Accident Rpt# GAA17CA342	**06/15/2017 1300 CDT**	**Regis# N915AJ**	**Pocahontas, AR**	**Apt: N/a**
Acft Mk/Mdl AIR TRACTOR INC AT 802		**Acft SN 802A-0566**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual** **Prob Caus: Pending**
Eng Mk/Mdl P&W CANADA PT6A-65AG		**Acft TT 1045**	**Fatal 0** **Ser Inj 0**	**Flt Conducted Under: FAR 137**
Opr Name: C&C FLYING SERVICE INC.		**Opr dba:**		**Aircraft Fire: NONE**
				AW Cert: SPR

Summary

The agricultural application pilot reported that, during the initial climb and as soon as the airplane "broke ground," he turned left and subsequently encountered turbulence that caused the left wing to "dip." He added that he applied full right aileron and rudder but that the airplane continued to sink and turn left. Subsequently, the left wing impacted terrain, the airplane cartwheeled, and a postcrash fire ensued.

The fuselage, empennage, and both wings sustained substantial damage.

The pilot reported that there were no preaccident mechanical malfunctions or failures with the airplane that would have precluded normal operation.

An automated weather observation station, 12 nautical miles south of the accident site, reported, about the time of the accident, calm wind, clear skies, temperature 84øF (29øC), and dew point 64øF (18øC).

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The pilot's failure to maintain lateral/bank control during the initial climb in turbulent conditions.

Events

1. Initial climb - Turbulence encounter
2. Initial climb - Loss of control in flight
3. Initial climb - Collision with terr/obj (non-CFIT)

Findings - Cause/Factor

1. Personnel issues-Task performance-Use of equip/info-Aircraft control-Pilot - C
2. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Lateral/bank control-Not attained/maintained - C
3. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Climb rate-Not attained/maintained
4. Environmental issues-Conditions/weather/phenomena-Turbulence-(general)-Effect on operation

Narrative

The aerial application pilot reported that, during the initial climb as soon as the airplane "broke ground," he turned left and subsequently encountered turbulence that caused the left wing to "dip." He added that, he applied full right aileron and rudder, but the airplane continued to sink and turn left. Subsequently, the left wing impacted terrain, the airplane cartwheeled, and a post-crash fire ensued.

The fuselage, empennage, and both wings sustained substantial damage during the impact and post-crash fire.

The pilot reported that there were no preaccident mechanical malfunctions or failures with the airplane that would have precluded normal operation.

An automated weather observation station, 12 nautical miles south, about the time of the accident, reported the wind as calm, clear skies, temperature 84øF (29øC), and dewpoint 64øF (18øC).

Accident Rpt# CEN17LA043	**11/23/2016 1759 CST**	**Regis# N80RT**	**Moorhead, MN**	**Apt: Moorhead Municipal Airport JKJ**
Acft Mk/Mdl BEECH 200		**Acft SN BB-370**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl PRATT&WHITNEY PT6A-41			**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 135**
Opr Name: FLIGHT DEVELOPMENT, LLC		**Opr dba:**		**Aircraft Fire: NONE**
				AW Cert: STN

Summary

The commercial pilot was conducting an on-demand passenger flight at night in instrument meteorological conditions that were at/near straight-in approach minimums for the runway. The pilot flew the approach as a nonprecision LNAV approach, and he reported that the approach was stabilized and that he did not notice anything unusual. A few seconds after leveling the airplane at the missed approach altitude, he saw the runway end lights, the strobe lights, and the precision approach path indicator. He then disconnected the autopilot and took his hand off the throttles to turn on the landing lights. However, before he could turn on the landing lights, the runway became obscured by clouds. The pilot immediately decided to conduct a missed approach and applied engine power, but the airplane subsequently impacted terrain short of the runway in a nose-up level attitude. The pilot reported that there were no mechanical anomalies with the airplane that would have precluded normal operation. It is likely the pilot lost sight of the runway due to the visibility being at/near the straight-in approach minimums and that the airplane got too low for a missed approach, which resulted in controlled flight into terrain.

A passenger stated that he and the pilot were not wearing available shoulder harnesses. The passenger said that he was not informed that the airplane was equipped with shoulder harnesses or told how to adjust the seats. The pilot sustained injuries to his face in the accident.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The pilot's failure to attain a positive climb rate during an attempted missed approach in night instrument meteorological conditions that were at/near approach minimums, which resulted in controlled flight into terrain.

Events

1. Approach-IFR final approach - Loss of visual reference
2. Approach-IFR missed approach - Controlled flight into terr/obj (CFIT)
3. Approach-IFR missed approach - Collision with terr/obj (non-CFIT)

Findings - Cause/Factor

1. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Climb rate-Not attained/maintained - C
2. Personnel issues-Task performance-Use of equip/info-Aircraft control-Pilot - C
3. Environmental issues-Conditions/weather/phenomena-Ceiling/visibility/precip-(general)-Effect on operation - C
4. Aircraft-Aircraft systems-Equipment/furnishings-Emergency equipment-Not used/operated
5. Personnel issues-Task performance-Communication (personnel)-Issuing instructions-Pilot

Narrative

On November 23, 2016, at 1759 central standard time, a Beech 200, N80RT, impacted terrain during a missed approach from runway 30 at Moorhead Municipal Airport (JKJ), Moorhead, Minnesota. The pilot initiated a missed approach after losing visual reference of the runway environment during the final segment of a GPS instrument approach. The pilot and two passengers sustained minor injuries and four passengers were uninjured. The airplane received substantial damage. The airplane was operated by Flight Development, LLC under the provisions of 14 Code of Federal Regulations Part 135 as a single-pilot on-demand passenger flight. The flight was operating on an instrument rules flight plan. Night instrument meteorological conditions prevailed at the time of the accident. The flight departed from Baudette International Airport (BDE), Baudette, Minnesota, at 1714 and was destined to JKJ.

A passenger stated that he and his work crew had been flying between Baudette and Moorhead on a weekly basis for the past 5-6 weeks to build agricultural storage facilities. The passenger stated that the pilot had flown the work crew on one of the previous flights, and the remainder of the flights were flown by the company chief pilot and the company director of operations.

The passenger stated that the accident flight was the first flight in which he was seated in the copilot seat. The passenger stated that he and the pilot were not wearing a shoulder harness. The passenger stated that he was not informed that the airplane was equipped with shoulder harnesses, how to use them, and how to adjust the seats. The passenger stated that he would have adjusted the seat if he would have known that was an option and used his shoulder harness, as he is a safety conscious person.

The pilot stated that before he was handed off from Minneapolis Center to Fargo Approach, he listened to the automated weather observing system (AWOS) at JKJ, which reported that light north winds, a ceiling of 300 feet above ground level, and 1.25 statute mile visibility. He checked in with Fargo Approach and

informed them that he had the weather at JKJ and requested the area navigation (RNAV) approach to runway 30 starting at IVEJE, the initial approach fix (IAF). N80RT was not equipped with a wide area augmentation system (WAAS) GPS so he flew the approach as a non-precision lateral navigation (LNAV) approach (straight-in approach minima were: 300 feet above ground level and 1 statute mile visibility). He told Fargo Approach that he realized the weather was deteriorating and would make one attempt at JKJ and then divert to Hector International Airport (FAR), Fargo, North Dakota. Fargo Approach issued a clearance to the IAF, and initial approach altitude, and provided missed approach instructions. The pilot stated that he had flown this approach numerous times and briefed the approach. He stated that the approach was stabilized with the appropriate altitudes and airspeeds throughout and did not notice anything unusual. Upon leveling off at the missed approach altitude of 1,300 feet mean sea level, he looked for the runway. After what seemed like just a few seconds he saw the runway end lights, the strobe lights, and the precision approach path indicator. He disconnected the autopilot and took his hand off the throttles to turn on the landing lights for landing. Before he could even turn on the landing lights, the runway disappeared from sight due to the clouds. He immediately decided to perform a missed approach and applied engine power. He said that he referenced the flight director, but did not recall what it was indicating. He did not feel any sinking feeling indicating that he was losing altitude. He said that It seemed like just a few seconds before the airplane impacted the ground. The airplane struck the ground in somewhat of a nose-up, level bank attitude. The airplane slid along the ground and turned slightly to the right before coming to rest.

The passenger stated that prior to departure, the pilot said they needed to get going because the weather was getting bad in Fargo. While en route, the passenger heard Fargo Air Traffic Control Tower advise weather was not good, and the pilot stated he would try to fly to JKJ first and then fly to FAR, if that did not work. The passenger said the pilot asked him to be on the lookout for the runway and about 3,600 feet the airplane banked to line up for the approach. The passenger said he heard an audible "too low" warning three times, saw some runway lights at eye level, and then the airplane impacted the ground. The passenger said he did not think the pilot initiated a go-around, and he did not see him adjust engine power settings or move the control yoke. The passenger stated that he received facial injuries that required stitches.

The pilot reported that there was no mechanical malfunction/failure with the airplane.

The pilot's safety recommendation on how the accident could have been prevented was:

"Stick to my normal personal weather minimums and not attempt a non-precision approach to minimums. It would of been so easy to go to Fargo and do the ILS. I have always lectured to my students on the advantage of having two pilots when things are challenging. This is a prime example of such [an accident]. Over confidence is always something that we have to try to keep in check."

A review of the pilot's training records showed that the pilot completed the company's Federal Aviation Administration (FAA) approved ground and flight training program, dated August 17, 2016. The ground training was conducted by the company director of operations and the company chief pilot. The pilot's flight training, which was 10.8 hours in duration, was conducted by the company chief pilot. The pilot received and passed his most recent Part 135.293 Airman Proficiency Check, dated August 18, 2016, which was conducted by an FAA inspector from the Fargo Flight Standards District Office. The check was performed using a Beech 200 and was 1.7 hours in flight duration. The pilot received a grade of satisfactory for all of the check's maneuvers/procedures.

