



Records Show 27 U.S.-registered Helicopters Involved in Midair Collisions During 1990s

The collisions represented 1.4 percent of all accidents involving helicopters registered in the United States throughout the decade.

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Joel S. Harris

Data from the U.S. National Transportation Safety Board (NTSB) showed that 1,972 U.S.-registered helicopters were involved in accidents during the period from 1990 through 1999; 27 of those helicopters (1.4 percent) were involved in midair collisions. (For comparison, 20,409 U.S.-registered airplanes were involved in accidents during the same period. Of that number, 290 airplanes [1.4 percent] were involved in midair collisions.)

A review of the accident data showed that:

- In every final report that assigned probable cause for the midair collision, action by a pilot or flight crew was cited;
- The average flight time for pilots of 19 accident helicopters (all of the reports in which the pilot's total flight time was recorded) was 5,135 hours; and,
- All of the accident reports said that the collisions occurred in visual meteorological conditions (VMC).



The accident data were obtained from the NTSB Aviation Accident/Incident Database and the NTSB monthly accident lists and accident synopses.¹ Three types of accident reports are found in the NTSB records: preliminary reports, which are completed within five working days of the accident; factual reports, which incorporate additional information that becomes available during the weeks and months following the accident; and final reports, which include a statement of the probable cause of the accident and which may not be completed for months — or sometimes years — after the accident.

This article includes information about 20 midair collisions involving U.S.-registered helicopters. Eight were collisions between two helicopters (including one accident in which a U.S.-registered helicopter and a Canadian-registered helicopter collided; the Canadian helicopter is not included in the statistics in this article), and 12 were collisions between one helicopter and one airplane. The information was obtained from 18 final reports, five factual reports and four preliminary reports. (Two of the four preliminary reports discussed two helicopters

involved in the same midair collision in 1998. The other two preliminary reports discussed midair collisions outside the United States; in those instances, NTSB was not the primary investigative authority and therefore did not update preliminary accident information.²⁾

The 18 final reports discussed a total of 14 midair collisions. (Four of the accidents were collisions between two helicopters; therefore, two reports — one for each helicopter involved — exist for each of those accidents.) In all 14 collisions, action by a pilot or flight crew was cited as a causal factor. Pilots or the flight crew were cited six times for “inadequate visual lookout” or for failure to maintain “adequate lookout” or “adequate visual lookout.” Pilots were cited four times for failure to “maintain clearance” or to “maintain adequate clearance,” three times for failure to “maintain visual separation” or “maintain safe separation,” and once for “failure ... to see and avoid.”

Flight time among the helicopter accident pilots varied from a low of 74 flight hours to a high of 17,795 flight hours.

Data showed that one single-engine airplane pilot had more than 40,000 flight hours when his airplane was involved in a midair collision with a helicopter. In that accident, a Sikorsky MH-53E helicopter, flown by two U.S. Navy pilots, collided with a Cessna 172RG that was being flown on a “fish-spotting” mission near the Virginia coast July 11, 1994.³ The Cessna struck the water, which was about 10 feet (three meters) deep, and was destroyed. The pilot received fatal injuries. The Sikorsky, which was damaged substantially and which was flown for several minutes after the collision with a section of the Cessna’s severed wing embedded in it, was landed in a field about two miles (3.2 kilometers) north of the collision site. There were no injuries to any of the four crewmembers aboard the Sikorsky.

The Navy helicopter had departed from Chambers Field, Naval Air Station, Norfolk, Virginia, and was on a routine maintenance test flight. Weather at Norfolk shortly before the accident included scattered clouds at 9,000 feet, broken clouds at 25,000 feet and visibility of 10 miles (16 kilometers). Winds were from 30 degrees at 7 knots.

The helicopter was on a military flight plan and the pilots were not in radio contact with Norfolk Departure Control Radar (DR-1). The Cessna pilot was receiving flight following from DR-1 and was using an assigned transponder code. Nevertheless, there was no radio communication between DR-1 and the Cessna for 33 minutes before the collision, which occurred at 4:18 p.m. local time.

The pilot-in-command of the helicopter said in a written statement:

“We climbed to 6,000 feet in an orbit over the water off to the west of the peninsula ... we completed the [fuel] dump test after just a minute or two, and I initiated a descent. I was descending in a left orbit over the water As we turned ...

