

National Transportation Safety Board - Aircraft Accident/Incident Database

| | | | | |
|---|---------------------|---------------------|------------------------------|------------------------|
| Accident Rpt# CEN17LA190 | 05/04/2017 1400 CDT | Regis# N144HF | Tahoka, TX | Apt: T-bar Airport 2F4 |
| Acft Mk/Mdl AIR TRACTOR INC AT 502-UNDESIGNAT | Acft SN 502-0068 | Acft Dmg: DESTROYED | Rpt Status: Prelim | Prob Caus: Pending |
| Eng Mk/Mdl P&W PT6-A-34AG | Acft TT 11090 | Fatal 0 Ser Inj 0 | Flt Conducted Under: FAR 137 | |
| Opr Name: PLAINS AERIAL APPLICATIONS | Opr dba: | | Aircraft Fire: GRD | |
| | | | AW Cert: SPR | |

Events

1. Takeoff - Loss of engine power (total)
-

Narrative

On May 4, 2017, about 1400 central daylight time, an Air Tractor AT-502B, N144HF, registered to Wilmington Trust Company, Wilmington, Delaware, and operated by Plains Aerial Applications, Olton, Texas, was destroyed by impact and a post-crash fire following a loss of engine power after takeoff from the Bar-T Airport (2F4), near Tahoka, Texas. The commercial pilot, who was the sole occupant, sustained minor injuries. The aircraft was being operated under the provisions of Federal Code of Regulations Part 137 as an aerial application flight. Visual meteorological conditions prevailed in the vicinity and no flight plan was filed. The flight originated from 2F4, Tahoka, Texas, and its intended destination was to a local field to apply chemicals.

The pilot reported that he had flown several aerial application flights in the morning and the airplane was operating normally. Prior to the final flight of the day, while the airplane was being loaded with chemicals, he heard a noise, but all engine gauges appeared to indicate that everything was normal. He taxied down runway 35, applied power, and took off. The engine gauges indicated, ITI 8,000, propeller RPM 2,200. About 30 feet above the ground, the airplane plane started making a noise and the engine was surging. The pilot attempted to add more power, but the engine was not responding, and he tried to keep the airplane flying. Just as the pilot was going to dump the chemical load, the airplane veered to the left and hit the ground. After the pilot exited the airplane and post-crash fire ensued.

A witness at the airport, saw the airplane takeoff and fly about 1/2 way down the runway. He stated that the airplane touched down on its left wheel and became airborne again. He saw the airplane past the departure end of the runway and it was losing altitude. He then saw the left wing tilting down and the airplane impacted the ground.

National Transportation Safety Board - Aircraft Accident/Incident Database

| | | | | |
|---------------------------------|---------------------|---------------|-------------------|--|
| Accident Rpt# DCA16CA202 | 06/12/2016 1645 EDT | Regis# N104NN | Jamaica, NY | Apt: N/a |
| Acft Mk/Mdl AIRBUS A321 231-231 | | Acft SN 5895 | Acft Dmg: NONE | Rpt Status: Factual Prob Caus: Pending |
| Eng Mk/Mdl IAE V2533-A5 | | | Fatal 0 Ser Inj 1 | Flt Conducted Under: FAR 121 |
| Opr Name: AMERICAN AIRLINES | | Opr dba: | | Aircraft Fire: NONE |
| | | | | AW Cert: STT |

Summary

On June 12, 2016, about 1645 eastern daylight time, American Airlines flight 117, an Airbus A321, N104NN, encountered turbulence in cruise flight at FL170 that resulted in one flight attendant receiving a serious injury. The other 109 passengers and crew members onboard were not injured. The airplane was not damaged. The regularly scheduled domestic passenger flight was operating under the provisions of 14 Code of Federal Regulations Part 121 from John F. Kennedy International Airport (JFK), New York, New York, to Los Angeles International Airport (LAX), Los Angeles, California.

The captain stated that after takeoff the he advised the cabin crew to remain in their jumpseats due to possible turbulence. A few minutes later, he announced it was safe to move about the cabin. The captain further stated that seat belt sign was still illuminated at the time of the event, and there were no visible indications of any convective activity in the area. The Captain said that he did not think of this event further, until he was later contacted by a flight attendant who stated that she had been thrown sideways during the turbulence event, and had been injured as a result.

The Flight Attendant stated that she did not think much of the incident or injury and she flew for another four days. She then went to her doctor since her ankle was not getting any better and was diagnosed with a fractured foot.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: an encounter with convective turbulence that resulted in a flight attendant injury.

Events

1. Enroute-climb to cruise - Turbulence encounter

Findings - Cause/Factor

1. Environmental issues-Conditions/weather/phenomena-Turbulence-Convective turbulence-Effect on personnel - C

Narrative

On June 12, 2016, about 1645 eastern daylight time, American Airlines flight 117, an Airbus A321, N104NN, encountered turbulence in cruise flight at FL170 that resulted in one flight attendant receiving a serious injury. The other 109 passengers and crew members onboard were not injured. The airplane was not damaged. The regularly scheduled domestic passenger flight was operating under the provisions of 14 Code of Federal Regulations Part 121 from John F. Kennedy International Airport (JFK), New York, New York, to Los Angeles International Airport (LAX), Los Angeles, California.

The captain stated that after takeoff the he advised the cabin crew to remain in their jumpseats due to possible turbulence. A few minutes later, he announced it was safe to move about the cabin. The captain further stated that seat belt sign was still illuminated at the time of the event, and there were no visible indications of any convective activity in the area. The Captain said that he did not think of this event further, until he was later contacted by a flight attendant who stated that she had been thrown sideways during the turbulence event, and had been injured as a result.

The Flight Attendant stated that she did not think much of the incident or injury and she flew for another four days. She then went to her doctor since her ankle was not getting any better and was diagnosed with a fractured foot.

National Transportation Safety Board - Aircraft Accident/Incident Database

| | | | | |
|---|-----------------|-------------------------|-------------------|--|
| Incident Rpt# DCA16IA200 | 07/07/2016 2042 | Regis# N333NW | Rapid City, SD | Apt: Ellsworth Afb KRCA |
| Acft Mk/Mdl AIRBUS INDUSTRIE A320 211-231 | | Acft SN 329 | Acft Dmg: NONE | Rpt Status: Factual Prob Caus: Pending |
| Eng Mk/Mdl CFM INTL. CFM56 SERIES | | | Fatal 0 Ser Inj 0 | Flt Conducted Under: FAR 121 |
| Opr Name: DELTA AIR LINES INC | | Opr dba: DELTA AIRLINES | | Aircraft Fire: NONE |

Summary

The flight was routine until nearing the Rapid City terminal area. The crew had initially briefed for landing on runway 32, but the wind had shifted and favored runway 14. The crew reported that they had prepared for the runway 14 approach as well, so the change was not a significant factor. Delta chart material did include an advisory regarding the close proximity and alignment of the two airports.

Landing on runway 14 required more flying distance than runway 32, however, at 2030, the crew discussed the need to descend more rapidly. The flight was not altitude restricted by ATC. At 2035, ATC instructed the flight to fly heading of 300 degrees for the downwind leg of the visual approach. At that time the airplane was 9 miles abeam RAP at 12,000 feet. The ATC controllers noted that the airplane was high and fast for the visual approach. Field elevation of RAP was 3,200 feet and with a nominal remaining flying distance of about 15 to 18 miles the airplane was positioned well above the typical 300 feet per mile descent.

At 2036:30 the captain called the airport in sight and called for gear down and flaps one, configuring the airplane for a more expeditious descent. At this point RAP was south-southwest of the airplane, at the 8 o'clock position, while RCA was at the 10 o'clock position, therefore, it is likely the captain was actually looking at RCA.

Shortly afterward, ATC issued a vector for base leg, but the crew requested to extend the downwind due to high altitude, which ATC approved.

At 2039, the crew accepted a turn to base leg as the airplane was descending through 5,800 feet, about 5.5 miles north of RCA, and about 12 miles north of RAP. This was consistent with altitudes on the RNAV14 approach to RAP, but a somewhat steeper than normal angle to RCA.

ATC cleared the flight for "visual approach runway one-four. Use caution for Ellsworth Air Force Base located six miles northwest of Rapid City Regional." FAA order 7110.65 directs controllers to describe the location of a potentially confusing airport in terms of direction/distance from the aircraft. During interviews, the crew stated they misheard the controller's warning for the typical position advisory given on an instrument approach, and it supported their idea that the correct landing runway was 6 miles away. The FO did query the Captain if he had the right airport in sight, who expressed some uncertainty. Both crewmembers had little to no experience flying into either RAP or RCA, however, they did not verify their position to the desired landing runway using either the automation, or by querying ATC; and switched off the autopilot and Flight Directors removing possible cues as to their position related to RAP

At the time ATC cleared the flight for the visual approach the airplane was positioned on the final approach course of the RNAV14 approach, and at a reasonable altitude for that approach, therefore, there was no immediate indication to ATC that the crew had identified the wrong airport.

Shortly after, the captain increased the descent rate as high as 1,200 feet per minute, resulting in an unstable approach as he was focused on the wrong

National Transportation Safety Board - Aircraft Accident/Incident Database

landing runway. The crew realized the mistake just prior to touchdown, but considered it was safer to complete the landing at that point.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The flight crew's misidentification of the desired landing runway due to excess altitude requiring an extended downwind, and failure to use all available navigation information.

Events

1. Landing - Runway incursion veh/AC/person

Findings - Cause/Factor

1. Personnel issues-Action/decision-Info processing/decision-Identification/recognition-Flight crew - C
2. Personnel issues-Task performance-Planning/preparation-Flight planning/navigation-Flight crew - F
3. Personnel issues-Action/decision-Action-Lack of action-ATC personnel - F
4. Personnel issues-Action/decision-Info processing/decision-Identification/recognition-ATC personnel - F

Narrative

HISTORY OF FLIGHT

On July 7, 2016, at 2042 mountain daylight time (MDT), Delta Air Lines flight 2845, an Airbus A320, N333NW, landed on runway 13 at Ellsworth Air Force Base, Rapid City, South Dakota (RCA). The airplane was not damaged and there were no injuries. The flight was a regularly scheduled passenger flight from the Minneapolis St. Paul International Airport, Minneapolis, Minnesota (MSP) operating under the provisions of 14 Code of Federal Regulations Part 121, with a planned destination of Rapid City Regional Airport (RAP).

The flight crew reported the takeoff, climb, cruise, and initial descent to be routine until nearing the Rapid City area. The captain was the pilot flying and the first officer (FO) was the pilot monitoring for the flight leg.

Prior to arrival into the RAP area, the captain anticipated and briefed the ILS32 approach; however, due to his personal procedure, he also briefed the RNAV/GPS14 approach. Prior to contacting Ellsworth Approach Control, the FO obtained the latest weather for RAP, which included wind from 140 degrees at 4 knots. The approach briefing included the airport information page, the anticipated taxi route to the gate after landing, and the close proximity of RCA to RAP.

At 2029:29, the airplane was descending through flight level 235 (about 23,500 feet above sea level) descending to 17,000 feet, and the flight crew made initial contact with Ellsworth Radar Approach Control (EA). The approach controller acknowledged and cleared the flight to descend to 5,300 feet and to expect a visual approach to runway 14. The crew acknowledged, and discussed the need to descend more rapidly. The captain was demonstrating to the FO a technique on setting up the Flight Management System (FMS) to configure for approach. During this exchange the airplane was approximately 45 nautical miles east of RAP.

At 2034:58, the airplane was abeam RAP and the EA controller instructed the crew to fly heading of 300 degrees for a downwind leg to the visual approach. The EA controller and the RAP tower controller discussed on landline communications that the airplane was high and fast for the visual approach. During the exchange the airplane descended through about 12,000 feet. Field elevation of RAP was 3,200 feet and with a nominal remaining flying distance of about 15 to 18 miles the airplane was positioned well above the typical 300 feet per mile descent.

At 2035:18 the captain noted that the airplane's speed was too high, and then noted that his technique on the FMS was not going to work the way he intended, and switched back to open descent. At 2036:30 the captain said "there's the airport," and called for gear down and flaps one. At this point the airplane was east of RCA, and RAP was south-southwest of the airplane.

At 2037:15 the EA controller instructed the flight to turn to a heading of 230 degrees, for the base leg of the visual approach. At this time, the airplane was descending through 9,200 feet and was positioned 9 miles north of RAP. Total flying distance via base leg and final would have been about 12 miles. Ellsworth AFB was directly abeam the left side of the airplane by about 4 miles.

The FO advised the controller that they were "a little high" and requested an extended downwind leg. The controller approved and asked the pilot to advise when they were ready to turn in. The airplane had turned about 15 degrees left during the previous discussion, and continued to slow. The airplane had travelled about 5 miles in a northwesterly direction, and was descending through 6,600 feet, about 11 miles north of RAP when the controller asked the pilot if he could begin a turn toward the runway. At 2039:12 the pilot advised he could accept a turn and that he had the field in sight. At that time the airplane was 12 miles north of KRAP, and less than 2 miles abeam the extended centerline. KRCA was directly between the airplane's position and KRAP about 6 miles south.

National Transportation Safety Board - Aircraft Accident/Incident Database

The EA controller advised the pilot "cleared visual approach runway one-four. Use caution for Ellsworth Air Force Base located six miles northwest of Rapid City Regional." The FO acknowledged the approach clearance, and said to the captain "you got the right one in sight?" The captain replied "I hope I do."

After turning onto the base leg the captain selected a direct radial to the ZUDIM intersection, the final approach fix for the RAP RNAV GPS 14 approach, and armed the approach. ZUDIM is located 1.2 miles southwest of RCA. The captain reported that the airplane captured the approach about 5 miles from ZUDIM. The FO reported that he observed his navigation display (ND) and the flight was straight on the "correct" navigation line to the runway.

The airplane turned left, passing through and slightly west of the extended centerline for RAP runway 14. From 2039:45 to 2040:45 the airplanes descent rate slowed and was close to level at 4,900 feet. This altitude and position is consistent with the altitudes published on the RNAV 14 approach chart in that area; the specified altitude for crossing ZUDIM waypoint, directly abeam RCA, is 4,900 feet.

During this period, at 2040:10, the pilot asked if he should contact tower, and the EA controller instructed him to switch to the tower frequency. At that time, the airplane was about 5 miles north of RCA, about 11 miles north of RAP and positioned close to the extended centerlines of either runway. The captain switched off the autopilot, and directed the first officer to clear the flight director display. Just after switching to the tower frequency, the airplane began a rapid descent from 4,600 feet, about 3 miles from the RCA runway threshold, to landing at KRCA, with a field elevation of 3,276 msl.

The captain reported that about 500 feet agl he did not observe the PAPI lights; however, he remained "focused on the visual approach." At 2041:25 the captain stated "confirmed stable." The airplane was 1.5 nm from the threshold of KRCA, 8 nm from KRAP. The airplane was descending approximately 1,200 feet per minute, and the captain said "this is the most [expletive] approach I've made in a while."

As they approached the runway, the captain retarded the thrust levers to idle, at which point they realized that they were landing at RCA. According to both crewmembers. the landing runway 13 was "uneventful" and they cleared the runway onto taxiway "D" and notified the RAP air traffic control tower.