FAA Advisory Circular 91-65, Use of Shoulder Harnesses in Passenger Seats, states in part:

On December 17, 1985, the National Transportation Safety Board (NTSB) issued safety recommendation A-85-124, recommending issuance of advisory circular to provide information on crash survivability aspects of small aircraft. The recommendation was the result of an NTSB general aviation airplane crashworthiness project. In the project, the safety board examined 500 relatively severe general aviation airplane accident, to determine what proportion of the occupants would have benefited from the use of shoulder harnesses and energy-absorbing seats. The safety board found that 20 percent of the fatally-injured occupants in these accidents could have survived with shoulder harnesses (assuming the seat belt was fastened) and 88 percent of the seriously injured could have had significantly less severe injuries with the use of shoulder harnesses. Energy-absorbing seats could have benefited 34 percent

of the seriously injured. The safety board concluded that shoulder harness use is the most effective way of reducing fatalities and serious injuries in general aviation accidents.

Part 135.117, Briefing of Passengers Before Flight, states that before each takeoff each pilot in command of an aircraft carrying passengers shall ensure that

all passengers have been orally briefed on: the use of seat belts, the placement of seat backs in an upright position before takeoff and landing, location and means for opening the passenger entry door and emergency exits, location of survival equipment, if the flight involves extended overwater operation, ditching procedures and the use of required flotation equipment, if the flight involves operations above 12,000 feet MSL, the normal and emergency use of oxygen, and location and operation of fire extinguishers.

Accident Rpt# GAA17CA150 02/06/2017 1600 CST	**Regis# N246CA**	**Poplar Bluff, MO**	**Apt: Poplar Bluff Muni POF**	
Acft Mk/Mdl BEECH F90-UNDESIGNAT	**Acft SN LA-27**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual**	**Prob Caus: Pending**
Eng Mk/Mdl PRATT & WHITNEY PT6A/60A	**Acft TT 8640**	**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 091**	
Opr Name: THE H COMPANY	**Opr dba:**		**Aircraft Fire: NONE**	
			AW Cert: STN	

Summary

The pilot reported that, during an instrument meteorological conditions flight, he chose to accomplish an area navigation approach. He reported that he descended to his minimum descent altitude of 800 ft, decreased the airspeed, and began looking outside the cockpit for the runway. He recalled that the visibility was 3/4 mile, and that, about 20 seconds later, the airplane struck tree tops. The pilot immediately executed the missed approach procedure and made an approach to an alternate airport. The right wing sustained substantial damage.

The pilot reported that there were no preaccident mechanical malfunctions or failures with the airplane that would have precluded normal operation.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The pilot's descent below the minimum descent altitude during a nonprecision approach, which resulted in a tree strike.

Events

1. Approach-IFR final approach - Altitude deviation
2. Approach-IFR final approach - Controlled flight into terr/obj (CFIT)

Findings - Cause/Factor

1. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Altitude-Not attained/maintained - C
2. Environmental issues-Physical environment-Object/animal/substance-Tree(s)-Effect on equipment - C
3. Personnel issues-Psychological-Attention/monitoring-Monitoring environment-Pilot - C

Narrative

The pilot reported the during an instrument meteorological condition flight, he elected to accomplish an area navigation approach. He reported that he descended to his minimum descent altitude of 800 feet, decreased the airspeed and began looking outside the cockpit for the runway. He recalled that the visibility was _ of a mile and about 20 seconds later the airplane struck tree tops. The pilot immediately executed the missed approach procedure and made an approach at an alternate airport. The right wing sustained substantial damage.

The pilot reported that there were no preaccident mechanical malfunctions or failures with the airplane that would have precluded normal operation.

Accident Rpt# WPR16LA125	**06/14/2016 1550 PDT**	**Regis# N1076Y**	**Bishop, CA**	**Apt: Bishop BIH**
Acft Mk/Mdl BELL 206-L1		**Acft SN 45380**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl ALLISON 250 C30P		**Acft TT 34947**	**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: GLOBAL EQUITY INVESTMENTS, LLC		**Opr dba:**		**Aircraft Fire: NONE**

Summary

The private pilot departed on a cross-country flight with two passengers onboard the helicopter, which had been filled with 110 gallons of fuel (88 gallons of which were in the aft tank) before departure. The pilot reported that, after encountering headwinds that were about 15 knots greater than anticipated and turbulence for more than 2 hours, he saw that the helicopter was low on fuel and decided to land at a nearby airport. He began a descent from 12,000 ft mean sea level (msl), but as he passed through 10,000 ft msl, he heard a "violent explosion in the engine compartment," followed by the illumination of the engine-out indication light. The pilot immediately initiated an autorotation and made two unsuccessful attempts to restart the engine during the descent. He flared the helicopter at 2,000 ft to avoid settling into a crater, and it subsequently impacted terrain hard. Paint transfer signatures on one of the main rotor blades indicated that they likely contacted and severed the tailboom during landing.

The pilot stated that he did not pull the fuel pump circuit breakers before or during the accident flight; however, the unbreeched aft fuel tank was void of fuel when first responders examined it shortly after the accident, and the fuel pump circuit breakers were found in the "off" position. Further, operational tests of the fuel system and engine did not reveal any blockages or mechanical malfunctions. Fuel computations showed that the engine consumed 88 gallons of fuel, the quantity that would have been in the aft tank at the time of departure, and the pilot reported that he customarily disengages the fuel pumps after each flight. It is likely that the pilot's improper fuel management, possibly from departing with the fuel pumps in the "off" position, prevented fuel trapped in the forward tanks from reaching the engine and resulted in fuel starvation.

The pilot had planned the flight around 15-knot winds despite multiple weather forecasts issued before his departure that indicated the presence of about 30-knot headwinds along his flight route. It is likely that the pilot's poor preflight weather and fuel planning resulted in greater-than-anticipated fuel consumption, which led to the low fuel state and the pilot's decision to divert to a closer airport.

The pilot did not experience any control issues throughout the long autorotation from 10,000 ft, and weather reports indicated that he would not have encountered any visibility restrictions during the descent, so he should have had sufficient time to properly flare the helicopter and land. However, he chose to initiate a flare at 2,000 ft, which likely reduced the rotor rpm and led to hard impact with terrain.

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Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The pilot's improper preflight weather planning, fuel planning, and fuel management, which resulted in fuel starvation and a loss of engine power. Contributing to the severity of the accident was the pilot's initiation of the landing flare at a high altitude, which led to a subsequent hard landing.

Events

1. Enroute-cruise - Fuel related
2. Emergency descent - Loss of engine power (total)
3. Emergency descent - Off-field or emergency landing
4. Autorotation - Collision with terr/obj (non-CFIT)

Findings - Cause/Factor

1. Personnel issues-Task performance-Planning/preparation-Weather planning-Pilot - C
2. Personnel issues-Task performance-Planning/preparation-Fuel planning-Pilot - C
3. Aircraft-Fluids/misc hardware-Fluids-Fuel-Fluid management - C
4. Personnel issues-Task performance-Use of equip/info-Use of equip/system-Pilot - C
5. Personnel issues-Action/decision-Action-(general)-Pilot - F
6. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Landing flare-Incorrect use/operation - F

Narrative

"***This report was modified on August 1, 2017. Please see the docket for this accident to view the original report.***

On June 14, 2016, about 1550 Pacific daylight time, a Bell 206L-1 helicopter, N1076Y, was substantially damaged during an autorotative landing attempt near Bishop, California, following a loss of engine power during cruise flight. The private pilot and two passengers were not injured. The helicopter was owned by a private company and operated by the pilot under the provisions of Title 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed, and

no flight plan was filed for the cross-country flight that departed Corona Municipal Airport (AJO), Corona, California, at approximately 1320. The personal flight was destined for Mammoth Yosemite Airport (MMH), Mammoth, California.

According to the pilot, the flight departed AJO with 110 gallons of fuel on board and flew direct to General Wm. J. Fox (WJF), Lancaster, California to avoid restricted airspace. He planned the flight around a forecasted headwind of approximately 15 knots. Once he reached WJF, the pilot then flew a direct course to MMH, but after more than 2 hours of flight in 30 knot headwinds and turbulence the pilot decided to land at Bishop Airport to service the helicopter, which only had 110 lbs (about 16 gallons) of fuel remaining. He began a descent from his cruising altitude, 12,000 feet mean sea level (msl), but as he passed below 10,000 feet msl, the pilot heard a "violent explosion in the engine compartment" and immediately felt the helicopter vibrate. He then observed an engine out light indication and quickly initiated an autorotation. During the helicopter's descent to land, the pilot made two attempts to restart the engine, but was unsuccessful. The pilot reported that he observed that he was "too high" in the last 2,000 feet of his descent. He subsequently pulled the collective early to avoid landing in a crater; however, the helicopter impacted the ground hard, which resulted in substantial damage to the tail boom.

A review of photographs supplied by the Federal Aviation Administration (FAA) showed the accident was surrounded by flat terrain and terrain suitable for landing. Further, images from an online mapping tool showed flat topography near the accident site.

According to FAA records, the helicopter was manufactured in 1980, and registered to Premiere Rotors, LLC on February 19, 2008. The helicopter was powered by a Rolls Royce M250 C30P, 650 shaft horsepower turboshaft engine, which was installed in 1992 in accordance with supplemental type certificate SH5695SW. A review of the aircraft logbooks revealed that the helicopter's most recent 100 hour inspection was completed on July 1, 2015 at which time the airframe had accumulated 34,947 total flight hours and the engine had accumulated 17,261 total flight hours. According to the registered owner, the accident pilot had entered into a lease-to-buy contract a few months prior to the accident with the intent of purchasing the helicopter.

