# VFR into IMC

## Helping students avoid GA's number one killer

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In spite of safety improvements over the years, continued visual flight rules (VFR) flight into instrument meteorological conditions (IMC) still remains the number one cause of fatal general aviation aircraft accidents. A VFR-into-IMC accident occurs on average about once a week in the United States. Unfortunately, compared to a fatality rate of about only 19 percent for other GA accidents, 80 percent of these accidents result in fatalities. That's because pilots who attempt VFR flight into IMC either fly under controlled flight into terrain (CFIT) or experience spatial disorientation resulting in uncontrolled flight into terrain.

Most of these accidents involve relatively low-time inexperienced private pilots, but an AOPA Air Safety Foundation study found that more than a third involve pilots with more than 1,000 hours of flight time. Commercial pilots aren't immune either. Worldwide,

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VFR-into-IMC accidents are responsible for about 20 percent of commercial CFIT accidents, while in the United States they were recently responsible for about half of the state of Alaska's fatal air taxi and two-thirds of its fatal commuter airline accidents.

Statistics indicate that we are doing a fairly good job of shielding student pilots from these types of accidents, but once they leave the confines of the supervised and protected flight-training environment, their risk of becoming a statistic dramatically increases. As professional flight instructors, we have a critical role in preparing our students to avoid a fatal encounter with adverse weather. As our students first line of defense, we must familiarize ourselves with the nature of this hazard so we can better prepare our students avoid it.

## Environmental Factors

The first obvious factor in these accidents is the presence of adverse weather in the form of cloud, fog, or other precipitation that reduces ceiling and visibility values below regulatory VFR weather minimums. These minimums are established in the belief that pilots will have adequate visual reference to safely maneuver their aircraft. However, VFR-into-IMC accidents have occurred in weather conditions that were higher than legal VFR weather minimums. Also, recent research indicates that pilots aren't good at judging ceiling and visibility from a moving airplane, and the ability to accurately do so is a crucial component in avoiding an accident. University of Illinois researchers recently had pilots fly a simulated VFR flight in weather conditions that deteriorated to below-VFR minimums en route. They found that most pilots overestimated both visibility and ceiling values, but those who continued to fly into simulated adverse weather had significantly higher estimates of flight visibility. Other research confirms that a major reason pilots, especially inexperienced ones, continue flying into deteriorating weather is their inability to determine when they are in or nearing IMC.

Flying at night also increases the risk—by at least a factor of three. Approximately 10 percent of GA flight operations take place at night, yet about a third of these types of accidents occur after dark. Adding mountains to the mix significantly raises the risk. Eight of the 10 states with the highest VFR-into-IMC accident rates are located in designated mountainous areas. Moisture-laden Pacific air arriving over the mountains of the western United States and Canada is particularly troublesome. Low-pressure systems and frontal weather reduce visibilities and create ceilings below the mountaintops, severely limiting options for successful VFR flight. Too many pilots have met their fate while attempting to scud run beneath clouds in narrow, winding mountain passes. Pilots fly into dead-end valleys where the terrain rises at a steeper rate than their aircraft can climb, or into narrow valleys where there is no room to turn around. Many VFR-into-IMC accidents have occurred after the pilot initiated a 180-degree turn.

## Psychological Aspects

We can get trapped not only by the weather, but also by our own thinking. For example, most GA pilots believe they possess greater flying skill, are less likely to take risks in flight, and are less likely than their peers to experience an aircraft accident. Research conducted by my colleague and me also confirms that most VFR pilots believe they are less likely than others to experience a VFR-into-IMC accident and believe they are more capable than others at both avoiding and successfully flying out of IMC.

How we *frame* our go/no-go decisions can also bias our choices. For example, if you had a choice between a sure win of $85 and an 85 percent chance to win a $100, which would you choose? Most of us would avoid the risk and take the sure gain of $85 (*risk averse*). How about a choice between a sure loss of $85 and an 85 percent chance of losing $100? Most of us would choose the risk of losing the $100 (*risk seeking*). Research has discovered that if we frame our go/no-go decision in terms of the certain loss of unwanted overnight motel expenses and missed appointments over only a chance of a loss (i.e., an accident), we will likely avoid

the sure loss of diverting and try to make it to our destination. If we frame our decision in terms of the certain gain of landing safely over only a chance of a gain (i.e., successfully making it to our destination), we are more likely to divert to the nearest suitable airport and wait it out.