At 2042:24, the RAP tower controller notified the EA controller that DAL2845 had landed at RCA instead of RAP. The EA controller contacted RCA tower and began the process of handling the "wrong airport" landing with the tower and airfield operations personnel. On the ATC interphone, the RAP tower controller stated that he was initially watching the airplane on the tower radar display, but at the time of landing was entering traffic count information.

PERSONNEL INFORMATION

The captain was 60 years old. He held an Airline Transport Pilot (ATP) certificate with type ratings on the Airbus A-320 and A-330, and the Boeing 747 with Second-in-Command privileges. He also held a commercial pilot certificate for instrument helicopter, a flight engineer certificate, and an FAA first-class medical certificate dated April 8, 2016. He had approximately 25,800 hours total time, and 2,980 hours in the A320. He was originally hired with Republic Airways on June 9, 1986, which merged with Northwest Airlines in October of 1986, and subsequently merged with Delta in January of 2010. At the time of the incident, he was based in Salt Lake City, Utah.

A review of FAA records found no prior accident, incident, or enforcement actions.

According to Delta Air Lines' records the captain's previous experience flying into RAP was December 4, 2014, and a subsequent departure from RAP on December 6, 2014. No other records of previous experience with the airport were located.

The First Officer was 51 years old and resided in Utah. He had an ATP certificate with a type rating on the Airbus A-320. He also had a FAA first-class medical certificate dated January 4, 2016. His date of hire with Delta Air Lines was May, 2000. At the time of the incident, he was based at Salt Lake City. He had logged approximately 7,600 hours total time, with 2,324 hours in the A320. He had never flown to RAP or RCA before as a pilot.

A review of FAA records found no prior accident, incident, or enforcement actions.

AIRCRAFT INFORMATION

N333NW, manufacturer construction number 0329, was an Airbus 320-211, manufactured in 1992. The airplane had a maximum ramp weight of 170,635 pounds, and had a total passenger seating capacity of 160, and contained 4 flight crew seats and 5 cabin crew seats. Recorded data and airline records

National Transportation Safety Board - Aircraft Accident/Incident Database

indicated no relevant mechanical, systems, or maintenance issues with the airplane.

Electronic Flight Instrument System (EFIS)

The incident airplane was equipped with an electronic flight instrumentation system. The system included 6 flat panel displays, of which 2 were considered the Primary Flight Displays (PFD) and 2 were considered Navigation Displays (ND), which provided flight and navigation information in a digital format. The crew reported they operated the ND in Rose NAV mode which displays a full compass rose oriented to the aircraft heading, a depiction of the aircraft position with reference to the flight plan inserted into the FMS, and additional information associated with the flight plan. The destination runway and the runway identifier are depicted in white. In some cases, parallel or crossing runways are also depicted. According to Delta documentation the ROSE NAV mode "is particularly useful for maintaining orientation when being vectored near an airport prior to approach."

METEOROLOGICAL INFORMATION

The Rapid City Regional Airport weather observation at 20:58 indicated clear skies, 10 miles visibility and light winds from 170 degrees.

Sunset was at 20:38, approximately 4 minutes prior to the event, the end of civil twilight was 21:13. According to NTSB Meteorological staff, the sun would have been at an azimuth of about 304 degrees true and about 1 degree below the horizon at the time of the incident.

AERODROME INFORMATION

Rapid City Regional Airport (RAP)

Rapid City Regional Airport was located 8 miles southeast of Rapid City, South Dakota, had a field elevation of 3,204 feet msl, and was located at a latitude/longitude of N44°02.7'W103°03.4'. The airport was serviced by an FAA Air Traffic Control Tower that was in operation from 0600 to 2200 local time. The tower was in operation at the time of the incident. Radar services to DAL2845 were provided by Ellsworth Approach Control, located at the Ellsworth Air Force Base. RAP runway 14/32 was 8,701 feet long and 150 feet wide, the surface was concrete and grooved. Runway 14 was equipped with high intensity runway lights (HIRL) and runway end identifier lights (REIL). Runways 14 and 32 were equipped with a 4-light precision approach path indicator (PAPI) on the left side of the runway with a 3.00-degree glide path angle.

Runway 14 was serviced by an RNAV and a VOR approach.

Ellsworth Air Force Base (RCA)

Ellsworth Air Force Base was located 5 miles northeast of Rapid City, South Dakota, had a field elevation of 3,276 feet msl, and was located at a latitude/longitude of N44°08.7'W103°06.2'. The airport was serviced by a US Air Force Air Traffic Control Tower that was in operation on the day of the incident from 0800 to 2100 local time. The airport was also equipped with a military airport beacon, which operated from sunset to sunrise. RCA had a single runway designated as 13/31. Runway 13/31 was 13,497 feet long and 300 feet wide, the surface was concrete and grooved. Both runways had a 4-light PAPI located on the left side of the runway with a 3.00-degree glide path angle, HIRL, Approach Light System with Sequenced Flashing Lights (ALSF-1), and REIL.

Each runway was served by an ILS approach.

Delta Air Lines' Operational Specific 10-7 and 10-7a Pages

Delta Air Lines provided Delta pilots with operational specific information on airports that are served by Delta Air Lines. The information is provided as a 10-7 page, also known at Delta as the "green page," within the Jeppesen Chart structure. The information provided by the 10-7 charts includes operation frequency, gate number information at the specific airport, airport specific procedures for departures and arrivals, general information, and Special Notes. The 10-7 page for KRAP provided within the special notes section the following information: "Ellsworth AFB lies northwest of RAP on final approach for runway 14. These airports have similar runway alignment and can be mistaken for one another."

FLIGHT RECORDERS

National Transportation Safety Board - Aircraft Accident/Incident Database

The cockpit voice recorder (CVR), an Allied Signal 980-6022-001, serial number 0777 was a solid-state CVR that recorded 2 hours of digital cockpit audio. The recorder was received with no heat or structural damage and the audio information was extracted from the recorder normally, without difficulty. The quality of the audio was characterized as good to excellent. A CVR group was convened and created a transcript. Timing on the transcript was established by correlating the CVR events to common events on the flight data recorder (FDR).

The FDR, a Honeywell SSFDR, Model 980-4700 serial number 4425 records a minimum of 25 hours of airplane flight information in a digital format using solid-state flash memory as the recording medium. The recorder was received in good condition and the data were extracted normally from the recorder. Correlation of the FDR data to the event local time, mountain daylight time (MDT), was established by using the FDR recorded GMT hour, minute and second time parameters and then applying an additional -6 hour offset to change GMT to local MDT time.

MEDICAL AND PATHOLOGICAL INFORMATION

Both pilots completed company drug screening tests on July 8, 2016. Results of these tests for both pilots were negative. The captain told NTSB investigators that he was wearing his glasses, as required by his medical certificate.

ADDITIONAL INFORMATION

FAA Order 7110.65 specified phraseology to warn pilots of similar airports is contained in paragraph 7-4-3g: In those instances where airports are located in close proximity, also provide the location of the airport that may cause the confusion. EXAMPLE- "Cessna Five Six November, Cleveland Burke Lakefront Airport is at 12 o'clock, 5 miles. Cleveland Hopkins Airport is at 1 o'clock 12 miles. Report Cleveland Hopkins in sight."

Aviation Safety Reporting System (ASRS) Reports

A review of wrong airport landing data provided by ASRS revealed that in the previous 20 years approximately 600 wrong airport landings or near landings had been voluntarily reported. Of those, 6 occurred while attempting to land at RAP and resulted in a landing or landing attempt at RCA. Four of those reported were conducted by general aviation aircraft, which consisted of piston and turbojet aircraft, and two of those events were done during commercial air carrier passenger operations.

Previous "Wrong Airport" Incidents Involving RAP and RCA

According to information provided by Ellsworth, similar incidents of pilot confusion between RAP and RCA have occurred in the past, ending in either an unauthorized landing at RCA or a low approach to RCA before the mistake was identified and corrected by ATC or the pilot. For example, on August 17, 2015, a Hawker business jet inbound to the area from the west was vectored northwest of RCA for a visual approach to RAP. The crew misidentified RCA as their destination and completed an unauthorized landing. On June 19, 2004, a Northwest Airlines Airbus A319 also completed an unauthorized landing at RCA after the crew confused RCA with RAP. Ellsworth reported that pilot confusion between RAP and RCA continues to be fairly common, although the problem is typically detected and corrected by ATC or the crew before landing.

NTSB Wrong Airport Landing Investigations

DCA14IA037

On January 12, 2014, about 1808 CST (0008Z), Southwest Airlines flight 4013, a Boeing 737-7H4, N272WN, mistakenly landed at M. Graham Clark Downtown Airport (PLK), Branson, Missouri, which was 6 miles north of the intended destination, Branson Airport (BBG), Branson, Missouri. The flight had been cleared to land on runway 144 at BBG, which was 7,140 feet long; however, landed on runway 12 at KPLK, which was 3,738 feet long. Night visual meteorological conditions prevailed at the time. The flight crew visually acquired the airport and completed the flight via visual reference. However, the flight crew failed to comply with the company guidance to monitor all available navigational information and subsequently indicated that they had misidentified PLK as BBG.

DCA13IA016

National Transportation Safety Board - Aircraft Accident/Incident Database

On November 21, 2013, about 2120 local time, a Boeing 747-400LCF (Dreamlifter) landed at the wrong airport in Wichita, Kansas, in night VMC conditions. The airplane was being operated as a cargo flight from John F. Kennedy International Airport (JFK), Jamaica, New York, to McConnell Air Force Base (IAB), Wichita, Kansas. Instead, the flight crew mistakenly landed the airplane at Colonel James Jabara Airport (AAO), Wichita, Kansas. The flight crew indicated that during their approach to the airport, they saw runway lights that they misidentified as IAB. The flight was cleared for the RNAV GPS 19L approach, and the flight crew saw AAO but misidentified it as IAB. The flight crew then completed the flight by visual reference to the AAO runway. Once on the ground at AAO, the flight crew was uncertain of their location until confirmed by the IAB tower controller. The AAO runway was 6,101 feet long, whereas IAB runways were 12,000 feet long.

Previous NTSB Recommendations and Guidance

In April, 2014, the NTSB issued a Safety Alert for landings at the wrong airport. In the Safety Alert, pilots were guided to use the following tools to prevent landings at the wrong airport:

Adhere to standard operating procedures (SOPs), verify the airplane's position relative to the destination airport, and use available cockpit instrumentation to verify that you are landing at the correct airport.

Maintain extra vigilance when identifying the destination airport at night and when landing at an airport with others in close proximity.

Be familiar with and include in your approach briefing the destination airport's layout and relationship to other ground features; available lighting such as visual glideslope indicators, approach light systems, and runway lighting; and instrument approaches.

Use the most precise navigational aids available in conjunction with a visual approach when verifying the destination airport.

Confirm that you have correctly identified the destination airport before reporting the airport or runway is in sight.

Safety Recommendation A-15-010

ATC radar data processing systems typically include minimum safe altitude warning (MSAW) functions that compare the aircraft's expected trajectory with its observed trajectory and alert controllers if the aircraft is in danger of collision with terrain or obstructions. This is accomplished by comparing the aircraft's altitude against a digital terrain model until it reaches the vicinity of the destination airport, when the processing changes to compare the aircraft's observed trajectory against expected trajectories for landing aircraft.

In "wrong airport" landings, MSAW systems should detect that the aircraft is unexpectedly descending to the ground away from the destination airport and generate a minimum safe altitude alert. Review of Ellsworth radar data showed that as DAL2845 approached the RCA area, the system applied MSAW rules for RCA arrivals instead of RAP arrivals. Consequently, no alert was generated in this incident. This behavior has been identified in other "wrong airport" landings. On May 4, 2015, the NTSB issued safety recommendation A-15-10 to the FAA, asking that FAA, "Modify the minimum safe altitude warning (MSAW) software to apply the MSAW parameters for the flight plan destination airport to touchdown, rather than automatically reassigning the flight to another airport based on an observed (and possibly incorrect) trajectory." The recommendation is currently classified "Open - Acceptable Alternate Response."

National Transportation Safety Board - Aircraft Accident/Incident Database

| | | | | |
|---|---------------------|----------------|---------------------|--|
| Accident Rpt# CEN16FA158 | 04/19/2016 2115 CDT | Regis# N7MC | Slidell, LA | Apt: Slidell ASD |
| Acft Mk/Mdl BEECH 65 A90 1 | | Acft SN LM-106 | Acft Dmg: DESTROYED | Rpt Status: Factual Prob Caus: Pending |
| Eng Mk/Mdl PRATT & WHITNEY CANADA PT6A-20 | Acft TT 15208 | Fatal 2 | Ser Inj 0 | Flt Conducted Under: FAR PUBU |
| Opr Name: ST TAMMANY PARISH MOSQUITO ABATEMENT DIS | Opr dba: | | | Aircraft Fire: GRD |

Events

1. Approach-VFR pattern base - Unknown or undetermined
3. Approach-VFR pattern base - Loss of control in flight

Narrative

HISTORY OF FLIGHT

On April 19, 2016, about 2115 central daylight time, a Beech 65-A90-1 airplane, N7MC, collided with towers suspending high-power transmission lines while attempting to land at Slidell Municipal Airport (ASD), Slidell, Louisiana. Both pilots were fatally injured, and the airplane was destroyed. The airplane was registered to and operated by the Saint Tammany Parish Mosquito Abatement District as a 14 Code of Federal Regulations Part 91 public aircraft operations flight. Night visual meteorological conditions existed at the airport at the time of the accident, and the flight was operating on a visual flight rules flight plan. The local flight originated about 2000.

After completing a planned mosquito abatement application flight, the pilots radioed their intention to land at ASD. The accident pilots were flying a visual pattern to runway 18, and another company airplane was behind them conducting a practice GPS approach to runway 18. When the pilot of the other company airplane radioed that they had crossed the GPS approach's final approach fix, the accident pilot radioed that they were on the left base leg and were number one to land at the airport. Seconds later, the pilots of the other company airplane saw a blue arc of electricity, followed shortly after by a plume of fire. The accident pilots could not be reached on the radio, and the company pilots notified emergency personnel. The airplane was located in a marsh about 0.6 nautical mile north-northwest of the approach end of runway 18.

PERSONNEL INFORMATION

Pilot

The left seat pilot, age 59, held a commercial pilot certificate with ratings for airplane single-engine land, airplane multiengine land, and instrument airplane. In addition, he held a flight instructor certificate for airplane single-engine and instrument airplane. He was issued a second-class medical certificate, dated February 18, 2016, with the limitation that he must wear corrective lenses for near and distant vision. On his medical application, the pilot reported that he used hydrochlorothiazide and irbesartan.

As of December 11, 2015, the pilot reported accruing 6,825 hours of single-engine total time with 50 hours logged in the preceding 6 months and 952 hours of multiengine total time with 15 hours logged in the preceding year. His flight time in the Beech C90 was 15 hours with 5 hours logged in the preceding year. He estimated that he had 7,762 total hours with 1,135 hours of night time, 10 hours of actual instrument time, and 305 hours of simulated instrument time. He reported his last biennial flight review occurred in February 2014.

Company records showed that the pilot flew the accident airplane for 7.4 hours in 2015 and 5.7 hours in 2014. On July 1, 2015, the pilot was approved by the aerial operations supervisor to act as pilot-in-command for the accident airplane and a Britten-Norman BN-2T airplane, N717MC.

