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Judgment Remains Key in Avoiding Potentially Fatal Weather Encounters

Helicopter pilots operating under visual flight rules should carefully consider whether the flight can be conducted safely when weather briefers advise that "VFR flight is not recommended."

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Inflight collisions with obstacles and uncontrolled collisions with terrain occur with alarming frequency when helicopter flight operations are conducted under visual flight rules (VFR) in reduced-visibility weather conditions. These kinds of accidents are particularly serious because they often result in fatalities and total destruction of the aircraft.

Inflight collisions with obstacles can occur in reduced visibility that often accompanies marginal weather conditions. Uncontrolled collision with terrain following spatial disorientation commonly results when VFR flight is continued into instrument meteorological conditions (IMC).

A review and analysis of more than 1,793 turbine-powered helicopter accidents, which were investigated by the U.S. National Transportation Safety Board (NTSB) during the period from 1973 to 1993, revealed that of 203 inflight collisions with obstacles or terrain, one-quarter of the occurrences involved reduced-visibility weather conditions as a causal factor.[1] Wires were the most common obstacle hit by helicopters.

The analysis found that more than 80 accidents resulted from uncontrolled collisions with terrain during VFR operations in marginal weather or during flight under instrument flight rules (IFR) in IMC. Loss of visual references and spatial disorientation were cited as causal factors in these accidents.

Marking obstructions and improving instrument flight skills can help reduce these kinds of accidents. The most effective method, however, may be to avoid high-risk situations.

When a weather briefer says that "VFR flight is not recommended," it is a *recommendation.* The pilot must make the decision to fly or not to fly a VFR flight into marginal weather conditions.

A pilot is not required to cancel a flight simply because the weather is marginal. If the flight is completed successfully, with no violation of regulations, the pilot will have done his or her job, and only the pilot will know what level of risk was involved. Usually the risk level goes unreported.

U.S. Federal Aviation Regulations (FARs) Part 91.155(b)(1) permits VFR helicopter operations in uncontrolled airspace (U.S. Class G) below 1,200 feet (366 meters) above ground level (AGL) with no minimum

visibility as long as the pilot remains clear of clouds and operates "at a speed that allows the pilot adequate opportunity to see any air traffic or obstruction in time to avoid a collision."[2]

This requirement recognizes the helicopter's capability to fly very slowly and to hover when airborne, unlike fixed-wing aircraft. The helicopter's unique capabilities of operating "low and slow" while retaining maneuverability make it useful for transportation in many marginal-weather situations. Also, helicopters, which are designed primarily for visual flight operations, usually provide the pilot a much better view outside the aircraft than most fixed-wing aircraft.

Some obstacles, however, such as wires or antenna towers, can appear to be invisible even in optimum weather conditions at any flight speed. This increases the risk of a collision with such obstructions, especially at night when visibility might be further restricted by fog or rain.

The following account is typical of such an accident.[3] The accident occurred in poor weather and resulted in three fatalities. The pilot's helicopter struck the obstacle during darkness in IMC.

The Bell 206B, with a single pilot and two passengers, departed Concord, California, U.S., on a return flight to Gnoss Field, Novato, California, approximately 27 miles (43.4 kilometers) to the northwest. About 19 of those miles (30.6 kilometers) would be flown that night.

The pilot obtained weather briefings from flight service before the originating flight at Gnoss Field and before the return flight from Concord. He was advised during both briefings that "VFR flight is not recommended." Reported ceilings in the area were as low as 700 feet (213 meters) and visibilities were as low as three miles (4.8 kilometers) in rain and fog. The temperature was 59 degrees F (15 degrees C) and the dew point was 57 degrees F (14 degrees C). Inflight weather advisories (AIRMETS) called for IMC, and reported mountain obscuration and turbulence with occasional ceilings below 1,000 feet (305 meters) and occasional visibility below three miles (4.8 kilometers).

The pilot, who was familiar with the flight route, completed the originating flight without incident.

