



Aviation Investigation Final Report

Location:	Majuro,	Accident Number:	WPR18FA188
Date & Time:	July 4, 2018, 21:14 UTC	Registration:	N8648F
Aircraft:	Hughes 369	Aircraft Damage:	Destroyed
Defining Event:	Unknown or undetermined	Injuries:	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Aerial observation		

Analysis

The pilot was employed by a US company that leased the helicopter and the pilot's services to a Taiwanese fishing ship. The pilot and the turbine-powered, float-equipped helicopter were stationed on the ship, and a Taiwanese observer provided fish-spotting services. No helicopter maintenance personnel were stationed on the ship.

Most of the brief flight was captured by a shipboard surveillance camera. The camera faced forward, with a field of view that included the helicopter on the landing platform, as well as the ocean surface forward of and on both sides of the ship. The ocean surface appeared glassy, with only slight swells and no waves. According to the Federal Aviation Administration, the visual aspects of glassy water make it difficult to judge an aircraft's height above the water, and the smooth, reflecting surface can lead to confusion.

The helicopter lifted off and immediately entered a right descending turn, flying out of view on the right side of the image. Several seconds later, the helicopter re-entered the field of view via the upper right image frame. The helicopter was traveling nearly horizontal from right to left at an altitude that was sufficiently low for visible ripples to form on the water surface behind the helicopter. The helicopter struck the water, overturned, and remained afloat inverted. Skiff boats responded to the accident location within minutes, and both helicopter occupants, who were still strapped into their seats, were recovered but unable to be resuscitated.

Most of the helicopter, absent the tail boom and several main rotor blades, was recovered from the water, transported to shore, and examined two months later.

Subsequent recovery and examination of the helicopter revealed no evidence of any mechanical anomalies that would have prevented continued flight above the water surface. Main rotor blade damage signatures indicated that the engine was providing significant power at the time of water impact.

Two days before the accident, the helicopter, which had been parked outside on the ship's landing platform, was exposed to a significant storm. Afterward, the pilot initially had some difficulty starting the engine because it had too much water in it. These difficulties, which included the expulsion of oil and smoke from the engine during the start attempts were resolved, and the pilot conducted a subsequent flight (before the accident flight) that lasted 1.5 hours. The oil and smoke were likely the result of a stuck check valve in the engine oil system, which would not have affected engine operation.

The pilot's toxicology results indicated the presence of a sedating antihistamine that can reduce reaction time. The pilot's impairment, if any, from this medication could not be determined given the detected level of medication. However, it is possible that the medication affected the pilot's reaction time, which was especially critical given that the glassy, nearly featureless ocean surface could have hampered the pilot's ability to visually determine the helicopter's height above the water surface. This ocean surface condition, either alone or along with a decreased reaction time, could have compromised the pilot's ability to recognize and correct the helicopter's descent toward the water.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to maintain clearance above the surface of the ocean.

Findings

Personnel issues	Monitoring environment - Pilot
Aircraft	Altitude - Not attained/maintained
Environmental issues	Water - Effect on operation
Environmental issues	Water - Contributed to outcome

Factual Information

History of Flight

Initial climb	Unknown or undetermined (Defining event)
Maneuvering-low-alt flying	Collision with terr/obj (non-CFIT)

On July 5, 2018, about 0914 local time (coordinated universal time [UTC] + 12 hours), an MD Helicopters (Hughes) 369D helicopter, N8648F, impacted the Pacific Ocean near the Republic of Nauru in the Marshall Islands about 20 seconds after liftoff from a Taiwan-registered fishing ship. The commercial pilot and the non pilot-rated observer (who was the designated fish-spotter) received fatal injuries. The helicopter was destroyed by impact forces and salt water immersion. The helicopter was registered to Vertol Systems Company (VSC) of Hillsboro, Oregon, and operated as a Title 14 *Code of Federal Regulations* Part 91 aerial observation flight. Visual meteorological conditions prevailed at the time of the accident. No flight plan was filed for the flight, which was originating at the time of the accident.

