

WPR18FA188 - Examination Notes

Wednesday, August 29, 2018
9:00 AM

National Transportation Safety Board Office of Aviation Safety Washington, D.C. 20594

A. ACCIDENT:

Location:	Central Pacific Ocean
Date:	4 July 2018
Aircraft:	N8648F / MDHI 369D

B. EXAM LOCATION & PARTICIPANTS:

Marshall Islands International Airport
VSC hangar
Majuro Atoll, Marshall Islands

NTSB	Van McKenny Aerospace Engineer (Helicopters) Washington, DC
MD Helicopters	Joan Gregoire Chief Air Safety Investigator Mesa, AZ
Boeing	John Hobby Air Safety Investigator Mesa, AZ
Rolls Royce	Jon Michael Air Safety Investigator Indianapolis, IN
Directorate of Civil Aviation	Alice John Principal AVSEC/FAL/AGA Inspector Majuro, Marshall Islands
Vertol Systems Company (VSC)	Craig Keighley Operations Manger Tigard, OR

C. ACCIDENT SUMMARY:

On July 4, 2018, about 2114 Universal Coordinated time, a Hughes 369D helicopter, N8648F, impacted international waters in the Pacific Ocean about 20 seconds after takeoff from a Taiwan-registered fishing boat. The commercial pilot and the observer received fatal injuries. The helicopter was destroyed by the impact and salt water immersion. The helicopter was registered to Vertol Systems Company of Hillsboro, Oregon, and operated as a 14 Code of Federal Regulations Part 91 aerial observation flight. Visual meteorological conditions existed about the time of the accident.

The wreckage was recovered onto the fishing boat, which then transported it to a Vertol Systems Company (VSC) facility on the atoll of Majuro in the Marshall Islands; that landfall occurred about 4 days after the accident. The wreckage was rinsed with fresh water after it was brought ashore and placed in a humidity controlled shipping container.

A low-definition surveillance video on the fishing boat captured the helicopter's liftoff and the accident but did not capture the intervening flight. The weather was clear, and the sea appeared relatively glassy.

D. VIDEO OBSERVATIONS

The members of wreckage examination group reviewed the shipboard video. The following observations and comments were made.

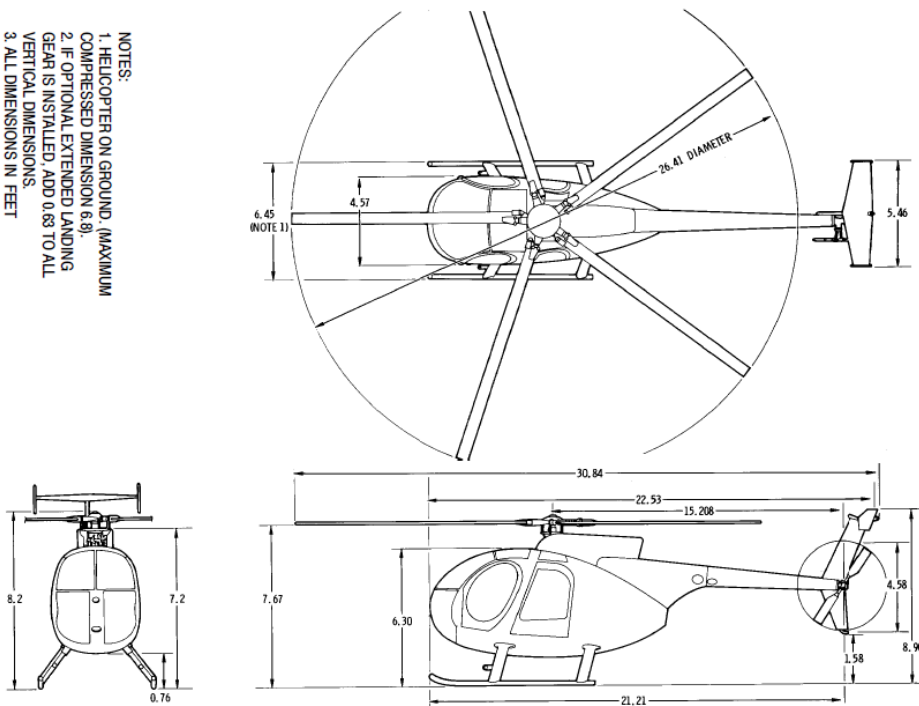
- The helicopter is positioned on a helicopter landing deck located over the ship's bridge. The pilot side door is off. The landing deck height is estimated to be 40 feet above the water (operator's representative who is familiar with the ship stated the deck is about 40 feet above the water).
- The sea state was calm. The water surface appears glass like. The ship's bow does move vertically in reaction to slight ocean swell.
- Some equipment covers on the ship move in reaction to wind, however, wind direction could not be determined from the video.
- The helicopter is facing about 45° to the port from the ships bow and lifts off into an immediate descending right turn of about 90° of heading change, crossing the front of the ship from port to starboard (left to right).
- The helicopter exits the camera field of view to the starboard (right) and its altitude appears to be below the level of the ship's helicopter landing deck.
- The helicopter re-enters the camera field of view on the upper right of the frame.
- It is traveling from right to left at a low level. Ripples on top of the water surface appear behind the helicopter as it travels from right to left in the picture frame. The helicopter appears to be in a shallow descent.
- A float appears to skim the water and then immediately the helicopter noses over in to the water in front of the ship. The helicopter is upside down and completely submerged.
- The ship immediately turns to the port, away from the helicopter splash point.