Shortly after departure on the return flight, the pilot contacted Concord air traffic control (ATC) and requested a special VFR clearance through the control zone. ATC approved the request and reported that the visibility had varied from four miles (6.4 kilometers) to about two miles (3.2 kilometers), and told the pilot to report when he was clear of the control zone or if VFR conditions were encountered. The pilot stated that it looked a little dark where he was and that he would advise ATC of any changes in flight conditions.

During his conversation with Concord ATC, the pilot commented on the problem of unmarked wires in the area and how difficult it was to see them even in daylight.

About 15 minutes later, after departing the control zone, the aircraft collided with a 223-foot (68-meter) power-line tower, which supported three 115,000-volt power lines. Witnesses reported that the helicopter was flying slowly (46 to 50.4 knots based on the speed of one witness's vehicle) about 200 feet (61 meters) AGL when it exploded on impact with the tower. The wreckage, entangled in the tower structure, burned for about 20 minutes. All three occupants were killed.

The U.S. National Transportation Safety Board (NTSB) determined that the probable causes of this accident were the "pilot's intentional flight into known adverse weather, continued flight into instrument meteorological conditions and improper altitude."

The pilot, who was familiar with the flight route, completed the originating flight without incident.

Towers are sometimes marked with small strobe lights, which help attract a pilot's attention. Wires strung between power-line towers, however, are not as easy to mark. Some wires have large, brightly painted balls attached to make them more visible. [Flight Safety Foundation in November 1993 recognized the developer of illuminated spherical markers designed to improve power-line visibility. The markers are illuminated entirely by the power line's electrical field. The developer, Richard Milton, received the FSF Adm. Luis de Florez Award in recognition of his contribution to flight safety.]

But the balls may be nearly impossible to see at night or in bad weather. In addition, some residential neighborhood groups have objected to them as unsightly and opposed their installation.

Preparation builds confidence, and confidence is required when flying only by reference to the aircraft's flight instruments. Otherwise, sensory illusions can overcome a pilot's ability to control the aircraft effectively. With sufficient preparation, the pilot knows before takeoff what to expect at various points during the flight, so he can be sure he has the skills and a properly equipped aircraft to complete the flight safely.

The following accident might have been prevented if the pilot had been properly prepared for instrument flight

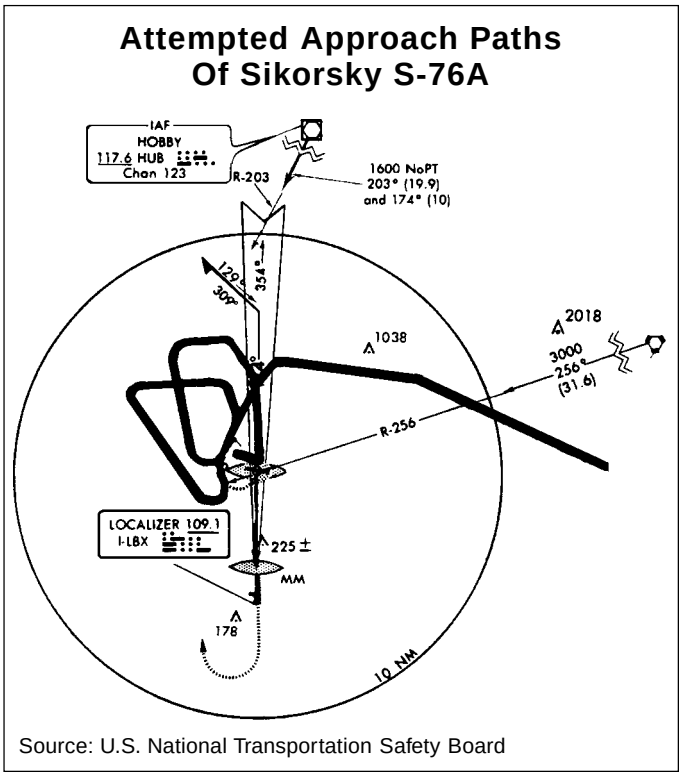

Figure 1

and had avoided the task saturation of trying to simultaneously fly the aircraft, navigate an instrument landing system (ILS) approach and communicate on two radios.[4] A weather briefing from a flight service station was not obtained before the flight.

