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# Aviation Safety: VFR into IMC Accidents

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**AVIATION SAFETY:**  
**VFR Into IMC Accidents**

Introduction

Aviation is one of the safest forms of transportation. In fact, general aviation (all flying except airlines and military) just recorded its safest year since the 1950s. The accident rate for 1992 was 7.19 per 100,000 flight hours with the fatal accident rate at 1.50 per 100,000 hours. 1993 data is still being compiled (Landsberg 1993).

A few years ago, the National Transportation Safety Board (NTSB) released a special study about accidents involving Visual Flight Rules (VFR) flight into Instrument Meteorological Conditions (IMC). Between 1975 and 1986, VFR into IMC conditions accounted for 4% of all general aviation accidents but accounted for 17% of all general aviation fatalities. While preventing VFR into IMC accidents would not lower the overall accident rate by much, it would significantly improve general aviation's fatal accident rate. This paper will take a close look at VFR into IMC accidents and possible ways of reducing the amount of those types of accidents (NTSB 1989, 1).

### Definitions

All flying is done under one of two sets regulations: Visual Flight Rules (VFR) or Instrument Flight Rules (IFR). When a pilot begins his or her flight training, all flying is done under VFR. To operate under IFR, a pilot must possess an Instrument Rating. The requirements for this rating are spelled out in Federal Aviation Regulation Part 61. In order to obtain this rating, a pilot must have at least 125 hours, 40 of which must be done by using instrument references only (DOT 1993).

When flying under VFR, a pilot relies on visual references outside the airplane. The pilot needs to see the ground and the horizon to maintain straight and level flight. In addition, ground references are used to assist in terrain avoidance and navigation.

While flying IFR, a pilot relies on flight instruments for indications of the airplane's attitude, altitude, position, and other information. Since it takes at least 40 hours of flying by only instrument references to obtain an instrument rating, one can imagine that it is not an easy skill to acquire.

The University of Illinois conducted a study about instrument flying. They wanted to determine how long a pilot who has no instrument training could expect to live after flying into bad weather and losing visual contact with the ground. Twenty student "guinea pigs" flew into simulated instrument weather and all went into graveyard spirals or lost control of the airplane. The only difference between the students was the

time until they lost control of the airplane. The average time until this occurred was two minutes and 58 seconds (FAA 1986, 1).

The regulations defining VFR and IFR flight are very specific. Chapter 14 of the Code of Federal Regulations outlines aviation regulations. Part 91 of that code contains "General Operating and Flight Rules" for general aviation aircraft. Federal Aviation Regulation 91.155 gives the basic VFR weather minimums.

The weather conditions necessary for VFR flight depend on many different factors. The type of airspace the airplane is operating in effect the VFR weather minimums. The least restrictive cases are when an airplane is required to only have one mile of visibility while remaining clear of the clouds. The most restrictive VFR weather minimum occurs above 10,000 feet where to maintain VFR, a pilot must have at least five miles of visibility and be at least one mile of horizontal distance from the clouds. At these altitudes, there are faster planes as well as more IFR traffic.

The primary reason for increased weather minimums where IFR traffic is flying is to ensure separation between airplanes. VFR aircraft must have time to see IFR traffic emerging from clouds and react by maneuvering the airplane to avoid a collision. Since there have been a relatively small number of collisions between IFR and VFR traffic, these minimums have working relatively well. However, these weather minimums have not avoided VFR into IMC accidents.

National Transportation Safety Board Study

In 1989, the National Transportation Safety Board released a report titled "General Aviation Accidents Involving Visual Flight Rules Flight into Instrument Flight Conditions." The report presented a compilation of statistics from the NTSB's Aviation Accident Data System. It analyzed 361 accidents that occurred between 1983 and early 1987 in which VFR flight into IMC was listed as the probable cause or a related factor. 276 of these accidents were fatal with a total of 583 fatalities. 94 percent involved airplanes with the remainder involving helicopters (NTSB 1989, 1-14).

There are several different typical outcomes of these accidents. One type is when a pilot enters the clouds or poor visibility and loses control of the aircraft. Another type is where the pilot flies at low altitudes to avoid the clouds and runs into terrain or an obstacle.

The NTSB study produced many facts that were common to a large number of the accidents. For example, it was determined that for 40 percent of the accident pilots, there was no record of any pre-flight weather briefing (NTSB 1989, 6). Not only is the failure to get a complete weather briefing foolish, it is illegal. Federal Aviation Regulation 91.103 reads, "Each pilot shall, before beginning a flight, become familiar with all available information concerning the flight. This information must include...for a flight under IFR or a flight not in the vicinity of an airport, weather reports and forecasts..." (DOT 1993).

Pilot experience also plays a factor in many of the accidents. The NTSB study provided raw numbers which can be used to help identify certain characteristics of pilots who were involved in "VFR flight into IMC" accidents:

71% held a Private Pilot Certificate

52% had less than 500 total flight hours

46% had less than 100 flight hours in the type aircraft

77% were not instrument rated

57% had less than 20 hours of instrument flight time

While the NTSB study provided some information, it left many questions unanswered. NTSB Member Lemoine V. Dickinson was critical of the study for not going beyond the presentation of statistics and charts. He said, "I do not believe that we have analyzed the reasons that these accidents have occurred. It was my understanding that this was the purpose of this safety study and not just a compilation of several years worth of accident data." (NTSB Reporter 1989, 1).