I noted civilian traffic at the 12 o’clock position, low, a few miles out. The copilot stated she had the traffic in sight, and the crew chief stated that lookouts were posted. I continued the left orbit, descending at approximately 1,000 feet per minute. As I turned through a northeasterly heading on the next orbit, I heard and felt the impact.”

The pilot then executed an emergency autorotational descent, changed the transponder code from 1200 to the emergency code of 7700 and landed.

In her statement, the copilot said that she “spotted a small civilian aircraft over land approximately four miles out, much lower ... and not headed in our general direction.” She told the pilot that she saw the traffic, and they continued in a left descending turn for “one or two full rotations.”

“[T]hen as we turned away from land again, I caught a glimpse of something out the corner of my eye,” said the copilot. “I jerked my head to the right and saw a civilian aircraft just prior to it impacting us on our aft starboard [right] side. The aircraft appeared to be in a climbing left turn. I did not actually see it hit us as I had snapped my head back toward the front to grab the controls in an effort to take evasive maneuvers.”

Norfolk Departure Control remained unaware of the accident and of the helicopter’s emergency transponder code for 23 minutes after the collision, when the DR-1 controller transmitted, “Fish spotter two-four-Romeo, you still out there?”

There was no reply.

The accident report said that a recorded radar study showed that “the helicopter was turning from northeast to north (left) descending from 4,300 feet to 3,500 feet, overtaking the Cessna from above and behind. The Cessna is shown by the radar maneuvering left and right, in a northwesterly direction, maintaining between 3,400 and 3,500 feet.”

The recorded radar study also showed that the helicopter was descending at a rate as fast as 2,000 feet per minute.

Most of the damage to the helicopter was to the right aft section of the fuselage. Several parts of the Cessna were found near the helicopter and inside the helicopter’s cargo area and main cabin area. The Cessna’s left outboard section of wing was found about 65 feet (20 meters) behind the helicopter after the helicopter landed. One of the helicopter crewmembers saw the part fall off the helicopter just before the helicopter touched down.

When the Cessna was recovered, the left wing was detached from the root.

In an NTSB postaccident interview, the DR-1 controller was asked about the 7700 transponder code that the helicopter squawked after the collision.

“The controller said he may have seen a 7700 code, but he didn’t know,” the accident report said. “[Aircraft squawking 7700] ... were described as a constant thing, not unusual in that area, which is over water. ... They see code 7700 every day.”

All three pilots were properly certificated and held valid medical certificates at the time of the accident. The helicopter pilot had 948 flight hours; the copilot had 342 flight hours. The accident report said that the probable cause of the accident was “inadequate visual lookout by the flight crew of the helicopter.” A factor related to the accident was the “failure of the departure controller to issue a traffic advisory.”

As a result of the accident, the Norfolk International Tower area manager of training has included the subject of 7700 codes in semiannual training programs, and a computerized program was developed to provide an audio alarm for controllers when pilots set their aircraft transponders to 7700.

The review of the accident data showed that seven of the accident helicopters were equipped with piston engines; the other 20 helicopters had turboshaft engines, and that number included five multi-engine turboshaft helicopters (Figure 1).

Of the 20 midair collisions, 13 occurred in daylight, and two occurred in darkness. Accident reports on five collisions did not state light conditions at the time of the accident.

In 15 of the 20 midair collisions, visibility was at least 10 statute miles; in no instance was visibility less than four miles (6.4 kilometers). One report listed a restriction to visibility; the restriction was haze.

One accident in which two helicopters collided in VMC occurred on the morning of June 1, 1997, three miles (five kilometers) west of Intracoastal City, Louisiana.⁴ The collision involved a Bell 206B JetRanger III operated by Air Logistics, with a predominantly blue paint scheme, and a Bell 206L1 LongRanger operated by Houston Helicopters, with a predominantly red paint scheme. Both helicopters were operating under U.S. Federal Aviation Regulations (FARs) Part 91 positioning flights.

The Houston Helicopters radio log indicated that the company’s pilot reported departing from the Abbeville Municipal Airport in Abbeville, Louisiana, at 1119 local time, en route to an offshore oil platform in the Gulf of Mexico.

Radar data recorded by a U.S. Air Force balloon tethered 29 miles (46 kilometers) southeast of Abbeville indicated that, after takeoff, the helicopter was flown on a heading of approximately 210 degrees with a groundspeed of about 110 knots. There is no record that the helicopter made a radio transmission before entering the Intracoastal City Traffic Advisory Area.