Copilot

The copilot, age 68, who was in the right seat, held an airline transport pilot certificate with ratings in airplane single-engine land, multiengine land, rotorcraft-helicopter, and instrument airplane and helicopter. He also held a commercial pilot certificate for airplane single-engine sea and a flight instructor certificate for airplane single and multiengine, rotorcraft-helicopter, and instrument airplane and helicopter. He was issued a second-class medical certificate, dated July 14, 2015, with the limitation that he must have available glasses for near vision. On his medical application, the copilot reported that he used diltiazem, losartan, pravastatin, metoprolol, etodolac, pantoprazole, sildenafil, and warfarin.

National Transportation Safety Board - Aircraft Accident/Incident Database

As of February 25, 2016, the pilot reported accruing 4,310 hours of single-engine total time with 50 hours logged in the preceding 6 months and 5,910 hours of multiengine time with 105 hours logged in the preceding year. His flight time in the Beech C90 was 627 hours with 59 hours logged in the preceding year. He estimated that he had 18,163 total hours with 4,619 hours of night time, 2,199 hours of actual instrument time, and 431 hours of simulated instrument time. He reported that his last biennial flight review occurred in February 2014.

The copilot was also the department's aerial operations supervisor. He had worked for the Saint Tammany Parish Mosquito Abatement District for 31 years. According to other company pilots, although the copilot was the more senior pilot, he was seated in the right seat and would have been performing copilot duties.

Both pilots had flown the accident airplane together on April 4, 7, 8, 11, and 18, 2015, for a total of 6.9 hours. Each flight ended in a night landing to ASD. On the forms for each of the flights, the area for "comments and/or mechanical problems" was blank.

AIRCRAFT INFORMATION

The low-wing, twin engine airplane was manufactured in 1968. It was powered by two 550-shaft-horsepower Pratt & Whitney Canada PT6A-20 turboprop engines. Each engine drove a three-blade, variable-pitch, full-feathering Hartzell HC-B3TN-3B propeller. The airplane was operated as a public aircraft operations flight by the Saint Tammany Parish of Louisiana for mosquito abatement purposes.

The airplane's most recent inspection was a combined Phase I through IV and annual inspection recorded on December 1, 2015, at an airframe total time of 15,189.6 hours. On that date, the left engine had accrued 9,676.6 hours since new and 1,638.4 hours since overhaul. The right engine had accrued 7,413 total hours since new and 1,248.5 hours since overhaul. Airplane forms filled out before the flight showed that the airplane had logged 15,207.1 total hours.

The airplane was originally manufactured as a US Army U-21D. It remained in military service until 1995 when it was sold to a civilian company. In 1998, the airplane was registered with the Federal Aviation Administration (FAA) as a Beechcraft 65A90-1 and issued a special airworthiness certificate for restricted use for the purpose of agriculture and pest control. The airplane was acquired by the Saint Tammany Parish in June 2012. The airplane was equipped with a radar altimeter and had controls installed in both pilot seats.

METEOROLOGICAL INFORMATION

At 2053, the ASD automated weather reporting facility reported calm wind, visibility 10 miles, clear sky, temperature 68ø F, dew point 64ø F, and a barometric pressure of 30.09 inches of mercury .

Astronomical data from the US Navy Observatory indicated that the moon rose on the day of the accident at 1730 and set the following morning at 0541. The moon disk illumination was 94%.

COMMUNICATIONS

The accident pilots were communicating on the airport's common traffic advisory radio frequency (CTAF), which was not recorded. The pilots in the company airplane who were also on the CTAF reported no distress calls before the accident.

AIRPORT INFORMATION

ASD is located 4 miles northwest of Slidell, Louisiana, and is a publicly owned, nontowered airport that is open to the public. The airport is at an elevation of 28 ft mean sea level. It has a 5,002 ft long, 100 ft wide asphalt runway aligned with 18/36. Runway 18 has a displaced threshold with a published landing distance of 4,057 ft. It is lit with medium-intensity runway lighting and runway end identifier lights, which are preset to low intensity between the hours of dusk and dawn. There is precision approach path indicator lightning (PAPI) located on the left side of the runway, configured for a 3.0ø glideslope.

The other company pilots reported that the airfield lighting was illuminated and that the PAPI operated normally.

WRECKAGE AND IMPACT INFORMATION

The airplane initially impacted two 70- to 80-ft-tall towers that suspended high-power transmission lines . The lines generally ran on a heading of 150ø/330ø and, due to their height, were not required to be illuminated. Ceramic isolators were shattered on the northern pole, and the top guide wire was damaged on the southern pole. A portion of the airplane's lower chemical tank and left wing tip were found directly beneath the poles. The airplane's debris path followed a 175ø heading in marshy terrain for about 555 ft.

The main wreckage came to rest about 0.6 nautical mile northwest of runway 18's approach end. The main wreckage consisted of the metal hopper tank frame, the upper portion of the fuselage, cockpit instrumentation, inboard left wing, outboard right wing, left horizontal, vertical stabilizer, rudder, and the left engine with its propeller. A postimpact fire consumed a majority of the cabin structure. The airplane's nose was generally aligned with 350ø magnetic, and the fuselage was inverted.

Flight control continuity was confirmed to all surfaces. The flaps were in the retracted position. The elevator and rudder trim positions could not be determined due to impact damage. The fuel selector position could not be determined. The emergency locator transmitter (ELT) was still attached to the airplane, and the antenna and was found in the "armed" position, but it was thermally damaged. The company pilots in the other airplane reported that they did not hear any ELT beacon.

Both pilots' restraint hardware remained latched; the webbing was consumed by fire. The left fuel flow gauge read 400 pounds per hour and the right fuel gauge read 250 pounds per hour. The cockpit instrumentation was impact and thermally damaged and was largely unreadable. The right inlet turbine temperature gauge read about 700ø. The left propeller speed read about 1,100 rpm.

The right engine was impact-separated and found upright. Its propeller remained attached to the engine. Two of the three blades displayed S-bending with nicks on their leading edges. Examination of the left propeller blades found one blade almost completely consumed by the postcrash fire. Another blade was partially consumed and displayed curling with a rearward bend. The third blade was curled and bent rearward. No anomalies were detected with the airframe and engine.

A thermally damaged SD card was recovered from the airplane's ADAPCO Wingman GX system and sent to the National Transportation Safety Board laboratory for data extraction. Due to the damage sustained in the accident, the chips on the card were not recoverable.

MEDICAL AND PATHOLOGICAL INFORMATION

Pilot

The St. Tammany Parish Coroner's Office conducted an autopsy on the pilot. The autopsy showed no natural diseases that could have posed a potential hazard to flight safety.

The FAA Civil Aerospace Medical Institute performed forensic toxicology on specimens from the pilot. Testing was negative for carbon monoxide and ethanol. The following drugs were detected:

Ibuprofen detected in urine
Irbesartan detected in urine
Irbesartan detected in blood

The pilot had previously reported the use of irbesartan, which is used to treat high blood pressure, to the FAA. Ibuprofen is a nonnarcotic analgesic and anti-inflammatory agent and is available in prescription and nonprescription forms.

Copilot

The St. Tammany Parish Coroner's Office conducted an autopsy on the copilot. Although the autopsy did note several chronic medical conditions, there did not appear to be any natural diseases that posed an immediate hazard to flight safety.

The FAA Civil Aerospace Medical Institute performed forensic toxicology on specimens from the copilot. Testing was negative for ethanol and 15% carbon

monoxide was detected in blood from the heart. The following drugs were detected:

Diltiazem detected in urine

Diltiazem detected in blood (heart)

Metoprolol detected in urine

Metoprolol NOT detected in blood (heart)

Rosuvastatin detected in urine

Rosuvastatin detected in blood (heart)

Warfarin detected in urine

Warfarin detected in blood (heart)

The copilot had previously reported all of the detected medications except the rosuvastatin to the FAA. Rosuvastatin is a prescription medication used to reduce blood cholesterol and triglycerides levels.

ADDITIONAL INFORMATION

The FAA's Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25A), dated 2008, Chapter 10, "Night Operations," states the following:

Night Illusions

A black-hole approach occurs when the landing is made from over water or non-lighted terrain where the runway lights are the only source of light. Without peripheral visual cues to help, pilots will have trouble orientating themselves relative to Earth. The runway can seem out of position (downsloping or upsloping) and in the worse case, results in landing short of the runway. If an electronic glide slope or visual approach slope indicator (VASI) is available, it should be used. If navigation aids (NAVAIDs) are unavailable, careful attention should be given to using the flight instruments to assist in maintaining orientation and a normal approach. If at any time the pilot is unsure of his or her position or attitude, a go-around should be executed.

Approaches and Landings

To fly a traffic pattern of proper size and direction, the runway threshold and runway-edge lights must be positively identified. Once the airport lights are seen, these lights should be kept in sight throughout the approach. Distance may be deceptive at night due to limited lighting conditions. A lack of intervening references on the ground and the inability of the pilot to compare the size and location of different ground objects cause this. This also applies to the estimation of altitude and speed. Consequently, more dependence must be placed on flight instruments, particularly the altimeter and the airspeed indicator.

The altimeter and VSI [vertical speed indicator] should be constantly cross-checked against the airplane's position along the base leg and final approach. A visual approach slope indicator (VASI) is an indispensable aid in establishing and maintaining a proper glidepath.

National Transportation Safety Board - Aircraft Accident/Incident Database

| | | | | |
|---|---------------------|----------------|-----------------------|--|
| Accident Rpt# ERA16CA302 | 07/20/2016 1830 EDT | Regis# N46CE | Burnsville, NC | Apt: Mountain Air Airport 2NC0 |
| Acft Mk/Mdl BEECH B200-UNDESIGNAT | | Acft SN BB1492 | Acft Dmg: SUBSTANTIAL | Rpt Status: Factual Prob Caus: Pending |
| Eng Mk/Mdl PRATT AND WHITNEY PT6A-61 | | Acft TT 1838 | Fatal 0 Ser Inj 0 | Flt Conducted Under: FAR 091 |
| Opr Name: CENTURY EQUIPMENT COMPANY INC | | Opr dba: | | Aircraft Fire: NONE |
| | | | | AW Cert: STN |

Events

1. Landing-landing roll - Airport occurrence
-

Narrative

The pilot stated that during approach to the 50-foot-wide runway, in his airplane which had a 54.5-foot wingspan, he maintained a left wing low attitude to account for a crosswind from the left and touched down 1 to 2 feet right of the runway centerline. While correcting towards the runway centerline, the right wing collided with a bush located off the right side of the runway resulting in substantial damage to the right aileron. He indicated there was nothing mechanically wrong with the airplane that caused the collision, and that he had flown into the same airstrip between 30 and 50 times. Following the accident, the bush was removed.

National Transportation Safety Board - Aircraft Accident/Incident Database

| | | | | |
|---|---------------------|---------------------|------------------------------|---------------------------------------|
| Accident Rpt# CEN17LA123 | 01/23/2017 1900 MST | Regis# N216CS | Durango, CO | Apt: Durango-la Plata County DRO |
| Acft Mk/Mdl BEECH C 99-NO SERIES | | Acft SN U-216 | Acft Dmg: SUBSTANTIAL | Rpt Status: Prelim Prob Caus: Pending |
| Eng Mk/Mdl PRATT & WHITNEY CANADA PT6A-36 | Acft TT 26580 | Fatal 0 Ser Inj 0 | Flt Conducted Under: FAR 135 | |
| Opr Name: ALPINE AIR INC | Opr dba: | Aircraft Fire: NONE | | AW Cert: STN |

Events

1. Takeoff - Loss of control in flight
-

Narrative

On January 23, 2017, about 1900 central standard time (CST), a Beechcraft C99, N216CS, departed the runway during an attempted takeoff at Durango La-Plata County Airport (DRO), Durango, Colorado. The airplane sustained substantial damage to both engines. The airline transport-rated pilot and commercial-rated co-pilot were not injured. The airplane was registered to Alpine Aviation Inc, and was operated under the provisions of 14 Code of Federal Regulations Part 135 as a cargo flight. Instrument meteorological conditions prevailed for the flight, and an instrument flight rules flight plan was filed.

National Transportation Safety Board - Aircraft Accident/Incident Database

| | | | | |
|------------------------------------|---------------------|---------------|-----------------------|---------------------------------------|
| Accident Rpt# ERA17LA170 | 05/02/2017 1815 EDT | Regis# N911GE | Orange Springs, FL | Apt: N/a |
| Acft Mk/Mdl BELL 206-B | | Acft SN 5271 | Acft Dmg: SUBSTANTIAL | Rpt Status: Prelim Prob Caus: Pending |
| Eng Mk/Mdl ROLLS-ROYCE 250-C20 SER | | Acft TT 8966 | Fatal 0 Ser Inj 1 | Flt Conducted Under: FAR PUBU |
| Opr Name: MARION COUNTY SHERIFF | | Opr dba: | | Aircraft Fire: NONE |
| | | | | AW Cert: STN |

Events

1. Maneuvering-hover - External load event (Rotorcraft)
-

Narrative

On May 2, 2017, about 1815 eastern daylight time, a Bell 206B helicopter, N911GE, sustained substantial damage during firefighting operations near Orange Springs, Florida. The helicopter was registered to and operated by the Marion County Sheriff's Office as a public-use aircraft. The commercial pilot sustained serious injuries. Visual meteorological conditions prevailed and no flight plan was filed for the local flight that departed Ocala International Airport, Ocala, Florida, about 1500.

According to the Aviation Unit Commander, the pilot was utilizing a firefighting bucket (Bambi Bucket) and had completed between 25 and 30 drops on the fire zone. He landed at a nearby landing zone, refueled, and completed 3 or 4 additional drops when the accident occurred. After lowering the bucket into the water and filling it, he pulled the bucket from the water and immediately felt "a severely out of CG condition to the right." He assumed that the bucket cables were entangled in the tail skid, so he released the water from the bucket. The condition persisted, so he rocked the helicopter to attempt to free the cable; however, this was not successful. He then released the cable with the cargo release button. He heard the "clunk" sound that was typical with releasing the bucket, then he heard another "clunk." The helicopter then began to spin violently and crashed into the water. The pilot freed himself from the cockpit, inflated his personal flotation device, and swam to shore. He utilized his cell phone to call for assistance and was rescued by first responders.

An initial examination of the wreckage revealed cable marks on the right rear skid tube for about 6 inches in length. There was also a torsional fracture of the tail rotor short shaft.

