The Safety Wire

October 2022

During the past month, we had a lot of great training going on around the country. Delaware State Police hosted a Safety Day where there were 12 different agencies in attendance along with vendors. This was a great day that allowed these agencies get together at no cost and learn about aviation safety concerns.

The Airborne Public Safety Association put on a Safety Stand-To on the 11th, hosted by Mesa Police Department. During this one-day training event, we had approximately 50 personnel in attendance learning on topics that included human factors, patrol tactics, brownout landing/takeoff procedures, and an industry safety update. Overall, this was a phenomenal day of training we were able to put on with the help of our sponsors.

Gwinnett County Police Department hosted a safety day in the middle of the month for the surrounding agencies in the Atlanta area. Riverside County Sheriff's Department hosted their Safety Day Fly In. What a turn out this brought for a one-day event. Nearly twenty different agencies from surrounding areas took part in the training. Lastly, the Airborne Public Safety Association hosted our Natural Resources Virtual Safety Stand-To on the 26th of this month. We drew a crowd of over 30 individuals from across the country. Topics that were discussed over the afternoon were low level flight profiles and hazards of

manned aircraft, unmanned aircraft survey profiles, and unmanned aircraft wildlife and law enforcement uses. Overall, October was a great month of valuable training all over the nation.

These small one-day events provide lots of good training and material to take back to your agency. If your agency might not have a large budget for more of the big multiday events, I urge you to get out, find these free one-day events and make it a point to get to them. There is nothing more valuable in our profession then getting multiple different agencies and personnel together in one place, providing many opprotunities to network. Networking can provide information just as important as the training because it engages you with people of the same profession, which for aviation, does not happen too often. You can take back ideas that may help your unit grow, or you may be the one providing a great idea to help out another agency. All these mini training days help crews stay proficient and remain up to date on the current tactics and safety climate, enhancing overall unit effectiveness. These events also prove to be easier to get approval by command staff due to being short, so a unit won't be short staffed. They are cost effective if not free, and if you choose to fly an aircraft to one of these events, you can take advantage of that flight to make it a training point somehow, someway.

I urge everyone over the next few months to keep your eyes open for these types of events. Reach out to APSA if you are interested in hosting a safety day or put it together yourself. Regardless of your approach, make it a priority to get some training scheduled that results in better unit preparedness.

ONLINE MEETINGS

APSA conducts regularly scheduled online meetings for aviation safety officers, aircraft maintenance technicians, airborne SAR personnel, Natural Resource aviators and UAS operators via a videoconference you can join using your computer, mobile device or phone. Online meetings are open to any APSA member. Contract maintenance providers to APSA members are welcome to participate in the maintenance meeting as well. If you would like to join, send an email to: safety@publicsafetyaviation.org

The schedule for upcoming APSA online meetings is as follows.

SAR:
Wednesday, November 2, 2022
1:00 PM - 2:00 PM EDT (1700 UTC)

UAS:
Wednesday, November 9, 2022
1:00 PM - 2:00 PM EST (1800 UTC)

Safety Officers:
Friday, November 18, 2022
1:00 PM - 2:00 PM EST (1800 UTC)

Maintenance:
Wednesday, December 7, 2022
1:00 PM - 2:00 PM EST (1800 UTC)

Natural Resources:
Wednesday, December 14, 2022
1:00 PM - 2:00 PM EST (1800 UTC)

"No man will make a great leader who wants to do it all himself or get all the credit for doing it"

~ Andrew Carnegie

EMERGENCY PROCEDURE OF THE MONTH

In each monthly emergency situation, discuss what you would do, as a crew, to respond to the following emergency. If the EP does not apply to your specific aircraft, think of something similar.

Drone Strike

Analysis

HOUSTON, Texas
May 2, 2020, 02:03 Local MD Helicopter 369
Loss of control in flight Public aircraft

Accident Number: Registration: Aircraft Damage: Injuries:

CEN20LA167 N8375F Substantial
1 Fatal, 1 Serious

Aviation Investigation Final Report

The pilot of the police helicopter reported that, while making a right orbit over a scene during a night flight, he felt a "strong vibration" in the controls, and the helicopter rotated rapidly to the right. The pilot recalled no unusual sounds, warning horns, or caution or warning lights before the event. According to the pilot, the helicopter was "spinning like [the] tail was not functioning," and he responded by performing the emergency procedure for "loss of tail rotor." He lowered the collective and pushed the cyclic forward "to gain forward airspeed and airflow over the vertical stabilizer." Automatic dependent surveillance data showed that the helicopter began a tight right turn as its groundspeed accelerated from 10 to 30 knots. The groundspeed remained at 30 knots for about 5 seconds before slowing to 20 knots. The right turn then continued and tightened, and the helicopter flew straight for the final 5 seconds of flight. The helicopter descended rapidly until it impacted an unoccupied building and terrain, which destroyed the helicopter.

