National Transportation Safety Board
Aviation Accident Factual Report

Location:	Unknown, PO	**Accident Number:**	WPR17LA075
Date & Time:	02/22/2017, 1325 LCL	**Registration:**	N805LA
Aircraft:	HUGHES 369A	**Aircraft Damage:**	Substantial
Defining Event:	Fuel contamination	**Injuries:**	2 Serious
Flight Conducted Under:	Part 91: General Aviation - Aerial Observation		

On February 22, 2017, about 1325 local time, a Hughes (McDonnell-Douglas/Boeing) model 369A helicopter, N805LA, was substantially damaged during an autorotation to the Pacific Ocean, in international waters near Guam. The commercial pilot was seriously injured, and the aerial observer's injuries were reported as "minor." The aerial observation flight was operated by Jim's Air Repair, which was owned by an individual who owned multiple helicopter operations, the largest of which was Hansen Helicopters. The flight was conducted under the provisions of 14 Code of Federal Regulations Part 91, during daylight visual meteorological conditions.

A written accident report was completed and submitted to the NTSB by a representative of Hansen Helicopters. According to that report, the flight was a fish-spotting mission that was operating from a Japanese fishing boat. The report stated that the helicopter had been airborne about 30 minutes, cruising about 1,000 ft above the ocean, when the pilot noticed that a "Generator Light" was illuminated. The report then stated that, in response to the light, the pilot applied friction to the collective control in order to free one hand to reset a switch, and that concurrently, the pilot "felt the helicopter drop suddenly." The pilot noticed that the main rotor rpm was "at the bottom of the green" arc on the cockpit instrumentation. He initiated an autorotation but the helicopter struck the water in what a Hansen representative termed a "hard landing." The main rotor blades severed the tail boom, but the helicopter remained upright and afloat, supported by its utility floats.

The wreckage was recovered to the fishing boat, and subsequently transported to a Hansen Helicopters facility on Guam. On March 13, 2017, representatives from the Federal Aviation Administration (FAA), Boeing, and Rolls Royce examined the wreckage at the Hansen facility.

Pilot Information

Certificate:	Flight Instructor; Commercial	**Age:**	43, Male
Airplane Rating(s):	None	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	3-point
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	Helicopter	**Toxicology Performed:**	No
Medical Certification:	Class 2 Without Waivers/Limitations	**Last FAA Medical Exam:**	01/04/2016
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	07/07/2015
Flight Time:	2936 hours (Total, all aircraft), 1350 hours (Total, this make and model), 2842 hours (Pilot In Command, all aircraft), 120 hours (Last 90 days, all aircraft), 40 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Other Flight Crew Information

Certificate:	None	**Age:**	38, Male
Airplane Rating(s):	None	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	3-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:	0 hours (Total, all aircraft), 0 hours (Total, this make and model)		

The pilot was a US citizen who held FAA Commercial and Flight Instructor certificates. The filed report indicated that the pilot had about 2,936 total hours of flight experience, all of which were in helicopters, and 1,350 hours of which were in the accident helicopter make and model. The pilot's most recent flight review was completed in July 2015, and his most recent FAA second-class medical certificate was issued in January 2016. The medical certificate status reverted to third-class status after 12 months, and per FAA regulations, the pilot could not exercise his commercial privileges for compensation.

NTSB attempts to interview the pilot were unsuccessful; he was still hospitalized and could not be reached telephonically. FAA attempts to interview the pilot in person on March 13 were also unsuccessful; he refused to speak to the FAA without counsel, but was unable or unwilling to provide the name of, or any other contact information for, his counsel. Two days later, the pilot was transferred by air ambulance to the Philippines for surgery related to his accident injuries. The pilot made no subsequent contact with the NTSB.

The observer was a Japanese citizen, and according to a representative of Hansen Helicopters, he had no pilot experience. The observer was evacuated to Japan shortly after the accident, and no NTSB attempts were made to interview him.