National Transportation Safety Board - Aircraft Accident/Incident Database

Accident Rpt# WPR16LA142 07/17/2016 1409 PDT Regis# N790RJ Mt. Adams, WA Apt: N/a
Acft Mk/Mdl BELL UH 1H-NO SERIES Acft SN 70-16371 Acft Dmg: SUBSTANTIAL Rpt Status: Factual Prob Caus: Pending
Eng Mk/Mdl LYCOMING T53-L-703 Acft TT 8885 Fatal 0 Ser Inj 0 Flt Conducted Under: FAR PUBU
Opr Name: KING COUNTY SHERIFFS OFFICE Opr dba: Aircraft Fire: NONE

Summary

The commercial pilot was conducting a public flight in the helicopter to transport two search and rescue personnel to a landing zone located in mountainous terrain at an elevation of about 7,800 ft. The pilot reported that he aborted his first approach, which was from the north, because he felt that he was using too much left pedal. On his second approach, which was from the south, the helicopter yawed right. The pilot recognized that a loss of tail rotor effectiveness was occurring. He attempted to recover control by reducing the collective and applying forward cyclic; however, the helicopter spun and impacted the ground. The pilot reported that there were no mechanical malfunctions or failures with the helicopter that would have precluded normal operation. It is likely that, during the landing approach, as the helicopter's airspeed dropped below effective translational lift and the pilot added power to compensate, there was insufficient left pedal to stop the resulting right yaw, and the pilot lost control of the helicopter due to a loss of tail rotor effectiveness.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The pilot's failure to maintain yaw control as he slowed the helicopter during a landing approach, which resulted in the loss of helicopter control due to the loss of tail rotor effectiveness.

Events

1. Landing - Loss of tail rotor effectiveness
2. Landing - Collision with terr/obj (non-CFIT)

Findings - Cause/Factor

1. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Yaw control-Not attained/maintained - C
2. Personnel issues-Task performance-Use of equip/info-Aircraft control-Pilot - C
3. Environmental issues-Physical environment-Terrain-Mountainous/hilly terrain-Contributed to outcome

On July 17, 2016, about 1409 Pacific daylight time, a Bell UH-1H helicopter, N790RJ, impacted mountainous terrain while maneuvering near a landing zone located at an elevation of about 7,800 feet in Mount Adams, Washington. Two pilots, four crewmembers and two passengers were not injured; however, the helicopter sustained substantial damage. The helicopter was registered to and operated by the King County Sheriff's Department and was supporting a Search and Rescue (SAR) mission at the time of the accident. Visual meteorological conditions prevailed at the time of the accident, and no flight plan had been filed for the public flight that originated from Yakima Air Terminal/McAllister Field (YKM), Yakima, Washington about 1330.

The pilot reported that after refueling at YKM, he departed to transport two SAR personnel onto Mt. Adams to retrieve an injured hiker. While en route, a sensor unit on the helicopter indicated 5 knots of wind. As they approached the hiker from the north, the pilot used too much left pedal and decided to abort the approach. He attempted a second approach from the south, but the helicopter yawed to the right, which the pilot attributed to a loss of tail rotor effectiveness (LTE). In an attempt to recover, the pilot reduced the collective and applied forward cyclic. The helicopter spun about 540 degrees, impacted the ground, and then departed the mountain. The pilot did not observe any indications of a malfunction with the rotor or the drive system on the helicopter. In his subsequent report, he reported that there were no mechanical malfunctions or anomalies that could have precluded normal operation. The helicopter then returned to YKM.

The FAA issued Advisory Circular (AC) 90-95, Unanticipated Right Yaw in Helicopters, in February 1995. The AC states that LTE is a critical, low-speed aerodynamic flight characteristic that could result in an uncommanded rapid yaw rate, which does not subside of its own accord and, if not corrected, LTE could result in the loss of aircraft control. It also stated, "LTE is not related to a maintenance malfunction and may occur in varying degrees in all single main rotor helicopters at airspeeds less than 30 knots."

Paragraph 6 of the AC covered conditions under which LTE may occur. It stated: "Any maneuver which requires the pilot to operate in a high-power, low-air-speed environment with a left crosswind or tailwind creates an environment where unanticipated right yaw may occur."

Paragraph 8 of the AC stated: "OTHER FACTORS...Low Indicated Airspeed. At airspeeds below translational lift, the tail rotor is required to produce nearly 100 percent of the directional control. If the required amount of tail rotor thrust is not available for any reason, the aircraft will yaw to the right."

Paragraph 9 of the AC stated: "When maneuvering between hover and 30 knots: (1) Avoid tailwinds. If loss of translational lift occurs, it will result in an increased high power demand and an additional anti-torque requirement. (2) Avoid out of ground effect (OGE) hover and high power demand situations, such as low-speed downwind turns. (3) Be especially aware of wind direction and velocity when hovering in winds of about 8-12 knots (especially OGE). There are no strong indicators to the pilot of a reduction of translation lift... (6) Stay vigilant to power and wind conditions."

National Transportation Safety Board - Aircraft Accident/Incident Database

| | | | | |
|---------------------------------|---------------------|---------------|-------------------|--|
| Accident Rpt# DCA17CA072 | 02/11/2017 1950 MST | Regis# N7822A | Phoenix, AZ | Apt: Phoenix Sky Harbor PHX |
| Acft Mk/Mdl BOEING 737 76N-76N | | Acft SN 32596 | Acft Dmg: NONE | Rpt Status: Factual Prob Caus: Pending |
| Eng Mk/Mdl CFM INTL CFM56-7B22 | | Acft TT 47885 | Fatal 0 Ser Inj 1 | Flt Conducted Under: FAR 121 |
| Opr Name: SOUTHWEST AIRLINES CO | | Opr dba: | | Aircraft Fire: NONE |
| | | | | AW Cert: STT |

Summary

On February 11, 2017, about 1950 mountain standard time, Southwest Airlines flight 4152, a Boeing 737-700, N7822A, had a catering agent fall from the airplane while alongside provisioning the airplane. On board were the captain, first officer, three flight attendants and several passengers. The regularly scheduled passenger flight was operating under the provisions of 14 Code of Federal Regulations Part 121 from Phoenix Sky Harbor International Airport (PHX), Phoenix, Arizona, to Sacramento International Airport (SMF), Sacramento, California.

According to Southwest Airlines, while passengers were boarding the airplane at the gate, a catering agent returned to the airplane to provide a box of peanuts. The agent stopped the provisioning truck short of the airplane creating a gap between the truck and the airplane. After entering the airplane to deliver the peanuts, the agent lost situational awareness and stepped backwards, falling through the gap, and suffered a fractured rib.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: the catering agent's lack of situational awareness when exiting the airplane that resulted in a serious injury.

Events

1. Prior to flight - Ground handling event

Findings - Cause/Factor

1. Personnel issues-Task performance-Planning/preparation-(general)-Ground crew - C

Narrative

On February 11, 2017, about 1950 mountain standard time, Southwest Airlines flight 4152, a Boeing 737-700, N7822A, had a catering agent fall from the airplane while alongside provisioning the airplane. On board were the captain, first officer, three flight attendants and several passengers. The regularly scheduled passenger flight was operating under the provisions of 14 Code of Federal Regulations Part 121 from Phoenix Sky Harbor International Airport (PHX), Phoenix, Arizona, to Sacramento International Airport (SMF), Sacramento, California.

According to Southwest Airlines, while passengers were boarding the airplane at the gate, a catering agent returned to the airplane to provide a box of peanuts. The agent stopped the provisioning truck short of the airplane creating a gap between the truck and the airplane. After entering the airplane to deliver the peanuts, the agent lost situational awareness and stepped backwards, falling through the gap, and suffered a fractured rib.

National Transportation Safety Board - Aircraft Accident/Incident Database

| | | | | |
|--|---------------------|---------------|-------------------|--|
| Accident Rpt# DCA12CA059 | 03/03/2012 1720 EST | Regis# N453AW | Harrisburg, PA | Apt: Philadelphia Intl PHL |
| Acft Mk/Mdl BOMBARDIER INC CL-600-2B19 | | Acft SN 7838 | Acft Dmg: NONE | Rpt Status: Factual Prob Caus: Pending |
| Eng Mk/Mdl GE CF34 SERIES | | | Fatal 0 Ser Inj 1 | Flt Conducted Under: FAR 125 |
| Opr Name: AIR WISCONSIN AIRLINES CORP | | Opr dba: | | Aircraft Fire: NONE |
| | | | | AW Cert: STN |

Summary

On March 3, 2012, about 1720 eastern standard time, Air Wisconsin 3733, a Bombardier CL-600-2B19, N453AW, experienced turbulence during descent into Philadelphia International Airport (PHL), Philadelphia, Pennsylvania. Of the 50 passengers and crew onboard the airplane, one flight attendant received serious injuries and the airplane was not damaged. The flight was operating under 14 CFR Part 121 as a regularly scheduled passenger flight from Cleveland Hopkins International Airport (CLE), Cleveland, Ohio to PHL.

According to the flight crew, as the airplane was descending through about 17,000 feet, the flight initially experienced light turbulence so the flight crew turned on the seatbelt sign. Shortly after, the airplane experienced severe clear air turbulence that caused the airplane to drop at least 300 feet. At the time of the turbulence, the flight attendant (FA) was in the galley securing the beverage cart and was thrown to the ceiling and onto the floor injuring her back. The FA was assisted into her jumpseat by a passenger. The flight crew declared an emergency with ATC and requested emergency personnel meet the airplane at the gate. After landing, the FA was transported to the hospital and diagnosed with a fracture of her L-1 vertebrae.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: an inadvertent encounter with clear air turbulence during descent.

Events

1. Enroute-descent - Turbulence encounter

Findings - Cause/Factor

1. Environmental issues-Conditions/weather/phenomena-Turbulence-Clear air turbulence-Effect on personnel - C

Narrative

On March 3, 2012, about 1720 eastern standard time, Air Wisconsin 3733, a Bombardier CL-600-2B19, N453AW, experienced turbulence during descent into Philadelphia International Airport (PHL), Philadelphia, Pennsylvania. Of the 50 passengers and crew onboard the airplane, one flight attendant received serious injuries and the airplane was not damaged. The flight was operating under 14 CFR Part 121 as a regularly scheduled passenger flight from Cleveland Hopkins International Airport (CLE), Cleveland, Ohio to PHL.

According to the flight crew, as the airplane was descending through about 17,000 feet, the flight initially experienced light turbulence so the flight crew turned on the seatbelt sign. Shortly after, the airplane experienced severe clear air turbulence that caused the airplane to drop at least 300 feet. At the time of the turbulence, the flight attendant (FA) was in the galley securing the beverage cart and was thrown to the ceiling and onto the floor injuring her back. The FA was assisted into her jumpseat by a passenger. The flight crew declared an emergency with ATC and requested emergency personnel meet the airplane at the gate. After landing, the FA was transported to the hospital and diagnosed with a fracture of her L-1 vertebrae.

National Transportation Safety Board - Aircraft Accident/Incident Database

| | | | | |
|----------------------------------|--------------------|------------------|-----------------------|--|
| Accident Rpt# ERA15LA135 | 02/24/2015 612 EST | Regis# N989FX | Baltimore, MD | Apt: Baltimore/washington Intl BWI |
| Acft Mk/Mdl CESSNA 208-B | | Acft SN 208B2403 | Acft Dmg: SUBSTANTIAL | Rpt Status: Factual Prob Caus: Pending |
| Eng Mk/Mdl P&W CANADA PT6A-114A | | Acft TT 1103 | Fatal 0 Ser Inj 0 | Flt Conducted Under: FAR 135 |
| Opr Name: MOUNTAIN AIR CARGO INC | | Opr dba: | | Aircraft Fire: NONE |
| | | | | AW Cert: STN |

Summary

The airline transport pilot was taxiing the airplane to the parking ramp after a night flight. As he approached a point where the taxiway intersected a service road, a ground service vehicle crossed in front of the airplane. To avoid a collision, the pilot applied the brakes and used reverse thrust, which stopped the airplane about 3 ft from the vehicle. The rapid application of braking and reverse thrust resulted in the airplane rocking backward and the empennage striking the ground, substantially damaging the airframe. The operator of the ground service vehicle reported that he was distracted while he attempted to retrieve a security badge and did not see the airplane as it approached the intersection. State law required that ground vehicles always yield right of way to taxiing aircraft.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The ground service vehicle operator's failure to yield right of way to the airplane due to distraction, which necessitated the pilot's use of reverse thrust and braking to avoid a collision and resulted in the airplane's empennage striking the ground.

Events

1. Taxi-from runway - Abrupt maneuver

Findings - Cause/Factor

1. Environmental issues-Physical environment-Object/animal/substance-Ground vehicle-Effect on operation - C
2. Personnel issues-Psychological-Attention/monitoring-Monitoring environment-Other/unknown - C

Narrative

On February 24, 2015, at 0612 eastern standard time, a Cessna 208B, N989FX, was substantially damaged when its empennage struck the ground while taxiing at Baltimore Washington International Airport (BWI), Baltimore, Maryland. The airline transport pilot was not injured. Night visual meteorological conditions prevailed, and an instrument flight rules flight plan was filed for the flight, which originated from Newark Liberty International (EWR), Newark, New Jersey and was destined for BWI. The on-demand cargo flight was conducted under the provisions of 14 Code of Federal Regulations Part 135.

Following an uneventful flight, the pilot landed the airplane on runway 33R, before exiting to the left onto taxiway J. He then continued to taxi to the southwest and transitioned onto taxiway AA. As the airplane approached the intersection of the taxiway and a service road, a ground service vehicle approached from the airplane's right. The pilot applied the airplane's brakes and full reverse thrust, and the airplane came to a stop. The ground service vehicle passed in front of the airplane at an estimated distance of between 2 and 3 feet, and the vehicle and the airplane did not collide.

The pilot stated that the "hard" braking and reverse thrust application caused the nose landing gear strut to compress, resulting in a "spring effect that was multiplied by removing reverse thrust rapidly." The airplane then pitched up and the empennage struck the ground, resulting in substantial damage to the airframe. The pilot reported that there were no pre-accident mechanical malfunctions or failures of the airplane's systems.

The operator of the ground service vehicle stated that he was proceeding to the security gate and was reaching down to grab an airport badge. The operator noticed the airplane when he looked up and immediately "slammed" on the brakes. The vehicle eventually came to a stop after crossing the taxiway.

Review of security camera video showed a sequence of events consistent with the statements provided by the pilot and the ground vehicle operator. Additionally, the airplane was taxiing with its landing lights, taxi lights, strobe lights, and rotating beacon lights on. The ground service vehicle's headlights, taillights, running lights, and a roof-mounted beacon were also on.

The 0554 weather conditions reported at BWI included 10 statute miles visibility and scattered clouds at 22,000 feet. The beginning of civil twilight occurred at 0620 and sunrise occurred at 0647. Moonrise occurred at 1024.

Code of Maryland Regulations 11.03.01.04 K(1) titled "Yielding the Right-of-Way" states "Any person operating a motor vehicle on the air operations area shall yield the right-of-way to aircraft in motion or aircraft with engines running, ready to be put in motion."

National Transportation Safety Board - Aircraft Accident/Incident Database

| | | | | |
|----------------------------------|---------------------|-----------------------|---------------------|--|
| Accident Rpt# CEN15FA171 | 03/12/2015 2315 CDT | Regis# N919EM | Eufaula, OK | Apt: N/a |
| Acft Mk/Mdl EUROCOPTER AS 350 B2 | | Acft SN 4113 | Acft Dmg: DESTROYED | Rpt Status: Factual Prob Caus: Pending |
| Eng Mk/Mdl TURBOMECA ARRIEL 1D1 | | Acft TT 1943 | Fatal 1 Ser Inj 2 | Flt Conducted Under: FAR 135 |
| Opr Name: EAGLEMED LLC | | Opr dba: EAGLEMED LLC | | Aircraft Fire: NONE |
| | | | | AW Cert: STN |

Summary

The commercial pilot was conducting a positioning flight back to the base after conducting an emergency medical services flight during which a patient was transported to a hospital. According to one of the two medical crewmembers onboard the flight, the crew checked the weather before the flight, and the report showed ceilings at 8,500 ft. and 6 miles visibility at their intended destination and ceilings at 10,000 ft. at the departure location. During the flight to transport the patient, the pilot stated that the clouds above their cruise altitude were lower than he expected. The pilot descended the helicopter and landed it at the hospital helipad without incident. While on the ground, the pilot checked the weather conditions again, and they were the same. After the pilot conferred with the medical crew per their risk management procedures, they decided to return to their base as planned.

