

C I V I L   A E R O N A U T I C S   B O A R D  
A I R C R A F T   A C C I D E N T   R E P O R T

Adopted: July 12, 1962

Released: July 18, 1962

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WORLD AIRWAYS, INC., DOUGLAS DC-6AB, N 90779,  
AGANA NAVAL AIR STATION, GUAM, MARIANA ISLANDS,  
SEPTEMBER 19, 1960

SYNOPSIS

On September 19, 1960, at approximately 0602 local time, a Douglas DC-6AB, N 90779, operated by World Airways, Inc., as Military Air Transport Flight 830/18, bound for Wake Island and the United States, crashed and burned on Mt. Barrigada approximately two nautical miles from the departure end of runway 6L, Agana Naval Air Station, Guam, Mariana Islands. Of the 94 occupants on board, seven crew members and 73 passengers received fatal injuries; one crew member and 13 passengers survived.

The flight received FAA Air Route Traffic Control route and departure clearances and took off into night VFR weather conditions. It made a right turn after takeoff and although making a continuous climb over the distance flown, it struck Mt. Barrigada at a point approximately 300 feet above the elevation of the airport, and slid into the thick underbrush cutting a swath for nearly 1,000 feet before it came to rest. Damage and injury were more attributable to fire than impact forces.

The Board determines that this accident occurred because of the failure of the pilot to comply with published departure procedures applicable to runways 6 left and 6 right.

Investigation

Flight 830 was a passenger flight provided pursuant to contract between the Military Air Transport Service of the United States and World Airways, Inc., of Oakland, California. The flight originated at Clark Air Force Base, Philippine Islands, and departed there at 1857 <sup>1/</sup> on September 18, 1960, and arrived at Agana Naval Air Station, Guam, at 0150 on September 19, 1960. The flight on which the accident occurred was a continuation of Flight 830 to Wake Island, Honolulu, Hawaii, and Travis Air Force Base, California. The flight from Clark Air Force Base was reported to be routine.

After the flight arrived at Guam, the passengers and incoming crew deplaned and the outgoing crew, under the command of Captain Rudy J. Holman, readied the aircraft for the continuation of the flight. They had been at Agana Naval Air Station since September 16, 1960, awaiting the arrival of Flight 830 from Clark Air Force Base.

The aircraft, a Douglas DC-6AB, N 90779, was reported to be in good condition by the incoming crew and, as best as could be determined, there were no discrepancies entered on the aircraft log. However, upon inspection of the aircraft at Guam, a hole was discovered in the aluminum skin on the left side of the vertical stabilizer to the rear of the HF antenna bracket. Upon closer inspection, an additional "L" shaped fatigue crack was observed below the hole in the skin. The HF antenna was removed and the hole was enlarged and trimmed. The "L" shaped fatigue area was cut out and trimmed, and a temporary fabric patch about 18 inches square was installed, covering both holes. This repair

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1/ All times herein are Guam Daylight based on the 24-hour clock.

work was performed by employees of Pan American World Airways, Inc., under contract with World Airways and under the supervision of outgoing Flight 830's flight engineer.

The repairmen objected to putting on the fabric patch, stating that a metal patch was proper. However, they completed this work at the insistence of the outgoing flight engineer and it met with his approval. Captain Holman was present with the maintenance leadman and the flight engineer during the conversation regarding the objection to the repair work but, as far as could be determined, the repair work satisfied the captain.

The civil flight operations at the MATS terminal at Agana Naval Air Station were operated by Pan American World Airways. Captain Holman's crew used this facility as a base of operations according to existing policy. Passenger manifesting was handled by MATS personnel housed in the same building.