There were no known recorded communications between the helicopter and the ship before or during the accident flight. A forward-facing surveillance video camera on the ship captured the helicopter's liftoff and water impact. The permanent-type float-equipped helicopter was positioned on the ship's landing platform, which was about 40 ft above the waterline. The sky was clear, the sea state was calm, and the water surface was glassy in appearance, with no waves and minimal swells. While on the platform, the helicopter faced about 45° to port (left). The left-side of the helicopter was visible and revealed that the left cockpit door was not installed. The helicopter lifted off and began an immediate descending right turn of about 90° heading change and disappeared off the right edge of the image frame. It then re-entered the image frame, traveling from right to left, well ahead of the ship's bow. The helicopter was sufficiently low that it left visible disturbances on the water surface behind it. While still flying forward, the helicopter contacted the surface of the water and immediately nosed over into an inverted position. The wreckage remained afloat, but the low resolution of the image prevented any determination of its condition.

The ship captain's statement indicated that two "skiff boats" were dispatched to "rescue" the helicopter occupants. Both occupants were recovered from inside the helicopter, but they were not able to be resuscitated. The wreckage was recovered and secured on the deck of the ship. No other significant details were provided in the ship captain's statement or accompanying incident report. Subsequent documentation showed that the helicopter was placed lying on its right side for transport to shore. About 4 days after the accident, the helicopter was delivered to the VSC facility on the atoll of Majuro in the Marshall Islands. VSC personnel righted and then partially disassembled the helicopter for storage in a temperature- and humidity-controlled shipping container, where it remained until examined by investigators a few months later.

Pilot Information

Certificate:	Commercial	Age:	39,Male
Airplane Rating(s):	None	Seat Occupied:	Left
Other Aircraft Rating(s):	Helicopter	Restraint Used:	4-point
Instrument Rating(s):	Helicopter	Second Pilot Present:	No
Instructor Rating(s):	Helicopter	Toxicology Performed:	Yes
Medical Certification:	Class 2 Without waivers/limitations	Last FAA Medical Exam:	October 17, 2017
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	
Flight Time:	650 hours (Total, all aircraft)		

Other flight crew Information

Certificate:	None	Age:	Male
Airplane Rating(s):	None	Seat Occupied:	Right
Other Aircraft Rating(s):	None	Restraint Used:	4-point
Instrument Rating(s):	None	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	None None	Last FAA Medical Exam:	
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:	9999 hours (Total, all aircraft), 9999 hours (Total, this make and model)		

Federal Aviation Administration (FAA) records indicated that the US pilot held a commercial pilot certificate with rotorcraft-helicopter and instrument helicopter ratings and a flight instructor certificate with a rotorcraft-helicopter rating. Records and information provided by VSC were incomplete. As of November 2016, the pilot had accumulated about 650 hours of total flight experience, including about 428 hours in turbine-powered helicopters. According to information provided by VSC, the pilot began flying for VSC in 2017. VSC did not provide any information regarding the pilot's flight time at VSC. The pilot's most recent VSC "Annual Competency Check" flight review was completed in March 2018, and his most recent FAA second-class medical certificate was issued in October 2017.

Aircraft and Owner/Operator Information

Aircraft Make:	Hughes	Registration:	N8648F
Model/Series:	369 D	Aircraft Category:	Helicopter
Year of Manufacture:	1978	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	180257D
Landing Gear Type:	Float	Seats:	2
Date/Type of Last Inspection:	June 30, 2018 100 hour	Certified Max Gross Wt.:	3000 lbs
Time Since Last Inspection:	2 Hrs	Engines:	1 Turbo shaft
Airframe Total Time:	17560 Hrs as of last inspection	Engine Manufacturer:	Rolls-Royce
ELT:	C126 installed, activated, did not aid in locating accident	Engine Model/Series:	250-C20B
Registered Owner:	Vertol Systems Co Inc	Rated Power:	420 Horsepower
Operator:	Vertol Systems Co Inc	Operating Certificate(s) Held:	None

FAA records indicated that the accident helicopter was manufactured in 1978 and was equipped with a Rolls-Royce (Allison) 250-C20B turboshaft engine. VSC records indicated that as of June 30, 2018, the helicopter had accrued a total time in service of about 17,560 hours, and the engine had a total time of about 15,645 hours. The records also indicated that the accident engine had been removed from another VSC helicopter and installed in the accident helicopter on that date.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	0 ft msl	Distance from Accident Site:	
Observation Time:		Direction from Accident Site:	
Lowest Cloud Condition:		Visibility	10 miles
Lowest Ceiling:		Visibility (RVR):	
Wind Speed/Gusts:	5 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	270°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:		Temperature/Dew Point:	
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Majuro	Type of Flight Plan Filed:	Unknown
Destination:		Type of Clearance:	Unknown
Departure Time:	21:14 UTC	Type of Airspace:	Unknown

Meteorological information provided by VSC included wind speed less than 10 knots, visibility 10 miles, clear skies, and temperature 31° C.