According to a National Transportation Safety Board (NTSB) weather study, multiple weather forecasts that had been issued prior to the time of the pilot's departure, showed a probability of high winds throughout his route of flight. A National Weather Service Surface Analysis Chart depicted a thermal low-pressure system over southern Nevada with a trough of low pressure extending northward. The chart showed a 12-hectopascal pressure gradient across southern California and supported strong wind gusts over the mountainous regions of eastern California. The winds aloft forecast for the area that had been issued about 6 hours prior to the pilot's time of departure and was valid beginning at 1400 indicated winds from the west-southwest at approximately 17 to 30 knots. An area forecast issued at 1245 forecasted southwesterly winds at 20 knots gusting to 30 knots. Further, multiple Terminal Aerodrome Forecasts that were issued on the morning of the accident flight indicated up to 30 knot wind gusts along the pilot's route of flight.

The weather at Bishop Airport (BIH), Bishop, California near the time of the accident indicated winds from 280 degrees at 7 knots, clear skies, temperature 32 degrees C, dewpoint -2 degrees C, and a barometric altitude of 29.76 inches of Hg.

The helicopter came to rest in a slight nose up attitude approximately 4 nautical miles from Bishop Airport, Bishop, California. A first responder who arrived at the accident site moments after the impact reported that he was able to view the "fittings" at the bottom of the "fuel tank" and observed that the tank was void of fuel. An FAA inspector who arrived on-scene the day after the accident, reported that the fuel pump circuit breakers were extended indicating that the pumps were in the OFF position. The pilot subsequently reported that he flew with the fuel pump circuit breakers ON, and pulled them after the helicopter came to rest. He later added that he customarily disengages the fuel pumps by pulling the circuit breakers after each flight. Later that day, the pilot and the FAA inspector could hear the fuel pump motors run as they cycled the fuel pump circuit breakers several times. The helicopter was subsequently transported to a secure facility in Rancho Cordova, California where an airframe examination was completed by representatives of the airframe and engine manufacturers under the supervision of the NTSB and FAA.

An initial inspection of the airframe revealed that the empennage had separated from the aft tailboom. The aft section of the tail rotor drive shaft at the tailboom displayed rotational scoring consistent with rotation at impact. The top half of the left end plate on the horizontal stabilizer was separated. One tail rotor blade was bent, but remained attached to the tail rotor hub and its opposing blade was separated at the blade root. Both tail rotor blades displayed paint transfer markings at the leadings edges and the separated blade exhibited a gouge mark near the outboard tip of the blade. Paint transfer markings similar in color to the color scheme of the accident helicopter were found on the outboard leading edges of one of the main rotor blades, which displayed bending opposite the direction of rotation.

According to the Bell 206L-1 flight manual, the helicopter's total fuel system capacity was 99.4 gallons. According to the owner, the helicopter was equipped with a fuel range extender that expanded the fuel tank size to accommodate a total of 110 gallons of usable fuel. The helicopter fuel system included two

interconnected forward fuel tanks with a capacity of 11 gallons each. The aft fuel tank, located below the aft cabin, has a total capacity of approximately 88 gallons.

A fuel system diagram furnished by the helicopter manufacturer shows that fuel is transferred from the forward tanks to the main fuel tank using right and left boost pumps located in the main tank and an ejector pump located between the two forward tanks. Fuel is then pumped from the aft tank to the engine through an airframe mounted fuel filter. After the helicopter is started, the fuel boost pumps engage to begin directing fuel from the forward tanks to the aft tank. The fuel boost pumps can only be deactivated through two circuit breakers that control each pump.

Fuel line continuity was observed from the forward fuel tank to the inlet port of the engine driven fuel pump. Both the right and left fuel boost pumps operated normally and continuously when tested using the cockpit circuit breakers; the left fuel boost pump measured 8 psi and the right boost pump measured 5 psi. A representative of the FAA stated that he noted the fuel boost pump circuit breakers were extended, indicating that the pumps were OFF when he arrived at the accident site. The pilot reported that he flew with the fuel boost pumps ON, but subsequently pulled the fuel boost pump circuit breakers after the accident when the helicopter came to rest. An inspection of fuel recovered from the fuel pump inlet line appeared free of contaminants.

The fuel gauge, which monitors the fuel quantity from the left forward tank and the main fuel tank, indicated approximately 40-50 lbs. of fuel (5.88 - 7.35 gallons) during the postaccident examination. Subsequently, a representative of the FAA drained approximately 20 gallons of fuel from the helicopter's fuel sump. A sample submitted to a laboratory for analysis revealed that it displayed the same specifications as JET A fuel.

A fuel consumption of approximately 35 gallons per hour, furnished by the helicopter manufacturer, was used to compute the approximate fuel burn during the accident flight. Based on the pilot's reported fuel quantity of 110 gallons at the time of his departure, the helicopter would have burned about 88 total gallons of fuel during the 2 hour and 30 minute long flight.

Approximately 1 teaspoon of fuel was drained from the fuel feed line that was connected to the fuel spray nozzle and considered normal by the engine manufacturer. The fuel was clear in appearance and free of contamination. The fuel spray nozzle tip displayed a black soot pattern with no indications of carbon deposits, blockage or streaking.

Collective and cyclic control continuity was verified from the cockpit to the main rotor assembly. Tail rotor pedal continuity was traced from the tail rotor pedals to the tailboom.

A subsequent engine examination/test run was performed at the engine manufacturer's facility with oversight from the NTSB.

An initial engine examination revealed that the N1 and N2 tach-generator drive gears rotated freely by hand using a speed handle.

Both the upper and lower magnetic chip detectors were free of ferrous debris.

The compressor inlet was free of debris, but exhibited a build-up of black residue around the back edge of the compressor front support.

A leak test was performed after a soap solution was applied to all fittings, connections and air lines. Approximately 50 PSI of pressurized air was directed through the Pc pneumatic line, which revealed no presence of leaks as the soap solution was not excreted.

During the three test runs, the engine functioned normally at ground-idle, flight-idle, max-continuous power and take-off power. Additionally, during subsequent transient tests, when the power was reduced to flight-idle and rapidly advanced to take-off power, the engine responded normally and produced maximum power without hesitation. Further, the vibration measurements were within the prescribed limitations of the manufacturer.

According to the manufacturer, the engine performance was 4.8% below new engine production standards at maximum take-off power, which was attributed to a faulty anti-ice solenoid valve that had failed in the open position, as designed.

Accident Rpt# CEN17LA188	**01/24/2017 845 CST**	**Regis# N6040Y**	**Fort Worth, TX**	**Apt: Bell Training Facility 3XS7**
Acft Mk/Mdl BELL 407		**Acft SN 53371**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl ROLLS-ROYCE 250-C47B		**Acft TT 8530**	**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: BELL HELICOPTER TEXTRON INC.		**Opr dba:**		**Aircraft Fire: NONE**

Summary

The flight instructor was demonstrating the emergency procedure for a full-authority digital engine control (FADEC) failure that would cause it to switch from auto to manual mode as part of the helicopter manufacturer's training program. The instructor stated that the helicopter was in a stable 5-ft hover when he was demonstrating the maneuver. To begin the demonstration, the flight instructor intentionally switched the FADEC to the manual mode. After about 10 seconds, the engine speed began to increase, which resulted in a corresponding increase in the main rotor speed. The instructor increased the collective control input in an attempt to control the engine and rotor speeds. The helicopter subsequently climbed and began to shake violently. The instructor initiated a descent for landing with an excessive descent rate, which resulted in damage to the landing skids and tailboom upon touchdown.♂♂The helicopter flight manual emergency procedure for a FADEC failure and the training program procedure for the FADEC manual mode demonstration both noted that the engine and rotor speeds must be maintained between 95% and 100% with the collective and throttle controls. The demonstration procedure also noted that the throttle control should be in the fly position when the FADEC is placed into manual mode. A review of engine data recovered from the FADEC indicated that the throttle was not in the fly position before beginning the demonstration, which likely resulted in a greater increase in engine and rotor speeds than would have been expected. The flight instructor did not promptly manage the increase in the engine and rotor speeds, which resulted in an inadvertent overspeed condition and subsequent airframe vibrations that prompted the need for an emergency landing.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The flight instructor's failure to prevent the engine/rotor overspeed condition during the demonstration maneuver and the excessive descent rate during the emergency landing, which resulted in a hard landing. Contributing to the engine/rotor overspeed condition was the flight instructor's failure to comply with the demonstration procedure.

Events

1. Maneuvering-hover - Simulated/training event
2. Emergency descent - Off-field or emergency landing
3. Landing - Hard landing

Findings - Cause/Factor

1. Personnel issues-Task performance-Use of equip/info-Aircraft control-Instructor/check pilot - C
2. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Descent rate-Not attained/maintained - C
3. Personnel issues-Task performance-Use of equip/info-Use of equip/system-Pilot - F
4. Personnel issues-Task performance-Use of equip/info-Use of policy/procedure-Instructor/check pilot - F

Narrative

On January 24, 2017, about 0845 central standard time, a Bell 407 helicopter, N6040Y, was substantially damaged during a hard landing at the Bell Training Facility Heliport (3XS7), Fort Worth, Texas. The flight instructor and pilot receiving instruction were not injured. The helicopter was registered to and operated by Bell Helicopter Textron as a 14 Code of Federal Regulations Part 91 instructional flight. Visual meteorological conditions prevailed at the time of the accident. The flight was not operated on a flight plan. The flight originated from the Bell Helicopter Hurst Heliport about 0820.

The flight instructor stated that he was demonstrating the emergency procedure for a failure of the full authority digital engine control (FADEC) unit from auto to manual mode. The helicopter was in a stable 5-foot hover at the time. To begin the demonstration, the FADEC was intentionally switched into manual mode. After approximately 10 seconds, the engine speed began to increase, which resulted in a corresponding increase in the main rotor speed. The instructor increased the collective control input in an attempt to control the engine and rotor speeds. The helicopter subsequently climbed to about 25 feet above ground level (agl) and began to shake violently. The instructor initiated a descent for landing; however, the helicopter contacted the ground with a sufficient descent rate to "spread the skids." The helicopter was shut down and the pilots exited without injuries.

