

14(a)

File No. 2-0106

CIVIL AERONAUTICS BOARD

AIRCRAFT ACCIDENT REPORT

ADOPTED: August 4, 1959

RELEASED: August 8, 1959

REPUBLIC ALOUETTE II HELICOPTER, N 526, IN THE  
GULF OF MEXICO NEAR LAKE CHARLES,  
LOUISIANA, DECEMBER 2, 1958

SYNOPSIS

An Alouette II helicopter, N 526, owned and operated by Petroleum Helicopters, Inc., crashed in the Gulf of Mexico approximately 25 miles south-southwest of Cameron, Louisiana, in the early afternoon of December 2, 1958. The pilot and the three passengers received fatal injuries. The aircraft was a total loss from impact damage and subsequently salt water corrosion.

N 526 was used to transport personnel and supplies to various offshore drilling platforms in the Gulf of Mexico under a contract between Petroleum Helicopters, Inc., and the Shell Oil Company. On December 2, four normal flights were completed in accordance with this purpose. During the fifth, about eight minutes after a normal takeoff, the helicopter crashed in the Gulf.

Following an exhaustive search the wreckage was located in the water six miles from its takeoff point and on course for Cameron. The time of the accident was approximately 1320 c. s. t.

On the basis of all available evidence the Board believes the accident resulted from mechanical difficulty. Although the nature of the problem could not be shown by physical evidence, it is believed that binding of the swashplate bearing assembly may have been the cause.

Because binding of the swashplate bearing had occurred on this and other Alouette II helicopters previously, a redesign of the unit was under way at the time of the accident. Since then the redesigned unit has been approved and installed on all Alouette II helicopters of U. S. registry.

The FAA has taken corrective action by issuing Airworthiness Directives 59-2-3 and 59-5-6 which require replacement of the swashplate oilite bearings and spacer with redesigned oilite bearings and spacers; safetying of the lateral trim cylinder cap nut; a rework of the emergency fuel shutoff lever; and lubrication of the swashplate assembly every five hours.

Investigation

N 526 had been dispatched from Morgan City, Louisiana, to an oil drilling rig located in the Gulf of Mexico. It departed the Morgan City Heliport at

1135<sup>1</sup>/<sub>1</sub> and arrived at the rig, located in an area known as Block 82, at 1240. The flight was without incident and the aircraft did not require refueling at the rig. This type of offshore flight is customarily flown at 500 feet altitude in accordance with established company practice.

At approximately 1314 the company radio at Cameron received a message from N 526 advising that the flight left the rig at 1312 and was estimating Cameron Heliport at 1345. A call to the flight was made at 1335 by the company radio but was not answered. Another company helicopter, N 5166B, was directed by radio to proceed to Block 82 and check on N 526. After it reported that N 526 was not on the platform at Block 82, it was ordered to take a direct course from Block 82 to Cameron Heliport. After flying this course about five to seven minutes the pilot sighted a large oil slick and two helicopter floats in the water. Closer investigation revealed two persons in life jackets floating face down. (Life jackets are customarily worn by passengers and pilots during offshore flights.) He was unable to land because of high swells but hovered over the area directing to the scene a boat whose crew subsequently picked up two bodies and floating helicopter wreckage. The two men, identified as passengers, were examined by a doctor and pronounced dead. Their injuries were multiple and severe, indicating violent impact.

Weather at the time was: Ceiling unlimited; visibility unrestricted except for patches of haze, at least 5 miles of visibility at all times; wind north 5-10 m. p. h.; sea condition 3- to 4-foot swells; Lake Charles barometer 30.16 inches.

Search operations began on December 3, 1958; however, the main wreckage was not located until December 11 when it was found by U. S. Navy minesweepers and divers at a point 25 miles south-southeast of Cameron (Lat. 29 degrees 27' N., Long. 93 degrees 06' W.) and approximately on course. Bodies of the pilot and third passenger were found with the wreckage. The following day all major components of the helicopter were recovered and taken to the company base at Lafayette, Louisiana.

The shock damper tubes connecting the center fuselage structure and the float assembly cross tubes had failed in compression as though from a hard level landing. Damage to the tail boom and tail rotor was also indicative of a dipping of the tail rotor in the water.

Except for these failures, all other damage appeared to have resulted from a second and much more severe impact with the water while the aircraft was in an inverted attitude. Nearly all damage was consistent and indicated that the helicopter was traveling primarily downward with a slight forward speed and some rotation to the right (as viewed from above).