Wreckage and Impact Information

Crew Injuries:	2 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:		Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 Fatal	Latitude, Longitude:	7.110285, 171.179718(est)

The wreckage was examined in Majuro about 2 months after the accident. The fuselage was mostly intact, but most of the tailboom was absent. All four landing gear struts and braces were attached to the fuselage. Crush and skin deformation were observed along the upper portions of the aft fuselage, tailboom fairing, and the upper aft left side of the cockpit. Both aft (cabin) doors were present and attached. Both front (cockpit) doors were absent, and damage patterns were consistent with those doors not being installed for the accident flight. Most windscreen and cabin Plexiglas were absent.

The cockpit retained most of its original volume. The "OFF/ON" key, battery switch, and start pump switch were all set to their respective "ON" positions, and the fuel valve handle was found in its open, fuel on position. No seat pan deformation of either forward seat was observed. Both seats were equipped with four-point harnesses. Both lap belts had been cut, presumably by ship personnel during

rescue/recovery efforts. The harness webbing remained connected to the inertia reels, which operated normally.

Flight controls were installed only at the left cockpit station. Collective control continuity was verified to the top of the tunnel-routed control tube. The cyclic stick was connected to the lateral lower control tube and the lower bell crank, but the upper ends of the control tubes were fractured. The antitorque pedals remained attached and free to move. Continuity was established from the pedals to the upper end of the control tube.

Most of the tailboom, including the tail rotor, tail rotor transmission, and vertical and horizontal stabilizers, had separated from the helicopter and were not recovered. Both the tail rotor drive shaft and the tail rotor pitch control tube were truncated at the location of the tailboom separation.

The main rotor hub remained attached to the main rotor drive shaft, which remained splined into the main transmission. The helicopter had five main rotor blades. The red and white main rotor blades were wrapped around the rotor head multiple times. A 32-inch section of the yellow main rotor blade remained attached to the hub; the remaining section of the blade was absent. The blue and green main rotor blades were absent.

The main transmission was securely attached to the airframe, but was damaged by saltwater corrosion, and mechanically seized. No metal particles were observed on the transmission chip detectors. The engine-to-transmission drive shaft remained connected at both ends. The tail rotor drive shaft remained connected to the main transmission. No distortion or other abnormalities of the KAflex couplings were found. The freewheel unit was removed, and it manually rotated smoothly in one direction and locked in the other direction, consistent with the unit's design.

The engine remained securely mounted to the airframe with evidence of some external impact damage. The oil reservoir was overfilled, consistent with oil migration due to the helicopter being on its side while in transit to Majuro. The scavenge oil filter was clean, and a minor amount of sludge and a black plastic-like fragment were observed on the pressure oil filter element. Both engine chip detectors were free of ferrous material. Separately, the engine oil system was equipped with a check valve that could occasionally become stuck open, and permit oil to enter the engine gearbox. That oil would then be ejected or burned during engine start-up, but this condition would not have any adverse effect on normal engine operation.

Throttle and power turbine governor linkages were both continuous from the collective control to their respective engine components and moved freely. The compressor inlet and first-stage wheel showed no foreign object damage. The N1 rotor did not rotate in either direction. The N2 rotor did not rotate in the drive direction but rotated in the opposite direction. The 4th stage turbine wheel was undamaged. After the turbine module was separated from the gearbox, both the N1 and N2 rotors rotated freely.

All engine fuel line connections were secure, and all fuel lines contained fuel. A vacuum check of the fuel system did not reveal any air leaks. A leak check of the pneumatic system that controls engine power was attempted, but an obstruction in the power turbine governor Pc air input tee prevented a full test. According to the Rolls-Royce representative, this clogging was consistent with saltwater immersion. The engine fuel system components were removed, and the lines were inspected; no cracks

or abnormalities were observed. The airframe and engine-mounted fuel filters had no contaminants. A total of 23 gallons of fuel was drained from the helicopter. A fuel sample was clear and straw colored, with no contamination or water visible.

All observed damage was consistent with water impact and immersion, and/or severing of the tailboom. The airframe and engine examinations did not reveal any pre-impact abnormalities that would have precluded normal operation.