The latest radio facility charts, maps, and other aids to pilots were available there to the crews. A poster, printed in large lettering, lay under the glass on top of the dispatch counter. It read as follows: "ATTENTION PILOTS! REF: Radio Facility Charts page 72 - Directory of Airdromes: Aircraft departing runway 6L will not make a right turn until a minimum of 1,000 feet has been attained." This poster was on display at the time Captain Holman's crew was using the dispatch office. It should be noted, however, that the notice referred to by the poster did not appear in Radio Facility Charts, page 72, as advertised. That publication had been reentitled "USAF/USN Flight Information Publication En Route Low Altitude Pacific and Far East" and the referenced notice appeared on page 78 of that document. Furthermore, there is no indication that the obsolescence, or even the existence, of the poster was known to Captain Holman.

Immediately following the accident, Agana Naval Air Station instituted the practice of having the tower advise pilots prior to takeoff on runway 6L to climb straight ahead to 1,000 feet before turning.

A folder containing weather information prepared by the U. S. Navy forecaster on duty was issued to the crew by Pan American World Airways during the dispatching process. The local weather existing at Agana Naval Air Station at 0606 was 1,400 scattered; 14,000 scattered; high overcast; visibility 15 miles; temperature 77 degrees; dewpoint 75 degrees; wind east-southeast 5 knots; altimeter 29.80. Civil twilight began that morning at 0649 and official sunrise was at 0710.

The approximate gross weight of the aircraft was 99,005 pounds at time of takeoff. The center of gravity location was 23-1/2 percent of the mean aerodynamic chord. The allowable gross takeoff weight from Agana Naval Air Station for the aircraft was in this case 103,000 pounds, using Anti-Detonation Injector (ADI) fluid and with autofeathering on. The landing weight allowable at Wake Island was 86,780 pounds. The center of gravity limits were 14.1 percent to 33 percent MAC.

A preflight inspection was made by the crew, and the MATS personnel also conducted an inspection of the aircraft in accordance with MATS requirements. The flight crew consisted of eight people, one of which was an employee of the Federal Aviation Agency.

The flight's radio transmissions to Agana Tower were not recorded; however, the transmissions of the tower were recorded, and the transmission regarding ATC route and departure clearances was given to the flight as follows:

"ATC clears World Airways seven seven niner to the Wake Island Airport, rhumb line track; maintain one one thousand; read back." "Roger, seven seven niner, clearance correct as read: call one minute prior to takeoff." "Roger, seven seven niner, we're getting your climbout instructions at this time." "Seven seven niner, I have your climbout instructions." "Roger, right turn after takeoff, climb one zero zero degrees, contact center on one three five point nine after takeoff." "Roger, clearance correct as read, seven seven niner, your're cleared for takeoff." The flight then began its takeoff roll at 0600.

The takeoff as observed by several witnesses appeared and sounded normal. The aircraft became airborne at approximately the 5,000-foot point on the 7,986-foot runway. As the aircraft passed over a brightly lighted construction area at the end of the runway, it was observed to make an immediate shallow right turn and take up a climb heading.

Approximately 50 seconds after takeoff the aircraft first struck trees on Mt. Barrigada at an elevation of 580 feet m.s.l., or 300 feet higher than the elevation of the takeoff runway, and at a bearing of 087 degrees magnetic from the end of the runway. After cutting a slightly curved swath 975 feet in length in a direction averaging 120 degrees magnetic, the aircraft came to rest. According to survivors, the first portion of the impact with the trees was slight but the forces then increased in severity and fire broke out just before the aircraft came to rest. The fire seemed to come forward through the cabin from behind. The survivors left the aircraft through a hole in the left side of the cabin, an escape hatch on the right side over the wing, and

the copilot's window. According to the navigator, the sole surviving crew member, nothing unusual occurred in the cockpit and to the best of his memory all checklists were called out and followed, and nothing was indicated by the crew's actions or by their voices which reflected anything but a normal condition.