Relative to the aircraft's normal attitude, the cabin overhead structure, back, and sides were crushed downward, slightly aft, and to the right. The two front seats were broken downward and to the rear. The fuel tank was forced upward and forward from the inertia of the fuel and the seams near the top had burst. One main rotor blade sleeve was broken downward and all three blades had overtraveled downward. The top of the engine combustion chamber housing, tailpipe, and sheet metal accessory covers were crushed in by water

impact. The horizontal stabilizers were both bent downward and showed severe hydraulic forming on the upper surfaces. The float assemblies were torn from the helicopter and away from the fuselage but were only slightly damaged.

The entire airframe was studied in an attempt to find pre-impact damage, to relate damage patterns, and to separate impact from recovery and handling damage. All functional units were disassembled and carefully examined. No evidence of pre-impact damage to, or failure of, the mechanical and structural components was found during the study of the wreckage. The mechanical linkage in the flight control systems was studied and all failures in the systems were determined to have resulted from impact forces and the breakup of the helicopter. The components of the swashplate bearing assembly (star assembly) were examined for evidence of binding but none was found. No evidence of pre-impact mechanical interference or jamming was found on any of the control system components.

On January 17-18, 1959, the star assembly, with its uniball and bearing cones, was operated in a test jig to see if there was any inherent tendency for the unit to bind. This was done because binding had occurred on another star assembly installed on N 526, and had also occurred on other Alouette II helicopters in service. Binding in the unit endangers the control of the helicopter and could conceivably make the helicopter uncontrollable if the binding were severe since it causes the cyclic stick to rotate in a circle at rotor r. p. m. Binding also prevents the pilot from sending an emergency radio message since the microphone button is located on top of the cyclic control stick. No binding tendency was noted in the test run of 10 hours; however, the test rig did not exactly simulate inflight loads on the star assembly. It should be noted that the previous known occurrences of swashplate bearing binding left no detectable evidence of the malfunction on the parts involved.

An examination and teardown of the turbine engine disclosed no indication of an inflight structural failure, operational difficulty, or indication of fire prior to or subsequent to the accident. However, examination indicated that the engine was not developing appreciable power at the final impact.

Damage to the emergency fuel shutoff valve control linkage was such as to indicate the valve was halfway between open and closed at the time of impact. In this position, the engine would not receive fuel and an immediate flameout would result. The emergency fuel shutoff valve control is located on the cockpit floor between the two pilot seats. It is a lever which is vertical when the valve is open. Rearward motion closes the valve. It is readily accessible to the occupant of either pilot seat. As a result of this accident the manufacturer has modified the control to prevent inadvertent movement of the lever.

Pilot McCann had nearly 2,400 hours of helicopter pilot flight time, as well as over 1,000 hours of fixed-wing pilot flight time, and had acted in supervisory capacities for Petroleum Helicopters, Inc.

Petroleum Helicopters, Inc., has an extensive background of helicopter operation in various parts of the world. The company was organized in 1949 and pioneered the use of helicopters in the offshore transportation of personnel and material. It operates in excess of 3,000 hours of helicopter time a

month and since the start of its operation has transported nearly a million passengers. During the fiscal year of 1958 it operated as many as forty-six helicopters and is currently operating thirty-eight.

### Analysis

It is most likely that the helicopter was at its customary cruising altitude of 500 feet when difficulty started. If such were the case the pilot would in all probability lose no time in making an immediate descent and landing. The precise manner of descent from 500 feet cannot be learned inasmuch as there were neither witnesses nor survivors. However, the failure pattern found in the shock strut tubes is indicative of a level and skipping type of landing prior to the inverted impact. Substantiation of such a hard level landing is evidenced by the failure of the tail boom downward at the forward attach lugs allowing the tail rotor to strike the water while rotating, which bent the blades inward, causing one to strike and break the upper right tail boom longeron. Damage from water impact along the upper side of the helicopter indicated a severe, inverted, nearly vertical impact with slight forward motion and clockwise rotation (as viewed from above).

Since a skipping contact preceded the inverted impact, it is essential that there was enough energy in the rotor system to enable the helicopter to regain an altitude of 50 feet or more to cause the existing degree of water damage on impact. This indicates that the helicopter had normal rotor r. p. m. (and possibly power) or excess forward speed at the time of the initial skipping contact. The inverted final impact is believed to have been the consequence of applying up-collective pitch to reduce the rate of descent and losing the tail rotor. With the loss of the tail rotor the helicopter would rotate in a direction opposite to that of the main rotor. Because of damage sustained by contact with the water, a severe pitch down could occur while the fuselage was facing opposite to the line of flight with the aircraft then becoming inverted.