Figure 1 - Ship with Similar Flight Deck

E. DETAILS OF THE EXAMINATION

- NOTES:
 1. HELICOPTER ON GROUND, (MAXIMUM COMPRESSED DIMENSION 8.8).
 2. IF OPTIONAL EXTENDED LANDING GEAR IS INSTALLED, ADD 0.63 TO ALL VERTICAL DIMENSIONS.
 3. ALL DIMENSIONS IN FEET



AIRFRAME

The helicopter was stored in a temperature and humidity controlled conex box and secured with a lock on the conex doors. The skids and floats had been removed and the rear landing gear struts depressurized to facilitate placement of the helicopter in the conex.

The helicopter was pulled out of the conex box and placed in to the VSC hangar for the wreckage examination. The rear landing gear struts were repressurized, so the helicopter sat in its normal ground attitude.



Figure 2 - In Conex



Figure 3 - In Operator's Hangar

Model: 369D	SN: 180257D
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- The front left cockpit door was not present. The hinge pins were in place.
- A rotor blade tip (white blade) was wedged into the fuselage above the left door frame.
- Skin buckling was observed on the upper aft left side of the cockpit enclosure near the canted station 78.50 bulkhead.
- The left main cabin door was closed and latched, the window plexiglas was not present.
- A portion of the tail boom remained attached to the fuselage. The aft part of the tail boom, including the tail rotor, tail rotor transmission, and vertical and horizontal stabilizers, had separated from the tail boom and was not present. It was presumed separated and lost during the accident sequence.
- The tail rotor drive shaft and control tube were present in the tail boom up to the location of the tail boom separation.
- Crush and deformation of skin was observed along the upper portion of the aft fuselage and tail boom fairing.

- The engine inlet fairing had separated from the airframe; the right-side had been recovered with the helicopter.
- The entire engine air inlet screen or particle separator was not present.
- Both engine bay doors were attached at their hinges.
- The right-side main cabin door was closed and latched. The window plexiglas was not present.
- The right-side copilot door was not present. The hinge pins were in place.
- The right- side copilot door frame was buckled inward. A witness indentation was located on outer edge of the cockpit deck. The door frame had a creased deformation at the forward center. Black paint transfer marks were identified on the upper portion of the door frame area.
- The center windscreen bow was fractured about pilot head level. Windscreen plexiglass was not present for either pilot or copilot sides.
- The left, right, forward, and aft landing gear struts and braces were attached to the fuselage with no apparent damage to the attachment structure.
- The right front landing gear strut was bowed and displaced slightly inward.
- A fuel sample was taken from the fuel tank sump. The sample was clear, straw colored, and no contamination or water was visible. 23 gallons of fuel was drained from the aircraft.

COCKPIT

The cockpit appeared in good condition. The windscreen Plexiglas was not present. Occupiable space for the pilot (left side) appeared to not have been compromised.