About 1120, the Air Logistics helicopter departed from the Air Logistics Intracoastal City heliport, westbound to Grand Chenier, Louisiana. The Air Logistics heliport is about 14 miles (22 kilometers) south of the Abbeville airport. A company flight plan was filed, and the pilot announced his departure on the local advisory frequency.

Air Force radar data showed the Air Logistics helicopter heading approximately 270 degrees after takeoff and traveling about 105 knots.

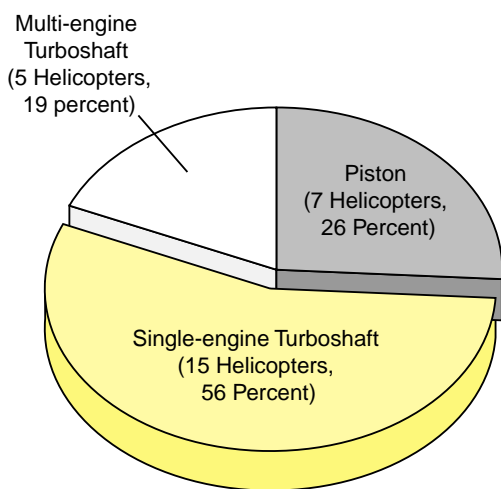
The pilot of the Air Logistics helicopter said that after departure, he “climbed to 700 feet AGL [above ground level], leveled off, set cruise power and scanned the instruments.” This was in compliance with published Helicopter Safety Advisory Conference (HSAC) practices for operations in the Intracoastal City area, which recommend that outbound traffic should “execute an expeditious climb between 700 feet and 1,000 feet after takeoff.”

The recommended practice for aircraft passing through the traffic advisory area is to do so “at 1,200 feet or above” and to “call at 10 [nautical miles] ... giving altitude and route of flight.”

The report said that, after leveling off his helicopter at 700 feet, the Air Logistics pilot saw “the nose and left side of a red helicopter” to his right and at a “slightly lower altitude.” He rolled his helicopter to the left and was in a left bank of 40 degrees to 45 degrees when he felt the impact.

“The pilot’s next recollection was that his helicopter was in a descent on an easterly heading and ‘shaking violently,’” the

Helicopter Types Involved In U.S. Midair Collisions, 1990–1999



Note: Percentages do not total 100 because of rounding.
Source: Joel Harris

Figure 1

report said. "His helicopter touched down in the water, rolled over and sank. He was able to free himself from the helicopter and swim to the surface, where he was picked up by a man in a boat."

The man in the boat witnessed the collision and said that he "observed a red helicopter [from Houston Helicopters] overhead and to his right traveling 'roughly westbound.' The red helicopter 'appeared to be climbing slowly.' He then noticed a second, blue, helicopter [the Air Logistics helicopter] 'slightly north of and slightly higher than the first' helicopter; the blue helicopter was also traveling westbound 'but on a course heading that would intersect the red helicopter.' ... The pilot of the blue helicopter attempted to avoid the collision 'by pitching the aircraft up and simultaneously banking to the right very steeply.' The witness then observed the main-rotor blades of the blue helicopter impact the tail rotor of the red helicopter. The red helicopter's tail rotor shattered 'with visible debris and a loud explosion,' and the tail boom 'folded downward and separated from the fuselage.' The red helicopter 'pitched over fully inverted' and impacted in the trees."

After the collision, the witness said that he observed the blue helicopter as it descended "rapidly in a controlled manner to land in the water." As the blue helicopter passed his boat, the witness "observed it shuddering violently and small pieces of debris falling off."

The Air Logistics helicopter was damaged substantially, and the pilot received minor injuries. The Houston Helicopters aircraft was destroyed, and the pilot received fatal injuries.

The report said that the probable cause of the accident was "the failure of both pilots to see and avoid each other's aircraft. Factors were the failure of the pilot of [the Houston Helicopters aircraft] to use the available traffic advisory service and the failure of the operator ... to make the use of traffic advisory services a company standard operating procedure."

The review of accident data showed that two of the helicopters involved in midair collisions were being operated under FARs Part 135 as on-demand air taxis, two were military aircraft, two were police helicopters and the function of one was not known. The others were being operated under Part 91.

Four of the 27 accident helicopters were involved in photography missions.