A Navy helicopter and a U. S. Air Force C-54 were used by the Civil Aeronautics Board investigators in an attempt to determine the approximate flightpath of N 90779. A course of 280 degrees magnetic (reciprocal of 100 degrees) was flown in the helicopter from the point of impact to a point on a straight line projected from the centerline of runway 6L. The purpose of this was to determine the approximate location of the spot where N 90779 made the right turn after takeoff. Later, using these data, the C-54 was employed to determine the flightpath and to develop a time envelope. By simulating the  $V_2$  speed of a DC-6 and timing from the estimated point of takeoff, it was determined that the flight time envelope was 50 seconds. A probable flightpath was determined by climbing straight ahead to the point determined by the helicopter to be where N 90779 commenced its right turn, and a right turn with a bank of 15 degrees was made in the C-54 at this point and continued until a heading of 100 degrees magnetic was attained. This aligned the aircraft exactly with the swath made where N 90779 crashed. A witness, whose house is located on the flightpath, stated that the aircraft which crashed had flown directly over his home, which confirmed the flightpath as flown by the C-54.

The helicopter was also used to search for the fabric patch that had been placed over the two holes in the vertical stabilizer of N 90779 because the patch was not on the stabilizer at the scene of the accident. The vertical stabilizer was relatively intact, although it had been exposed to some fire. There existed, therefore, a possibility that the patch, which had been applied to the metal with dope, had burned; nevertheless, the search was made. Personnel of the Marine Corps also searched for the patch by using trucks to drive along the flightpath, but it was not found by either method.

Inasmuch as the flight had made a predawn takeoff, much consideration was given to the question of the adequacy of the flashing red beacon light upon the summit of Mt. Barrigada. It was determined that the beacon was in operation during the takeoff and short flight. The beacon was mounted on top of an 84-foot tower - well above all trees or other obstruction. It, however, operated on acetylene gas and was of much lower intensity than the electric beacons on top of several radio antennas which were situated slightly to the right of the flightpath but lined abreast with the acetylene beacon and about 200 feet lower in altitude. Since the accident the acetylene beacon has been replaced by a red electric obstruction beacon containing two 600-watt bulbs, which combine to produce 2,000 candle power. This beacon flashes 32 times per minute and is actuated by a photoelectric cell.

A thorough examination was made of the engines, propellers, fuel system, and ADI system of the aircraft. The powerplants were damaged in varying degrees by the impact and the fire that followed. An extensive teardown inspection was

made of the powerplants over a period of a week. Nothing was revealed that cast any doubt on their capability of normal operation prior to impact.

Propeller governors Nos. 1, 3, and 4 were operated on a test stand at the Hamilton Standard Factory in the United States. The No. 2 governor was damaged to the point that it could not be tested. The test revealed that upon impact the No. 1 engine was operating at approximately 2660 r.p.m.; No. 3 engine at 2555 r.p.m.; and No. 4 engine at 2520 r.p.m. The propeller blade angle of each engine showed an average setting of: No. 1, 36 degrees; No. 2, 36 degrees; No. 3, 34 degrees; and No. 4, 36 degrees. All propeller blade fractures were examined for evidence of fatigue, but none was found.

A number of cowl flap screwjacks were recovered from each of the four engines. The total lengths of these screwjacks were measured to be 1.53 to 1.58 feet. A comparison of this screwjack length with comparable measurements of both a sister aircraft and a built-up engine showed the extension of the screwjacks to represent a "cowl flap full open" position.

Samples of fuel and ADI fluid were taken from the tanks from which the aircraft had been serviced while at Agana Naval Air Station. Laboratory tests showed the fuel and ADI fluid to be within required specifications and uncontaminated.

Investigation revealed that all of the aircraft wreckage was confined within the impact area. Contact with trees punctured the fuel tanks and the ground fire consumed the majority of the aircraft structure. There was no evidence of fire prior to initial contact with ground objects.

The manner in which the aircraft struck trees prior to ground contact indicated that the aircraft had been in a slight right turn with an almost level longitudinal attitude. The aircraft first struck the trees at an elevation of 580 feet m.s.l., and came to rest approximately 975 feet beyond at an elevation of 605 feet m.s.l.

