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FLIGHT SAFETY FOUNDATION

# HELICOPTER SAFETY

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*For Everyone Concerned with the Safety of Flight*

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## Every Helicopter Pilot Must Be Prepared for Inadvertent Entry into Instrument Meteorological Conditions

*The first line of defense is to avoid inadvertent instrument meteorological conditions, but vital guidelines can prepare a pilot for coping with the unexpected.*

—  
*Joel S. Harris  
FlightSafety International*

The twin-turbine helicopter captain was engaged in a maintenance test flight (tracking main rotor blades) at night under a 400-foot (122-meter) overcast. Because the flight would be in the traffic pattern and very brief, the 50-year-old captain apparently deemed the weather acceptable. Then the unexpected happened: The pilot and a mechanic, who was in the left seat, found themselves in inadvertent instrument meteorological conditions (IMC).

The pilot elected to fly the helicopter higher until he broke through the top of a 2,000-foot (610-meter) cloud layer and saw the moon above. He radioed his company operations and asked another pilot to read him the approach plate for the local instrument landing system (ILS) approach. Following this, he contacted air traffic control (ATC), and reported his situation and asked for vectors to the ILS. According to ATC radar information, his airspeed during his first two approaches varied from 26 knots to 108 knots. Both of the approaches were unsuccessful.

On the third approach, the captain radioed the pilot at his base operations that "I've got an attitude problem," then after a short delay, he stated, "I'm going to crash." The wreckage was found scattered over a large area near the middle marker, and there was evidence that the main rotor

blades had hit the tail boom and radome and then separated in flight.

The U.S. National Transportation Safety Board (NTSB) found that the probable cause of the 1987 accident was inadvertent visual flight rules (VFR) flight into IMC by the pilot-in-command, and possible spatial disorientation.<sup>1</sup>

A 1988 NTSB study of emergency medical service (EMS) helicopter accidents found that unplanned entry into IMC was the single most common factor in fatal EMS helicopter accidents.<sup>2</sup> Lonney McCann, formerly the director of training at Indianapolis Helicopter Corp., Indianapolis, Indiana, U.S., and now an EMS helicopter-flight instructor, said, "I think under the right circumstances anyone can [enter] inadvertent IMC, especially at night."<sup>3</sup>

The U.S. Federal Aviation Administration (FAA) manual, *Aeronautical Decision Making for Air Ambulance Helicopter Pilots*, notes that "even on the clearest night with VFR conditions, a pilot can come close to IFR [instrument flight rules, i.e., inadvertent IMC] operations if there is no moon and/or no ground lights to establish a horizon reference. Or, on the other hand, a profusion of ground lights below and stars above can merge into a continuous sweep of pinpoints



that deprive a pilot of any horizon reference. However, the real 'killer' lurking in the night sky is the unseen cloud. Clouds disappear easily in the dark, and you can fly into one without seeing it coming."<sup>4</sup>

Because inadvertent-IMC accidents frequently include pilot fatalities, these accidents often cannot provide investigators with complete information on the events that led to the accidents. Information about these types of accidents can be supplemented by incident reports from the U.S. National Aeronautics and Space Administration (NASA) Aviation Safety Reporting System (ASRS).

A search conducted and published by ASRS, which sampled 100 helicopter incidents that occurred during 1987 to 1994,<sup>5</sup> found several incidents that involved inadvertent IMC. In one of these events, which occurred in 1993, a non-IFR rated helicopter pilot encountered IMC conditions in a non-IFR-equipped helicopter. The pilot reported that, although he knew weather conditions along his route of flight were poor, "... [I] still took off, knowing the conditions that were waiting for me." During the en route phase of the flight, the pilot and his passenger encountered rising terrain and lowering ceilings:

"I was still stupidly flying at 100 knots, then ... poof! Into the clouds, ground contact was lost. I knew 'down' meant death, so I, a lowly VFR-only pilot, pulled aft cyclic and climbed into the clouds. Thank God I [had] about ... 12 hours instrument training and knew enough to go to the attitude indicator immediately where I stayed until breaking out in what seemed an eternity later, though probably less than a minute. I've read about the article stating that my life span upon entering the clouds was 178 seconds so I suppose that if I'm ever stupid enough to do this again, I now have only about 108 seconds to live."