Postaccident examination of the helicopter revealed no evidence of preimpact failures of the tail rotor control or drive systems. Further, there was no evidence found of a preimpact failure of the helicopter structure, main rotor system, cyclic and collective flight controls, or the engine. Based on the available data, the reason for the vibration described by the pilot could not be determined.

A video taken by a ground witness showed the helicopter in a rotating descent before impact. Evaluation of the video revealed that the helicopter's yaw rate increased from 146° to 178° per second while the helicopter was visible and that the helicopter's yaw was to the right, which was opposite the rotation of the main rotor blades. However, the video did not record the onset of the rotation.

A performance study considered whether a loss of tail rotor effectiveness (LTE) or a vortex ring state had occurred during the accident sequence. If the pilot's statement that he accelerated to try to gain control of the spinning helicopter corresponds with the increase in speed from 10 to 30 knots, the yaw would have begun before that time and preceded the final tightening right turn. During the 30 seconds before the increase in speed, the helicopter was on a track where it would have encountered the reported winds as a right quartering headwind of low magnitude; this wind was not conducive to main rotor disc interference LTE, weathercock stability LTE, or tail rotor vortex ring state LTE. Further, the study determined that a vortex ring state was not consistent with the helicopter's apparent level flightpath at the likely onset of the spin, and a vortex ring state does not usually result in an uncontrolled spin.

Regarding loss of translational lift LTE, the performance study determined two factors that might have contributed to the uncommanded right yaw event: the increased anti-torque requirement when the helicopter was below the onset of translational lift and the right rolling moment induced by the introduction of translational lift when the helicopter was accelerating from low speed. However, the helicopter was not equipped with a flight recorder that could have provided additional data about when the yaw event began, the helicopter's attitude and power, and the pilot's inputs; therefore, the investigation could not determine the reason for the uncommanded right yaw.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

An uncommanded right yaw that occurred for reasons that could not be determined based on the available evidence, which resulted in a loss control.

Factual Information

On May 2, 2020, about 0203 central daylight time, a MD 369E helicopter, N8375F, was destroyed when it was involved in an accident near Houston, Texas. The pilot sustained serious injuries, and the tactical flight officer sustained fatal injuries. The helicopter was operated as a Title 14 *Code of Federal Regulations* Part 91 public aircraft flight.

The pilot reported that, before the flight, he performed and completed a preflight examination of the helicopter, a review of the maintenance records, a check of the weather conditions, and a safety assessment. The pilot stated that no anomalies or concerns were found. About 0104, the helicopter departed from William P. Hobby Airport (HOU), Houston, Texas, and began a patrol flight over the city of Houston. The pilot noted that, when flying over a scene, his normal procedure was to make right turns to orbit the scene to provide the tactical flight officer with, and allow the forward-looking infrared camera to capture, the best view of the scene. The pilot also noted that he generally flew the helicopter at an airspeed of at least 30 knots while orbiting.

The helicopter had successfully flown over several scenes before it approached a scene near the accident location and began orbiting to the right. The helicopter was completing its second orbit when it began an uncommanded rotation to the right. The pilot recalled that, just before the helicopter began to rotate, he felt a “strong vibration” in the controls. The pilot did not recall the helicopter’s airspeed at the time, and he did not hear any unusual sounds or warning horns and did not see any caution or warning lights. According to the pilot, the helicopter was “spinning like [the] tail was not functioning,” and he responded by performing the emergency procedure for “loss of tail rotor.” He lowered the collective and pushed the cyclic forward “to gain forward airspeed and airflow over the vertical stabilizer.” The helicopter continued to spin “very violently” so he also reduced power. He was wearing night vision goggles and began searching for a suitable landing area and any potential obstructions. The pilot’s last memory of the event was maneuvering to avoid a building.

Automatic dependent surveillance-broadcast (ADS-B) data provided by the Federal Aviation Administration (FAA) showed that the helicopter approached the accident location just before 0200, slowed to a groundspeed between 40 and 60 knots, and descended to complete a right circling turn over the area at an altitude of 600 ft. One minute later, the helicopter began a right turn at an altitude of 500 ft. At 0202:20, the helicopter turned onto a southeasterly heading, and its groundspeed slowed to about 10 knots. At 0203:20, the helicopter began a tight right turn, and its groundspeed accelerated from 10 to 30 knots. The groundspeed remained at 30 knots for about 5 seconds before slowing to 20 knots. The right turn continued and tightened until 0203:39, and the helicopter flew straight for the final 5 seconds of flight.