Maintenance personnel noticed a crease in the tailboom after it was repainted as part of the repair process. The helicopter maintenance manual stated that creases in tailboom skins are not permitted under any circumstances. In such instances, the tailboom must be repaired or replaced.

Data recovered from the FADEC unit revealed that, at the time the FADEC was switched from auto to manual mode, the throttle position (PLA) was 98%, the rotor speed was 100%, and the fuel flow 264 pounds per hour. About 3 seconds later, the rotor speed, engine speed, and fuel flow began to increase. The rotor

speed reached a maximum of 118%. The throttle position was subsequently reduced with a corresponding decrease in engine and rotor speeds.

The helicopter flight manual stated that in the case of a FADEC failure, the pilot must maintain the engine and rotor speeds between 95% and 100% with the collective and throttle controls, and land as soon as practical. The procedure included a warning that depending on the flight profile and power setting at the time of the failure, the transition to manual mode may result in an increase (overspeed) or a decrease (underspeed) of the engine/rotor speed within 2 to 7 seconds after the failure warning, requiring positive movements of the collective and throttle.

The procedure for the FADEC manual mode demonstration noted that the throttle control should be in the fly position when the FADEC is placed into manual mode. The engine and rotor speeds should be maintained between 95% and 100% during the maneuver.

According to the helicopter manufacturer, the throttle fly position corresponded to a PLA of 90% in the FADEC data. As a result, a PLA of 98% was consistent with the throttle not being in the fly position at the time of the FADEC demonstration. Without the throttle in the fly position, when the FADEC is switched into manual mode, the unit will adjust fuel flow to that commanded by the throttle setting. In the accident scenario, this was an increase in fuel flow from that being provided by the FADEC in auto mode to maintain the hover, which caused the engine and rotor speeds to increase. As a result of the accident, the helicopter manufacturer revised the training program to perform the FADEC manual mode training in a flight simulator/training device rather than in the helicopter.

Accident Rpt# ERA17CA056 10/25/2016 1500 EST	**Regis# N161PD**	**Ponce, PR**	**Apt: Mercedita PSE**	
Acft Mk/Mdl BELL OH 58A-NO SERIES	**Acft SN 71-20559**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual**	**Prob Caus: Pending**
Eng Mk/Mdl ROLLS ROYCE T63A720	**Acft TT 6497**	**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 091**	
Opr Name: PUERTO RICO POLICE DEPARTMENT	**Opr dba:**		**Aircraft Fire: NONE**	
			AW Cert: NON	

Summary

During an instructional flight, the helicopter was about 40 to 50 ft above ground level and at 60 knots when the flight instructor intended to demonstrate a simulated engine failure and run-on landing. Although the flight instructor had intended to recover from the maneuver before an actual run-on landing, he noticed that he did not have enough rotor rpm to recover and chose to continue with the run-on landing. The helicopter then landed hard on a taxiway and slid about 300 ft before coming to rest upright. The flight instructor added that there were no preimpact mechanical malfunctions or failures with the helicopter that would have precluded normal operation. Examination of the helicopter by a Federal Aviation Administration inspector revealed damage to the aft engine bulkhead and wrinkles in the helicopter panels near the tailboom and rotor gear box.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The helicopter flight instructor's inadequate demonstration of a simulated engine failure, which resulted in a hard landing.

Events

1. Takeoff - Simulated/training event
2. Autorotation - Hard landing

Findings - Cause/Factor

1. Personnel issues-Task performance-Use of equip/info-Aircraft control-Instructor/check pilot - C
2. Personnel issues-Action/decision-Action-Incorrect action performance-Instructor/check pilot - C
3. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Prop/rotor parameters-Not attained/maintained - C

Narrative

During an instructional flight, the helicopter was at an altitude of 40 to 50 ft above ground level, at 60 knots, when the flight instructor intended to demonstrate a simulated engine failure and run-on landing. Although the flight instructor had intended to recover from the maneuver prior to an actual run-on landing, he noticed that he did not have enough rotor rpm to recover and elected to continue with the run-on landing. The helicopter then landed hard on a taxiway and slid about 300 ft before coming to rest upright. The flight instructor added that there were no preimpact mechanical malfunctions or failures with the helicopter that would have precluded normal operation. Examination of the helicopter by a Federal Aviation Administration inspector revealed damage to the aft engine bulkhead and wrinkles in the helicopter panels near the tail boom and rotor gear box.

Accident Rpt# GAA17CA132 02/01/2017 1630 PST	**Regis# N519EH**	**Carson City, NV**	**Apt: Carson CXP**	
Acft Mk/Mdl BELL HELICOPTER TEXTRON 206-L1	**Acft SN 45429**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual**	**Prob Caus: Pending**
Eng Mk/Mdl ROLLS ROYCE 250-C30P	**Acft TT 15845**	**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 091**	
Opr Name: AAROW AVIATION	**Opr dba:**		**Aircraft Fire: NONE**	
			AW Cert: STN	

Summary

The flight instructor on the controls of the high skid-equipped-landing-gear helicopter reported that he was the pilot-in-command (PIC). The PIC reported that he and another flight instructor were performing simulated emergency procedures during the flight. He reported that he attempted to demonstrate a simulated fixed-pitch (right stuck antitorque pedal) emergency procedure. He reported that, during the maneuver, the nose of the helicopter was about 40ø nose right of centerline. He reduced the throttle, and the nose corrected to about 20ø nose right of centerline. The helicopter touched down on taxiway delta with minimal forward airspeed, and it then bounced about 5 ft above the ground and yawed right about 1 3/4 turns.ÿThe helicopter touched down a second time about 65 ft south of the taxiway centerline and rolled onto its left side. The helicopter sustained substantial damage to the firewall, main rotor drive system, and tail rotor drive system.

A METAR at the time of the accident reported that the wind was from 110ø at 08 kts. The flight instructor seated in the right seat reported that the wind at the time of the accident was from 090ø at 08 kts.

When the PIC was asked by the National Transportation Safety Board investigator-in-charge if he placed the collective in the full-down position after touchdown or if he increased the collective after the initial touchdown, he responded that he could not remember. When asked if he applied full left pedal to combat the right yaw, he said that he did not because the event happened quickly.

According to the Federal Aviation Administration Helicopter Flying Handbook (FAA-8083-21A), the Helicopter Instructor's Flying Handbook (FAA-8083-4), and Advisory Circular (AC) 90-95 "Unanticipated Rapid Right Yaw in Helicopters," the loss of tail rotor effectiveness is a critical, low-speed aerodynamic flight characteristic that can result in an uncommanded rapid yaw rate that does not subside of its own accord and, if not corrected, can result in the loss of aircraft control.

AC 90-95, Section 7.d.3. (page 7), defines flight characteristics and wind azimuths and states that the tail rotor vortex ring state occurs when the wind is from 210ø to 330ø.

Winds within this region will result in the development of the vortex ring state of the tail rotor.

AC 90-95, Section 10, "Recommended Recovery Techniques," (page 8), states:

a. If a sudden unanticipated right yaw occurs, the pilot should perform the following:

(1) Apply full left pedal. Simultaneously, move cyclic forward to increase speed. If altitude permits, reduce power.

(2) As recovery is effected, adjust controls for normal forward flight.

b. Collective pitch reduction will aid in arresting the yaw rate but may cause an increase in the rate of descent. Any large, rapid increase in collective to prevent ground or obstacle contact may further increase the yaw rate and decrease rotor rpm.

The pilot reported that there were no preaccident mechanical malfunctions or failures with the helicopter that would have precluded normal operation.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The pilot-in-command's delayed remedial action to arrest the right yaw after the bounced landing while operating in a flight regime conducive to the loss of tail rotor effectiveness, which resulted in a roll-over.

Events

1. Landing-flare/touchdown - Abnormal runway contact
2. Landing-flare/touchdown - Dynamic rollover

Findings - Cause/Factor

1. Personnel issues-Action/decision-Action-Delayed action-Instructor/check pilot - C
2. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Yaw control-Not attained/maintained - C
3. Personnel issues-Task performance-Use of equip/info-Aircraft control-Instructor/check pilot - C

Narrative

The flight instructor on the controls of the high skid-equipped landing gear helicopter reported that he was the pilot in command (PIC). The PIC reported that he and another flight instructor were performing simulated emergency procedures during the flight. He reported that he attempted to demonstrate a simulated fixed pitch (right stuck anti-torque pedal) emergency procedure. He reported that during the maneuver the nose of the helicopter was about 40ø nose right of centerline. He reduced the throttle and the nose corrected to about 20ø nose right of centerline. The helicopter touched down on taxiway delta with minimal forward airspeed, and the aircraft bounced about 5 ft above the ground and yawed right about 1 _ turns. The helicopter touched down a second time about 65 ft

south of the taxiway centerline and rolled onto its left side. The helicopter sustained substantial damage to the firewall, main rotor drive system and tail rotor drive system.

The Meteorological Aerodrome Report for the airport which the accident occurred and at the time the accident occurred, identified that the wind was out of the 110ø at 08 kts.

The flight instructor seated in the right seat, reported that the wind at the time of the accident was out of 090ø at 08 kts.

When the PIC was asked by the NTSB investigator-in-charge (IIC); was the collective placed in the full down position after touchdown, he could not remember. When asked if he increased the collective after the initial helicopter touchdown; he could not remember. When asked if he applied full left pedal to combat the right yaw, he said that he did not because the event happened quickly.

According to the Federal Aviation Administration Helicopter Flying Handbook (FAA-8083-21A) and The Helicopter Instructors Flying Handbook (FAA-8083-4) and Advisory Circular (AC) 90-95 Unanticipated rapid right yaw;

Loss of Tail Rotor Effectiveness (LTE) is a critical; low-speed aerodynamic flight characteristic which can result in an uncommanded rapid yaw rate which does not subside of its own accord and, if not corrected, can result in the loss of aircraft control.

