Things That Go Bump in the Flight

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Joining the Royal New Zealand Air Force in 1988 was the realization of a dream for me. I had earned my private pilot's license a few years earlier, and I found the discipline, high standards, and relentless emergency training somewhat of a shock. Looking back, I believe this training saved my life and the lives of all those on board a UH-1 when its tail rotor failed and I was pilot.

With only 301.4 hours in the Huey, I was a junior bograt and seldom authorized as captain. Generally, the tasks the squadron flew required the better-qualified pilots to occupy the right seat. However, to get experience, we occasionally were sent out on day navigation exercises, as was the case on this particular day.

As Number Two in the formation, we were positioning downwind left-hand for Runway 03 at the local airfield. The rejoin was briefed to be a run-in, low-level on Runway 03, followed by a 1-second, 270-degree right break to terminate outside the Number 4 hangar. All was going as planned except for Number One's VHF radio, which had failed just minutes before. In their place, my crew was doing all the joining calls for the formation.

In mid-downwind and only 1½ miles from the airfield, we felt and heard a high frequency vibration throughout the airframe. It's funny how often you hear, feel, or smell something in the cockpit but, after consultation with the crew, the problem appears to have been a figment of your imagination. In the hope that this was perhaps one of those times, I sheepishly asked the question, "Can you guys hear or feel that?" Over the intercom my crewmembers replied, "Sure can." There was little doubt in our minds that, with the airfield so close, we should turn left, leave the formation, and land as soon as possible.

Once clear of the other aircraft and with the whole airfield in our sights, we had about a minute to address the issue; strangely, though, the vibration had gone away. All the flight controls were responding normally, and all the instruments were normal. Since the noise had gone and everything appeared to be okay, I felt no cause for alarm. My copilot had his hands full operating two radios, and I don't think he particularly was worried either. Why should he? After all, the noise was gone.

As we crossed the perimeter fence, the Number Four hangar came into sight. I felt a slight sense of relief: Home was now only 300 yards away. However, we were far from out of the woods. As the Huey approached translational, I introduced collective to arrest the rate of descent. When I did, the aircraft made a sudden and violent yaw to the right. I never had seen or experienced anything like this in all the training I had received.

One thing did seem obvious—pulling up the collective had caused this immediate problem, so the sensible act was to put it back down. I did this and, fortunately, the rotation stopped at about 110 degrees. Then the nose came left again to settle at 60 to 70 degrees out to the right. It came as no great surprise that the vibration was back and with far more vengeance than before. Some height and speed were lost, but we still were crossing the ground at approximately 20 knots and descending at about 40 feet.

Acting on instinct, I tried to introduce power and increase airspeed. The aircraft responded, but continued flying at an alarming attitude: The left skid was very low, and the nose was wavering between 70 and 90 degrees to the right. Despite reducing the rate of descent (thereby delaying impact with the ground), efforts to climb proved fruitless as the aircraft

threatened to rotate through 90 degrees every time power was increased beyond a critical point. My copilot and crewman automatically performed the critical actions of a mayday call and secured the passengers in their crash positions.

The point of impact was quite obvious at about 100 yards away. As the aircraft approached 10 feet, still crossing the ground at about 20 knots, I had no choice but to treat this as a low-power tail rotor emergency. For a helicopter like the Huey, which has a counter-clockwise rotating main rotor, a low-power tail rotor emergency means the tail rotor is not producing the thrust required for a given power setting and, as power is introduced and/or airspeed is reduced, the nose rotates to the right. The only corrective measure is to close the throttle, which eliminates torque; the nose then rotates left for a matter of seconds, during which time the aircraft should be run on while the skids are aligned with the direction of travel.

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During training we would never practice such an extreme low-power scenario. I had not seen this maneuver performed with the nose beyond 20 to 30 degrees to the right. I briefed the crew of my intention to close the throttle to flight idle and proceeded to do so. The aircraft yawed to the left but didn't quite reach the direction of travel. Suddenly the rotation reversed, and the nose was rotating to the right again. Now we really were committed—rotor rpm was reducing rapidly, and the rotation was accelerating through 90 degrees to the right.

Instinct took over again and I attempted to reduce ground speed to zero, for the aircraft surely would turn over if we hit with any sideways movement. The left toe kissed the ground but didn't grab it, allowing 15 more feet of flight before contacting it again, only this time harder. As the skid tore into the soft topsoil, the remaining sideways movement caused the aircraft to rear up on its left skid, all the time rotating to the right. The last of the energy was dispelled as the left heel also penetrated the topsoil. The aircraft, now completely out of control, threatened to roll over.

Fortunately, the dynamic rollover effect stopped before the center of gravity exceeded the limit of the left skid. The aircraft ungracefully fell back down and for the first time contacted the ground with both skids. It was now facing 180 degrees opposite of the approach heading. The crewman quickly exited the aircraft to check for the cause of this hair-raising ride. The copilot and I looked anxiously at each other while we secured the engine and turned the electronics off. The main rotor still was winding down when the crewman returned and said the tail rotor was not turning at all. He could see the failed tail rotor drive hanger bearing. This was the first time during this 50-second ordeal that any of us could think clearly enough to acknowledge the fault and its seriousness.

I flew the Huey for 5½ more years and eventually qualified as both a fixed- and rotary-wing instructor. I now have a total of 2,500 flying hours, of which 1,800 are on helicopters. I never have forgotten the time my tail rotor failed, and I doubt I ever will. Surprisingly, I don't think I would do anything different if it happened again. Perhaps I wouldn't have flown a normal approach but, again, the noise was gone and there were no signs of a serious problem. After all, how often do you hear a noise that turns out to be nothing?

I attribute our instinctive handling of this problem to the excellent instruction I received during my training. To put it in simple terms, when you fly helicopters there are some things that have to be instinctive. The initial actions required when you lose yaw control or tail rotor effectiveness is an example of one of these times. You've been trained by the best. Use that training to keep you and your crew safe! ♦

—This article was written by Royal New Zealand Air Force (RNZAF) squadron leader, Ian MacPherson. You can read this true account and many others in Greg Whyte's book entitled, "Fatal Traps for Helicopter Pilots" recently published in August 2003 in New Zealand. You can preview and order the book at http://www.fataltraps.com. For more info, contact Greg Whyte, P.O. Box 75, Waikato Mail Centre, Hamilton 2015 New Zealand, Fax: +64-7-850-6053 or e-mail: greg@fataltraps.com.