Wreckage and Impact Information

The helicopter came to rest on its left side at the base of a building. The helicopter had initially impacted the roof of the building and subsequently fell to the ground. The wreckage area was compact with no significant debris trail and no evidence of a postcrash fire. All five main rotor blades were present at the accident site. The left skid tube was separated from the main fuselage, but the right skid remained attached. A longitudinal tear was observed along the skin and structure of the fuselage underside. The tailboom remained attached to the main fuselage, but the empennage (comprising the vertical fin, horizontal stabilizer, tail rotor gearbox, and tail rotor) was separated from the tailboom and came to rest on top of the right side of the helicopter near the engine bay. The tail rotor gearbox remained installed on the empennage, and both tail rotor blades remained attached to the tail rotor hub. A postaccident examination revealed no evidence of a preimpact failure of the helicopter structure, main rotor system, tail rotor system, cyclic and collective flight controls, or the engine.

The helicopter's fractured tail rotor driveshaft was examined by the National Transportation Safety Board's Material (NTSB's) Laboratory. The driveshaft had fractured in the middle of the shaft and adjacent to a cylindrical support sheath. The fracture was perpendicular to the axis of the shaft and had fracture features consistent with torsional overstress with some bending.

Tests and Research

The NTSB conducted an aircraft performance study for this accident. ADS-B data and nearby weather observation information were used to examine the helicopter's performance. The data showed that the flight began from HOU about 0104 and lasted about 1 hour. During the flight, the helicopter's altitude varied between 400 and 700 ft mean sea level, and its groundspeed ranged between 20 and 130 knots.

The witness video of the accident helicopter was also evaluated. Although the helicopter could be seen spinning from 0203:35 to 0203:44, the video did not record the beginning of the spin. The video study determined the yaw rate was increasing from 146° to 178° per second while the helicopter was visible. The helicopter's yaw was to the right, opposite the rotation of the main rotor blades. The start of the yaw event could not be determined from the available video evidence. As previously noted, the pilot stated that he accelerated to try to gain control of the spinning helicopter. If the pilot's statement corresponds with the increase in speed from 10 to 30 knots at 0203:20, the yaw would have begun before that time.

The performance study considered whether a loss of tail rotor effectiveness (LTE) might have occurred during the accident sequence. LTE occurs when airflow through the tail rotor is altered such that there is no longer enough anti-torque thrust to keep the helicopter fuselage from yawing opposite the rotation of the main rotor blades. Helicopters with counterclockwise- rotating main rotor blades (such as the MD Helicopter 369) are at risk of LTE in low-speed flight when the wind is from the left or a tailwind exists. Between 0202:50 and 0203:20, the helicopter was on a track of about 137° and would have encountered the reported wind (4 knots from 170°) as a right quartering headwind of low magnitude. While on this track, the reported wind was not conductive to main rotor disc vortex interference LTE, weathercock stability LTE, or tail rotor vortex ring state LTE.

The study also considered whether a vortex ring state might have occurred. A vortex ring state describes an aerodynamic condition in which a helicopter may be in a vertical descent with 20% to up to maximum power applied yet little or no climb performance. A vortex ring state was not consistent with the helicopter's apparent level flightpath at the likely onset of the spin, and a vortex ring state does not usually result in an uncontrolled spin.

FAA Advisory Circular 90-95, Unanticipated Right Yaw in Helicopters, discusses a type of LTE referred to as a loss of translational lift, which is lift due to the helicopter's forward motion. When a helicopter is at a speed below translational lift, more power is required for the helicopter to stay aloft, and the amount of anti-torque needed to maintain yaw control increases. Further, in slow forward flight, the air entering the tail rotor is disturbed by the main rotor and is less efficient. The transition to forward flight with translational lift typically occurs at a speed between 16 and 24 knots. During this transition, the anti-torque requirements change, and a pilot must make adjustments as needed.

As stated above, from 0202:50 to 0203:20, the helicopter was on a track of 137° with a 4-knot right quartering headwind. The helicopter's 10- to 15-knot groundspeed at the time along with the headwind would have made the helicopter susceptible to changing lift and power conditions; thus, the required anti-torque would also change. Without sufficient anti-torque, an uncommanded right yaw could have resulted.

In addition, as the helicopter accelerates and translational lift increases, it induces a right rolling motion, and, according to the FAA's *Helicopter Flying Handbook* (FAA-H-8083-21A), the helicopter pitches up. This pitch-up necessitates increased anti-torque and forward cyclic. Thus, if the helicopter experiences an uncommanded right yaw below the transition to translational lift, increasing power to increase speed could further contribute to the right yawing motion and need for anti-torque.

The performance study determined that the increased anti-torque requirement when below the onset of translational lift and right rolling moment induced by the introduction of translational lift when accelerating from low speed may have been factors contributing to the uncommanded right yaw event. However, without additional data about when the yaw event began, the helicopter's attitude and power, or pilot inputs, it is not possible to determine the reason for the uncommanded right yaw.