Another ASRS reporter was operating an EMS helicopter in weather that had deteriorated to approximately 700 feet (214 meters) overcast and two miles (3.2 kilometers) visibility, when:

"Suddenly the visibility dropped to less than a mile and I made the mental decision to make a 180-degree turn. ... I started a right turn ... about halfway through the turn we went solid [IMC]. I elected to fly the aircraft and continue my turn and initiate a climb to a higher altitude. I contacted departure, told him of my approximate location and intentions. ... He had me in radar contact. Our first clearance was for the ILS 12 Left approach. I responded several minutes later that we would not be able to accept the ILS approach and was offered an ASR [airport surveillance radar] approach to Runway 23. We broke out at 1,900 feet [580 meters] MSL [mean sea level] and three

[miles] to four miles [4.8 kilometers to 6.4 kilometers] from the runway. The controller did an excellent job on the approach. This problem was encountered due to flying in marginal weather conditions. It would not have happened if we [had] waited until later in the day or until the next day when conditions would have greatly improved, or if we [had] turned around sooner than we did."

Another reporter operating in marginal weather lost all ground reference at 400 feet above ground level (AGL) during a take-off from an airport. He reported that:

"I immediately climbed and contacted a military approach facility and advised inadvertent [IMC], position and request. They assisted me immediately. I made an approach back to my departure airport. While approaching the missed approach point, the crew and I observed the runway lights and beacon. I turned to prepare for landing but lost sight of the airport. I did, however, see a light in a yard of a home I recognized at one [mile] to two miles from the airport and landed in a large farm field behind the home. Although the ship was not IFR-certified, it was fully equipped, [and] this situation had been previously addressed and rehearsed. An instrument rating, planning for inadvertent weather and current approach plates kept a bad situation from ending in disaster."

The first line of defense against inadvertent IMC for any pilot is to take all necessary steps to avoid the situation. Thorough weather planning is perhaps the most important step, and that includes a working knowledge of weather charts, reports and forecasts, along with local weather trends.

Another important defense against inadvertent IMC is a willingness to land the aircraft.

Such willingness runs counter to the pressures pilots sometimes feel to meet schedules, complete their missions and show that they are equal to any situation. Another FAA publication, *Aeronautical Decision Making for Helicopter Pilots*, includes "Get-there-itis" among its list of "classic piloting psychological pitfalls." The manual says that "this 'disease' ... clouds the vision and impairs judgment by causing a fixation on the original goal or destination, combined with a total disregard for any alternative courses of action."<sup>6</sup>

If a helicopter pilot experiences a lowering ceiling and reduced visibility, and changing course does not improve the situation, he or she should consider making an off-site landing to avoid scud running or inadvertent IMC. (*Aeronautical Decision Making for Helicopter Pilots* defines scud running as "pushing the capabilities of the pilot and the aircraft to the limits by trying to maintain visual contact with the terrain while trying to avoid physical contact with it. This attitude is characterized by the old pilot's joke: 'If it's too bad to go IFR, we'll go VFR.'")

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***A working knowledge of weather charts, reports and forecasts, along with local weather trends, can help avoid an inadvertent IMC encounter.***

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Despite thorough planning and adherence to weather minimums, it is possible for helicopter pilots to enter inadvertent IMC. McCann described his own experience:

"I was flying a single-engine turbine helicopter that was not instrument certified, although I was instrument rated and current. During a night EMS hospital transfer I called ATC for permission to transit an airport traffic area. The tower informed me that the weather on the field was variable 1,200 [feet (366 meters)] to 1,500 [feet (458 meters)] overcast and five miles [eight kilometers] visibility. I crossed the field about 900 feet [275 meters) AGL and had gone about another five miles when without warning the visibility went to zero. I was over a sparsely populated area with few ground lights and the weather was totally undetectable. I knew there were towers in the area that were 500 [feet (153 meters)] to 1,000 feet [305 meters] tall. I considered making a 180-degree turn to try to get out of the weather, but because of the towers I decided against that course of action. So I went wings-level, brought the power into the top of the green and began a climb. After about a minute, I broke out on top with the moon overhead. During the climb, the medical crew wanted to know if they should call the hospital and explain our situation. I considered that a distraction, and asked them to stay cool and be quiet.