During the accident flight, the helicopter was southbound at a cruise altitude of about 1,500 ft. mean sea level (msl) in an area with a terrain elevation of about 700 to 900 ft. msl, and dark night visual meteorological conditions existed. According to the medical crewmembers, about midway to their destination, the helicopter entered instrument meteorological conditions (IMC). After a brief discussion, during which one of the crewmembers told the pilot to go "up," the pilot stated he was going to divert to another airport because he saw lights, and he then began a left turn.

Although both crewmembers reported seeing trees and one of them told the pilot to "pull up," shortly after , the helicopter impacted trees and terrain atop a wooded hill at an elevation of about 840 ft. msl, which resulted in the separation of the tailboom and portions of the fuselage; the main wreckage came to rest on its right side.

A meteorological reporting station located about 20 miles north-northwest of the accident location reported a broken ceiling at 2,400 ft. above ground level (agl) and 10 statute miles visibility at the time of the accident. Another meteorological reporting station located about 28 miles south of the accident location reported cloud bases between 900 and 2,100 ft. agl at the time of the accident. An examination of the helicopter revealed no preimpact anomalies that would have precluded normal operation. It is likely that the pilot experienced special disorientation during a turn after inadvertently entering IMC, which resulted in the helicopter descending into trees atop high terrain.

Zolpidem, which is a prescription hypnotic medication used to treat insomnia and may impair mental and/or physical ability required to perform potentially hazardous tasks such as driving or operating heavy machinery, was detected in the pilot's blood and liver. Given it was not detected in the central blood, it could not be determined whether or to what extent it might have impaired the pilot .

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The flight's inadvertent encounter with night instrument meteorological conditions, which resulted in the pilot turning the helicopter and subsequently descending into trees and terrain due to spatial disorientation.

Events

1. Enroute-cruise - VFR encounter with IMC
2. Enroute-cruise - Loss of visual reference
3. Enroute-change of cruise level - Controlled flight into terr/obj (CFIT)
4. Post-impact - Part(s) separation from AC
5. Post-impact - Roll over
6. Post-impact - Cabin safety event

Findings - Cause/Factor

1. Personnel issues-Psychological-Perception/orientation/illusion-Spatial disorientation-Pilot - C
2. Environmental issues-Conditions/weather/phenomena-Ceiling/visibility/precip-Clouds-Effect on operation - C
3. Environmental issues-Physical environment-Terrain-Mountainous/hilly terrain-Contributed to outcome
4. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Altitude-Not attained/maintained - C

National Transportation Safety Board - Aircraft Accident/Incident Database

Narrative

HISTORY OF FLIGHT

On March 12, 2015, about 2315 central daylight time, a Eurocopter AS350 B2 helicopter, N919EM, impacted trees and terrain while maneuvering near Eufaula, Oklahoma. The commercial pilot was fatally injured, and the two medical crewmembers sustained serious injuries. The helicopter was destroyed. The helicopter was registered to and operated by Eagle Med, LLC, Wichita, Kansas, as Eagle Med 35, a 14 Code of Federal Regulations Part 135 emergency medical services (EMS) positioning flight. Dark night visual meteorological conditions prevailed at the time of the accident, and a company visual flight rules flight plan had been filed. The helicopter departed from St. Francis Hospital Heliport (4OK3), Tulsa, Oklahoma, about 2248 and was destined for McAlester Regional Airport (MLC), McAlester, Oklahoma.

According to the two medical crewmembers, one of whom was an emergency medical technician (EMT) and one of whom was a flight nurse, the crew checked the weather before the previous flight to transfer a patient to 4OK3, and the report showed ceilings at 8,500 ft and 6 miles visibility at MLC and ceilings at 10,000 ft. at 4OK3. During the flight to transport the patient, the pilot stated that the clouds above their cruise altitude were lower than he expected. The pilot descended the helicopter and then landed it at 4OK3 without incident. While on the ground at 4OK3, the pilot checked the weather conditions again, and they were the same. The pilot conferred with the medical crew per their risk management procedures, and they decided to return to MLC as planned. The helicopter took off and headed southbound at a cruise altitude of about 1,500 ft. mean sea level (msl) in an area with a terrain elevation of about 700 to 900 ft. msl.

The EMT, seated in the far left back seat, stated that they were about halfway to MLC when they suddenly entered instrument meteorological conditions (IMC). He recalled the pilot saying that this was "not good." He told the pilot to climb to 3,500 ft., but he did not think the pilot initiated a climb. He also told the pilot that he could see lights on the horizon. The pilot asked him to "tell him about those lights." He told the pilot, "They are to the left" and gestured a left turn with his hands. The EMT said that he then saw a strobe flash and trees and said, "pull up," but the helicopter crashed.

The flight nurse, seated in the far right back seat, stated that as they departed the Tulsa area, she began monitoring their route on the chart. She added that they were practicing a procedure regarding inadvertently encountering IMC when the EMT said, "We're in a cloud." The pilot responded, "What do I do now?" and the EMT answered, "go up." The pilot then said that he was proceeding to Okmulgee, Oklahoma, because he could see lights to the left. He then said, "I'm turning left." When he started the turn, the EMT began yelling "pull up." The pilot then said, "What's that noise?" The EMT responded, "that's your 500" (altitude warning). The flight nurse said she started seeing trees and then did not see or hear anything after that.

The helicopter had an EMS Sky Connect GPS transmitter that sent 39 messages to the company containing location information and device power status. The last three messages showed the helicopter as it approached the accident site. The third-from-the-last message showed the helicopter on a 173° heading at 414 ft. and a ground speed of 118 knots. The next-to-last message showed the helicopter on a 146° heading at 397 ft. and a ground speed of 110 knots. The last message showed the helicopter on a 172° heading at 380 ft. and a ground speed of 119 knots.

PERSONNEL INFORMATION

The pilot held a commercial pilot certificate with single-engine land airplane, helicopter, and instrument ratings. On August 23, 2014, he was issued a second-class medical certificate with no limitations.

Company records showed that the pilot had flown 2,384.7 total hours and 7.6 hours in the 30 days before the accident. The records also showed that the pilot successfully completed a flight review in the accident make and model helicopter on February 24, 2014.

AIRCRAFT INFORMATION

The four-place, single-engine helicopter, serial number 4113, was configured for EMS transport. It was equipped with a single 143-gallon fuel tank and was powered by a 712-horsepower Turbomeca Arriel 1D1 turboshaft engine, serial number 19080.

A review of the company's maintenance records revealed that the helicopter was maintained under a company aircraft inspection program and had undergone a 100-hour inspection on March 9, 2015, at total airframe time of 1,935.2 hours. The Hobbs meter was recovered at the accident site, and it read 1,941.5 hours.

The Federal Aviation Administration (FAA) conducted a ramp inspection of the Eagle Med facility on March 11, 2015, that revealed discrepancies with the night vision goggle (NVG) lighting system and the radio altimeter indicator. The NVG system and radio altimeter were deferred until a 100-hour inspection could be

National Transportation Safety Board - Aircraft Accident/Incident Database

completed on the NVG system and a filter could be replaced on the radio altimeter indicator. Until that was completed, helicopter night vision goggle operations were not permitted.

METEOROLOGICAL INFORMATION

A meteorological reporting station was located at Okmulgee Regional Airport, Okmulgee, Oklahoma, about 20 miles north-northwest of the accident location at an elevation of about 720 ft. A 2315 automated weather report indicated wind from 020° at 3 knots, visibility of 10 statute miles or greater, ceiling broken at 2,400 ft. above ground level (agl), broken cloud layer base at 3,000 ft. agl, temperature 12° C, dew point temperature 11° C, and an altimeter setting of 30.13 inches of mercury. From 2015 to 2315, the reported cloud layer was generally at or above 5,000 ft. agl; however, at 2255 (20 minutes before the accident), the reported cloud layer was scattered at 1,100 ft. agl.

A meteorological reporting station was located at MLC about 28 miles south of the accident location at an elevation of 770 ft. At 2053, MLC reported overcast clouds with bases at 9,000 ft. agl. Beginning at 2153 and continuing through the accident time, MLC automated reports indicated that the lowest cloud bases were between 900 and 2,100 ft. agl.

WRECKAGE AND IMPACT INFORMATION

The accident site was located atop a wooded hill on an embankment next to a creek about 9 miles west of Eufaula at an elevation of 840 ft. msl. The helicopter came to rest on its right side and was oriented on an easterly heading. (See figure 1 for a photograph showing the accident site and main wreckage.)

Figure 1. A photograph showing the accident site and main wreckage.

The initial impact point was a tree about 190 ft. west of the main wreckage. Several trees in the immediate vicinity of the helicopter were broken and showed marks that corresponded with impact marks on the helicopter's fuselage and rotor blades. The wreckage debris path was on a bearing of 093° from the initial tree impact.

The main wreckage consisted of the cabin, fuselage, fuel tank, engine, transmission, main rotor system, and left skid. The cockpit area, including the instrument panel, windscreens, right side pilot seat, medical litter, and chin windows, was broken downward, separated, and fragmented. The horizontal situation indicator was found with the heading stopped at 093°, the course selector needle was found set to 175°, and the heading bug was found set to 240°. The right cockpit and cabin doors were broken out, twisted, and fragmented. The left cabin and cockpit doors were also broken out. The left cabin door rested on the left skid, and the left cockpit door was behind the helicopter fuselage. The left skid was undamaged. The aft portion of the fuselage was broken upward and twisted about 45° to the right.

The transmission and engine were broken downward and aft but remained intact. The main rotor system mast and head remained attached to the transmission. The three blades remained attached at the head but were displaced aft. The outboard leading edges of all three blades showed gouges and fractures. One blade was bent downward 30° about 5 ft. outboard of the rotor head. The outboard portion of the blade was broken aft about 4 ft. from the bend. The other two blades were broken aft about 5 ft. outboard of the rotor head.

The fuel tank remained intact. During wreckage recovery, about 60 gallons of clean, uncontaminated fuel were removed from the tank.

Adjacent to the right side of the helicopter fuselage, in and along the creek and on the opposite side of the creek, were broken pieces of the right skid, flight publications, medical equipment, pieces of the cabin interior, the right cockpit door, and parts of the right cockpit door frame. The pilot seat was located along the creek aft of the helicopter fuselage. The pilot seat was intact and the restraints were connected. It was separated from the floor track.

The tailboom was separated about 2 ft. aft of the fuselage, was resting upright on the ground about 55 ft. aft of the main wreckage, and was oriented west-northwest, opposite the main wreckage. The top and bottom vertical stabilizers were broken aft. The left horizontal stabilizer was intact but showed

upward bends at the inboard trailing edge and aft tip. The right horizontal stabilizer was bent and broken upward and twisted aft. A 6-ft-long piece of broken tree trunk was located beneath the left horizontal stabilizer and along the left side of the tailboom. The tail rotor hub and blades were attached and located beneath the tail rotor gear box. One tail rotor blade was broken near the hub but remained attached. Both blades showed chordwise scratches, and the leading edges and ends of the blades showed bends and gouges. The tail rotor drive shaft was separated torsionally at the connection to the tail rotor gear box and fractured torsionally about 30 inches outboard of the gear box. The drive shaft was also separated about 4 ft. forward of where the tailboom was separated from the fuselage.

Pedal and cyclic control to the main and tail rotor systems was established. The helicopter and all the separated components were recovered for further examination. The examination of the engine, transmission, flight controls, and other systems revealed no preimpact anomalies.

Three personal electronic devices were recovered from the wreckage and sent to the National Transportation Safety Board's Vehicle Performance Laboratory for examination and data extraction; no data pertinent to the accident were extracted. For more information, see the report, "Multiple Electronic Devices," in the public docket for this accident.

MEDICAL AND PATHOLOGICAL INFORMATION

The Board of Medical Investigations, Office of the Chief Medical Examiner, Eastern Division, Tulsa, Oklahoma, conducted an autopsy of the pilot. The pilot's death was attributed to "multiple blunt impact injuries."

The Federal Aviation Administration's Bioaeronautical Sciences Research Laboratory conducted toxicology testing on the pilot's specimens. The tests detected zolpidem in the pilot's blood and liver. Zolpidem is a prescription hypnotic medication used to treat insomnia and may impair mental and/or physical ability required to perform potentially hazardous tasks such as driving or operating heavy machinery.

SURVIVAL ASPECTS

After impact, the surviving medical crewmembers egressed the helicopter wreckage, and the EMT immediately called company dispatch to report the accident and their location. Several agencies then used the position report from the crew, data from the on-board GPS, and signals from the 406-MHz emergency locator transmitter to locate the wreckage. Emergency responders hiked in dark night conditions through remote rugged terrain and arrived at the crew's location several hours later.

ADDITIONAL INFORMATION

Per company information, in 2012, Eagle Med entered into the FAA's Safety Management System and established a risk management program. Risk mitigation procedures the company follows includes Crew Resource Management and their "EagleMed Three to Go - One to Say No" policy where it takes the consensus of all three crew members to agree to take a mission, but it only takes one crew member to say no to reject a flight.

National Transportation Safety Board - Aircraft Accident/Incident Database

| | | | | |
|---|---------------------|-----------------------|---------------------|---------------------------------------|
| Accident Rpt# ERA16LA265 | 04/26/2016 1500 EDT | Regis# N145HN | Pittsburgh, PA | Apt: West Penn Hospital Heliport PN80 |
| Acft Mk/Mdl EUROCOPTER DEUTSCHLAND GMBH | Acft SN 9302 | Acft Dmg: SUBSTANTIAL | Rpt Status: Factual | Prob Caus: Pending |
| Eng Mk/Mdl TURBOMECA ARIEL 1E2 | Acft TT 3362 | Fatal 0 | Ser Inj 0 | Flt Conducted Under: FAR 135 |
| Opr Name: AIR METHODS CORP | Opr dba: | | Aircraft Fire: NONE | AW Cert: STT |

Summary

The accident flight, which was an on-demand air medical flight, was the second flight of the day following maintenance work that had been performed on the helicopter earlier that morning. The commercial pilot reported that the flight was uneventful but that, after landing, he noticed that the left vertical fin cowling had partially separated and contacted a tail rotor blade. Further examination of the helicopter revealed that the right vertical fin cowling remained secured but that 8 of the 11 fasteners on the left vertical fin cowling were unlocked, consistent with maintenance personnel not properly securing them following the maintenance work that was performed earlier that day.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: Maintenance personnel's failure to properly secure the left vertical fin cowling during recent maintenance, which resulted in its separation and subsequent contact with the tail rotor system during flight.