Another bias occurs when we have too much invested to quit a given a course of action even if it's a failing one. A student of mine was driving late one night in his car, and his gas gauge indicated near empty. He was in the middle of nowhere and didn't know if he would find a gas station before he ran out of fuel. If he turned around, he would likely make it to a station he had passed about 15 minutes earlier but struggled with the decision because all of the time and resources invested would be wasted. This *entrapment* bias makes it difficult for pilots to turn back in the face of deteriorating weather and is one of many complex and usually unconscious psychological factors that influence our decision to press on, a condition known as *get-home-itis*. Recent statistics also confirm that many of these accidents occur on the last leg of a return trip (*last-leg syndrome*) because the desire to get home overrides a pilot's ability to make a sound go/no-go decision.

Statistics also indicate that compared to other GA accidents, a significantly higher proportion of VFR-into-IMC accident flights carry passengers on board. That means that the presence of others (e.g., friends, family, employer) can negatively influence our go/no-go decisions. The accident record is replete with examples of how others' expectations led to poor decisions by pilots. Without even being aware of it, other people can make our decisions for us. We are, in effect, no longer flying the airplane. *They* are.

## Training Students

What can you do to protect your students from this hazard? The following tips may aid you in helping them avoid a VFR-into-IMC accident.

*1. Insist your students always get weather briefings.* Even if it's just pattern practice, not only will they determine if the weather is suitable for flight, but the more briefings they get, the more knowledgeable your students will become about weather. Ensure they obtain weather advisories on a regular basis from Flight Watch to alert them of any significant changes in the weather ahead, especially ceiling and visibility values. Help them to recognize the signs of deteriorating weather through accurate interpretation of METARs, TAFs, and FAs. Make sure they learn how to see the big picture to understand what's causing the adverse weather.

*2. Help them understand that a good pilot never stops learning about weather.* Encourage them to take a college-level weather course to learn all they can about meteorological processes. Help them make basic rule-of-thumb predictions based on existing weather conditions so they can become what every successful pilot is—an amateur weather forecaster. It will then become easier for them to recognize the signs of deteriorating weather both by visual observation and through proper interpretation of aviation weather reports and forecasts.

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*3. Help them establish personal weather limits.* Experienced pilots know the value of establishing personal weather minimums and sticking to them. The FAA has an excellent online tutorial (*http://flysafe.faa.gov*) that takes pilots through a personal minimums checklist to help avoid inadvertent flight into IMC. Adhering to their own miminums, even if the pressure is on to keep going, will also prevent them from scud running at low altitude under the clouds, a practice responsible for countless VFR-into-IMC accidents.

*4. Alert them to the risks of night flying.* Explain the inherent risks of flying at night and why their personal weather minimums need to be higher. Show your students how to fly above minimum terrain and obstacle clearance altitudes (or minimum IFR altitudes if instrument-rated), and stress the importance of remaining over well-lighted areas if possible. It's more difficult to see clouds at night, so ensure your students are proficient in conducting a 180-degree turn on instruments.

*5. Provide thorough mountain-flying training.* If your students must fly over mountainous terrain, make sure they receive extensive mountain flying training from a qualified and experienced instructor (which might not be you). Unfortunately, this is an area where a little knowledge can be dangerous, so consider several days (at least one day) of both ground and in-flight training. Not only will such training help students appreciate and manage the hazards of mountain flying in good weather (downdrafts, poor aircraft performance, turbulence, and steep and narrow valleys), but it will also instill in them a sober realization of the increased risks when the weather is iffy. In Canada, many experienced mountain pilots use personal weather minimums of 2,000-foot ceilings and 5 miles visibility in mountainous regions—it should obviously be higher for inexperienced pilots. There are guidelines when traversing mountain passes below a ceiling, and the practice can be done safely only if (1) the ceiling and visibility are good and will remain so, (2) there is plenty of altitude between you and the surface and/or obstructions (power lines), and (3) there is sufficient room to do at least a 180-degree standard-rate turn.

