart has a record of approximately 4177 hours of flying time, over 500 hours of which were on the type of equipment involved in this accident. He was thoroughly experienced over the route in question and the type of operation involved. Pilot Hart had not yet been required to possess an appropriate pilot certificate issued pursuant to the Civil Air Regulations, effective November 1, 1937 but such certificate will be required at the next renewal date of his current license.

The co-pilot, designated by the company as First Officer, was W. E. Allen. First Officer Allen holds a current certificate of competency. His latest physical examination, taken on March 17, 1938, showed him to be physically qualified. He has a record of over 3900 hours of flying time and held the rating as captain with the company. He was serving as First Officer at the time of this accident for the purpose of familiarization with the San Juan - Kingston - Trinidad service. He had extensive experience in the type of operation involved.

Other members of the crew were C. L. Mason, Radio Operator, and A. G. Lucignani, Purser.

Passengers on board were:

Edmond L. Meyer, 1 Rue de Clichy, Paris (9)
Lionel Dumery, 59 London Lane, Bromley, Kent Eng.
Norman Ritchey, Darien, Connecticut.
Rafael Mir Serrano, San German, Cuba.
Adelina M. Mir, San German, Cuba.

William Espeut, Buff Bay, Portland, Jamaica.
Albert Ebanks, 20 Long Mountain Rd., Kingston, Jamaica.
Eustace S. Ellington, Lawrence Tavern, St. Andrew, Jamaica.
Francis Legge, 11 Holborn Road, Half Way Tree, Jamaica.
Merritt N. Cootes, U. S. Legation, Port au Prince, Haiti.
Walter M. Lethbridge, Holquin, Oriente, Cuba.
Amos M. Steward, 28 Luke Lane, Kingston, Jamaica.

The aircraft, a Sikorsky, Model S-43 flying boat, was owned and operated by the Pan American Airways, Inc., of 135 East 42nd Street, New York, New York. It was inspected and approved for certificate by the Department of Commerce on April 21, 1938, and at the time of the accident and pending the actual receipt of the certificate, bore a temporary licensed authorization Number NC-16932. At the time of the accident, this aircraft was being operated on scheduled flight Number 105 from San Juan, Puerto Rico to Kingston, Jamaica with intermediate scheduled stops at San Pedro, D. R.; Port au Prince, Haiti and Santiago, Cuba.

On April 22, 1938, this airplane, manned by the crew listed, made a scheduled flight from Miami, Florida to San Juan, Puerto Rico. It remained in San Juan on the 23rd and 24th in accordance with schedule. On April 25, 1938 scheduled flight (105) was made between San Juan and Santiago, Cuba, without incident. At Santiago, the amount of fuel was checked and found to be 320 gallons. No additional fuel was added. Thirty-four gallons of oil was on board. At the time of departure, the gross load of the airplane was 18,238 pounds. The allowable gross load is 19,500 pounds. Figuring the fuel consumption, the gross load at the time of the accident was 17,602 pounds or 1,898 pounds below maximum.

Departure from Santiago was made at 19:03 G.C.T. The expected arrival time at Kingston would have been 20:23 G.C.T. The weather was clear with light southeasterly winds and all reports available at the time indicated favorable flying weather.

All radio contacts were normal throughout the flight and are interpreted as follows:

DEPARTURE:

NC-16932 departed Santiago (for Kingston) at 19:04 G.C.T. with 12 passengers (Rodrigues).

POSITION REPORT - AIRPLANE TO SHORE STATIONS:

NC-16932 at 19:25 G.C.T. (Position) latitude 19° 20' N., Longitude, 76° 00' W., flying at 5,000 feet, course 190°. Signed Hart.

WEATHER - KINGSTON TO AIRPLANE -

Surface weather at Kingston at 19:35 G.C.T. Cloudy, visibility unlimited, ceiling 2,000 feet, percentage of overcast 7/10 to 9/10. Wind S.E. 9 knots velocity, cloudy, barometer 29.89, temperature 82°. Air smooth. Small patch of blue sky to the ESE. Rain ESE to SE.

POSITION REPORT- AIRPLANE TO SHORE STATIONS.

NC-16932 at 19:55 G.C.T. (Position) latitude 18° 10' N. Longitude 76° 10' W. Flying at 2,000 feet. Course 190°. Signed Hart.

POSITION REPORT - AIRPLANE TO SHORE STATIONS.