Events

1. Enroute-cruise - Miscellaneous/other

Findings - Cause/Factor

1. Personnel issues-Task performance-Maintenance-(general)-Maintenance personnel - C
2. Aircraft-Aircraft structures-Fuselage-(general)-Incorrect service/maintenance - C

Narrative

On April 26, 2016, about 1500 eastern daylight time, a Eurocopter Deutschland GMBH MBB-BK-117 C-2, N145HN, operated by Air Methods Corp, was substantially damaged during cruise flight to West Penn Hospital Heliport (PN80), Pittsburgh, Pennsylvania. The commercial pilot, three crewmembers and one patient were not injured. The on-demand air medical flight was conducted under the provisions of 14 Code of Federal Regulations Part 135. Visual meteorological conditions prevailed and a company flight plan was filed for the flight that originated from Grafton City Hospital Heliport (22WV), Grafton, West Virginia, about 1430.

The pilot reported that the patient transfer flight was the second flight of the day, following maintenance work that was performed on the helicopter earlier that morning. The patient transfer flight was uneventful; however, after landing the pilot noticed that the left vertical fin cowling had partially separated and came in contact with a tailrotor blade. The pilot added that 8 of the 11 fasteners on the left vertical fin cowling were unlocked.

Examination of the tailrotor blade by representatives from the helicopter manufacturer revealed that the tailrotor blade had sustained substantial damage.

Examination of the helicopter by a Federal Aviation Administration inspector revealed that the Dzus fasteners on the right vertical fin cowling remained secured while the Dzus fasteners on the left vertical fin cowling were unlocked, consistent with them not being properly secured by maintenance personnel following the maintenance work that was performed.

Additionally, the operator reported that there were no mechanical failures or malfunctions with the helicopter.

National Transportation Safety Board - Aircraft Accident/Incident Database

| | | | | |
|---|---------------------|-----------------------------|---------------------|---------------------------------------|
| Accident Rpt# CEN17FA183 | 05/15/2017 1529 EDT | Regis# N452DA | Teterboro, NJ | Apt: Teterboro TEB |
| Acft Mk/Mdl GATES LEARJET 35A | | Acft SN 35A-452 | Acft Dmg: DESTROYED | Rpt Status: Prelim Prob Caus: Pending |
| Eng Mk/Mdl GARRETT TFE 731 SER | | | Fatal 2 Ser Inj 0 | Flt Conducted Under: FAR 091 |
| Opr Name: TRANS-PACIFIC AIR CHARTER LLC | | Opr dba: TRANS-PACIFIC JETS | | Aircraft Fire: GRD |
| | | | | AW Cert: STN |

Events

1. Approach-circling (IFR) - Loss of control in flight

Narrative

On May 15, 2017, at 1529 eastern daylight time, a Gates Learjet 35A, N452DA, operated by Trans-Pacific Jets, departed controlled flight while on a circling approach to runway 1 at the Teterboro Airport (TEB), Teterboro, New Jersey, and impacted a commercial building and parking lot. The captain and first officer died; no one on the ground was injured. The airplane was destroyed by impact forces and postcrash fire. The airplane was registered to A&C Big Sky Aviation LLC and operated by Trans-Pacific Air Charter LLC under the provisions of 14 Code of Federal Regulations Part 91 as a positioning flight. Visual meteorological conditions prevailed, and an instrument flight rules (IFR) flight plan was filed. The flight departed from the Philadelphia International Airport (PHL), Philadelphia, Pennsylvania, about 1504 and was destined for TEB.

The accident flight was the crewmembers' third flight of the day. The first flight departed TEB about 0732 on a Part 91 positioning flight and landed about 0815 at the Laurence G. Hanscom Field (BED), Bedford, Massachusetts, where they refueled and boarded a passenger. They departed BED about 1009 on a Part 135 on-demand charter flight and landed at PHL about 1104.

The captain filed an IFR flight plan to TEB planning a 28-minute flight at a cruising altitude of flight level 270 (27,000 feet) with a cruise speed of 441 knots and a departure time of 1430. After departure about 1504, the flight was cleared to climb to 4,000 feet above mean sea level (msl). The flight reached a maximum altitude of 4,000 feet msl. About 1515, the flight was cleared to descend to 3,000 ft msl. The New York Terminal Radar Approach Control (TRACON) cleared the flight for the TEB ILS Runway 6 Approach, circle to land runway 1. TRACON instructed the flight to switch frequencies and contact TEB air traffic control (ATC) about 9 miles from the airport; however, the flight did not check onto the ATC's frequency until 4 miles from the airport. ATC cleared the flight to land on runway 1 and issued the TEB winds of 320 degrees at 16 knots, gusting to 32 knots.

Radar track data indicated that the flight did not start its right circling turn until it was less than 1 mile from the approach end of runway 6. According to TEB ATC, aircraft typically start the right turn at the final approach fix for runway 6, which is located 3.8 nm from the approach end of runway 6.

A TEB ATC controller reported that he observed the airplane bank hard to the right and he could see the belly of the airplane with the wings almost perpendicular to the ground. The airplane then appeared to level out for just a second or two before the left wing dropped, showing the entire top of the airplane. Other ground witnesses also reported that they observed the airplane in a right turn with the wings in a high angle of bank. Some witnesses described seeing the airplane's wings "wobbling" before the left wing dropped and the airplane descended to the ground. Security video cameras installed at numerous commercial buildings also captured the last moments of the flight, showing the airplane at high angles of bank. One security camera showed the airplane in a steep right wing low, nose down attitude at impact.

The accident site was located on a 180-degree bearing about 1/2 nautical miles from the threshold of runway 1 at TEB. The main wreckage was distributed in the parking lots of commercial businesses. The wreckage path and debris field was about 440 ft. long on a 135-degree heading, and 3 buildings and 16 vehicles were damaged by impact or fire. Although impact forces and postcrash fire destroyed and consumed much of the airplane, the examination of the wreckage revealed that all components of the airplane were located at the accident site.

The cockpit voice recorder (CVR) was located in the wreckage and was sent to the National Transportation Safety Board's (NTSB) Vehicle Recorder Laboratory. The CVR was auditioned by NTSB senior management staff and found to be operating at the time of the accident. A CVR Group will be formed and a transcript of the flight will be produced.

Four other airplane components that store non-volatile memory (NVM) and an iPhone were collected and sent to the NTSB Vehicle Recorder Laboratory for examination. All 4 components and the iPhone exhibited impact and fire damage. The 4 components were: 2 Honeywell N1 Digital Electronic Engine Controls (DEEC); 1 Flight Management System (FMS); and 1 Honeywell KGP-56 Enhanced Ground Proximity Warning System (EGPWS).

National Transportation Safety Board - Aircraft Accident/Incident Database

At 1452, the surface weather observation at TEB was: wind 350 degrees at 20 knots gusting to 30 knots; 10 miles visibility; scattered clouds at 4,500 ft; temperature 19 degrees C; dew point 6 degrees C; altimeter 29.75 inches of mercury.

The TEB automated terminal information services (ATIS) Z was in effect at the time of the accident. The 1451 ATIS Information Z stated that the current weather was: wind 350 degrees at 18 knots gusting to 29 knots; visibility 10; light rain, 5,500 ft scattered; temperature 18 degrees C; dew point 6 degrees C; altimeter 29.74 inches of mercury. ILS Runway 6 circle approach in use. Low level wind shear advisory in effect. . "

National Transportation Safety Board - Aircraft Accident/Incident Database

| | | | | |
|-----------------------------|---------------------|-----------------|-----------------------|--|
| Accident Rpt# ERA16LA030 | 10/30/2015 1158 EDT | Regis# N920JP | Marion, SC | Apt: N/a |
| Acft Mk/Mdl HUGHES 369D | | Acft SN 290449D | Acft Dmg: SUBSTANTIAL | Rpt Status: Factual Prob Caus: Pending |
| Eng Mk/Mdl ALLISON 250-C20B | | Acft TT 14932 | Fatal 0 Ser Inj 0 | Flt Conducted Under: FAR 133 |
| Opr Name: ROTOR BLADE LLC | | Opr dba: | | Aircraft Fire: GRD |
| | | | | AW Cert: SPR |

Summary

The commercial pilot of the helicopter was trimming trees on a power line right-of-way when the externally-mounted saw blades jammed. He climbed the helicopter out of the area and elected to return to the landing zone (LZ) to have the saw blades cleared. As he began a forward transition directly to the LZ, the helicopter yawed to the right. He initially corrected the situation with left pedal inputs. While maintaining a heading into the wind, he felt a "thump" and heard a "pop" sound, and the helicopter began to spin to the right out of control. The engine continued to run throughout the event. The helicopter settled into trees as the pilot attempted to cushion the landing with collective control inputs. The helicopter subsequently impacted the ground.

An examination of the wreckage revealed a spiral fracture in the tail rotor control torque tube that connected the left and right seat pedals. Metallurgical examination of the torque tube revealed that it failed in overload due to torsional stresses. A design review by the helicopter manufacturer's engineering department revealed that the torque tube met all airworthiness standards and design criteria.

It was apparent that, based on the pilot's comments and the fracture characteristics of the torque tube, it fractured in flight, immediately before the loss of helicopter control. Although no airframe or foreign obstructions were found in the tail rotor control system, it is possible that a momentary jam existed, though the source could not be determined despite a thorough examination of the wreckage. Although the tail rotor pitch control was replaced about 25 hours of time in service before the accident, and a tail rotor control rigging check was required at that time, aircraft damage prevented an evaluation of the tail rotor control rigging condition at the time of the accident.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: A momentary jam in the tail rotor control system from an undetermined source, resulting in a torsional fracture of the tail rotor control torque tube and a loss of helicopter control.

Events

1. Enroute - Flight control sys malf/fail
2. Uncontrolled descent - Collision with terr/obj (non-CFIT)

Findings - Cause/Factor

1. Aircraft-Aircraft systems-Flight control system-(general)-Malfunction - C
2. Not determined-Not determined-(general)-(general)-Unknown/Not determined

Narrative

On October 30, 2015, about 1158 eastern daylight time, a Hughes 369D, N920JP, collided with terrain while transitioning to cruise flight near Marion, South Carolina. The commercial pilot was not injured, and the helicopter was substantially damaged by impact forces and a small postcrash fire. The helicopter was operated by Rotor Blade LLC under the provisions of 14 Code of Federal Regulations Part 133 as an external load (aerial saw) flight. Day, visual meteorological conditions prevailed, and no flight plan was filed. The local flight originated from Marion County Airport (MAO), Mullins, South Carolina about 1130.

According to reports provided by the operator, the pilot was trimming trees on a power line right-of-way when the saw blades jammed. He climbed the helicopter out of the area and elected to return to the landing zone (LZ) to have the saw blades cleared. As the pilot began a forward transition directly to the LZ, the helicopter yawed to the right. He initially corrected the situation with left pedal inputs. While maintaining a heading into the wind, the pilot felt a "thump" and heard a "pop" sound, and the helicopter began to spin to the right, out of control. The engine continued to run throughout the event. The helicopter settled into the trees as the pilot attempted to cushion the landing with collective control inputs. The helicopter collided with the ground and came to rest. A small postcrash fire ensued and the pilot extinguished it with a fire bottle.

An inspector with the Federal Aviation Administration responded to the accident site and examined the wreckage. The helicopter came to rest in a wooded area. The main rotor blades received structural damage from impact forces. The fuselage received structural damage and the tail boom was severed from impact forces.

The wreckage was recovered to the operator's facilities for further examination. The helicopter was configured to be flown from the left cockpit seat. The right seat collective and cyclic control sticks were removed; however, the right pedals were installed without foot rests. Examination of the tail rotor control torque tube linking the left and right seat pedals revealed that the tube was cracked in a spiral pattern. The torque tube was removed from the helicopter and forwarded to the NTSB Materials Laboratory for examination. Due to extensive airframe damage, tail rotor control rigging at the time of the accident could not

National Transportation Safety Board - Aircraft Accident/Incident Database

be established. No foreign or airframe obstructions were found that would account for a jam in the tail rotor control system.

The tail rotor control torque tube was examined at the NTSB Materials Laboratory. The examination of the tube piece with a 5X to 50X stereo-zoom microscope revealed that the fracture initiated at a through-hole in the tube and helically propagated around approximately 90 percent of the circumference of the tube. The angle of the crack path was approximately 45 degrees relative to the longitudinal axis of the tube. The fracture surfaces exhibited through-thickness shear lips consistent with overstress fracture. The helical nature of the fracture path was consistent with torsional loading.

According to the manufacturer, the through-holes in the torque tube were not utilized on the 369D. The holes were designed for the installation of a friction bracket on MD 500N helicopters. When installed on the 369D, the holes were left open.

After the metallurgical examination of the tail rotor control torque tube, MD Helicopters engineering personnel conducted a design analysis of the torque tube. Their study found that the torque tube met all applicable airworthiness and design criteria.

The Helicopter Flight Log Reports showed the pilot's pedal support bracket, part number (PN) 369A7505-8, was reported broken on July 17, 2014. A maintenance logbook entry describing the work performed was not found. However, company inventory documents show the pedal support bracket and the pilot's tail rotor control torque tube, PN 369H7531-13, were provided as replacement parts. The helicopter had accrued about 1,380 hours of time in service since the torque tube was installed.

On October 17, 2015, or about 25 hours of time in service prior to the accident, the tail rotor pitch control was removed and replaced with an overhauled unit. According to the manufacturer, the removal and replacement of the tail rotor pitch control required that the rigging of the tail rotor controls be checked.

National Transportation Safety Board - Aircraft Accident/Incident Database

Accident Rpt# WPR15GA005 10/07/2014 1623 PDT Regis# N449DF El Portal, CA Apt: N/a
Acft Mk/Mdl MARSH AVIATION S 2F3AT-NO SERIES Acft SN 152838 Acft Dmg: DESTROYED Rpt Status: Factual Prob Caus: Pending
Eng Mk/Mdl HONEYWELL TPE331-14GR 8 Fatal 1 Ser Inj 0 Flt Conducted Under: FAR PUBU
Opr Name: USDA FOREST SERVICE FEPP Opr dba: Aircraft Fire: GRD

Summary

The airline transport pilot was conducting a visual flight rules, public firefighting retardant drop flight on an active fire. The airplane, call sign "Tanker 81," was supported by two other aircraft: an orbiting Air Tactical aircraft (ATGS) that coordinated the aerial operations with ground units and an Aerial Supervision Module (ASM) that flew ahead of the tanker to define the route and the drop initiation point. After successfully conducting one drop, Tanker 81 was reloaded with fire retardant, and it then returned to the fire area. The accident pilot coordinated his next drop with the ATGS and then followed the ASM to the drop.

According to the ASM pilot, he flew the proposed drop route and initiated smoke to show the Tanker 81 pilot the desired drop location. The route included a slight left turn to final and a right turn on exit over descending terrain. The ASM had descended to 4,000 ft msl during the run, and described a predominate tree off to the right of the flightpath as a hazard, and instructed the accident pilot to stay to the left of it. The ASM pilot also described "very clear, smooth air over the drop area." He asked the Tanker 81 pilot if he had seen the smoke and if the route looked OK to him? The Tanker 81 pilot responded that "it looked OK." The ASM then climbed to 5,100 ft msl to lead the drop run. The ASM joined the pattern on the downwind and then told the Tanker 81 pilot that he could descend to 5,100 ft msl. He continued to describe the drop and flightpath to the tanker pilot and told him that there was some thin top smoke on final but that he could see through it and that they would break out of the smoke before reaching the drop area. He added that the last response he received from the tanker pilot was when he said, "OK."