An occurrence of swashplate bearing binding fits well with the known circumstances in this accident since such binding, particularly if severe, makes cyclic control extremely difficult. On approaching the water, if the pilot were unable to get hold of the cyclic stick well enough to flare out effectively, he would move the collective up rather abruptly to break the descent and the fuel control unit would respond so that the engine would be developing full power at the time of the first water contact. Power would cause a rapid yaw, swinging the tail ahead after the tail rotor failure, and help provide the energy required to get the crippled helicopter up to an altitude sufficient to cause the damage resulting from the final inverted water impact. During this maneuver the passenger in the front left seat could accidentally have grasped the emergency fuel shutoff lever, thus accounting for the valve being found in the partially closed position and the aircraft having struck the water with little power.

### Conclusions

From the available evidence the Board concludes that the helicopter first contacted the water while upright with little or no control because of cyclic control difficulty of unknown nature and origin. The tail boom was damaged and the function of the tail rotor was destroyed at this time but there

remained sufficient speed and main rotor r. p. m. to lift the aircraft a considerable distance before it became inverted and fell to the surface.

Considering the past record of swashplate bearing binding, and evidence that no other malfunction or failure occurred, the Board concludes that this probably did occur and caused the accident. Previous instances of swashplate bearing binding left no detectable evidence on the parts involved and therefore no detectable evidence of binding would be expected in this case.

As a result of these investigations, it became apparent that certain changes should be made to this make and model helicopter. These were: (1) to filter or protect the vent air openings of the lateral trim bungee unit to prevent jamming of the piston by foreign objects, and (2) to prevent binding of the swashplate bearing assembly. Accordingly, the FAA, which participated in the accident investigation, in a telegram dated January 9, 1959, to all FAA Regional Administrators, required immediate compliance with the following Republic Aviation Corporation Service Bulletins:

(1) Service Bulletin No. 3.45-1 to prevent inadvertent loosening of the lateral trim cylinder cap nut.

(2) Service Bulletin No. 8.10-3 specifying rework of the emergency fuel shutoff lever to prevent accidental closing of the valve during flight.

(3) Service Bulletin No. 732-2 to insure positive and adequate lubrication of the main rotor swashplate assembly.

In addition, the telegram requested compliance with Republic Aviation Corporation's instructions for increasing the clearance of the swashplate ball joint assembly. On March 9, 1959, the FAA issued Airworthiness Directive 59-5-6, superseding AD 59-2-3 (which covered FAA January 9 telegraphic instruction) which required replacement of the swashplate oilite bearings and spacer with redesigned parts.

#### Probable Cause

The Board determines that there is insufficient evidence on which to base the probable cause of this accident. However, circumstances suggest swashplate bearing failure resulting in loss of control by the pilot.

BY THE CIVIL AERONAUTICS BOARD:

/s/ JAMES R. DURFEE

/s/ CHAN GURNEY

/s/ HARMAR D. DENNY

/s/ G. JOSEPH MINETTI

/s/ LOUIS J. HECTOR

## S U P P L E M E N T A L   D A T A

### Investigation

The Civil Aeronautics Board was notified of the accident at 1400 c.s.t., December 2, 1958. An investigation was immediately begun in accordance with the provisions of Section 702 (a), (2), of the Civil Aeronautics Act of 1938, as amended. Depositions were taken at Lafayette, Louisiana, January 29, 1959.

### Owner and Operator

The aircraft was owned and operated by Petroleum Helicopters, Inc., of Lafayette, Louisiana, and was under contract to the Shell Oil Company, (Off-shore Division). N 526 was used to transport personnel and supplies to various offshore oil drilling sites in the Gulf of Mexico, operated by the Shell Oil Company.

### The Aircraft

N 526, a Republic Aviation Corporation Alouette II helicopter, serial No. 1139, was manufactured in 1958, and was received by Petroleum Helicopters, Inc., on June 19, 1958. The engine, a Turbomeca Artouse, single shaft gas turbine, serial No. 392, was installed new on N 526 on September 11, 1958, and had a total time of 171:50 since manufacture. The three main rotor blades, serial numbers 911, 915, and 916, were installed on November 8, 1958, and had a total time of 61:30 hours. The two tail rotor blades, serial numbers 904 and 905, were installed on November 1, 1958, and had a total time of 74:15 hours. The helicopter had a total time of 410:40 hours with no overhauls. The swashplate - #4 - had a total time of 190:05 hours.

### Pilot

Robert Elton McCann, age 34, was employed by Petroleum Helicopters, Inc., on April 16, 1956. He held a currently effective airman certificate with commercial pilot and helicopter ratings. His flying hours totaled 3477:30, of which 2352:30 were in helicopters, and 37:00 hours in Alouettes. His last Class II physical examination was passed on April 25, 1958. His helicopter flying time last 30 days was 28:50 hours.