AC 90-95 Section 7. d. 3. (page 7) defines Flight Characteristics and wind azimuths: Tail rotor vortex ring state occurs when the wind is out of (210ø to 330ø).

1. Winds within this region will result in the development of the vortex ring state of the tail rotor.

AC 90-95, Section 10. a. 1-2 (page 8) is titled Recommended Recovery Techniques and states:

a. If a sudden unanticipated right yaw occurs, the pilot should perform the following:

(1) Apply full left pedal. Simultaneously, move cyclic forward to increase speed. If altitude permits, reduce power.

(2) As recovery is effected, adjust controls for normal forward flight.

b. Collective pitch reduction will aid in arresting the yaw rate but may cause an increase in the rate of descent. Any large, rapid increase in collective to prevent ground or obstacle contact may further increase the yaw rate and decrease rotor rpm.

The pilot reported that there were no preaccident mechanical malfunctions or failures with the helicopter that would have precluded normal operation.

Accident Rpt# CEN16LA288	**07/21/2016 1400 CDT**	**Regis# N7581F**	**Baldwin, WI**	**Apt: Baldwin Airport WI14**
Acft Mk/Mdl CESSNA 208B-B		**Acft SN 208B0389**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl HONEYWELL TPE331		**Acft TT 10660**	**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: SKY DIVE TWIN CITIES		**Opr dba:**		**Aircraft Fire: NONE**
				AW Cert: STN

Summary

Before the accident flight, the commercial pilot had conducted three flights, during which parachutists were successfully dropped. After each flight, he returned the empty airplane to a dry grass airstrip (1,950 ft long) and conducted full-stop landings. Because the temperature was over 90ø with high humidity, the pilot requested that his manifests allow only up to 14 parachutists and a longer time between shutdowns to ensure sufficient time for adequate engine cooling before the next flight. The pilot reportedÿthat pop-up rain showers had been passing north and south of his baseÿairport throughout the morning butÿthat they never came closer than 10 to 15 miles.

While preparing for the accident flight, the pilot noted that clouds were over the intended drop zone but that there was no rain and that the clouds were moving away from the northern edge of the drop zone, so the pilot decided that it was worth attempting the flight.ÿWhile climbing through 4,000 ft, an air traffic controller advised the pilotÿthatÿlight-to-moderate precipitation was in the area. The pilot continued to climb toward the drop zone, and the flight encountered light rain. The pilot advised the 14 parachutists that they were returning toÿland because of the weather.

The approach was a stabilized, power-on approach, which was much flatter thanÿthe previous approaches with an empty airplane. The pilot used flaps incrementally to 30ø (full flaps), initiated a flare over the threshold, and touched down at 65 knots. He used full-reverse propeller and retracted the flaps during the landing roll. When the pilot started to apply the brakes, he discovered that the braking action was null.ÿThe grass runway was wet because of a recent rain shower. Because of the hot temperature, humidity, full load of parachutists, and trees at the end of the runway, the pilot decided not to attempt a go-around. The pilot held full aft on the control yoke for aerodynamic braking, stayed in full-reverse propeller, and braked as much as possible without locking the wheels up. Just before coming to a complete stop (about 5 to 10 mph), the airplane rolledÿinto aÿditch before a road beyond the departure end of the runway, which resulted inÿsubstantial damage to the empennage.

According to the airplane manufacturer, the applicable Pilot's Operating Handbook (POH) tables did not provide distances for landing on wet grass runways. However, for landing on dry grass runways, 40% distance was added to the normal landing roll distance chart figures.ÿThe pilot reported that the airplane weighed 8,010 lbs, and the nearest weather reporting station to the accident site, located at an airport about 16 miles to the north, reported that the temperature was 30øC at the time of the accident. According to the POH chart, the minimum required landing distance would have been about 2,265 ft. The published length of the runway was 1,950 ft.

The closest airport had an available runway that was 5,507 ft long, which would have been well within the safe stopping distance for the fully loaded airplane. The pilot's decision to land the fully loaded airplane on the wet grass runway that had insufficient length for the landing led to the runway overrun. If he had chosen to land at the nearby airport that had sufficient length for the landing, the accident may have been avoided.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The pilot's decision to land the fully loaded parachutist drop airplane on a wet grass runway that had insufficient length for the landing in high temperature conditions, which resulted in a runway overrun, when a more suitable longer runway was available at a nearby airport.

Events

1. Landing-landing roll - Runway excursion

Findings - Cause/Factor

1. Personnel issues-Action/decision-Info processing/decision-Decision making/judgment-Pilot - C
2. Aircraft-Aircraft oper/perf/capability-Aircraft capability-Landing distance-Capability exceeded - C
3. Environmental issues-Conditions/weather/phenomena-Temp/humidity/pressure-High temperature-Effect on equipment
4. Environmental issues-Physical environment-Runway/land/takeoff/taxi surface-Wet surface-Effect on operation

Narrative

On July 21, 2016, about 1400 central standard time, a Cessna 208B air drop configured airplane, N7581F, registered to Desert Sand Aircraft Leasing Company, Inc., of Carson City, Nevada, sustained substantial damage during a runway excursion after landing on runway 18 at the Baldwin Airport (WI14), Baldwin, Wisconsin. The commercial pilot and 14 passengers were not injured. The air drop flight was being operated by Skydive Twin Cities, of Baldwin, Wisconsin, and conducted under the provisions of Federal Code of Regulations Part 91. No flight plan was filed and local traffic advisory was requested by the pilot. Visual meteorological conditions with light rain showers prevailed throughout the area. The flight originated from WI14 about 1350.

According to the pilot, he had ferried the airplane from Forest Lake, Wisconsin, to WI14 on the morning of the accident. The airplane had just completed its

100-hour inspection at Forest Lake. After flying three air drops without incident, he prepared for his fourth flight of the day. He stated that all the previous 3 flights had successfully deployed the parachutists and were full stop landings in an empty airplane. Due to the temperatures of 90+ degrees and high humidity, the pilot requested his manifests limit to 14 parachutists and allow a longer time between shutdowns to allow for adequate cooling before the next flight.

The pilot reported that pop-up rain showers had been passing north and south of Baldwin throughout the morning, but never coming closer than 10-15 miles. While preparing for the fourth flight of the day (accident flight) the pilot discussed the weather with an experienced parachutist. Clouds were currently over the intended drop zone but there was no rain and the clouds were moving away from the northern edge of the drop zone. The pilot and parachutist agreed that it was worth attempting the drop considering the cloud movement away from the drop zone. The 14 parachutists were loaded and the airplane took off. Climbing through 3,000 feet MSL, the pilot checked in with ATC for traffic advisory and a radio check. Climbing through 4,000 feet, ATC advised the pilot that light to moderate precipitation was in the area. The pilot continued to climb toward the drop zone to see if there was any rain over the area and about 1-1.5 miles from the zone, light rain was encountered. The pilot advised the parachutists that they were returning to Baldwin to land because of the weather.

After descending, the pilot set up a base leg to runway 18, and about two miles from the airport, turned on final. The approach was a stabilized, powered-on approach which was much flatter than the standard descent with an empty airplane. The pilot used flaps incrementally to 30-degrees (full flaps), initiated a flare over the threshold, and touched down at 65 knots. Full reverse propeller was used and the flaps retracted during the landing rollout. When the pilot started to apply brakes, he discovered that the braking action was null. The 1,950-foot-long grass runway was wet because of a recent rain shower. Because of the elevated temperature, humidity, full load, and trees at the end of the runway, the pilot decided to not attempt a go around. The pilot held full aft on the control yoke for aerodynamic braking, stayed in full propeller reverse, and braked as much as possible without locking the wheels up. Just before coming to a complete stop (about 5-10 mph), the airplane rolled into a ditch before a road beyond the departure end of the runway, resulting in substantial damage to the empennage. The pilot secured the engine and all the occupants exited the airplane.

According to Cessna, the applicable 208B Pilot Operating Handbook (POH) tables do not provide for landing on WET grass runways. However, for landing on DRY grass runways, 40% distance is added to the normal landing roll distance chart figures. On NTSB Form 6120, the pilot reported an aircraft weight 8,010 pounds at the time of the accident. The nearest weather reporting station to the accident site, located about 16 miles to the north, reported the temperature at 30 degrees C. According to the POH chart, with an estimated airplane weight of 8,010 pounds, and temperature of 30 degrees C, the minimum landing distance would have been about 2,265 feet. The published length of runway 18 at the Baldwin Airport was 1,950 feet.

New Richmond Municipal Airport (RNH) was located about 16 miles to the north of Baldwin Airport. The length of runway 14 at RNH was 5,507 feet.

In an interview and email correspondence with the owner/operator (Skydive Twin Cities), he stated that the company's SOP would be updated to include the following language: If landing on a grass runway shorter than 3000' while fully loaded, the aircraft should be taken to the nearest airport that meets or exceeds safe landing requirements. He also stated that they also discussed the accident with their contract pilots and gave them a reminder of their training to use their best judgement in situations like what happened in Baldwin, Wisconsin. They discussed avoiding flying in situations where weather may become an issue and erring on the side of caution in all situations.

Skydive Twin Cities had 17 pilots, most of whom were contractors and used seasonally. The company fleet was comprised of 4 Cessna Grand Caravans, 1 Short Body 114A Cessna Caravan, 1 King Air 90, and 1 SC7 Skyvan.