Aircraft and Owner/Operator Information

Aircraft Make:	HUGHES	**Registration:**	N805LA
Model/Series:	369A NO SERIES	**Aircraft Category:**	Helicopter
Year of Manufacture:	1969	**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	101355
Landing Gear Type:	Float	**Seats:**	2
Date/Type of Last Inspection:	05/07/2016, 100 Hour	**Certified Max Gross Wt.:**	2550 lbs
Time Since Last Inspection:	400 Hours	**Engines:**	1 Turbo Shaft
Airframe Total Time:	7375 Hours at time of accident	**Engine Manufacturer:**	ALLISON
ELT:	Not installed	**Engine Model/Series:**	250-C10D
Registered Owner:	JIMS AIR REPAIR	**Rated Power:**	317 hp
Operator:	JIMS AIR REPAIR	**Operating Certificate(s) Held:**	None

The helicopter, an OH-6A (Manufacturer's Model 369A, SN 101355) was delivered new to the US Army on February 24, 1970 as US Army SN 69-15985. Hughes Tool Company (HTC), Aircraft Division was the original manufacturer of the helicopter. HTC underwent several ownership (and name) changes subsequent to the production of this helicopter.

FAA registration and airworthiness documentation indicated that the helicopter was powered by a Rolls-Royce (Allison) C250 series turboshaft engine. FAA records indicated that the helicopter was first registered to Jim's Air Repair in August 2009. Jim's Air Repair is based in the country of Vanuatu.

Hansen-provided information stated that the airframe had 7,374.8 total hours of service, that the engine had 2,702.4 total hours of service, and that the engine had accumulated 393.7 hours in service since its most recent overhaul.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:		**Distance from Accident Site:**	
Observation Time:		**Direction from Accident Site:**	
Lowest Cloud Condition:	Clear	**Visibility**	20 Miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	350°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:		**Temperature/Dew Point:**	26°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Unknown, PO	**Type of Flight Plan Filed:**	None
Destination:	Unknown, PO	**Type of Clearance:**	None
Departure Time:	1255 LCL	**Type of Airspace:**	Unknown

The Hansen-provided accident report stated that the weather at the time of the event included winds from 350 degrees at 5 knots, visibility 20 miles, clear skies, temperature 26° C, and daylight conditions.

Wreckage and Impact Information

Crew Injuries:	2 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:	N/A	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Serious	**Latitude, Longitude:**	-1.148611, -146.758333 (est)

Airframe

The investigation team's first contact with the helicopter was about 3 weeks after the accident. The helicopter was examined inside a Hansen Helicopters building, where it was reported to have been stored since shortly after the accident. It was upright, resting on the left utility float, fuselage lower structure, and the right forward and aft struts. The right utility float had been removed from the helicopter during recovery. The four fuselage attach points for the landing gear struts/dampers were severely damaged, with torn skins and fractured structure.

The fuselage sustained extensive impact damage, with the left side more damaged than the right side. The tailboom was separated into at least two sections. According to the Hansen

Helicopters report, one portion of the tail boom assembly that was severed by the main rotor blades during the ocean impact was lost at sea. The recovered section was fracture-separated from the fuselage near fuselage station (FS) 197.78, and extended to approximately FS 258.0. The recovered section showed evidence of main rotor blade contact. The tailboom aft of FS 258.0, including the vertical and horizontal stabilizers, tail rotor transmission, and the tail rotor system, was not recovered from the ocean.

The canopy windscreens and overhead transparencies, doors, and doorframe structures were all damaged from impact. The cockpit instrument panel and center console assembly, and its associated components, showed little damage. Two hour meters were located in the helicopter. One displayed a reading of 937.8 hours, and the other one displayed a reading of 1,245.9 hours. Hansen personnel did not provide any information regarding the functions of these two hour meters.

Both the left and right cockpit seat pans were significantly deformed downward, and their box structures were crushed. The seat restraint systems were intact and functional.

The helicopter was equipped with single pilot, left hand controls. Cyclic and collective control system continuity was confirmed. The cyclic stick balance was consistent with the trim actuators being neutral. Anti-torque control continuity was confirmed from the pilot's pedals to the fractured tail rotor control rod at the tailboom separation point.