NC-16932 at 20:10 G.C.T. Sighted Kingston. Signed Hart.

WEATHER - KINGSTON TO NC-16932.

To NC-16932 at 20:13 G.C.T. Surface winds SE6 knots. Sea smooth. Signed Crombie.

POSITION REPORT - AIRPLANE TO KINGSTON.

NC-16932 at 20:31 G.C.T. Pan American to Kingston. Forced down at sea in heavy swells when left engine quit stop left pontoon smashed but ship will float for some time with minor leaks in hull stop send boat at once. Signed Hart.

After departing Santiago, nothing unusual was reported until after Kingston had been sighted. Altitude, from 5,000 feet to 2,000 feet had been lost in order to stay under the clouds as Kingston was approached. In conformity with company regulations when approaching for a landing, the fuel valves were changed to feed both engines from their respective reserve fuel tanks. The selector valve for the right side was changed first and then the left. Within a few seconds after changing the left selector valve to supply the left engine from the left reserve tank, the left engine faltered and quit. The altitude of the airplane at this time was approximately 1600 feet.

As nearly as can be determined the following procedure was then followed: The left fuel selector valve was immediately returned to cut in the main fuel tanks but the engine failed to pick up. The needle on the fuel pressure gauge was resting against its maximum stop which indicated 10 lbs. or more. Normal fuel pressure is 5 lbs. The nose of the airplane was pulled up slightly and 5° of flap was used in an effort to maintain level flight while at the same time efforts were made to start the dead engine. The cross-over valve was turned to cut in the right fuel system to the left engine and the hand fuel pump used. At this time the fuel pressure gauge read zero and the engine failed to respond and was subsequently braked to stop its rotation. Operating the right engine at 2100 RPM with a manifold pressure of approximately 37 inches of mercury, the airplane continued to lose altitude at the rate of about 200 feet per minute.

When it became apparent that a landing would have to be made in the open sea, the purser was ordered to check that all passengers' belts were fastened, and a 180° turn was executed to get out of the edge of a rain squall and to head into the wind. In this maneuver, altitude was lost from 500 feet to approximately 300 feet. Full 40° flap was then used and a stall landing made on the water. The landing appeared normal but the airplane struck a swell and was thrown into the air several feet. Upon the second contact with the water, the left pontoon was torn loose and the hull struck heavily.

An inspection of the airplane was made by the pilots to determine the damage sustained. It was found that some water was coming in the forward part of the hull. The pilot decided that the leaks were such that the airplane would remain afloat until boats could arrive from Kingston. He advised the Kingston base of the situation by radio as quoted above. At the same time all passengers were assisted into life preservers and red signal flares were sent up to attract the steamer SS Cavina. Then a rubber life raft was inflated and moored to the stern of the airplane for possible emergency. A life boat from the steamer SS Cavina took off all passengers, purser, mail, baggage and express and placed them aboard the steamer. The Captain, First Officer and Radio Operator remained with the airplane until it was apparent that it would not stay afloat.

They then proceeded to the steamer in the rubber life raft. From the log of the steamship SS Cavina, the airplane was sighted; disabled at 20:21 G.C.T. and sank at 21:45 G.C.T. A launch and a rescue tug had been dispatched to the scene from Kingston but arrived just after the airplane sank. However, three native canoes in charge of a company employee did arrive at the scene in time to have effected a rescue.

In reviewing the facts and circumstances surrounding this accident, nothing unusual was revealed in: the dispatching of this airplane out of Santiago; favorable weather was predicted and obtained. The rain squall encountered after sighting Kingston could not be considered serious and would not have constituted a hazard to the flight had both engines continued to function. The three main points of consideration seem to be:

1. The reason for the failure of the left engine.
2. The inability of the airplane to maintain level flight while operating on a single engine.
3. The reason for the airplane sinking.