Witnesses reported seeing the accident, and one of them provided a video that was taken from a vantage point along a mountain trail that was above Tanker 81's flightpath. The video revealed that while on approach, Tanker 81 struck trees with its left wing. Following the impact with the trees, the airplane entered a descending left roll, and it then impacted on the top of an approximate 800-ft-tall rock cliff. A fire erupted during the impact, the airplane fragmented, and the main wreckage was projected over the cliff and scattered over a wide river valley below the cliff face.

An examination of the wreckage site confirmed that the airplane's left wing had struck trees, and the outboard section of the left wing had separated from the airplane. Examination of the two engines revealed impact signatures consistent with their producing power at the time of impact. The pilot was in radio communications with either the fire base, the ATGS, or the ASM throughout the accident flight, and he did not report any concerns about the flight or mechanical issues.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: The pilot's failure to maintain clearance from trees while maneuvering at a low altitude.

Events

1. Maneuvering-low-alt flying - Low altitude operation/event
2. Uncontrolled descent - Collision with terr/obj (non-CFIT)

Findings - Cause/Factor

1. Personnel issues-Psychological-Attention/monitoring-Task monitoring/vigilance-Pilot - C
2. Aircraft-Aircraft oper/perf/capability-Performance/control parameters-Altitude-Not attained/maintained - C
3. Environmental issues-Physical environment-Object/animal/substance-Tree(s)-Contributed to outcome

Narrative

HISTORY OF FLIGHT

On October 7, 2014, about 1623 Pacific daylight time, a Marsh Aviation S-2F3AT airplane, N449DF, call sign "Tanker 81," impacted terrain while maneuvering in Yosemite National Park near El Portal, California. The airline transport pilot sustained fatal injuries, and the airplane was destroyed. The airplane was registered to the United States Department of Agriculture and operated by CAL FIRE. On this fire, it was under the operational control of US National Park Service (NPS), as a public firefighting flight. Visual meteorological conditions existed near the accident site about the time of the accident. The airplane had departed Columbia Airport (O22), Columbia, California, at 1608.

According to a CAL FIRE representative, Tanker 81 was stationed at the Hollister, California, air base and had been dispatched to the Dog Rock fire in

National Transportation Safety Board - Aircraft Accident/Incident Database

Yosemite National Park. The airplane successfully made one fire retardant drop and then proceeded to O22 to reload. Tanker 81 was supported by two other aircraft: an orbiting Air Tactical aircraft (ATGS) that coordinated the aerial operations with ground units and an Aerial Supervision Module (ASM) that flew ahead of the tanker to define the route and the drop initiation point.

Upon returning to the fire area, the accident pilot coordinated his next drop with the orbiting ATGS aircraft and then followed the ASM airplane. According to the ASM pilot, the ASM flew the proposed drop route and initiated smoke to show the Tanker 81 pilot the desired drop location. The route included a slight left turn to final and a right turn to exit over descending terrain. The ASM descended to 4,000 ft msl during the run, and described a predominate tree off to the right of the flightpath as a hazard, and instructed the accident pilot to stay to the left of it. The ASM pilot also described "very clear, smooth air over the drop area." The ASM pilot asked the Tanker 81 pilot if he had seen the smoke and if the route looked OK to him? The Tanker 81 pilot responded that "it looked OK." The ASM then climbed to 5,100 ft msl to lead the drop run. The ASM pilot joined the pattern on the downwind and then told the Tanker 81 pilot that he could descend to 5,100 ft msl. He continued to describe the drop and flightpath to the tanker pilot and told him that there was some thin top smoke on final but that he could see through it and that they would break out of the smoke before reaching the drop area. He added that the last response he received from the pilot was when he said, "OK," on the downwind and that this was not unusual.

The crew of the ATGS airplane reported that, while Tanker 81 was on final approach for the drop, it appeared to strike trees with its left wing. Both aircrews reported that there was smoke in the area but that visibility along the approach to the drop was good.

Witnesses reported seeing the accident, and one of them provided a video that was taken from a vantage point along a mountain trail that was above Tanker 81's flightpath. The video revealed that, while on approach to the drop site, Tanker 81 struck trees with its left wing. Following the impact with the trees, the airplane entered a descending left roll, and it then impacted on the top of an approximate 800-ft-tall rock cliff. A fire erupted during the impact, the airplane fragmented, and the main wreckage was projected over the cliff and scattered over a wide river valley area below the cliff face.

Tanker 81 was equipped with telemetry, which showed the airplane on a course heading of 253§ at 4,810 ft msl and 148 knots at 1623. The flight telemetry log is included in the public docket for this report.

PERSONNEL INFORMATION

The pilot held an airline transport certificate with airplane multiengine land, airplane single-engine land, and instrument ratings. The pilot was issued a Federal Aviation Administration second-class medical certificate on February 12, 2014, with the limitation that he must wear corrective lenses. The pilot's flight records showed that he had 6,567 total flight hours.

AIRCRAFT INFORMATION

The airplane was originally a Grumman S-2 manufactured in 1966, but it was remanufactured as a Marsh Aviation S-2F3AT in 2004. It was equipped with two Honeywell (Allied Signal) TPE331-14GR turbine engines. Total airframe time since new was 5,819.5 hours as of October 2, 2014. The airplane was operated in the restricted category and maintained under annual and 100-hour inspections. The latest 100-hour inspection was completed on August 23, 2014. A review of maintenance logs showed no evidence of any airplane mechanical/maintenance anomalies.

COMMUNICATIONS

The pilot of Tanker 81 was in radio communication with either the fire base, the ATGS, or ASM throughout the accident flight. The pilot did not express any concerns about the flight or report any mechanical issues.

METEOROLOGICAL INFORMATION

At 1600, the closest official weather reporting station, about 7 miles northwest of the accident site, reported sky condition clear, temperature 75øF, dew point 32§F, altimeter setting 29.90 inches of mercury, wind from 225§ at 10 to 15 knots, and visibility greater than 10 miles.

WRECKAGE AND IMPACT INFORMATION

National Transportation Safety Board - Aircraft Accident/Incident Database

The airplane impacted trees and terrain on a steep, heavily vegetated area within the active fire zone. All the wreckage sustained impact and fire damage. The top of a tree had been severed and lay on the ground, and the outboard section of the left wing was found separated from the airplane. The inboard end of the separated wing section leading edge showed impact marks perpendicular to the wingspan. The inboard end of the wing section was torn chordwise from leading edge to trailing edge. Along the chordwise tear, the sheet-metal tears were jagged, and the internal structure was pulled apart. The tear was outboard of the locking mechanism that locked the folding wing in place. The aileron and flap were in place.

The main fuselage, right wing, and both engines and their associated propellers were found in the river valley area below the cliff face. The wing-fold locking mechanism for the left wing's outboard section and the locking mechanism's locking devices, which were found in the "locked" position, were also located in the valley. The left-wing outboard section had separated outboard of the locking mechanism.

Examination of both engines revealed impact signatures consistent with their producing power at the time of impact. All the propeller blades exhibited S-bending and torsional twisting. Portions of the blades were fragmented and exhibited leading edge gouging and chordwise scratching.

Following the onsite examination, the wreckage was recovered to a secure facility and reexamined. No anomalies were noted with the airplane or engines.

OPERATIONAL INFORMATION

A review of the Interagency Aerial Supervision Guide (ASG), document PMS 505, NFES 002544, dated January 2014, Chapter 9, Tactical Aircraft Operations, outlines operational procedures for air tanker aircraft. Section 1, Low Level Operations, part b, item i defines a "show me" profile as a low-level pass made over the target using the physical location of the aircraft to demonstrate the line and start point of the retardant drop. The Show-Me Profile is normally used for the first airtanker on a specific run or when an incoming airtanker has not had the opportunity to observe the previous drop. A Show-Me can be used alone or before other profiles. The pilot [of the lead plane] begins the run when the airtanker crew can visually identify the aircraft, hazards, line, start and exit point of the drop.

An NTSB Operations Group was formed, and the Operations Group Chairman's report is available in the public docket for this report.

MEDICAL AND PATHOLOGICAL INFORMATION

The Mariposa County, Coroner, Modesto, California conducted an autopsy on the pilot. The pilot's cause of death was attributed to "multiple blunt force injuries."

The FAA Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, conducted toxicological testing on specimens from the pilot. No toxicological anomalies were found.

National Transportation Safety Board - Aircraft Accident/Incident Database

Accident Rpt# DCA15FA073 02/24/2015 616 CST Regis# N584FE St. Louis, MO Apt: Lambert-st Louis International KSTL
Acft Mk/Mdl MCDONNELL DOUGLAS MD Acft SN 48436 Acft Dmg: NONE Rpt Status: Factual Prob Caus: Pending
Eng Mk/Mdl GE CF6-80 SERIES Fatal 0 Ser Inj 1 Flt Conducted Under: FAR 121
Opr Name: FEDERAL EXPRESS CORP Opr dba: 3131 DEMOCRAT RD Aircraft Fire: NONE
AW Cert: STT

Summary

During cruise flight, the crew received a fire warning from the cargo compartment indicating that the fire suppression system had activated, along with hearing loud sounds from the cargo compartment. The flight crew elected to divert to St. Louis. Although the activation of the fire suppression was a false alarm, the decision to divert was prudent and correct. During the approach the crew made the decision to evacuate the airplane after landing, briefed the passengers in the courier area, and reviewed the evacuation checklist in the Quick Reference Handbook (QRH). The diversion and subsequent landing were performed without issue. After exiting the runway, and bringing the airplane to a stop in a safe area, the crew initiated an emergency evacuation using the left forward door (1L). The door opened, however, the 1L escape slide/raft did not fully deploy, appearing to be hung up on a strap. The first officer attempted to free it and the fire/rescue crew pulled on the slide and it appeared to inflate. However, because the slide inflation sequence had been interrupted, it was significantly underinflated and unable to support the weight of the crewmember, resulting in a serious injury. Post-incident examination of the 1L slide/raft was unable to determine the causes for the slide/raft to not inflate to full extension.

Cause Narrative

THE NATIONAL TRANSPORTATION SAFETY BOARD DETERMINED THAT THE CAUSE OF THIS OCCURRENCE WAS: a partial inflation of the 1L escape slide/raft due to undetermined reasons resulting in insufficient capability to support the weight of the crewmember.

Events

1. Standing - Evacuation
2. Standing - Sys/Comp malf/fail (non-power)
3. Standing - Sys/Comp malf/fail (non-power)

Findings - Cause/Factor

1. Aircraft-Aircraft systems-Equipment/furnishings-Escape slide-Failure - C
2. Aircraft-Aircraft systems-Equipment/furnishings-Escape slide-Inadequate inspection - F

Narrative

HISTORY OF FLIGHT

On February 24, 2015, about 0616 central standard time, a FedEx MD-11F, N584FE, landed at Lambert - St Louis International Airport (STL), St Louis, Missouri following automatic activation of the main deck fire suppression system. After landing, the four crewmembers deplaned through the left main cabin door using an evacuation slide. One of the four crewmembers on board was seriously injured during the evacuation; the other three crewmembers were not injured. The flight was operating under the provisions of 14 Code of Federal Regulations Part 121 as a cargo flight from Memphis International Airport (MEM), Memphis, Tennessee, to Minneapolis-St Paul International Airport (MSP), Minneapolis, Minnesota.

The captain was the pilot flying. During cruise at FL360 about 80 miles north of STL, lights illuminated on the flight deck glareshield indicating the Fire Suppression System (FSS) had activated on the main cargo deck. About the same time two jumpseat riders in the courier compartment heard a loud metallic bang noise similar to a cargo bin door falling in the cargo compartment and observed the FSS discharge indication lights were illuminated near the forward left (1L) door.

According to the cockpit voice recorder, at 0556:57, one of the crewmembers in the courier area called the flight deck via intercom and advised they heard a sound "like a can [cargo bin] got punctured." The flight crew acknowledged and discussed the indications, and at 0557:33, they declared an emergency with Air Traffic Control (ATC) and coordinated a diversion to STL. During the diversion, the crew reviewed abnormal procedures and planned on evacuating the airplane after clearing the runway. On approach to STL, the flight advised ATC that the fire was not confirmed but the "indications are there, and they're not going away."

At 0609:39 the flight crew notified a crewmember in the courier area they would "get off the aircraft" on the taxiway, and the crewmember acknowledged.

At 0616:00 the airplane landed on runway 12L, exited the runway at taxiway K and came to a stop at the intersection of taxiway K and taxiway F.

At 0616:29, the crew accomplished the evacuation checklist contained in the Quick Reference Handbook and exited the flight deck. The first officer performed

National Transportation Safety Board - Aircraft Accident/Incident Database

the emergency door/slide opening procedure at the 1L door. According to the crewmembers the slide did not appear to deploy completely and one crew member stated that it appeared to be ".caught up.in the straps that are part of the slide."

Airport Rescue and Firefighting (ARFF) personnel pulled on the slide and it then appeared to complete deployment.

The first officer jumped into the slide to exit the airplane. The slide did not slow the first officer as he descended to the tarmac; he impacted the tarmac and sustained a fracture to his L1 vertebrae.

ARFF personnel held the base of the slide in place and the remaining crewmembers lowered themselves to the ground using the slide.

INJURIES TO PERSONS

One crew member received serious injury and 3 crewmembers were not injured.

PERSONNEL INFORMATION

The flight crew consisted of two pilots and two additional pilot observers.

The captain, age 55, was hired by Federal Express in January 1997 and completed initial MD-11 training in June 2011.

The captain reported approximately 12,476 hours total time, including about 6,470 hours as pilot-in-command and 2,974 hours in the MD-11. There were no records or reports of any previous aviation incidents or accidents involving the captain. The captain held a valid Federal Aviation Administration (FAA) Airline Transport Pilot (ATP) certificate with type ratings for B-737, B-757/767, and MD-11 and a current FAA first-class medical certificate issued on September 2, 2014. Company records indicated his most recent proficiency check was June 3, 2014. Training and proficiency checks were current and the company reported that the captain had no record of failures during company training events.

The first officer, 51 years old, was hired by Federal Express in June 2006. He reported approximately 9,695 hours total flight time and about 2,642 hours in the MD-11. There were no records or reports of any previous aviation incidents or accidents involving the first officer. He held a valid FAA ATP certificate with type ratings for the B-757/767, MD-11, and B-727 SIC privileges only, and an FAA first-class medical certificate issued on October 7, 2014. The first officer's training and proficiency checks were current and the company reported he had no failures recorded during company training events. He completed initial training in the MD-11 in October 2014 and his most recent proficiency check was completed September 13, 2014.

AIRCRAFT INFORMATION

N584FE, manufacturer serial number 48436, was a McDonnell Douglas MD-11F equipped with three General Electric CF6-80 turbofan engines. The airplane was manufactured in 1992 and the company reported that the airplane had approximately 75,064 hours total time and 16,731 cycles on the airframe. Recorded data and airline records indicated no relevant maintenance issues with the airplane.