There was no evidence of any failure of the structures, flight controls or related systems prior to impact. The wing flaps and landing gear were fully retracted prior to impact.

The section of the vertical stabilizer which had been repaired prior to the flight's departure was sent to the Douglas Aircraft Company for examination. The company reported that neither the flight characteristics nor ultimate design-load strength would have been significantly affected in the airspeed envelope at which the aircraft was operated during this flight.

A review of all the maintenance records and flight logs on N 90779 was conducted. These logs were current through September 14, 1960. The review revealed that the aircraft was in an airworthy condition. The current log was destroyed in the wreckage; however, available duplicate records have revealed no discrepancies to have existed. Only remnants of the cockpit were recovered and none of the instruments was readable nor were the control positions determinable.

The World Airways DC-6 Technique Manual states that the flight engineer normally completes the preflight check including the cowl flap setting. The last item on the before-takeoff checklist states that the cowl flaps will be set at four degrees after takeoff clearance has been received and the aircraft

is positioned on the runway. The setting of four degrees was the streamlined or trail position for N 90779, since it did not have propeller spinners. The full open setting was 22 degrees.

The Technique Manual sets out the takeoff and climb procedures as follows: "Aircraft will be flown off at  $V_2$  speed." ( $V_2$  speed for this flight was approximately 115K IAS.) "When safely airborne, captain will call for 'gear up' and simultaneously signal visually. Copilot will actuate 'gear and flaps' on command. Flaps will be retracted at  $V_2$  speed plus 15 knots. After flaps have been retracted, captain will call for 'METO' power, ADI, and autofeathering, OFF." The manual stated that METO power is 1,900 brake horsepower and, for an altitude of from sea level to 7,100 feet, the engine is to be operated at 2,600 r.p.m., and 51.5 inches manifold pressure to obtain METO power. The manual further states " . . . when reaching en route climb speed of 155 knots, captain will call for 'climb power' and 'climb checklist.' Climb horsepower will be used as directed in 'cruise control manual.' A climbing airspeed of 135 knots may be used to obtain a maximum rate of climb in order to comply with ATC clearances, crossing altitudes . . .", etc.

Captain Rudy J. Holman, age 46, possessed an airline transport pilot certificate with a type rating in Douglas DC-6 aircraft. He had a total pilot time of 15,681 hours, of which 2,548 hours were in the DC-6. He had approximately 713 hours of instrument time and 6,343 hours of night flying time. His last six months' proficiency check in the DC-6 was successfully completed August 20, 1960. He possessed a valid Class I medical certificate with no limitations.

Captain Holman, when employed by another airline as a copilot, had been at Agana Naval Air Station on August 2, 3, and 4, 1958. It could not be determined if his arrival and departure were conducted during the day or night, or what runway was used. The available records do not indicate that he had been on Guam before or since those dates.

#### Analysis and Conclusions

Since the takeoff was made during the hours of darkness it may be assumed that the outline of Mt. Barrigada was not visible to the captain. However, the location of the mountain was well known to most pilots and the procedure to avoid it was clearly posted in the dispatch office.

In addition, World Airways operations manual stated that radio facility charts, current flight information manuals, and other documents which indicated the correct departure procedure for runway 6L, must be carried in the airplane. These documents advise pilots when taking off in this direction to climb to an altitude of 1,000 feet before turning to the east. It is therefore difficult to understand why this procedure was not followed. Owing to the low intensity of the single red flashing beacon on the summit of the mountain and the likelihood of early morning mountain haze, it is questionable whether the beacon would have been visible to the crew, thus alerting them to their precarious position in sufficient time for evasive action to be taken.

Although information concerning the climb restriction was available in publication form, a more effective procedure for dissemination of this information would have been the inclusion of the restriction in the departure instructions issued by ARTC. This procedure was adopted subsequent to the accident, at this facility.