The main rotor system hub assembly and components, strap assemblies, pitch housings, feather bearings, and pitch change links were relatively undamaged. The rotor system exhibited hub damage that was consistent with excessive blade lead/lag excursions and high flapping angles. All four main rotor blades were unbroken, with varying degrees of bends and skin damage. The damage to the main rotor system components was consistent with low rotor rpm, power-off, main rotor blade strikes.

Drivetrain continuity was established from the engine, through the main transmission, to the main rotor. Rotation of the main rotor hub by hand resulted in rotation of both the engine-to-transmission drive shaft and the tail rotor driveshaft. The over-running clutch assembly was functional. The transmission cooler blower assembly appeared undamaged. The main transmission appeared undamaged. One transmission magnetic chip plug had a small amount of unidentified paste-like material on it, and the other chip plug was clean.

The tail rotor driveshaft separation locations matched the locations of the tailboom separations. The shaft fracture signatures were consistent with lower-than-flight-normal rpm.

Engine

The engine is a two-spool design. In the direction of airflow, the first spool is referred to as "N1," and includes all 7 compressor stages and the first 2 turbine stages. The N1 turbine section, which drives the compressor, is also referred to as the "gas generator" turbine. The second spool includes the last two turbine stages and the mechanical accommodations to drive the rotor system. This section is also referred to as the "N2" or "power turbine" section.

The engine mounting structure was properly secured and generally intact. All engine mounts exhibited deformation consistent with a hard landing. Inspection of the engine exterior revealed no evidence of fire or uncontained failure. The N1 section was able to rotate freely, and had no indications of foreign object damage or housing rubbing. The N2 section showed no visible damage. Its rotation was stiff, but this appeared consistent with saltwater corrosion damage to the accessory gearbox, and not with impact damage.

All fuel, lubrication, and pneumatic lines, and their associated fittings, were found to be at least finger tight. No evidence of oil leakage was observed in the engine bay or surrounding area. The helicopter was positioned at an angle which precluded an accurate oil level determination, and no indications of oil underfill were noted.

No obstruction of the intake was noted, and no evidence of any mechanical failures or deficiencies that would have prevented normal engine operation was observed.

Fuel System

No information regarding the fuel on board, either at the time of departure or at the time of the accident, was provided to the investigation. No fuel was observed in the fuel tank during the examination. The fuel pump power wire was not wrapped around the start pump fuel line, as it was required to be; this condition can result in an erroneous fuel quantity indication. In addition, the in-tank quantity sensor exhibited visible corrosion.

A vacuum check of the engine fuel system indicated that there was a slow leak within the fuel system. During the check, systematic isolation of components traced the leak to a line that connected the fuel pump to the fuel control. The B-nut on the fuel pump side of this line was found to be excessively tight, and was the most likely leak source. However, visual examination of the B-nut ferrule did not reveal any obvious cracks or damage, and the exact source of the vacuum leak was not determined. According to the Rolls-Royce representative, the leak rate was insufficient to result in an engine power loss.

The fuel spray nozzle (FSN) appeared normal. The FSN filter screen exhibited contamination similar to that found in the fuel pump filter. A borescope examination revealed no evidence of foreign object damage or operational thermal damage to the gas generator turbine blades or nozzle vanes.

Significant evidence of water contamination was observed in the helicopter's fuel storage and delivery system, including all filters. The fuel cell cover was opened and water, with no evidence of fuel, was found inside the cell. Potential water entry points included the fuel vent system, a deficient fuel-cap seal, or tank damage. The investigation considered the possibility that damage, including torn/ripped structure around the fuel cell, might have compromised the fuel cell. However, no evidence of fuel leakage was observed, and no visible holes or tears were noted in the fuel bladder.

The contents drained from the fuel pump filter bowl contained significant amounts of entrained particulates, and a liquid suspected to be water. Water-detecting paste confirmed the presence of water. The filter bowl in the housing of the engine-driven fuel pump was opened

and examined. The filter exhibited significant contamination of unknown particulate matter, a paste-like substance, and what appeared to be plant material.