From available evidence, it appears that the engine stoppage was the result of a failure of the fuel supply system. Several possibilities for this failure were considered, including: an air lock, failure of the valve mechanism in the fuel system, and foreign matter in the system. The latter appears to coincide with the weight of the evidence available and is outlined as follows:

When the selector valve was shifted to the reserve tank on the left side, a surge occurred which dislodged or changed the position of the foreign particles in the system. This foreign matter caused a stoppage in the by-pass in the engine driven fuel pump. With this by-pass closed, the fuel pressure increased to more than 10 pounds. The increase in pressure caused an abnormal amount of fuel to pass the carburetor jets which in turn caused the motor to fail due to an extremely rich mixture. This abnormal pressure, which may have been as high as 20 or 30 pounds, may have caused the copper fuel line between the pump and carburetor to pull away from one of the two rubber hose connections in that line. The points brought out in the testimony which seemed to bear this supposition out are as follows:

(a) The failure of the engine occurred almost immediately after the selector valve was changed, which indicates that the change of the selector valve did not result in loss of fuel to the carburetor, inasmuch as the engine would have run 20 or 30 seconds on fuel in the carburetor and the lines after the fuel had been cut off at the valve. On the other hand, the change of the valve could cause a surge in the line which could dislodge or change the position of any foreign matter in the pump or line.

(b) The fuel pressure gauge indicated a pressure of more than 10 pounds by reason of the fact that the hand was against the stop on the high pressure side. Had there been a lack of fuel in the system, it is not believed that this excessive pressure would have been indicated, whereas, with the by-pass of the pump blocked, an excessive fuel pressure would be a natural result.

(c) From the testimony of the pilots, the engine stopped without back-firing or giving other indications of a lean mixture or lack of fuel. The manner in which the engine stopped appears to indicate an over-rich mixture.

(d) The fact that the pressure gauge showed more than 10 pounds pressure for a certain length of time and then dropped to zero seems to bear out the supposition that the fuel line carried away from the hose connection. Tests have shown that fuel lines similar to the one in question will carry away under pressures of 30 pounds or more when oil is present in the connections between the copper tubing and the hose or when the clamps or line boads are not in perfect condition. Such conditions might occur in an installation which had been in service for 350 hours, as was the case in question.

No evidence could be obtained which would explain why the airplane did not maintain level flight with one engine inoperative. Previous to the approving of the airplane in question, an airplane of the exact type was tested for single engine performance under full load condition of 19,500 pounds gross and successfully maintained a density altitude of 5,700 feet. At the time of these tests the operating engine was developing 695 H.P. When the left engine failed on the approach to Kingston, evidence indicates that the airplane was flying at a density altitude of 2700 feet, and the operating engine was computed to be developing approximately 750 H.P. The gross weight at this time was estimated to be approximately 17,602 pounds. All of these conditions were more favorable to single engine flight than the conditions which obtained during the tests described above. There are a number of factors which may have made single engine flight difficult in this instance, as follows:

1. The pilot had insufficient time to trim the airplane for the most favorable single engine performance due to the complications involved in attempting to start the dead engine, avoid the storm and prepare for an emergency landing.
2. The left engine on failing, would cause the propeller to automatically go into low pitch which would tend to lower single performance.
3. The water vapor content in the air was high which would lower this engine horsepower below that computed.
4. The rain would increase the amount of horsepower necessary for flight.
5. Pilot found it necessary to turn left to get out of the rain squall which placed the dead engine on the low side of the turn.
6. Airplane was flying through rough air at times due to the proximity of the squall.

In arriving at conclusions as to why the airplane sank, no evidence is available as to the exact extent of damage incurred in the landing. An examination made by the pilot immediately after landing convinced him that the airplane would remain afloat until a salvage tug could arrive from Kingston. His chief concern at the moment was the safety of his passengers and it was not until they were safely on board the steamer that the airplane began taking on water at a dangerous rate. From available evidence, it appears that the rapid increase in the rate of taking on water was due to the attitude at which the airplane had come to rest, with the nose and the left wing low. The toilet being in the forward part of the airplane and on the left side, might have become lower than the level of the outside water as the airplane settled and thus have permitted the rapid entry of sea water which would have caused the airplane to sink sooner than had been expected.

In arriving at a conclusion, after an analysis of the evidence available, it does not appear that this accident was due to any failure of the company or crew to operate or navigate the aircraft in accordance with prevailing rules and practices. Why the airplane did not maintain altitude with one engine inoperative is a matter of concern as previous tests indicate that airplanes of this exact type should sustain a reasonable altitude with one of the two engines stopped. The sudden increase of taking on water and subsequent sinking of the airplane before the arrival of the salvage tug is likewise a matter of concern. The depth of the water in which the airplane sank precludes the possibility of raising it. Were the airplane available for inspection, it would no doubt be possible to determine more definitely the answers to the three main points under consideration.

Opinion:

It is the opinion of the Investigating Board that the probable cause of this accident was failure of the left engine as a result of a failure in the fuel system and failure of the airplane to maintain single engine flight.

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