Medical and Pathological Information

No autopsy was conducted on the pilot prior to embalming and transport back to the US. An autopsy was performed by the US Armed Forces Medical Examiner Office at Dover Air Force Base, Delaware. The autopsy report concluded that there was no significant natural disease or trauma, and that the pilot's cause of death was "probable drowning."

Toxicology testing detected the presence of chlorpheniramine, (brand name Chlor-Trimeton) a sedating antihistamine, in the pilot's liver. This over-the-counter antihistamine helps control cold and allergy symptoms and may be used as a sleep aid. This medication can slow reaction times and may impair the mental and/or physical ability required for the performance of potentially hazardous tasks. Because this medication has a long elimination half-life (12 to 48 hours), the FAA recommends waiting 5 days after the last dose to perform airman duties. No other screened drugs of abuse or medications were detected in the pilot's specimens.

Organizational and Management Information

VSC leased helicopters and pilots to multiple companies, including foreign fishing companies operating in the southern and western Pacific Ocean. VSC had a logistics and maintenance base on Majuro (in the south Pacific Ocean) to facilitate these operations. Helicopters and pilots under contract were stationed on fishing ships, but no helicopter maintenance personnel were stationed on the ships. VSC would provide ship-board maintenance and maintenance personnel on a temporary, as-required basis. According to the available evidence, no VSC maintenance personnel were aboard the fishing ship during the days before or on the day of the accident.

Additional Information

Pilot Text Messages

On the day before and/or of the accident, the pilot exchanged several text messages with his wife. In the text messages, the pilot noted that the helicopter (which was housed outside on the ship's landing platform) would not start because the ship "went through a major rain storm for 2 days and it [the helicopter engine] got too much water in it." He also noted that "there were a lot of dry starts" and that an actual start "didn't go well," resulting in "smoke and oil everywhere." He further noted that the dry starts were "pushing too much oil into the engine so when it finally started all that oil came out." The pilot indicated that the problem had been resolved and that he had subsequently conducted a 1.5-hour flight. Finally, he indicated that he would be "flying again soon."

Glassy Water Operations

The FAA *Seaplane, Skiplane, and Float/Ski Equipped Helicopter Operations Manual* (FAA-H-8083-23) presented information regarding landings on glassy water. The manual stated, in part, the following:

Flat, calm, glassy water certainly looks inviting and may give the pilot a false sense of safety.... Unfortunately...the visual...characteristics of glassy water hold potential hazards for complacent pilots. Consequently, this surface condition is frequently more dangerous than it appears.... The visual aspects of glassy water make it difficult to judge...height above the water. The lack of surface features can make accurate depth perception very difficult, even for experienced...pilots. Without adequate knowledge of the...height above the surface, the pilot may...fly into the water at relatively high speed.... Besides the lack of surface features, the smooth, reflecting surface can lead to confusing illusions.

The manual also stated that "there are some simple ways to overcome the visual illusions and increase safety" when operating over glassy water, including using nearby objects, such as shorelines or boats, to aid in maintaining depth perception and altitude awareness.

Controlled Flight into Terrain

The FAA defines a controlled flight into terrain (CFIT) accident as one that "occurs when an airworthy aircraft is flown, under the control of a qualified pilot, into terrain (water or obstacles) with inadequate awareness on the part of the pilot of the impending collision." In April 2003, the FAA published Advisory Circular (AC) 61-134, "General Aviation Controlled Flight into Terrain Awareness." According to the AC, it "identifies some, but not all, of the risks associated with GA CFIT accidents, and provides some recommendations and strategies to combat CFIT within the GA community." One of these risks is loss of situational awareness.

The AC defined "situational awareness" as the pilot's knowledge of "what is happening around the aircraft at all times in both the vertical and horizontal planes. This includes the ability to project the near-term status and position of the aircraft in relation to other aircraft, terrain, and other potential hazards."

Administrative Information

Investigator In Charge (IIC): Huhn, Michael

Additional Participating Persons: Clifton Peterson; FAA; Los Angeles, CA
Jon Michael; Rolls-Royce; Indianapolis, IN
John Hobby; Boeing ; Mesa, AZ
Joan Gregoire; MDHI; Mesa, AZ

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Investigation Class: [Class](#)

Note: The NTSB did not travel to the scene of this accident.

Investigation Docket: <https://data.nts.gov/Docket?ProjectID=97687>

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