With low or zero fuel pressure, such as when the engine is not operating, the fuel supply line from the fuel pump filter to the FSN is normally closed at both ends by spring-loaded check valves. These check valves trap the fluid immediately prior to its introduction into the FSN and combustion chamber. The fluid from that line was drained and examined. That fluid was observed to be about 30% water.

The fuel system architecture precluded introduction of water into either the fuel pump or the FSN fuel line unless the engine was operating.

Maintenance Records

Hansen personnel reported that a mechanic was stationed on the fishing boat with the helicopter, but they provided only his name to the investigation. They did not state whether he was a certificated mechanic, and did not provide any mechanic certificate or qualifications information for him. In addition, Hansen reported that the mechanic was sent home to the Philippines after the accident. The investigation did not attempt to contact the mechanic.

The Hansen Director of Maintenance (DOM) provided the investigation with a binder that he represented as being the helicopter maintenance records. The binder included a mix of flight records, status reports, and copies of FAA 337 forms. Exclusive of the 337 forms, none of the contents conformed to the FAA maintenance entry requirements. The records contained multiple internal service time and/or component number discrepancies. According to the FAA inspector, cursory comparisons of the 337 forms with the records on file with the FAA in Oklahoma City revealed numerous discrepancies.

The most recent recorded 100 hour/Annual, 300 hour, or 600 hour inspection was completed and signed off by the Hansen Helicopters DOM on 5/7/16. On that inspection entry, the airframe time was listed as 6,891.1 hours, and the "Hobbs time" was listed as 544.1 hours. The inspection entry stated "Next inspection due is a 100 hour at 6991.1" [hours]. However, despite the fact that all available information indicated that the helicopter has accumulated nearly 400 hours since that inspection, no additional FAA-compliant inspection entries were observed for dates subsequent to 5/17/16.

Organizational And Management Information

Ownership and Control

The accident report filed by Hansen Helicopters stated that the form had been completed by the pilot, and that "Jim's Air Repair" was the operator of the helicopter. A Hansen representative stated that two organizations were "affiliated companies," but did not provide

any additional details at that time. In an email dated March 14, 2017, the representative stated that "Hansen Helicopters provides employment recruiting, training and logistical support for Jims Air Repair." In that same email, the Hansen representative also stated that the pilot was "working under a contractor's agreement with Jim's Air Repair out of Vanuatu."

Hansen Helicopters' primary facilities were in the US state of Georgia, and on Guam, a US territory. NTSB requests for documentation regarding the operational arrangements between Hansen Helicopters, Jim's Air Repair, the pilot, the maintenance providers, and the Japanese fishing boat were not satisfied; therefore the investigation was unable to independently determine which personnel and companies exercised the actual operational and maintenance control of the helicopter.

Injury Reporting Accuracy

The Hansen-filed written accident report to the NTSB indicated that the two persons on board sustained minor injuries, and Hansen never advised the NTSB of any changes to that status. About 13 days after the accident, the NTSB was advised via a third party that both the pilot and the observer had been hospitalized since the accident, as a result of injuries incurred in the accident. The NTSB was further advised by this third party that the observer had already been transferred to Japan, and that the pilot was scheduled to be transported to the Philippines for surgery for injuries sustained in the accident. The investigation was able to confirm that the pilot was seriously injured, but was unable to confirm the level or nature of the observer's injuries.

Additional Information

Fuel Contamination Source

After the damaged helicopter was delivered to Guam by the fishing boat, the boat departed without examination by either Hansen Helicopters personnel or any investigation-related personnel. Therefore, the specifics of the boat's storage and dispensing system for the helicopter fuel, or the equipment and procedures related to prevention and detection of fuel contamination, were not able to be determined. Thus, the investigation was unable to determine the fishing boat's potential as the source of the water contamination of the fuel.