Accident Rpt# CEN16LA274	**07/19/2016 1120 CDT**	**Regis# N179PT**	**East Troy, WI**	**Apt: East Troy Muni 57C**
Acft Mk/Mdl CHANCE VOUGHT F4U 5-5		**Acft SN 122179**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl PRATT & WHITNEY R2800		**Acft TT 2490**	**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: PRIVATE INDIVIDUAL		**Opr dba:**		**Aircraft Fire: NONE**
				AW Cert: SPE

Summary

Before the accident flight, the airplane's brakes were replaced with a custom brake system. Testing of the brake system after installation resulted in a failure of the right master cylinder. The cylinder was disassembled and the O-ring was found cut. The mechanic could not find any reason for the cut O-ring, so the O-rings on both master cylinders were replaced. The next brake test resulted in a brake fluid boil, and the brake builder informed the mechanic to change the type of hydraulic fluid. A subsequent ground brake test produced "no issues or hesitation with the brakes at all," to include "a full pressure pedal push to simulate a full locked brake to pressure test [the] system prior to taxi test." A maintenance flight was then conducted, and, during landing, the airplane began to drift to the right. The commercial pilot applied the left brake; however, the brake failed and the pedal "went to the floor." The airplane departed the runway and collided with a wind sock structure. Postaccident examination revealed that the left brake master cylinder O-ring was cut; however, the reason for the cut could not be determined.

After the accident, the mechanic contacted the master cylinder manufacturer for guidance. The company replaced the master cylinders with an upgraded model. The new cylinders were installed on the airplane and the mechanic, with guidance from the custom brake manufacturer, conducted more testing. A second airplane flew with the newer brake system without issue.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: A failure of the O-ring in the left brake master cylinder for reasons that could not be determined, which resulted in a loss of directional control during landing.

Events

1. Landing-landing roll - Miscellaneous/other
2. Landing-landing roll - Loss of control on ground
3. Landing-landing roll - Runway excursion
4. Landing-landing roll - Collision with terr/obj (non-CFIT)

Findings - Cause/Factor

1. Aircraft-Aircraft systems-Landing gear system-Master cylinder/brake valve-Failure - C

Narrative

On July 19, 2016, about 1120 central daylight time, a Vought F4U-5 Corsair airplane, N179PT, departed the runway surface after landing at the East Troy Municipal Airport (57C), East Troy, Wisconsin. The pilot was not injured and the airplane was substantially damaged. The airplane was registered to Fighters & Legends LLC and operated by a private individual under the provisions of 14 Code of Federal Regulations Part 91 as a personal flight. Visual meteorological conditions prevailed for the flight. The local flight departed 57C about 1115.

The pilot departed from 57C on a maintenance flight, in order to test the airplane brakes. He reported that the brake tested normal during the taxi. He applied the brakes several times in flight, and received positive pressure of the brake pedals. On the full stop landing to runway 8, the pilot applied the brakes and received normal braking action. As the airplane slowed, it slowly drifted to the right. The pilot applied a small amount of left brake to correct the drift and the pedal went to the floor; pumping the pedal did not correct the problem. In order to avoid a ditch, the pilot applied the right brake; however, the airplane's wing collided with the airfield's windsock. Substantial damage was sustained to the airplane's right wing.

Prior to the accident, the airplane's brakes were replaced with a custom brake system using Grove master cylinders. Testing of the brake system after installation resulted in a failure of the right master cylinder. The cylinder was disassembled and the O-ring was found cut. The mechanic could not find any reason for the cut O-ring, so the O-rings on both master cylinders were replaced with Viton O-rings and care was given to carefully place them into the cylinders. The next brake test resulted in a brake fluid boil, so the brake builder informed the mechanic to change the hydraulic fluid from MIL-PRF 5606 to MIL-PRF-83282. A subsequent ground brake test produced "no issues or hesitation with the brakes at all" to include "a full pressure pedal push to simulate a full locked brake to pressure test [the] system prior to taxi test."

After the accident, the mechanic contacted the master cylinder manufacturer (not the brake builder) for guidance. The company replaced the master cylinders with an upgraded model. The new cylinders were installed on the accident airplane and the mechanic, with guidance from the custom brake manufacturer, conducted more testing.

On February 6, 2017, a second Corsair flew with the newer brake system without issue.

Accident Rpt# CEN17LA151 04/08/2017 750 CDT	**Regis# N971QC**	**Nome, TX**	**Apt: N/a**	
Acft Mk/Mdl GRUMMAN ACFT ENG COR-SCHWEIZER	**Acft SN 1655**	**Acft Dmg: DESTROYED**	**Rpt Status: Factual**	**Prob Caus: Pending**
Eng Mk/Mdl PRATT & WITNEY PT6A-27	**Acft TT 900**	**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 137**	
Opr Name: TWIN COUNTY AIR-AG INC	**Opr dba:**		**Aircraft Fire: IFLT**	

Summary

The pilot was conducting agricultural operations when he noticed a "burnt wire" smell.ÿÿ He stated that smoke began to fill the cockpit, and he noticed flames outside the airplane. The pilot shut off the fuel selector and conducted a forced landing to a hay field.ÿ After landing, the fire consumed the majority of the airplane.ÿ

Review of maintenance records revealed the airplane's original engine was replaced by a turbine engine under a supplemental type certificate (STC); however, the STC holder did not perform or authorize the installation. Although the STC involved replacing the fuel lines every 5 years, the investigation revealed no records indicating that the fuel lines were replaced in accordance with the STC. Fire damage prevented a detailed examination of the engine installation; therefore, the origin of the fire could not be determined.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: An in-flight fire for reasons that could not be determined based on available information.

Events

1. Maneuvering-low-alt flying - Fire/smoke (non-impact)
2. After landing - Fire/smoke (non-impact)

Findings - Cause/Factor

1. Not determined-Not determined-(general)-(general)-Unknown/Not determined - C
2. Aircraft-Aircraft power plant-Engine (turbine/turboprop)-(general)-Incorrect service/maintenance

Narrative

On April 8, 2017, about 0750 central daylight time, a Grumman G-164A agricultural airplane, N971QC, conducted a forced landing near Nome, Texas. The pilot was not injured and the airplane was destroyed by fire during the accident. The airplane was registered to and operated by Twin County Air-AG, Inc. under the provisions of 14 Code of Federal Regulations Part 137 flight. Visual meteorological conditions prevailed at the time and no flight plan had been filed.

The pilot reported that he was conducting spray runs, when he noticed a burnt wire smell, he then noticed a low oil pressure indication. He partly opened the cabin door and noticed flames. The smoke and fire increased. Due to smoke in the cockpit, he had difficulty in seeing, but was able to find the engine fuel shut-off valve and closed it. The smoke cleared enough for him to select a hay field for a forced landing.

The responding Federal Aviation Administration (FAA) inspector noted that after landing, the fire consumed the majority of the airplane.
A review of the airplane records on file with the FAA, revealed that the airplane's original radial engine was replaced by a Walter M601E-11 turboprop engine; the Walter engine was subsequently replaced by Pratt & Whitney turboprop PT6A-27 engine on February 1, 2010.

The FAA inspector reported that the shop who owned the supplemental type certificate (STC) for the Pratt & Whitney did not perform, nor authorize the engine installation. He added the STC installation required special routing on the engine connections, including a 5-year replacement on the fuel lines. Investigators did not receive any records indicating the fuel lines were replaced in accordance with the STC. He also noted that the airplane's battery had recently been replaced.

The fire damage prevented a detailed inspection of the engine installation.

Accident Rpt# CEN17LA336	**09/02/2017 1645 CDT**	**Regis# N50MP**	**Burnet, TX**	**Apt: Burnet Municipal KBMQ**
Acft Mk/Mdl HUGHES 369A-NO SERIES		**Acft SN 1180860**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Prelim** **Prob Caus: Pending**
Eng Mk/Mdl ALLISON 250			**Fatal 0** **Ser Inj 1**	**Flt Conducted Under: FAR 091**
Opr Name: LYFT LLC		**Opr dba:**		**Aircraft Fire: NONE**
				AW Cert: STN

Events

1. Maneuvering-low-alt flying - Loss of engine power (total)

Narrative

On September 2, 2017, about 1645 central daylight time, a Hughes 369A helicopter, N50MP conducted an autorotation near Burnet, Texas. The pilot and one passenger were not injured, one passenger received minor injuries, and one passenger received serious injuries. The helicopter was substantially damaged during the landing. The helicopter was registered to and operated by Lyft, LLC, Missoula, Montana, under the provisions of 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed at the time of the accident.

According to the responding Federal Aviation Administration (FAA) inspector, the pilot and three passengers were conducting aerial hog hunt operations. The helicopter was en route to the Burnet Municipal Airport-Kate Craddock Field Burnet Municipal airport (KBMQ), Burnet, Texas, when the engine lost power. The pilot conducted an autorotation to a road; however, the helicopter landed hard, resulting in substantial damage to the fuselage and tailboom.

The wreckage was retained for further examination.

Accident Rpt# WPR16LA021	**11/03/2015 1130 PST**	**Regis# N510PA**	**Sedro-woolley, WA**	**Apt: N/a**
Acft Mk/Mdl MD HELICOPTER 369D		**Acft SN 811073D**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl ROLLS ROYCE 250-C20B		**Acft TT 9329**	**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 133**
Opr Name: OLYMPIC AIR INC		**Opr dba:**		**Aircraft Fire: NONE**
				AW Cert: STN

Summary

The commercial pilot reported that, while conducting longline operations, the helicopter lost engine power. The pilot entered the helicopter into an autorotation and attempted to land at the bottom of a hill on flat terrain, but the helicopter touched down on a slope; the tailboom, followed by the skids, impacted the side of a hill, and the helicopter then came to rest on its side.

During postaccident examination of the airframe and engine, debris was found throughout the fuel system. The start pump was removed, and the fuel bypass valve inlet port screenÿwas found covered with a brown, spongelike debris. Normal operation is with the start pump off (except when using alternate fuel mixtures or emergency fuels). When the start pump is not in use, fuel passes through the fuel bypass valve inlet port screen. The debris located on the fuel pump bypass valve inlet port screen, throughout the inside of the pump, and embedded in the centrifugal pump prevented the pump from producing sufficient fuel flow, which starved the engine of fuel and resulted in the power loss. Although the operator reported that it monitored for fuel contamination in the accident helicopter and its other company helicopters in accordance with the helicopter manufacturer's maintenance procedures, these procedures did not require that the fuel bypass valve inlet port screen be checked unless a cockpit warning indication light was activated. The light had not activated in the accident helicopter; therefore, the operator had not checked the screen. Following the accident, the helicopter manufacturer revised its procedures to require that the screen be checked whenever fuel contamination was identified.