The Sikorsky S-76A departed VFR from Freeport, Texas, U.S., for a test flight after installation of a main rotor dampener. Not far to the east, Galveston, Texas, was reporting a 400-foot (122-meter) ceiling and three-mile (4.8-kilometer) visibility in fog. The pilot, with a mechanic on board, inadvertently encountered IMC shortly after takeoff.

The pilot broke out of the weather above a layer of clouds that obscured the ground. He contacted his operations base and obtained local weather and the information he needed for an ILS approach to Brazoria County Airport, Angleton, Texas (Figure 1). No approach charts were on board the aircraft, and no plans had been made to conduct the flight under IFR.

Because the pilot was not prepared for the flight conditions in which he found himself, he had to develop a plan of action while controlling the aircraft by reference to instruments and communicating with ground facilities. The accident report did not say whether the aircraft was equipped with an autopilot, which could have reduced the pilot's workload.

Although the pilot did not declare an emergency, he did tell Houston approach that he was having trouble. Given the circumstances, it is clear that the pilot was over-tasked.

While maintaining communications with his operations base, the pilot established contact with Houston approach control on another radio to request assistance. Houston approach control established radar contact and began vectoring the helicopter for the ILS approach. During the first vector to final, however, the aircraft flew through the localizer approach course and had to be vectored back for another intercept. The second attempt was also unsuccessful; just before intercepting the final approach course on the second attempt, the aircraft entered a right turn away from the localizer and had to be vectored for another course intercept.

Vectors for the third approach attempt appeared to establish the aircraft on final. Nevertheless, just before crossing the outer marker, the aircraft turned sharply to the right. Radar contact was lost a few moments later. During the last few moments of the flight, the calculated ground speed varied between 106 knots and 28 knots. The pilot reportedly stated on his company radio frequency that he was in an unusual attitude and, after a few seconds, that he thought he was going to crash.

The aircraft broke apart in flight with three of the four main rotor blades contacting the fuselage. Both occupants were killed.

NTSB investigators found no malfunctioning aircraft components that could have contributed to the accident. The NTSB accident report determined that the probable causes of the accident were inadvertent VFR flight into IMC, the pilot's spatial disorientation and exceedance of the aircraft's design limits.

Loss of control because of spatial disorientation can be reduced if instrument training is emphasized and aircraft are equipped with stability augmentation systems. Procedures for coping with inadvertent IMC should be practiced frequently by VFR-rated pilots who fly in areas where poor weather is a frequent problem and inadvertent flight into IMC could occur.

The two accidents cited above represent weather-related accidents, influenced by conditions that the NTSB considers to be among the most serious for helicopter operations. Even instrument-rated pilots are susceptible to the dangers of flying VFR in conditions of reduced visibility and low ceilings.[5]

When confronted with adverse weather while flying VFR, a helicopter pilot has only three options: Continue flight under VFR to the destination or point of departure; make a discretionary landing short of the destination; or climb to a safe altitude, declare an emergency and request an

IFR clearance to an airport where an instrument descent for a visual landing can be accomplished.

The last option is often not chosen in time to prevent an accident because of the anxiety associated with disrupting the planned flight, encountering hazardous weather at higher altitudes or facing U.S. Federal Aviation Administration (FAA) enforcement action.

If the weather briefer says "VFR flight is not *recommended*," carefully reconsider the feasibility of initiating a VFR flight. If the risk is too great, cancel the flight. ♦

References

1. U.S. Federal Aviation Administration (FAA) Accident/Incident Database. "Air Data Research." (Data base search). 1994.

2. U.S. Federal Aviation Regulations (FARs) Part 91.

3. *Factual Report, Aviation Accident/Incident,* Report No. LAX92-1-A029. A special report prepared by the U.S. National Transportation Safety Board. 1991.

4. *Factual Report, Aviation Accident/Incident,* Report No. FTW87-F-A059. A special report prepared by the U.S. National Transportation Safety Board. 1987.

5. *Safety Study, Commercial Emergency Medical Service Helicopter Operations*. A special report prepared by the U.S. National Transportation Safety Board. 1988.

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