Five of the 20 midair collisions involved helicopters in formation flight or in a "lead-chase" configuration; in all five accidents, pilot error was cited as a causal factor.

An accident involving a photographic mission during formation flight occurred July 8, 1996, when a Hughes 369D collided with a Mooney M20J while filming for a television movie.⁵ The helicopter was autorotated into the Pacific Ocean, sank and was destroyed. The commercial pilot and three

passengers (one camera technician and two videotape engineers) were rescued. None of the occupants was injured.

Although the Mooney was damaged substantially in the collision and lost three feet (0.9 meter) of its right wing, the pilot flew the airplane to Honolulu International Airport, Hawaii, and landed there. Neither the airline transport pilot nor her two passengers (a camera technician and an actress) were injured.

The flight began with a preflight briefing that involved both pilots, who agreed that the Mooney would be the lead aircraft in a formation flight of two. After departure, the helicopter joined up on the Mooney's right side and slightly behind the airplane. Each pilot was flying from the left seat, and the Mooney's right front seat was occupied by the actress. The pilots were in radio contact with each other. The aircraft were flown past Diamond Head at about 100 knots and 1,000 feet above sea level while videotaping was in progress. Videotapes from both aircraft were recovered and reviewed by NTSB. They provided video and audio accounts of events before the collision.

The accident report said, "During the approximate two-minute period which preceded the collision, the rear-seated cameraman in the Hughes was filming the left side exterior of the Mooney. ... The aircraft appeared to be maintaining a level flight attitude."

Aboard the Mooney, a camera technician in the back seat was videotaping toward the front of the airplane, and an aft-pointing, stationary, dashboard-mounted camera filmed the actress and the pilot from the front.

Based on the recovered videotapes, the report said, "The Hughes decreased its distance from the Mooney's right wing, joined up in a tight side-by-side formation, and at times was several feet higher, lower, in front of and behind the Mooney."

The report said that, about one minute before the collision, "the Mooney pilot appears to notice that the helicopter has varied its altitude relative to her airplane and she comments about it, the pilot looks to the right toward the helicopter, she laughs, she looks left in the direction of the shoreline and states (to the actress) 'and over here used to be (sound of impact) (expletive deleted)'..."

A postaccident examination of the Hughes revealed that "the outboard portion of all five of its main-rotor blades sustained impact damage" and that the tip of one blade was severed. An inspection of the airplane revealed that "the outboard three feet of its right wing and a portion of the aileron [were] severed."

The report also said that the *Aeronautical Information Manual* provides the following guidance for formation flight: "Separation between aircraft within the formation is the

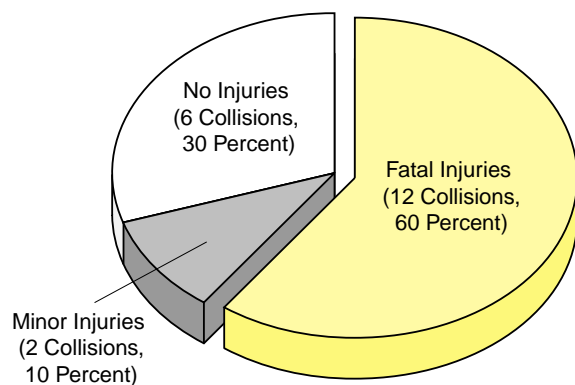
responsibility of the flight leader and the pilots of the other aircraft in the flight.”

The report also quoted FARs Part 91.111, which requires that “no person may operate an aircraft so close to another aircraft as to create a collision hazard.”

The report said that the probable cause of the accident was “the failure of both pilots to maintain adequate clearance from each other while in formation flight.”

Accident data showed that 12 of the 20 midair collisions (60 percent) involved fatalities; a total of 30 people were killed. Two of the collisions involved minor injuries, and six collisions involved no injuries (Figure 2).