- Flight controls were installed on the left side, configured for left hand command. Right side controls had been removed.
- Collective twist grip was in the fly position. The twist grip control continuity was confirmed to the engine fuel control unit.
- The left pedal was fully displaced and right pedal was full forward. [This is normal]
- The station 44.65 bulkhead and pedal attachment bracket appeared undamaged.
- The cyclic stick was about 3/4 forward and centered laterally.
- The instrument panel was separated at the base.
- No seat pan deformation of either the left or right seats was observed.

Hobbs	2976.4
Clock	7:03
Airspeed	130 kts
VSI	4,000 fpm climb
Altitude	-400 ft / 29.80 inHg
N2	0
Nr	0
ToT	120° C
TQ	0

N1	0
Amps	~15
Oil Pres	Off scale
Pitot Heat	OFF
Util Pwr	OFF
Start Pump	ON
Gen	ON
Pos Lt	OFF
Transponder	OFF / 1200
OFF/ON key	ON
Auto Ign	OFF
Bat	ON
Popped Circuit Breakers	ICS, Conv Pwr, 2 FM
Fuel Valve Handle	IN (open)

Radios

VHF Marine	IC-M424G / GPS
Standard Horizon Explorer	FM
VHF	Comm
iCom GPS	ED-5100
ELT - operator reported that the ELT was transmitting when the helicopter was recovered.	Kanniad 406 AF SN: 263754

Pilot Seat Harness

- 4-point harness with lift buckle
- Lap belt had been cut by shipboard personnel
- Harness webbing connected to inertia reel. Inertia reel locked when webbing was rapidly pulled.
- Web belt stitching was undamaged. No visible signs of webbing overload.

Copilot Seat Harness

- 4-point harness with lift buckle
- Lap belt had been cut by shipboard personnel
- Harness webbing connected to inertia reel. Inertia reel locked when webbing was rapidly pulled.
- Web belt stitching was undamaged. No visible signs of webbing overload.

MAIN ROTOR/ROTOR HEAD



Figure 4 - Rotor Head



Figure 5 - Rotor Head

- The main rotor hub was attached to the main rotor drive shaft, which remained within the static mast and splined into the main transmission.
- Red pitch housing
 - Pitch arm was fractured from the pitch housing
 - Pitch link was attached to swashplate
 - Pitch housing was attached to the strap pack assembly
 - Pitch control bearing housing was fractured
 - Lead-lag links were attached & undamaged
 - Rotor blade retention pins were in place
 - Blade was in an extreme lag position
 - Elastomeric damper not present
 - The entire red blade wrapped around rotor head 1 3/4 times
- White pitch housing
 - Pitch link rod end was fractured at swashplate and bent
 - Rod end at pitch housing was attached.
 - Pitch control housing was fractured
 - Strap pack assembly was intact
 - Lead-lag links were undamaged
 - Blade retention pins were in place.
 - Elastomeric damper was attached to blade
 - Entire white blade was wrapped around rotor head 2 times
- Blue pitch housing
 - Strap pack assembly was fractured at the upper hub
 - Pitch housing and blade was not recovered

- Lead-lag links were not recovered
 - Pitch change link was attached to the rotating swash plate
 - Blue blade was not recovered
- Yellow pitch housing
 - Pitch change link was fractured at pitch link bearing
 - Pitch control housing was fractured
 - Strap pack assembly was intact
 - Lead-lag links were intact
 - Elastomeric damper was fractured at clevis
 - Damper clevis was attached to yellow blade
 - Yellow blade section was 32 inches long and bent 90° aft of root fitting doublers. Remaining section of blade not recovered.
 - Blade pins were attached.
- Green pitch housing
 - Pitch housing, lead-lag links and blade was not recovered.
 - Blade pins were not recovered
 - Strap pack assembly was fractured at upper hub
 - Pitch link fractured at lower swash plate pitch link bearing

ROTOR BLADES

- Red - entire blade wrapped around rotor head 1 3/4 times.
- White - entire blade wrapped around head 2 times
- Blue - blade was not recovered
- Yellow - 32 inches of blade attached to rotor head.
- Green - blade was not recovered

TAIL ROTOR

Not present with the wreckage

- Tail rotor drive shaft extended 117 inches aft from the main transmission mount.
- Circular scoring was identified at the 67 inch and 97-inch locations
- A 3-inch dent was located at the 91.5 inch location
- The damper sleeve was present and undamaged.