Testing of the debris was consistent with naphthenates, which are surfactants that reduce the surface tension between the fuel and free water and allow the two liquids to mix. Refinery processing should remove all traces of naphthenic acid and its corresponding metal salts; however, in some refining processes, small amounts of the naphthenates can get carried through with the jet fuel, which can lead to microbial growth in the fuel. About 1 month before the accident, the operator found microbial growth in company fuel and treated the fuel with a microbiocide to destroy biological growth. However, there is no evidence that the microbiocide used by the operator contributed to the dissolution of the naphthenates, and the reason for the separation of naphthenates from the fuel could not be determined.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The loss of engine power due to fuel starvation as a result of naphthenate fuel contamination, which blocked the fuel flow through the start pump.

Events

1. Maneuvering - Loss of engine power (total)
2. Maneuvering-low-alt flying - Fuel starvation
3. Autorotation - Off-field or emergency landing

Findings - Cause/Factor

1. Aircraft-Aircraft systems-Fuel system-(general)-Not specified - C
2. Aircraft-Fluids/misc hardware-Fluids-Fuel-Fluid condition - C
3. Environmental issues-Physical environment-Terrain-Sloped/uneven terrain-Contributed to outcome
4. Aircraft-Aircraft systems-Fuel system-Fuel pumps-Not specified

Narrative

HISTORY OF THE FLIGHT

On November 3, 2015, at 1130 Pacific standard time, an MD Helicopters 369D, N510PA, was substantially damaged during a forced landing following a loss of engine power near Sedro-Woolley, Washington. The commercial pilot, the sole occupant, was not injured. Olympic Air was operating the helicopter as a 14 Code of Federal Regulations Part 133 external load flight. Visual meteorological conditions prevailed, and no flight plan was filed. The pilot departed from Arlington Municipal Airport, Arlington, Washington, about 0700.

According to the pilot, he was conducting longline operations using a 50-foot line to gather cedar pieces. After completing work at an initial jobsite, he flew to the second jobsite. Between jobs, the helicopter was refueled. Before beginning the second job, a safety briefing was conducted. The pilot then completed about 30 to 40 slings and as he was positioning the helicopter to lift a load from a slope, the helicopter suddenly lost engine power and he entered an autorotation. The pilot attempted to land at the bottom of a hill because of the flat terrain, but the helicopter touched down on the slope and the tailboom impacted the side of a hill, followed by the skids. The helicopter came to rest on its right side. Prior to the loss of engine power, the pilot did not receive any

warning lights during the flights.

TESTS AND RESEARCH

The National Transportation Safety Board investigator, the FAA representative, and representatives from MD Helicopters, Rolls-Royce, Boeing, and Olympic Air examined the helicopter following its recovery from the accident site.

Examination of the airframe and engine revealed contaminants throughout the fuel system, including the engine fuel filter. All warning lights functioned normally. Removal of the start pump showed the fuel bypass valve inlet port screen(the port used when the start pump is off) was covered with a brown, sponge-like debris (normal operation is with the start pump off except when using alternate fuel mixtures or emergency fuels). When the start pump is not in use, fuel passes through the fuel bypass valve inlet port screen. The debris was submitted to the NTSB Materials Laboratory for testing and identification.

The debris from the fuel bypass valve inlet port screen was examined using Fourier-transform infrared spectroscopy (FTIR) with a diamond attenuated total reflectance (ATR) accessory in accordance to ASTM E1252-98 (American Society for Testing Materials E1252-98: Standard Practice for General Techniques for Obtaining Infrared Spectra for Qualitative Analysis and American Society for Testing Materials). The debris was then examined by scanning electron microscope (SEM) and quantitative energy dispersive x-ray spectroscopy (EDS) in accordance with ASTM E15081. The FTIR and EDS examinations indicated that the unknown material was consistent with potassium naphthenate, a surfactant.

On January 12, 2016, the start pump was examined and tested at Globe Motors Inc. in Dothan, Alabama. The start pump was tested on a test bench with the contaminant in place. The electrically driven centrifugal fuel pump was tested in the non-powered and powered state, the pump demonstrated intermittent fuel flow from the discharge port; the pressure drop was erratic, and did not meet the defined performance parameters. The contamination was removed from the fuel bypass valve inlet port screen, and the start pump was retested. In the powered state, the fuel flow was intermittent and did not meet defined performance parameters. Disassembly of the start pump revealed debris internal to the pump and centrifugal impeller.

According to the operator, the company first identified fuel contamination in a company helicopter engine fuel filter on October 7, 2015. The operator reported that samples were retrieved from every refueling vehicle in its ground fleet, and some growth was noticed in a vehicle fuel tank, but not in the filters. All fuel sources were then treated with Biobor, a micro-biocide used in fuel to destroy microbial growth. This fuel was then supplied to company helicopters. For several years, the operator had been changing the engine fuel pump filter every 100 hours instead of the prescribed 300 hours due to contaminants.

MD Helicopters, Inc. (MDHI) maintenance procedures at the time of the accident required that the fuel bypass valve inlet port screen be checked if the FUEL FILTER cockpit warning light was activated. Because the light had not activated, the operator did not check the start pump screens. Following the accident, the helicopter manufacturer revised their maintenance procedures to require that the screens be checked when fuel contamination is identified.

During the examination of the helicopter, the main rotor blades were examined and cracking of the blade root fitting sealant, between the root fitting and airfoil, was observed on one of the blades. Although unrelated to the accident circumstances, one of the inboard sections of the main rotor blade was submitted to the Materials Laboratory for a detailed examination due to a previous event involving a blade root fitting disbond and its inspection procedures.

MDHI Maintenance Manual No. CSP-HMI-2 requires 100 hour inspections of the upper and lower root fittings for ".cracked adhesive/paint around the periphery of the root fitting." If the condition is found, the root fittings are to be inspected for disbonding. The root fitting inspection involves loosening (not removing) the outmost bolt and attempting to insert a 0.004 inch thick Mylar shim in the adhesive bond line between the root fitting and the blade doubler. The disposition of the blade is determined by the ability or inability of inserting the shim.

For the accident main rotor blade, visual inspections found cracked or missing paint around the entire periphery of the lower root fitting. The paint was intact around the upper root fitting. Magnified examination of the periphery of the lower fitting and area of missing paint near the outboard tip of the fitting revealed that the bond line was visible, however no gap was visible. The remaining bond line was hidden from direct view by the paint. The outermost bolt was then loosened, and a gap became visible, but a 0.004 inch thick feeler gauge could not be inserted. During the loosening and probing, more paint flaked off exposing more of the bond line. It was also noted that in some locations a fillet formed by adhesive squeezed out during manufacture partially hid portions of the bond line gap. Following loosening and removal of all bolts, the gap enlarged. In this condition, the 0.004 inch thick feeler gauge would easily slide into the exposed portions of the gap. At the two outermost bolt locations, the gauge would penetrate all the way to the bolt holes (about 1 inch). At the outermost bolt, the gap was estimated to be between 0.012 inch and 0.014 inch wide. Following these observations, MDHI and the blade manufacturer stated they would revise the main rotor blade inspection procedures to address the findings from this investigation.

ADDITIONAL INFORMATION

According to Chevron Global Aviation's publication-Aviation Fuels Technical Review, naphthenic acid and its corresponding metal salts can be present as naturally occurring materials in the crude oil or as residual refinery treating materials. Refinery processing should remove all traces of these materials. However, in some refining processes, small amounts of the naphthenates can get carried through with the jet fuel.

Following the accident, nearby workers tried to assist the pilot in evacuating the helicopter. He was unable to egress due to his headset cord. Once he removed his headset, he was able to egress from the helicopter. Following a prior accident, MD Helicopters had issued Operational Safety Notice 2015-001, Helmet Communication Cord Connection that notes, "In the event of an accident an attached communication cord may impede the occupants' ability to egress from the aircraft.Use of an intermediate "pig-tail" communication cord can help to mitigate this safety hazard."

Accident Rpt# GAA16CA325 06/17/2016 1400 CDT	**Regis# N155NR**	**Brainerd, MN**	**Apt: N/a**
Acft Mk/Mdl MD HELICOPTER 369E-500	**Acft SN 0623E**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl ROLLS ROYCE C20B		**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR PUBU**
Opr Name:	**Opr dba:**		**Aircraft Fire: NONE**
			AW Cert: STN

Summary

The commercial pilot reported that, during an aerial observation flight near known thunderstorms, the right center windscreen shattered. The pilot sustained multiple facial lacerations, but he was able to land the helicopter near a highway without further incident. The pilot reported that he did not see anything strike the windscreen and found no evidence of a bird strike.

Examination of the helicopter revealed that debris from the windscreen substantially damaged two of the main rotor blades and the leading edge of the horizontal stabilizer. Examination of the windscreen and its frame revealed evidence of cracking that originated in the center of the windscreen and propagated outward, consistent with impact forces from outside the helicopter.

DNA from samples taken from portions of the windscreen matched DNA from a Western Kingbird; however, given the extent of the damage to the windscreen, the small size of the Western Kingbird, and the pilot's statement, it is likely that this DNA was due to a previous bird strike and did not result in the failure of the windscreen. Therefore, the reason for the windscreen failure could not be determined.