Additionally, because the investigation was unable to interview the pilot, the specifics of his activities and procedures, including preflight inspection, regarding the prevention or detection of fuel contamination, were not able to be determined. Although the evidence was consistent with the water being present in the helicopter fuel system prior to the flight, the investigation was unable to determine when or how the water entered the fuel system, or why the pilot failed to detect the water in the fuel.

Helicopter Fuel System Information

The helicopter was equipped with two fuel cells that were interconnected. The two fuel cells were of the conventional bladder type, and were located under the cabin floor in separate

compartments. The helicopter was equipped with a single fuel filler neck and cap, located on the right side of the helicopter, aft of the cabin door.

The fuel cell sump drain was in the left fuel cell. There was one drain valve located on the lower fuselage in this sump area. It was spring-loaded to the closed position, and depressed (pushed in) to open. In addition, the helicopter was equipped with a drain valve that installed on the fuel line elbow assembly that was attached to the engine firewall.

Other Helicopter Systems and Flight Procedures

Helicopter electrical power was provided by a 24 volt battery, and a 28 volt starter-generator that was gear-driven by the engine. Generator output was controlled by a voltage regulator. The helicopter was equipped with a visual and aural caution/warning alerting system, part of which was an array of discrete, dedicated lights across the top of the instrument console. That alerting system was unable to be activated or tested during the examination due to a lack of electrical power on the helicopter.

One of those discrete annunciator lights was the "GEN OUT" light. According to the helicopter manufacturer's information, the dedicated "GEN OUT" annunciator light in the caution/warning array will illuminate when the generator "is not powering the electrical bus." A loss of engine power would result in such a condition and GEN OUT alert, among others. According to the helicopter manufacturer's guidance in the Rotorcraft Flight Manual (RFM), in the event of a generator failure, the pilot is to "Turn generator switch off" and "Reduce electrical load to 16 amperes or less, if possible."

The helicopter was equipped with N1, N2, and [Main] Rotor rpm gauges, also referred to as "tachometers." The N2 and Rotor rpm indications were presented on a single instrument, with two concentric scales and two indicating needles, one for each parameter. The scales were calibrated and positioned so that during normal operation, the N2 and Rotor rpm needles will be aligned with one another.

The tachometers were marked with green arcs and red radial lines to respectively denote normal operating range and minimum and maximum rpm values. The N2 scale was from 0 to 120%, and occupied an arc of about 290°. The N2 lower and upper rpm values were 100% and 103% respectively, and therefore occupied an arc of about 8°.

Engine power loss in this model helicopter will typically initially manifest itself with left yaw, decreases in engine and rotor rpm, and a change in noise level. Subsequent manifestations will include airspeed and altitude losses. To assist pilot detection of an engine failure, some helicopters of this model were equipped with an "Engine Out" alerting system. The system included a dedicated "ENG OUT" annunciator light, augmented by an aural warning horn. The generator switch must be ON to enable the Engine Out warning. N1 decrease below 55% will trigger these ENG OUT alert annunciations.

The accident helicopter was equipped with the ENG OUT annunciator light. However, the investigation was unable to determine the presence or condition of any of the other components of the Engine Out alerting system, or the pre- or post-accident functionality of that system, if in fact it was installed and intact.

The RFM procedures for an engine failure when operating more than 420 ft above the surface specified that the pilot should "enter normal autorotation by lower[ing the] collective pitch full down" and then selecting an appropriate landing spot and airspeed. The RFM also stated that an engine restart can be attempted at the pilot's "discretion."

For engine failures at altitudes below 420 ft, the RFM specified lowering of the collective to maintain minimum rotor rpm, and stated that the "amount and duration of collective reduction depends upon the height above the ground at which the engine failure occurs."

The pilot did not provide any indication that he was alerted to or noticed an engine power loss until after he became involved in addressing the generator problem, and the investigation was unable to question the pilot on his observations or actions.

Administrative Information

Investigator In Charge (IIC):	Michael C Huhn
Additional Participating Persons:	Douglas Dymock; FAA; Dallas Ft Worth, TX John Hobby; Boeing; Mesa, AZ Jack Johnson; Rolls Royce; Indianapolis, IN
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=94835