Evacuation Slide System

The airplane was equipped with emergency escape slides installed at the two forward doors; the 1L door and the 1R door. The 1L door was equipped with Evacuation System 60289-117, serial number 0406, manufactured by Air Cruisers in April 1994. The slide/raft assembly was overhauled and recertified to zero time in June of 2013. Maintenance and testing procedures for the evacuation slide/raft were contained in the Component Maintenance Manual 25-61-31.

METEOROLOGICAL INFORMATION

The STL surface observation at 0551 CST reported wind from 210 degrees at 3 knots, visibility 10 miles, clear skies, temperature minus 10 degrees Celsius, dew point temperature minus 17 degrees Celsius, and altimeter setting 30.18 inches of mercury.

AERODROME INFORMATION

National Transportation Safety Board - Aircraft Accident/Incident Database

The Lambert-St Louis International Airport (STL) was located about 10 miles northwest of the city of St Louis, Missouri. The airport conducted operations using 8 runways for commercial and general aviation. Runway 12L was grooved concrete, 9,003 feet long, 150 feet wide with a touchdown zone elevation of 528 feet. The runway was served by a 4-light precision approach path indicator system (PAPI) with a 3 degree glide path on the right side of the runway, and an approach light system sequenced flashers (ALSF2).

FLIGHT RECORDERS

A Smiths Industries combi Cockpit Voice/Flight Data Recorder (CVFDR), serial number 0000038, was downloaded at the NTSB Vehicle Recorder Division. The cockpit voice portion of the recorder included 2 hours of recording on four audio channels. The audio quality of the channels containing information from the captain's and first officer's audio panels, was characterized as excellent, and the audio quality of the channel containing information from the cockpit area microphone was characterized as fair. The recording included events from the flight beginning prior to engine start in MEM at about 0417 CST, and ending when the CVR was deactivated after landing in STL as the crew performed the evacuation checklist at 0617. Timing on the CVR summary was established by correlating CVR recorded touchdown time to the touchdown time reported by the airplane Aircraft Communications Addressing and Reporting System (ACARS) and adjusting to local CST.

The FDR, a Honeywell SSFDR 980-4700-001, serial number SSFDR-08811, was downloaded at the NTSB Vehicle Recorders Division. The recorder was found to be in good condition, however, data was not extracted from the FDR as it did not record parameters applicable to evacuation slide operation.

WRECKAGE INFORMATION

The slide and girt bar were removed from the airplane. The slide and associated components were shipped to the manufacturer for further examination and testing.

SURVIVAL ASPECTS

Video footage from an airport ramp camera revealed the airplane came to a complete stop, followed by the 1L door opening. The 1L slide/raft did not fully inflate during the deployment. The slide/raft was held up in the area of the first set of frangible links at the airplane attachment end of the slide/raft. The frangible links are designed to separate at pre-determined inflation tube forces as the slide/raft inflates allowing the slide/raft to fully extend to the ground. Aircraft rescue and firefighting (ARFF) personnel approached the partially inflated, unusable slide/raft and jumped to grab onto the slide/raft. The slide/raft then continued to unfold onto the ramp surface. The firefighter then pulled the slide/raft into an attitude consistent with normal deployment, but did not hold on to the slide/raft while the first crewmember evacuated. The crewmember jumped out of the 1L door into the slide/raft, which collapsed under his weight resulting in the crewmember forcefully contacting the tarmac. A short time later emergency personnel arrived to assist him. The remaining three crewmembers slid down the slide with the help of the firefighters supporting the slide. The 1R exit was not opened and the slide/raft was not deployed.

Post-incident examination of the 1L slide/raft was unable to determine the causes for the slide/raft to not inflate to full extension.

TESTS AND RESEARCH

A visual inspection of the Evacuation System at the manufacturer indicated the carrying case dated December 13, 1995 was in overall good condition with no notable signs of damage. The maintenance card was not found.

The storage side straps were both found intact and snapped in place on the top side of the carrying case. The strap on the right (airplane forward) side of the slide had no signs of damage. The strap on the left (airplane aft) side showed signs of drag marks across the top of the snap, torn webbing sections, and friction burn marks and melted fibers at the torn edges. Both reservoir attachment straps were torn apart at coincident locations. The torn fibers were soiled and showed signs of abrasion.

The slide/raft system markings indicated the date of manufacture was April, 1996, Girt bar markings/placard indicated the last maintenance overhaul was completed in March, 2013 and the next scheduled maintenance was due in March, 2016.

National Transportation Safety Board - Aircraft Accident/Incident Database

The inflation cable was not damaged and the quick disconnect was in place. Frangible links were separated and indicated proper color coordination for their respective locations on the escape slide inflatable.

The inflation hose, manufactured October 30, 1992, had dirty abrasion marks and a placard on the hose assembly indicated it was last tested in 2005. The manufacturers CMM indicated an integrity verification test of the inflation hose was recommended to be accomplished every 3 years up to and including 15 years and annually after 15 years.

A visual inspection of the reservoir and valve assembly revealed one of the two sling webbing was torn and the sling sleeve showed signs of abrasion and several holes torn in the fabric coincident with surface scuff marks on the reservoir. The valve assembly pressure gage glass was intact and the hard sleeve gage protector was cracked.

A visual inspection of the left (aft) side aspirator found the interior nozzle array in good condition. There were two scratches tracking down the inside of the aspirator mixing tube starting from the inlet housing junction and ending at the outlet. The inlet ring had some dents and scuffing on the outer edge. The right (forward) aspirator was found to be in good condition, with some signs of denting and scuffing on the inlet ring; although less extensive than the left side aspirator. The pressure relief valves were both intact and secure.

The slide was partially inflated for a preliminary inspection and showed no apparent leaks and no notable damage was found. There were no marks or discoloration indicating slide ingestion in the aspirator. The slide was deflated and the reservoir and valve assembly were pressurized in accordance with the Component Maintenance Manual procedures and successfully completed a leak check.

The reservoir and valve assemble were re-installed on the slide and a floor run functional test was accomplished, inflating the slide successfully. The upper tube was measured at 2.54 psi and the lower tube was measured at 2.43 psi, with no leaks detected in either chamber. The CMM indicated minimum pressure for the slide measured within 5 minutes after inflation during a floor run functional check should be 2.3 psi.

During a calibration check, the valve regulator peak pressure was measured to be 497 psi. The CMM requirement for this calibration check is 550 psi (plus or minus 50 psi). The pressure transducer used to test the regulator was calibrated to an accuracy of within .08%.

The inflation hose was hydro tested in accordance with CMM procedures at 900 psi with no leaks or deformation noted.

ADDITIONAL INFORMATION

The manufacturer recommended maintenance overhaul interval for the evacuation slide/raft was listed in the CMM. The recommendation stated in part;

"For Evacuation Systems perform the following every three years up to and including 15 years. After system has been in service for more than 15 years the following should be done each year, if the inflatable and hose are not replaced at 15 years." The table of recommended tests and inspections included a Functional Deployment Test, Inflatable Integrity Verification tests, Hose Integrity Verification Test, Light System Test, a check of various evacuation system components, and verification of compliance with all Service Bulletins and Service Information Letters.

The FedEx Maintenance Specification Item contained in their approved MD-11 Aircraft Maintenance Program indicated the evacuation slide/raft was to be overhauled every 3 years.

The manufacturers CMM indicated an integrity verification test of the inflation hose was recommended to be accomplished every 3 years up to and including 15 years and annually after 15 years.

Manufacturer records indicated three previous instances of a slide/raft that did not fully deploy inflation issue. None of the three previous incidents occurred on an airplane in service.

In 2005, a slide/raft was inadvertently deployed during a maintenance procedure and did not fully deploy. An investigation by the manufacturer found that the container assembly straps had not been properly stowed during installation and prevented complete deployment of the slide/raft.

National Transportation Safety Board - Aircraft Accident/Incident Database

In 2011, there were two separate incidents that occurred during functional tests of the slide/raft during scheduled maintenance. In one incident, although the root cause was not determined, evidence during an investigation by the manufacturer indicated that an unsecured assembly strap led to the slide/raft carrying case partially obstructing one of the aspirators preventing complete inflation of the lower slide chamber.

In the second incident in 2011, an investigation by the manufacturer concluded that a release strap which is required to trigger slide deployment, was not correctly attached and caused a delayed deployment. The delay in deployment displaced the slide/raft carrying case close to one of the aspirators resulting in partial blockage of the aspirator and insufficient airflow to inflate the lower chamber of the slide/raft.

National Transportation Safety Board - Aircraft Accident/Incident Database

| | | | | |
|---------------------------------|---------------------|---------------|---------------------|---------------------------------------|
| Accident Rpt# ERA17FA181 | 05/15/2017 1339 EDT | Regis# N220N | Eleuthera, FN BF | Apt: N/a |
| Acft Mk/Mdl MITSUBISHI MU2B-40 | | Acft SN 450SA | Acft Dmg: DESTROYED | Rpt Status: Prelim Prob Caus: Pending |
| Eng Mk/Mdl GARRETT TPE-331-10 | | Acft TT 4634 | Fatal 4 Ser Inj 0 | Flt Conducted Under: FAR 091 |
| Opr Name: ITHACA CONSULTING INC | | Opr dba: | | Aircraft Fire: NONE |
| | | | | AW Cert: STN |

Events

1. Enroute-cruise - Inflight upset

Narrative

On May 15, 2017, at 1339 eastern daylight time, radar and voice communication were lost with a Mitsubishi MU2B-40 airplane, N220N, over international waters near Eleuthera, Bahamas. Debris associated with the airplane was found floating amidst a fuel sheen the following day. The United States Coast Guard conducted a search by air and sea for 3 days, but the commercial pilot and three passengers were not found. The airplane departed Rafael Hernandez Airport (TJBQ), Aguadilla, Puerto Rico, about 1100 and was destined for Space Coast Regional Airport (TIX), Titusville, Florida. Instrument meteorological conditions prevailed, and an instrument flight rules flight plan was filed for the personal flight, which was conducted under the provisions of 14 Code of Federal Regulations Part 91.

According to Federal Aviation Administration (FAA) records, the airplane was a recent purchase, and registered January 23, 2017. A review of the airplane's flight history revealed that it was flown on the same route as the accident flight several times during the 4 months that the pilot operated the airplane.

Preliminary radar and voice communication information from the FAA revealed the airplane departed TJBQ, climbed to FL240 (24,000 ft), and maintained the same relative heading, airspeed and altitude for about 2.5 hours. The airplane was handled by the Miami Air Route Traffic Control Center (ZMA) as it entered an area of overlapping radar coverage. The overlapping facilities were ZMA, Nassau Approach Control, and Grand Turks Radar.

ZMA management reported that radar targets transitioning this area at "low" altitude will enter "coast" status for about 1 minute before the targets are fully reacquired. After approximately 3 minutes in a coast status, the ZMA controller attempted to contact N220N without success. There were no further communications with the airplane despite multiple attempts by air traffic control, and no further radar targets that could be associated with the airplane were acquired. The floating debris and fuel sheen were in an area consistent with the airplane's final radar target.

The pilot held a commercial pilot certificate with ratings for airplane single engine land, multiengine land, and instrument airplane. His most recent FAA third-class medical certificate was issued December 12, 2016, and the pilot reported 1,480 total hours of flight experience on that date.

According to FAA records, the airplane was manufactured in 1981. Its most recent annual inspection was completed December 30, 2016 at 4,634.2 total aircraft hours. The airplane was scheduled for a 100-hour inspection to be performed on May 16, 2017.

At 1400, the weather recorded at Linden Pindling International Airport (MYNN), about 80 miles west of the airplane's track, included scattered clouds at 1,200 ft, a broken ceiling at 3,000 ft, and an overcast ceiling at 10,000 ft, calm wind, and visibility 10 statute miles in light rain. The temperature was 26ø C, and the dew point was 23ø C. The altimeter setting was 29.97 inches of mercury.

Satellite imagery in the area surrounding the airplane's radar track depicted a consistent cloud layer with cloud tops around FL400 (40,000 ft), and upper air soundings confirmed icing conditions between -10ø and -20ø C in clouds.

At 1340, a PIREP (pilot report) was issued for light to moderate rime icing. The PIREP was received from a Boeing 737 airplane.

National Transportation Safety Board - Aircraft Accident/Incident Database

| | | | | |
|---------------------------------------|-----------------|-----------------|-----------------------|--|
| Accident Rpt# GAA17CA235 | 04/14/2017 2200 | Regis# N481HC | Richfield, UT | Apt: Richfield Muni RIF |
| Acft Mk/Mdl RAYTHEON AIRCRAFT COMPANY | | Acft SN BB-1908 | Acft Dmg: SUBSTANTIAL | Rpt Status: Factual Prob Caus: Pending |
| Eng Mk/Mdl PRATT & WHITNEY PT6-42 | | Acft TT 3631 | Fatal 0 Ser Inj 0 | Flt Conducted Under: FAR 091 |
| Opr Name: IHC HEALTH SERVICES INC | | Opr dba: | | Aircraft Fire: NONE |
| | | | | AW Cert: STT |

Events

1. Taxi-from runway - Miscellaneous/other

Narrative

The pilot reported that during taxi on a parking ramp at night he decided to make a 180ø left turn to position the airplane before picking up a patient. He added that during the turn, the right wing impacted a fence post.

The right wing sustained substantial damage.

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

National Transportation Safety Board - Aircraft Accident/Incident Database

| | | | | |
|---|-----------------|---------------|-----------------------|---------------------------------------|
| Accident Rpt# CEN17LA192 | 05/20/2017 1345 | Regis# N778TL | Canon City, CO | Apt: N/a |
| Acft Mk/Mdl ROBINSON HELICOPTER CO R66-NO | | Acft SN 0469 | Acft Dmg: SUBSTANTIAL | Rpt Status: Prelim Prob Caus: Pending |
| Eng Mk/Mdl ROLLS-ROYCE 250-C300/A1 | | | Fatal 0 Ser Inj 0 | Flt Conducted Under: FAR 091 |
| Opr Name: COLORADO VERTICAL | | Opr dba: | | Aircraft Fire: NONE |
| | | | | AW Cert: STN |

Events

1. Approach - Loss of control in flight
-

Narrative

On May 20, 2017, about 1345 mountain daylight time, a Robinson R66 helicopter, N778TL, impacted terrain following a loss of control on approach to landing near Canon City, Colorado. The commercial pilot and four passengers were not injured, and the helicopter sustained substantial damage. The helicopter was registered to Hynes Aviation Industries, Inc, and operated by Colorado Vertical under provisions of Title 14 Code of Federal Regulations Part 91 as a local air tour flight. Visual meteorological conditions prevailed and a company flight plan was filed for the local flight. The flight originated a private helipad near Canon City at an unknown time.

The pilot reported to the National Transportation Safety Board investigator-in-charge, that after completing the local air tour flight, the helicopter approached the private helipad. On approach about 50-60 kts, the pilot began to arrest the descent to view the wind sock and determine the proper approach to the helipad. About 200 ft above ground level, the pilot initiated a left turn and the helicopter started an uncommanded descent. The pilot applied power to stop the descent, but the helicopter continued sinking towards the terrain. Due to the low altitude, the pilot then committed to land and leveled the helicopter. During the landing, the back of the landing gear skids struck the terrain, which resulted in the main rotor blades contacting and severing in the tail boom. The helicopter came to rest upright and the occupants exited the helicopter.