Accident Rpt# GAA16LA325 06/17/2016 1400 CDT	**Regis# N155NR**	**Brainerd, MN**	**Apt: N/a**	
Acft Mk/Mdl MD HELICOPTER 369E-500	**Acft SN 0623E**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual**	**Prob Caus: Pending**
Eng Mk/Mdl ROLLS ROYCE C20B	**Acft TT 91**	**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR PUBU**	
Opr Name: MICHIGAN DEPARTMENT OF NATURAL RESOURCES	**Opr dba:**		**Aircraft Fire: NONE**	
			AW Cert: STN	

Summary

The commercial pilot reported that, during an aerial observation flight near known thunderstorms, the right center windscreen shattered. The pilot sustained multiple facial lacerations, but he was able to land the helicopter near a highway without further incident. The pilot reported that he did not see anything strike the windscreen and found no evidence of a bird strike.

Examination of the helicopter revealed that debris from the windscreen substantially damaged two of the main rotor blades and the leading edge of the horizontal stabilizer. Examination of the windscreen and its frame revealed evidence of cracking that originated in the center of the windscreen and propagated outward, consistent with impact forces from outside the helicopter.

DNA from samples taken from portions of the windscreen matched DNA from a Western Kingbird; however, given the extent of the damage to the windscreen, the small size of the Western Kingbird, and the pilot's statement, it is likely that this DNA was due to a previous bird strike and did not result in the failure of the windscreen. Therefore, the reason for the windscreen failure could not be determined.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The failure of the helicopter's windscreen for reasons that could not be determined based on the available information, which resulted in substantial damage to the main rotor blades and horizontal stabilizer.

Events

1. Enroute-cruise - Part(s) separation from AC
2. Enroute-cruise - Off-field or emergency landing

Findings - Cause/Factor

1. Aircraft-Aircraft structures-Windows-windshield system-Flight compartment windows-Failure - C

Narrative

This report was modified on August 30, 2017. Please see the docket for this accident to view the original report.

HISTORY OF FLIGHT

On June 17, 2016 about 1400 central daylight time (CDT), an MD Helicopters Inc., 369E, N155NR, sustained a windscreen failure in flight, 20 miles south of Brainerd Lakes Regional Airport, Minnesota. The helicopter was registered to the State of Minnesota Department of Natural Resources Enforcement Division and operated as a visual flight rules (VFR) public use local flight under the provisions of 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed for the flight, and company VFR flight following was in effect.

The commercial pilot reported that he conducted the aerial observation flight near known thunderstorms and that both the passenger and pilot doors had been removed from the helicopter. He reported that, about 20 miles south of his destination, he decreased the helicopter's airspeed to about 110 mph because, "it began to feel a little bumpy." The pilot added that, "suddenly with no warning," the right center windscreen shattered. The helicopter's nose dropped immediately, and the pilot lowered the collective. After slowing the helicopter to maintain control, the pilot conducted a precautionary landing without further incident. The pilot reported that he did not see anything strike the windscreen and found no evidence of a bird strike. Two of the helicopter's main rotor blades and the horizontal stabilizer sustained substantial damage. The pilot sustained facial lacerations, and the observer on board did not sustain any injury.

WRECKAGE AND IMPACT INFORMATION

According to the Federal Aviation Administration Inspector who responded to the accident, the right front windscreen failed in cruise flight for unknown reasons. A post-accident examination of the helicopter by the inspector revealed that debris from the windscreen had made gouges in the main rotor blades and the horizontal stabilizer. A significant portion of the windscreen was not recovered.

Examination of the recovered windscreen pieces revealed evidence of cracking that originated on the external surface of the center of the windscreen and then propagated outward.

TESTS AND RESEARCH

DNA samples taken from portions of the windscreen were sent to the Smithsonian Feather Identification Laboratory in Washington, DC. Microscopic examination of one of the samples revealed evidence of feathers. The DNA from the feathers matched the Western Kingbird (Tyrannus verticalis), which is a very small bird.

Accident Rpt# CEN17LA033	**10/29/2016 1540 CDT**	**Regis# N25YR**	**Dallas, TX**	**Apt: Dallas Executive RBD**
Acft Mk/Mdl NORTH AMERICAN TB 25N		**Acft SN 43-27868**	**Acft Dmg: SUBSTANTIAL**	**Rpt Status: Factual Prob Caus: Pending**
Eng Mk/Mdl CURTISS-WRIGHT CYCLONE		**Acft TT 5232**	**Fatal 0 Ser Inj 0**	**Flt Conducted Under: FAR 091**
Opr Name: COMMEMOATIVE AIR FORCE		**Opr dba:**		**Aircraft Fire: NONE**
				AW Cert: SPL

Summary

The airline transport pilot reported that the twin-engine, historic airplane was flying about 155 mph and 1,000 ft above ground level. Upon entering the left downwind leg of the airport traffic pattern, the pilot extended the landing gear. While the gear was in transit, the crew felt a jolt, as if a bird had impacted the front of the airplane. The pilot made a normal landing, parked the airplane, and noted damage to the left horizontal stabilizer and elevator.

A crew from another airplane reported to the pilot that they observed an object depart the accident airplane during landing gear extension. A postaccident examination revealed that the left inboard landing gear door separated in flight and impacted the engine nacelle, left horizontal stabilizer, and elevator. The landing gear door was later found in a field about 1.5 miles from the airport. The gear door was equipped with two arresting cables that were intended to prevent the door from hyperextending. The arresting cables were not installed in the correct position, and the investigation could not determine how long the arresting cables had been incorrectly installed. The landing gear door connecting rod was bent and fractured into two pieces at the safety wire drill hole. The fractured connecting rod was consistent with an overstress failure in bending. If the arresting cables had been installed correctly, it is likely that the landing gear door would not have separated from the airplane when the connecting rod failed.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The overstress failure of the landing gear connecting rod and the improper installation of the arresting cables, which allowed the landing gear door to depart in flight and impact the airplane.

Events

1. Maneuvering - Part(s) separation from AC

Findings - Cause/Factor

1. Aircraft-Aircraft systems-Landing gear system-Landing gear door retract sec-Failure - C
2. Aircraft-Aircraft systems-Landing gear system-Landing gear door retract sec-Incorrect service/maintenance - C

Narrative

HISTORY OF FLIGHT

On October 29, 2016, about 1540 central daylight time, a North American TB-25N airplane, N25YR, was damaged when the left inboard landing gear door separated in flight. The airline transport rated pilot, airline transport rated co-pilot, and seven passengers were not injured. The airplane sustained substantial damage. The airplane was registered to American Airpower Heritage Fly Museum and operated by the Central Texas Wing of the Commemorative Air Force (CAF) under the provisions of 14 Code of Federal Regulations Part 91 as an airshow flight. The local flight departed from the Dallas Executive Airport (RBD), Dallas, Texas, about 1500 and landed at RBD about 1545.

The pilot reported that the airplane was flying about 155 mph and 1,000 ft above ground level, when the airplane entered the traffic pattern. The landing gear was lowered on the downwind leg and when the gear was in transit the crew felt a jolt as if a bird had impacted the front of the airplane. The pilot noted that the main gear extended normally, but the nose gear was slow to indicate a down and locked position. He then felt a flight shudder from the airplane and a few seconds later the nose gear down indication was confirmed. He checked the flight controls for functionality with no abnormalities noted. He made a normal landing and parked the airplane.

The crew from another airplane reported to the pilot that they observed an object depart the accident airplane as the landing gear was extended in the traffic pattern. Witnesses on the ground reported observing the same event.

According to the responding Federal Aviation Administration (FAA) inspector, the left inboard landing gear door separated in flight and impacted the nacelle and then the left horizontal stabilizer and elevator. The airplane made an uneventful landing at RBD where damage was observed to the left horizontal stabilizer and elevator. The landing gear door was found in a field about 1.5 miles from RBD.

AIRCRAFT INFORMATION

A review of the maintenance logbooks revealed that a Phase B inspection, as a part of the continuous inspection program, was completed on February 12,

2016. There were no logbooks entries pertaining to the landing gear door and the operator stated they did not have any discrepancies with the associated components.

According to the airplane's operating manual, the maximum gear extended speed is 170 mph.

METEOROLOGICAL INFORMATION

The automated weather station located at RBD recorded wind from 170 degrees at 7 knots, gusting to 16 knots, 10 miles visibility, clear sky, temperature 82 degrees F, dew point 57 degrees F, and altimeter setting 30.05 inches of mercury.

TESTS AND RESEARCH

The landing gear door connecting rod assembly was found fractured into two pieces and was sent to the NTSB Materials Laboratory, Washington, DC, for examination. The examination revealed that one end of the connecting rod was outfitted with a spherical bearing rod end and the other end was outfitted with a clevis rod end. The clevis end was bent along the shank. The bend axis was perpendicular to the clevis hinge. The spherical bearing rod end was fractured in the threaded portion of the shank in the same plane as a drill hole for safety wire. There were no features indicative of a preexisting crack. Microscopic examination of the fracture surface revealed tear lines radiating away from the safety wire drill hole on the outer bend side of the fracture. The features observed on the connecting rod assembly were consistent with an overstress failure in bending.

ADDITIONAL INFORMATION

The CAF Director of Maintenance reported that the landing gear door connecting rod was bent and fractured into two pieces at the safety wire hole. The gear door is equipped with two arresting cables that are intended to prevent the door from hyperextending. He also reported that the arresting cables were not installed in the correct position. The investigation could not determine how long the arresting cables has been incorrectly installed.

The CAF Director of Maintenance issued an internal safety bulletin to warn the other B-25 crew of the safety issue. The bulletin noted that the inner gear door attachment rod bolt failed upon gear extension which allowed the door to fly open breaking both hinges and grounding straps. The door then struck the left horizontal stabilizer on the leading edge then passed under the horizontal and struck the elevator where it tore the fabric and bent one rib. The bulletin recommended to remove the safety wire and inner landing gear door bolts and inspect the mechanical gear door linkage for signs of stress. The door connecting rods must both push the doors open and then pull them closed. Once closed, the doors are held in position in tension by these connecting rods. Carefully inspect the shorter inner adjustment bolt for any signs of bending especially near the top attachment point.