Extent of Injuries Sustained In 20 U.S. Helicopter Midair Collisions, 1990–1999



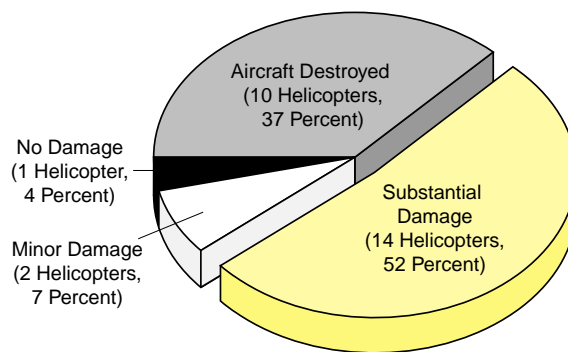
Source: Joel Harris

Figure 2

NTSB reports said that 10 of the 27 helicopters involved in the midair collisions were destroyed, 14 helicopters were damaged substantially, two received minor damage and one was not damaged (Figure 3). (Nevertheless, the report narrative on the helicopter that was listed as undamaged said that the helicopter’s tail-rotor drive shaft was severed in the accident; the discrepancy was not explained.)

The report that listed the helicopter as undamaged involved an Aug. 4, 1996, accident in which a McDonnell Douglas MD-369D single-turboshaft helicopter operated by Tundra Copters collided with a Cessna 185 near the Vanert Glacier in Alaska.⁶ Both aircraft were operated under FARs Part 135 as on-demand air taxi flights. Weather conditions were VMC. The helicopter was being flown east about 400 feet AGL and was carrying three geologists. The pilot said that the sun was in his eyes and that he was looking for a landing site. When he looked up, he saw the Cessna’s main landing gear “head on and an estimated 20 feet [six meters] away.”

Helicopter Damage Sustained In 20 U.S. Midair Collisions, 1990–1999



Source: Joel Harris

Figure 3

Then, the pilot said that he felt “an impact, and then severe vibration. The vibration was so severe he was unable to read any of the instruments in the cockpit. He elected not to make any pitch or power changes because the helicopter was still flying, and he was concerned that any control inputs might further decay aircraft control. He allowed the helicopter to descend towards a sloped area, and when about 50 feet above the ground, he applied power to stop the descent. When the power was applied, the helicopter began to spin quickly to the right. The pilot said although the tail-rotor drive shaft had been severed, probably upon impact, he was able to maintain some lateral control and minimize lateral drift until the helicopter impacted slightly sloping, brush-covered terrain.”

The helicopter pilot and his three passengers received minor injuries.

Examination of the Cessna revealed that the impact of the helicopter’s tail rotor had knocked off the airplane’s tail wheel.

The airplane was flown to its destination, where the pilot conducted a normal landing. Neither the airplane pilot nor his passenger was injured.

The report said that the probable cause of the accident was “the inadequate visual outlook by the pilots of both aircraft, and their failure to see and avoid the other aircraft. A factor associated with the accident was sun glare affecting the helicopter pilot’s vision.”♦

Notes and References

1. The accident data in this review were obtained through searches of the U.S. National Transportation Safety Board’s (NTSB) online Accident/Incident Database, available on the Internet at www.asy.faa.gov/asp/asy_ntsb.asp, and the NTSB monthly accident lists and accident synopses,

available at www.ntsb.gov/aviation/months.htm. The online searches of the databases were completed in May and June 2000.

2. NTSB accident reports NYC92WA186A and NYC99WA206. Accident report NYC92WA186A involved a U.S.-registered Hughes 369E that collided Sept. 29, 1992, over Niagara Falls, Ontario, Canada, with a Canadian-registered Bell 206B JetRanger III. The Hughes 369E was destroyed; the JetRanger III received substantial damage; and four people were killed. The Transportation Safety Board of Canada investigated the accident. (NTSB records also include a preliminary accident report, NYC92WA186B, on the Canadian-registered helicopter.) Accident report NYC99WA206 involved a U.S.-registered Robinson R22B, which collided June 22, 1999, with a Zlin Z-42M airplane near Grossenhain, Saxonia, Germany. Both aircraft were destroyed, and the flight instructor and student pilot in the airplane and the pilot and passenger in the helicopter were killed. The German Federal Bureau of Aircraft Accidents Investigation investigated the accident.

3. NTSB accident report NYC94FA119B.

4. NTSB accident report FTW97FA208A.

5. NTSB accident report LAX96LA267A.

6. NTSB accident report ANC96LA111A.

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Joel S. Harris holds an airline transport pilot certificate and a flight instructor certificate with ratings in both helicopters and airplanes. He is a U.S. Federal Aviation Administration-designated pilot-proficiency examiner, Federal Aviation Regulations Part 135 check airman and safety counselor. Harris is the assistant director of standards for quality assurance at FlightSafety International. He has administered more than 10,000 hours of flight, simulator and ground-school training to professional pilots.

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