The rate of acceleration and rate of climb of the aircraft would have been increased had the cowl flaps been properly set at four degrees instead of 22 degrees. However, the increase would not have been sufficient in itself to cause the aircraft to clear the obstructing terrain.

The Board believes the aircraft powerplants were capable of producing required power and were, in fact, delivering approximately 1,900 brake horsepower each at impact. Because of a slight variance in the r.p.m. of the engines, it is believed that the first power reduction to METO had just been completed prior to impact and the engines had not yet completely stabilized.

All of the evidence conclusively indicates that the aircraft did not collide with any object (other than the mountain), nor was there any in-flight fire or structural disintegration prior to initial impact. All the systems of the aircraft are believed to have been operative prior to impact.

Probable Cause

The Board determines that the probable cause of this accident was the failure of the pilot to comply with published departure procedures applicable to runways 6 left and 6 right.

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 on September 18, 1960, although the accident occurred on the other side of the International Date Line, on September 19, 1960. An investigation was immediately initiated in accordance with the provisions of Section 702(a)(2) of the Federal Aviation Act of 1958. An investigating team departed immediately for Guam and conducted the investigation at the scene over a period of nine days. Depositions were taken on Guam on September 29, 1960, and in Oakland, California, on November 30, 1960.

### Flight Personnel

Captain Rudy J. Holman, age 46, possessed an airline transport pilot certificate with a type rating in Douglas DC-6 aircraft. He had a total pilot time of 15,681 hours, of which 2,548 were in the DC-6. He had approximately 713 hours of instrument time and 6,343 hours of night flying time. His last six months' proficiency check in the DC-6 was successfully completed August 20, 1960, and he held a valid Class I medical certificate with no limitations.

First Officer Clayborne P. Claunch, age 31, held a commercial pilot certificate with AMEL, ASEL, and DC-4 ratings. His total pilot time was 6,317 hours with 217:11 hours in DC-6s. During the 90 days preceding this accident he had flown DC-6s for 208 hours. His total instrument time was 266 hours and his total night time was 4,617 hours. His last medical examination was passed on February 1, 1960, for Class I without limitations.

Flight Engineer Robert E. Davis, age 29, held all requisite certificates and ratings. His total time as flight engineer was 5,554 hours, of which 748

hours had been in DC-6s. In the last 90 days he had flown 216 hours in the DC-6. He passed his last Class I medical examination on March 21, 1960, without limitations.

Navigator Edgar W. Schwoyer, age 27, had a total time as navigator of 3,638 hours, of which 258 had been in the DC-6. In the last 90 days he had 201 hours in DC-6s. His last Class II medical examination was passed, without limitations, on November 2, 1959.

There were three stewardesses: Diddy H. Kaeger, Caroline Yates, and Patricia Ellis. An additional crew member was Gerald Pease of the FAA.

#### The Carrier

World Airways, Inc., is a Delaware corporation with headquarters at the Oakland International Airport, Oakland, California. The company holds a certificate of public convenience and necessity issued by the Civil Aeronautics Board authorizing the company to engage in supplemental air transportation and an operating certificate issued by the Federal Aviation Agency.

#### The Aircraft

N 90779 was a Douglas DC-6AB manufactured January 9, 1956, under serial No. 44914. A No. 4 block overhaul was completed at aircraft total time of 10,398 hours on October 4, 1959, at Tulsa, Oklahoma, prior to the aircraft's sale to World Airways by American Airlines. It was converted from a DC-6A (cargo) to a DC-6AB (passenger/cargo) by Air Research Aviation Corporation, Los Angeles, California, April 14, 1960, at an aircraft total time of 11,631:26 hours. At that time, its time since overhaul was 1,233:12 hours. Certification

of the aircraft was accomplished at this time. At the time of the accident it had accumulated a total of approximately 12,746 hours.

The engines were Pratt & Whitney, Model R2800-CB-17. All four had been overhauled within prescribed time limits. The propellers were Hamilton Standard, Model 43E60. All four had been overhauled within prescribed time limits.