*6. Teach marginal-weather avoidance.* As flight instructors we usually don't fly in weather conditions we wouldn't allow our students to fly in because we want to set a good example by modeling safe flying behavior to them. The hoped-for benefit is that once on their own they will fly only in good weather, thereby avoiding a VFR-into-IMC accident. However, sooner or later they will encounter unforeseen marginal weather and will need to know how to deal with it. Since research indicates the ability to accurately assess marginal visibility and ceiling values is an important skill in avoiding a VFR-into-IMC accident, there is value in exposing your students to some actual marginal VFR weather. As with stall/spin training, it is important your students understand that flying in marginal weather is not the norm for VFR operations and exposing them to this kind of weather is only designed to help them recognize, avoid, and extricate themselves from such weather should they encounter it. That said, instructors should avoid flying in marginal weather for routine lessons. Such training should help your students accurately judge ceiling and visibility values, recognize when the weather is at legal and personal weather minimums, determine minimum safe altitudes, and recognize and plan a safe way out. They can also be taught how to avoid overflying their visibility (like overdriving your headlights at night in a car) by slowing down and maneuvering at lower cruise speeds. Actual exposure to marginal weather conditions should also hit home the dangers of scud running, especially at night or in the mountains.

*7. Encourage them to obtain an instrument rating.* There's no doubt about it, instrument-rated pilots find themselves in fewer VFR-into-IMC accidents than their non-instrument-rated peers. That's because they're more likely to use that rating in marginal VFR weather. Keeping instrument-current and filing IFR whenever the weather looks questionable is a sure way to avoid the hazards of scud running at low altitudes.

*8. Teach them how to conduct a precautionary landing.* If filing IFR is not an option and your student finds the weather quickly closing in around them, they should consider a precautionary landing. Teach them how to judge field length, surface condition, and obstacles when conducting an off-airport landing. Landing in a farmer's field may be their safest option.

*9. Convince students that they can be their own worse enemy.* Unfortunately, even in the face of gradually deteriorating weather, most of us are already biased to continue. Not only do we believe we're unlikely to experience a VFR-into-IMC accident (*invulnerability*), we're convinced we can avoid it or successfully fly out of it (*macho*). The framing and entrapment biases also make it difficult for us to divert even in the face of evidence that we should. Pressure from others and from ourselves is a major cause of VFR-into-IMC accidents. When faced with pressure from others, students should eschew the risk of continued flight into deteriorating

weather and risk being unpopular instead. If something's not safe, as pilot in command they have the decision-making authority to change that. They should not let a family member, a friend, a boss, or even a more experienced pilot make their decisions for them. If they're uncomfortable about the weather, encourage them to trust their intuition, knowing that if it doesn't feel right it probably isn't no matter what someone else may think.

*10. Encourage them to ask for help.* Your students shouldn't wait until it's too late to ask ATC for a flight assist. ATC can vector them around bad weather, give minimum IFR obstacle clearance altitudes, and provide an IFR clearance if they elect to climb through the cloud to avoid a possible CFIT accident. It's important they're not more afraid of the possible repercussions than the hazardous weather itself. It's true they may get a follow-up call from the FAA after requiring priority assistance, but unless they're a repeat offender or if it is clearly a case of willful, careless, or reckless operation of the aircraft, that is about all they will get. The FAA's philosophy is they would rather a pilot learn from the situation to hopefully prevent reoccurrence, rather than take enforcement action. Pilots need to ask which is worse: a talk with the FAA or a fatal accident?

Learning to recognize adverse weather before they get into it and sticking to their personal weather minimums—especially at night or in the mountains—will go a long way in reducing the risk for your students. Obtaining an instrument rating and filing IFR in marginal weather provides extra insurance. Most importantly, recognizing that our decision-making is suspect and often unconsciously influenced by others is the first step in making better decisions. Despite what we've been told, VFR flight in a light aircraft is one of the least reliable forms of transportation. If we really *must* be somewhere, we should choose another mode of transportation. "If you have time to spare, take to the air." No truer adage has been said about VFR flight. The sooner our students accept that the safer they'll be.

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