"Once we were on top, I called ATC and told them our situation, informing them that although I was current, the aircraft was not equipped for IFR. They vectored me to a location where I could make a VFR let-down. I had recently been employed by a helicopter airline and was very IFR proficient. I think the outcome could have been very different if the event had occurred a year later, when I was no longer as proficient in IMC flight."<sup>7</sup>

Instrument currency and proficiency, not just being instrument rated, are the key. The NTSB EMS helicopter study noted that "13 of the 15 pilots involved in [weather-related] accidents had instrument ratings, but only one was current for instrument flight in helicopters. Instrument ratings provide no assurance that a noncurrent pilot will be capable of controlling a VFR helicopter in IFR conditions."<sup>8</sup>

The pilot's actions — immediately after becoming IMC — will determine the outcome of the event. Trained and proficient pilots, who have a plan of action in the event of inadvertent IMC, are more likely to experience a successful outcome. Most flight schools teach a method known as the "four Cs," — control, climb, course and communicate.

The first priority for the pilot is to *control*, or fly, the aircraft. Spatial disorientation can occur at the moment of inadvertent IMC. Suddenly entering a cloud or fog creates an illusion of pitching up. Not realizing this, a pilot may abruptly begin a descent by pushing the aircraft nose-down.

FAA Advisory Circular 60-4A, *Pilot's Spatial Disorientation*, reported that "during a recent five-year period, there were almost 500 spatial disorientation accidents in the United States. Tragically, such accidents resulted in fatalities [more than] 90 percent of the time. Tests conducted with qualified instrument pilots indicate that it can take as much as 35 seconds to establish full control by instruments after the loss of visual reference with the surface."<sup>9</sup> And those tests were conducted in fixed-wing aircraft, which are inherently stable in flight. To establish full control by instruments in a helicopter, which is inherently unstable, could take even longer.

The pilot should shift his full attention to the instruments and begin a scan. Continuing VFR flight into IMC is "even more dangerous if the pilot ... is unwilling to believe what the gauges are indicating," reports *Aeronautical Decision Making for Helicopter Pilots*.<sup>10</sup> The importance of first getting control of the aircraft by reference to instruments cannot be overemphasized.

As soon as the aircraft is under control by reference to instruments, a *climb* should be initiated. Often, inadvertent IMC encounters occur at low altitudes where flight into terrain is a threat if the aircraft is in even a slight descent. The pilot should initiate a controlled climb to an altitude that will provide obstruction clearance in the area of operation.

After the aircraft is in a controlled climb, the pilot can elect to turn carefully to a new *course* if known obstructions are ahead, or if the pilot believes weather will improve in a different direction.

After the pilot has control of the aircraft, has started a climb, and is on course, she should *communicate* with ATC, state her intentions and request any assistance desired. According the FAA's handbook, *Air Traffic Control*, when a pilot notifies ATC that he is in inadvertent IMC, the controller is instructed to "ask the pilot if he is qualified for and capable of conducting IFR flight." If the pilot responds affirmatively, the controller should instruct the pilot to file an IFR flight plan and will then issue an IFR clearance.

If the pilot says that he is not qualified for or capable of conducting IFR flight, the controller should "inform the pilot of the appropriate terrain/obstacle clearance minimum altitude. If the aircraft is below [the clearance minimum], furnish a heading or radial on which to climb to reach appropriate terrain/obstacle clearance minimum altitude." Controllers are also instructed to avoid unnecessary radio frequency changes, requiring a climb or descent during a turn, and abrupt maneuvers. Vectors to VFR conditions should follow.<sup>11</sup> Most important, pilots must make a conscious decision to develop good judgment to complement good flying skills.♦

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## Additional Reading from FSF Publications

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## About the Author

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### HELICOPTER SAFETY

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