FLIGHT CONTROLS

- Tail Rotor/Pedals
 - Antitorque pedals were free to move.

- Continuity established from pedals to the upper end of the tunnel routed control tube. Upper rod end was fractured just below the rod end sleeve.
- Upper bell crank was not recovered.
- Tail rotor control tube fractured just aft of main transmission. Components between the upper control rod and the tail rotor control rod were not recovered.
- Tail rotor control rod was continuous from immediately aft of the main transmission to the remaining end of the tail boom.
- Cyclic Controls
 - Cyclic stick connected to the lateral lower control tube and the lower bell crank
 - Lateral lower bell crank was fractured at the tunnel routed control rod.
 - Upper end of the upper control tube was fractured below the rod end sleeve.
 - The rotor head lateral bell crank was present. The bolt holes that attach the links to the stationary swash plate were fractured
 - The longitudinal link was attached to the stationary swash plate and separated from the longitudinal bell crank.
- Collective
 - Collective control was verified up to the top of the tunnel routed control tube.
 - Upper control tube was fractured at the upper rod end sleeve.
 - End of rotor head collective bell crank was fractured and missing.

TRANSMISSION

Model No: 369D25100-901	SN: 0889
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- The engine to transmission drive shaft was connected. No distortion of the KA flex couplings was evident. KA Flex coupling bolts were torque marked
- The freewheel unit was removed. When engaged by hand, the freewheel unit turned smoothly in one direction and locked in the other direction.
- The transmission case was damaged by salt water corrosion/disintegration.
- All four anchor bolts attached the transmission to the airframe.
- The transmission was seized and could not be turned by hand.
- The rotor head was removed and the vertical shaft splines that mate the rotor head to transmission appeared undamaged.
- The tail rotor drive shaft was connected to the main transmission output pinion.

ENGINE

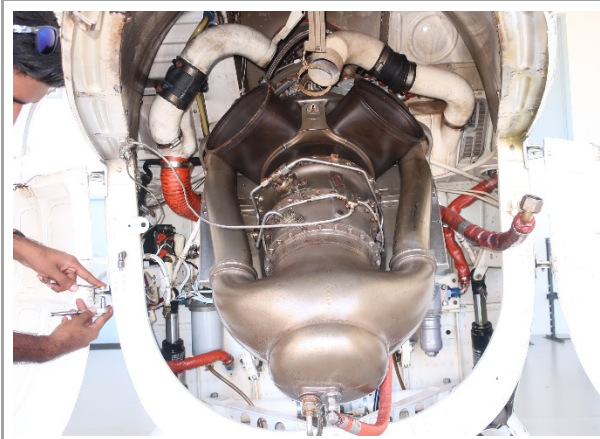


Figure 6 - Engine



Figure 7 - Engine FCU Setting

Model: Rolls Royce 250-C20B	SN: 833577 (no data plate)
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- Engine was securely mounted with evidence of external damage.
- FCU was in the fly setting of the throttle input lever.
- Power turbine governor linkage was continuous to the collective and moved freely
- N1 rotor was frozen
- N2 freewheeled in opposite direction of drive, would not turn in the drive direction
- Compressor inlet and first stage wheel showed no foreign object damage
- 4th stage turbine wheel was undamaged
- All fuel lines contained fuel
- Pressure and scavenge oil filters were clean
- Airframe and engine mounted fuel filters were clear of contaminants
- Fuel samples were retained from both fuel filters
- Oil sample was retained from the oil scavenge filter
- Upper or lower chip detectors had no ferrous material
- Engine was field disassembled with no pre-event abnormal conditions noted
- Vacuum check was performed on fuel system, no leaks detected.
- All external line connections were secure

FLOATS

- Type/Manufacturer: Apical
- The skids and floats had been removed by the operator to facilitate placement into the storage container.
- Right float had separated from the forward portion of the landing skid. The remaining section of the float had remained attached to the skid.
- Left float had remained attached to the landing skid. The aft skid extension had separated from the main skid.

- The inner lobe of the left float had a tear at the aft end.