One report that did make a few recommendations as to how to avoid VFR into IMC type accidents was produced by NASA's Aviation Safety Reporting System. The ASRS takes anonymous reports from pilots and air traffic controllers. They are submitted voluntarily when an airmen feels an unsafe condition existed. The ASRS uses these reports on occasion to study various safety problems.

A few years ago, they released "A Study of ASRS Reports

Involving General Aviation and Weather Encounters." The report describes a typical VFR into IMC encounter. "The pilot checked the weather with Flight Service and the forecast was for VFR. He took off and either encountered low visibility conditions or a cloud deck losing in beneath him. He continued in IMC or marginal VFR before electing to execute a return to VMC. He landed at an enroute airport or received an assist from air traffic control for vectors to his destination airport." (Hardy 1990, 162). Keep in mind that these reports came from time when a pilot felt an unsafe situation had happened as opposed to NTSB reports which happen only after an accident.

The ASRS study recommend that weather information could be improved. Weather reports, such as surface observations and pilot reports, need a better system of dissemination, the report concluded. It also said that pilot education of ways to receive weather information via the radio should be improved.

It is important to note that all aircraft do not have enough proper equipment to be certified for instrument flight. Instruments such as an artificial horizon or gyroscopic direction indicator are needed for instrument flying but are not found in a lot of smaller airplanes. But their presence in the plane does not necessarily prevent VFR into IMC accidents. An astonishing 72 percent of the accident aircraft were equipped for instrument flight (Golbey 1990, 116).

One good item to note about VFR into IMC accidents is that they are not a common as they used to be. For example, while the general aviation accident rate was reduced by 37 percent

between 1975 and 1986, the VFR flight into IMC accident rate decreased by 64 percent (Horne 1993, 112).

### Possible Solutions

As is the case with most pilot-related accidents, VFR into IMC accidents are almost entirely preventable. I believe there are several different things that can be done to reduce the occurrence of VFR into IMC accidents.

I feel that the dangers of flying into the clouds or areas of deteriorating weather are known by most pilots. Nevertheless, flight instructors must ensure that all of their students fully understand the hazards of any VFR flight in instrument conditions.

One skill that must be developed by all pilots is the proficiency at acquiring, reading, and interpreting weather information. Ten years ago, there were hundreds of Flight Service Stations which would provide weather information to pilots via the telephone or over the radio while airborne. Today, thanks to the proliferation of personal computers and fax machines, self briefing services are very common. It is important that pilots can understand the significance of the information being presented.

One startling fact is that pilots could miss every weather question on the FAA written tests and still receive a Pilot Certificate. For example, since a passing score on a written test (which is a requirement for earning a new certificate) is

70%, a pilot could conceivably miss every question dealing with meteorology on a test and still pass. However, flight instructors are required to discuss with students the subject areas in which they were found deficient on the written test. It is up to instructors to ensure that students know and understand weather thoroughly.

For people who are already pilots, there are some ways to make sure they stay proficient in making decisions in regards to flying in less than ideal weather. All pilots must go through a Biennial Flight Review every 24 months. This is one time when their weather knowledge can be tested. Also, the FAA and other aviation organization offer seminars across the nation dealing with a variety of topics. Since, according to the Aircraft Owners and Pilots Association (AOPA) Air Safety Foundation, weather is a factor in 40 percent of all general aviation accidents, it is a frequent topic in these meetings.

A good pre-flight weather briefing does not negate the possibility of encountering poor weather conditions in flight. Pilots must develop the judgement required to respond appropriately to in-flight situations like deteriorating weather. If the flight visibility is restricted by haze, fog, or rain, a pilot attempting to remain below a cloud layer will see the ground reference points disappear behind in the restricted visibility that the aircraft has just penetrated. This often creates an illusion that can lead the pilot to believe that conditions behind are worsening. Contributing to this illusion is the appearance that conditions ahead are

improving because the forward motion of the aircraft causes progressively more of the terrain ahead to come into view. Because of this, the pilot is reluctant to turn back ("Special" 1989, 3).

There are also many psychological reasons why a pilot would attempt to continue a flight in worsening weather. One such factor is "Get-home-itis." This happens when there is pressure to complete a flight due to passengers, flight schedules, meetings that can't be missed, jobs that have to be done, or just the fact that the pilot really wants to get home. This pressure to complete the flight is often a powerful one and a whole paper could be devoted to it.

To obtain a Private Pilot Certificate, a pilot must be able to demonstrate the following maneuvers while flying solely by reference to the instruments: straight and level flight, straight climbs and descents, and constant rate turns to heading. These maneuvers should be enough to enable a pilot, who has flown into a cloud or an area of poor visibility, to execute a 180 degree turn by using the instruments. This should allow a return to VMC.

These requirements are just bare minimums. Recovery from unusual attitudes, which would be used if a pilot loses control, should also be taught. These recoveries could be the last chance to avoid another VFR into IMC accident.

Conclusions

VFR into IMC accidents seem to be preventable. With the proper education, everyone should be made aware of the dangers of flying into areas of deteriorating weather.

All pilots should become somewhat proficient in instrument flying. At the least, they should be able to execute a 180 degree turn to return to VMC conditions as well as recover from unusual attitudes.

Pilots must also be able to recognize and accept the seriousness of flying into poor weather and recognize the need for immediate action to ensure the aircraft gets safely on the ground.

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